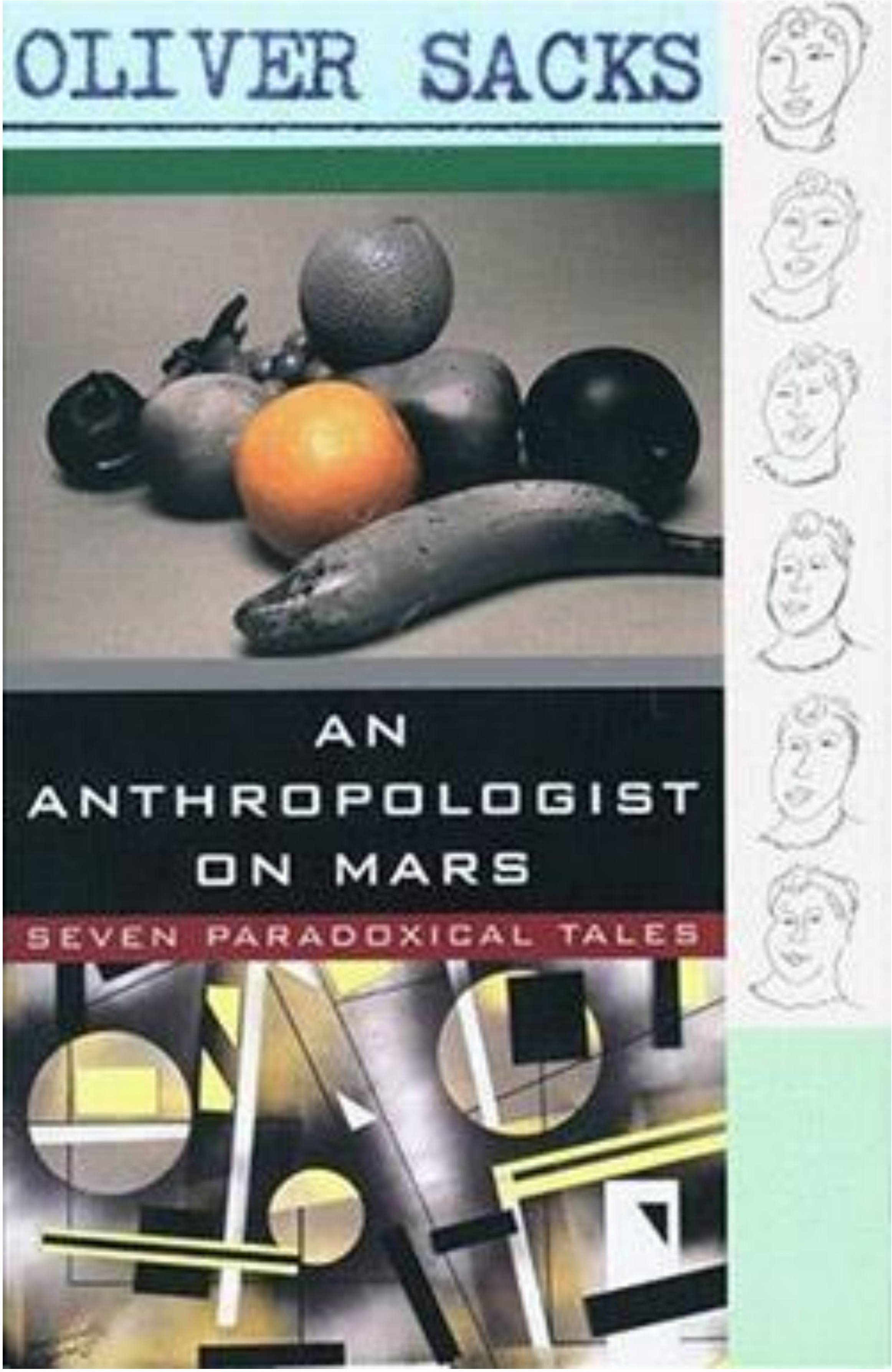

OLIVER SACKS

AN ANTHROPOLOGIST ON MARS

SEVEN PARADOXICAL TALES

An Anthropologist on Mars

SEVEN PARADOXICAL TALES

Oliver Sacks

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To the seven whose stories are related here

The universe is not only queerer than we imagine, but queerer than we can imagine.

J . B. S. Haldane

Ask not what disease the person has, but rather what person the disease has.

(attributed to) William Osler

Contents

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But to return to where I started-for all clinical studies, however widely theyadventure, or deeply they investigate, must return to the concrete subject,

the individuals who inspired them, and whom they are about. So to the sevenpeople who have trusted me, shared their lives with me, given so deeply oftheir own experience-and who, over the years, have become my friends-I dedicate this book.

Preface

I am writing this with my left hand, although I am strongly right-handed. Ihad surgery to my right shoulder a month ago and am not permitted, not capableof, use of the right arm at this time. I write slowly, awkwardly-but moreeasily, more naturally, with each passing day. I am adapting, learning, allthe while-not merely this left-handed writing, but a dozen other left-handedskills as well: I have also become very adept, prehensile, with my toes, tocompensate for having one arm in a sling. I was quite off balance for a fewdays when the arm was first immobilized, but now I walk differently, I havediscovered a new balance. I am developing different patterns, differenthabits& a different identity, one might say, at least in this particularsphere. There must be changes going on with some of the programs and circuitsin my brain-altering synaptic weights and connectivities and signals (thoughour methods of brain imaging are still too crude to show these). Though someof my adaptations are deliberate, planned, and some are learned through trialand error (in the first week I injured every finger of my left hand), mosthave occurred by themselves, unconsciously, by reprogrammings and adaptationsof which I know nothing (any more than I know, or can know, how I normallywalk). Next month, if all goes well, I can start to readapt again, to regain afull (and "natural") use of the right arm, to reincorporate it back into my body image, myself, to become a dexterous, dextral human being once again.

But recovery, in such circumstances, is by no means automatic, a simpleprocess like tissue healing-it will involve a whole nexus of muscular andpostural adjustments, a whole sequence of new procedures (and theirsynthesis), learning, finding, a new path to recovery. My surgeon, anunderstanding man who has had the same operation himself, said, "There aregeneral guidelines, restrictions, recommendations. But all the particulars youwill have to find out for yourself." Jay, my physiotherapist, expressedhimself similarly: "Adaptation follows a different path in each person. Thenervous system creates its own paths. You're the neurologist-you must see thisall the time."

Nature's imagination, as Freeman Dyson likes to say, is richer than ours, andhe speaks, marvellingly, of this richness in the physical and biologicalworlds, the endless diversity of physical forms and forms of life. For me, asa physician, nature's richness is to be studied in the phenomena of health anddisease, in the endless forms of individual adaptation by which humanorganisms, people, adapt and reconstruct themselves, faced with the challengesand vicissitudes of life.

Defects, disorders, diseases, in this sense, can play a paradoxical role, bybringing out latent powers, developments, evolutions, forms of life, thatmight never be seen, or even be imaginable, in their absence. It is theparadox of disease, in this sense, its "creative" potential, that forms thecentral theme of this book.

Thus while one may be horrified by the ravages of developmental disorder ordisease, one may sometimes see them as creative too-for if they destroyparticular paths, particular ways of doing things, they may force the nervoussystem into making other paths and ways, force on it an unexpected growth andevolution. This other side of development or disease is something I see, potentially, in almost every patient; and it is this, here, which I amespecially concerned to describe.

Similar considerations were brought up by A. R. Luria, who, more than anyother neurologist in his lifetime, studied the long-term survival of patientswho had cerebral tumors or had suffered brain injuries or strokes-and theways, the adaptations, they used to survive. He also studied deaf and blindchildren as a very young man (with his mentor L. S. Vygot-sky). Vygotskystressed the intactness rather than the deficits of such children:

A handicapped child represents a qualitatively different, unique type ofdevelopment& If a blind or deaf child achieves the same level of developmentas a normal child, then the child with a defect achieves this in another way, by another course, by other means-, and, for the pedagogue, it is particularlyimportant to know the uniqueness of the course along which he must lead thechild. This uniqueness transforms the minus of the handicap into the plus ofcompensation.

That such radical adaptations could occur demanded, Luria thought, a new viewof the brain, a sense of it not as programmed and static, but rather asdynamic and active, a supremely efficient adaptive system geared for evolutionand change, ceaselessly adapting to the needs of the organism-its need, aboveall, to construct a coherent self and world, whatever defects or disorders ofbrain function befell it. That the brain is minutely differentiated is clear: there are hundreds of tiny areas crucial for every aspect of perception andbehavior (from the perception of color and of motion to, perhaps, theintellectual orientation of the individual). The miracle is how they allcooperate, are integrated together, in the creation of a self *1*. 1This sense of the brain's remarkable plasticity, its capacity for the moststriking adaptations, not least in the special (and often desperate) circumstances of neural or sensory mishap, has come to dominate my ownperception of my patients and their lives. So much so, indeed, that I amsometimes moved to wonder whether it may not be necessary to redefine the veryconcepts of "health" and "disease," to see these in terms of the ability of the organism to create a new organization and order, one that fits itsspecial, altered disposition and needs, rather than in the terms of a rigidlydefined "norm."

Sickness implies a contraction of life, but such contractions do not have tooccur. Nearly all of my patients, so it seems to me, whatever their problems, reach out to life-and not only despite their conditions, but often because ofthem, and even with their aid.

Here then are seven narratives of nature-and the human spirit-as these havecollided in unexpected ways. The people in this book have been visited byneurological conditions as diverse as Tourette's syndrome, autism, amnesia, and total colorblindness. They exemplify these conditions, they are "cases" inthe traditional medical sense-but equally they are unique individuals, each ofwhom inhabits (and in a sense has created) a world of his own.

These are tales of survival, survival under altered, sometimes radicallyaltered, conditions-survival made possible by the wonderful (but sometimesdangerous) powers of reconstruction and adaptation we have. In earlier books Iwrote of the "preservation" of self, and (more rarely) of the "loss" of self, in neurological disorders. I have to come to think these terms too simple-andthat there is neither loss nor preservation of identity in such situations, but, rather, its adaptation, even its transmutation, given a radically alteredbrain and "reality."

The study of disease, for the physician, demands the study of identity, theinner worlds that patients, under the spur of illness, create. But therealities of patients, the ways in which they and their brains construct their own worlds, cannot be comprehendedwholly from the observation of behavior, from the outside. In addition to theobjective approach of the scientist, the naturalist, we must employ anintersubjective approach too, leaping, as Foucault writes, "into the interiorof morbid consciousness, [trying] to see the pathological world with the eyesof the patient himself." No one has written better of the nature and necessityof such intuition or empathy than G. K. Chesterton, through the mouth of hisspiritual detective, Father Brown. Thus when Father Brown is asked for hismethod, his secret, he replies:

Science is a grand thing when you can get it; in its real sense one of thegrandest words in the world. But what do these men mean, nine times out often, when they use it nowadays? When they say detection is a science? Whenthey say criminology is a science? They mean getting outside a man andstudying him as if he were a gigantic insect; in what they would call a dryimpartial light; in what I should call a dead and dehumanized light. They meangetting a long way off him, as if he were a distant prehistoric monster; staring at the shape of his "criminal skull" as if it were a sort of eerie growth, like the horn on a rhinoceros's nose. When the scientist talks about atype, he never means himself, but always his neighbour; probably his poorer neighbour. I don't deny the dry light may sometimes do good; though in one sense it's the very reverse of science. So far from being knowledge, it'sactually suppression of what we know. It's treating a friend as a stranger, and pretending that something familiar is really remote and mysterious. It'slike saying that a man has a proboscis between the eyes, or that he falls down in a fit of insensibility once every twenty-four hours. Well, what you call "the secret" is exactly the opposite. I don't try to get outside the man. Itry to get inside.

The exploration of deeply altered selves and worlds is not one that can be fully made in a consulting room or office. The French neurologist François L hermitte is especially sensitive to this, and instead of just observing his patients in the clinic, he makes a point of visiting them at home, taking them to restaurants or theaters, or for rides in his car, sharing their lives as much as possible. (It is similar, or wassimilar, with physicians in general practice. Thus when my father wasreluctantly considering retirement at ninety, we said, "At least drop thehouse calls." But he answered, "No, I'll keep the house calls-I'll dropeverything else instead.")

With this in mind, I have taken off my white coat, deserted, by and large, thehospitals where I have spent the last twenty-five years, to explore mysubjects' lives as they live in the real world, feeling in part like anaturalist, examining rare forms of life,- in part like an anthropologist, a neuroanthropologist, in the field-but most of all like a physician, calledhere and there to make house calls, house calls at the far borders of human experience.

These then are tales of metamorphosis, brought about by neurological chance, but metamorphosis into alternative states of being, other forms of life, noless human for being so different.

New York O.W.S.

June 1994

Notes

1. This, indeed, is the problem, the ultimate question, in neuroscience-and it cannot he answered, even in principle, without a global theory of brainfunction, one capable of showing the interactions of every level, from themicropatterns of individual neuronal responses to the grand macropatterns ofan actual lived life. Such a theory, a neural theory of personal identity, hasbeen proposed in the last few years by Gerald M. Edelman, in his theory ofneuronal group selection, or "neural Darwinism."

The Case of the Colorblind Painter

Early in March 1986 I received the following letter:

I am a rather successful artist just past 65 years of age. On January 2nd of this year I was driving my car and was hit by a small truck on the passenger side of my vehicle. When visiting the emergency room of a local hospital, I was told I had a concussion. While taking an eye examination, it was discovered that I was unable to distinguish letters or colors. The letters appeared to be Greek letters. My vision was such that everything appeared tome as viewing a black and white television screen. Within days, I could distinguish letters and my vision became that of an eagle-I can see a worm wriggling a block away. The sharpness of focus is incredible. BUT-I AMABSOLUTELY COLOR BLIND. I have visited ophthalmologists who know nothing about this color-blind business. I have visited neurologists, to no avail. Under hypnosis I still can't distinguish colors. I have been involved in all kinds of tests. You name it. My brown dog is dark grey. Tomato juice is black. Color TV is a hodge-podge&

Had I ever encountered such a problem before, the writer continued; could I explain what was happening to him-and could I help? This seemed an extraordinary letter. Colorblindness, as ordinarily understood, is something one is born with-a difficulty distinguishing red and green, or other colors, or (extremely rarely) an inability to see any colors at all, due to defects in the color-responding cells, the cones, of the retina. But clearly this was not the case with my correspondent, Jonathan I. He had seen normally all his life, had been born with a full complement of cones in his retinas. He had become colorblind, after sixty-five years of seeing colors normally- totally colorblind, as if "viewing a black and white television screen." The suddenness of the event was incompatible with any of the slow deteriorations that can befall the retinal cone cells and suggested instead a mishap at a much higher level, in those parts of the brain specialized for the perception of color.

Total colorblindness caused by brain damage, so-called cerebral achromatopsia, though described more than three centuries ago, remains a rare and important condition. It has intrigued neurologists because, like all neural dissolutions and destructions, it can reveal to us the mechanisms of neural construction-specifically, here, how the brain "sees" (or makes) color. Doubly intriguing is its occurrence in an artist, a painter for whom color has been of primary importance, and who can directly paint as well as describe what has befallen him, and thus convey the full strangeness, distress, and reality of the condition.

Color is not a trivial subject but one that has compelled, for hundreds of years, a passionate curiosity in the greatest artists, philosophers, and natural scientists. The young Spinoza wrote his first treatise on the rainbow; the young Newton's most joyous discovery was the composition of white light; Goethe's great color work, like Newton's, started with a prism; Schopenhauer, Young, Helmholtz, and Maxwell, in the last century, were all tantalized by the problem of color; and Wittgenstein's last work was his Remarks on Colour. And yet most of us, most of the time, overlook its great mystery. Through such a case as Mr. I.'s we can trace not only the underlying cerebral mechanisms or physiology but the phenomenology of color and the depth of its resonance and meaning for the individual.

On getting Mr. I.'s letter, I contacted my good friend and colleague Robert Wasserman, an ophthalmologist, feeling that together we needed to explore Mr. I.'s complex situation and, if we could, help him. We first saw him in April1986. He was a tall, gaunt man, with a sharp, intelligent face. Although obviously depressed by his condition, he soon warmed to us and began talking with animation and humor. He constantly smoked as he talked,- his fingers, restless, were stained with nicotine. He described a very active and productive life as an artist, from his early days with Georgia O'Keeffe in New Mexico, to painting backdrops in Hollywood during the 1940s, to working as an Abstract Expressionist in New York during the 1950s and later as an art director and a commercial artist.

We learned that his accident had been accompanied by a transient amnesia. He had been able, evidently, to give a clear account of himself and his accident to the police at the time it happened, late on the afternoon of January 2, but then, because of a steadily mounting headache, he went home. He complained to his wife of having a headache and feeling confused, but made no mention of the accident. He then fell into a long, almost stuporous sleep. It was only the next morning, when his wife saw the side of the car stove in, that she asked him what had happened. When she got no clear answer ("I don't know. Maybe somebody backed into it") she knew that something serious must have happened.

Mr. I. then drove off to his studio and found on his desk a carbon copy of the police accident report. He had had an accident, but somehow, bizarrely, had lost his memory of it. Perhaps the report would jolt his memory. But lifting it up, he could make nothing of it. He saw print of different sizes and types, all clearly in focus, but it looked like "Greek" or "Hebrew" to him.*2* A magnifying glass did not help; it simply became large "Greek" or "Hebrew."

(This alexia, or inability to read, lasted for five days, but then disappeared.)

Feeling now that he must have suffered a stroke or some sort of brain damage from the accident, Jonathan I. phoned his doctor, who arranged for him to be tested at a local hospital. Although, as his original letter indicates, difficulties in distinguishing colors were detected at this time, in addition to his inability to read, he had no subjective sense of the alteration of colors until the next day.

That day he decided to go to work again. It seemed to him as if he were driving in a fog, even though he knew it to be a bright and sunny morning.

Everything seemed misty, bleached, greyish, indistinct. He was flagged down by the police close to his studio: he had gone through two red lights, they said.

Did he realize this? No, he said, he was not aware of having passed through any red lights. They asked him to get out of the car. Finding him sober, but apparently bewildered and ill, they gave him a ticket and suggested he seek medical advice.

Mr. I. arrived at his studio with relief, expecting that the horrible mist would be gone, that everything would be clear again. But as soon as he entered, he found his entire studio, which was hung with brilliantly colored paintings, now utterly grey and void of color. His canvases, the abstract color paintings he was known for, were now greyish or black and white. His paintings-once rich with associations, feelings, meanings-now looked unfamiliar and meaningless to him. At this point the magnitude of his loss overwhelmed him. He had spent his life as a painter; now even his art was without meaning, and he could no longer imagine how to go on.

The weeks that followed were very difficult. "You might think," Mr. I. said, "loss of color vision, what's the big deal? Some of my friends said this, my wife sometimes thought this, but to me, at least, it was awful, disgusting."

He knew the colors of everything, with an extraordinary exactness (he could give not only the names but the numbers of colors as these were listed in a Pantone chart of hues he had used for many years). He could identify the green of van Gogh's billiard table in this way unhesitatingly. He knew all the colors in his favorite paintings, but could no longer see them, either when he looked or in his mind's eye. Perhaps he knew them, now, only by verbal memory.

It was not just that colors were missing, but that what he did see had a distasteful, "dirty" look, the whites glaring, yet discolored and off-white, the blacks cavernous-everything wrong, unnatural, stained, and impure.*3*Mr. I. could hardly bear the changed appearances of people ("like animated grey statues") any more than he could bear his own appearance in the mirror: he shunned social intercourse and found sexual intercourse impossible. He saw people's flesh, his wife's flesh, his own flesh, as an abhorrent grey;

"flesh-colored" now appeared "rat-colored" to him. This was so even when heclosed his eyes, for his vivid visual imagery was preserved but was now without color as well.

The "wrongness" of everything was disturbing, even disgusting, and applied to every circumstance of daily life. He found foods disgusting due to their greyish, dead appearance and had to close his eyes to eat. But this did not help very much, for the mental image of a tomato was as black as its appearance. Thus, unable to rectify even the inner image, the idea, of various foods, he turned increasingly to black and white foods-to black olives and white rice, black coffee and yogurt. These at least appeared relatively normal, whereas most foods, normally colored, now appeared horribly abnormal.

His own brown dog looked so strange to him now that he even considered getting a Dalmatian.

He encountered difficulties and distresses of every sort, from the confusion of red and green traffic lights (which he could now distinguish only by position) to an inability to choose his clothes. (His wife had to pick them out, and this dependency he found hard to bear; later, he had everything classified in his drawers and closet-grey socks here, yellow there, ties labeled, jackets and suits categorized, to prevent otherwise glaring incongruities and confusions.) Fixed and ritualistic practices and positions had to be adopted at the table; otherwise he might mistake the mustard for the mayonnaise, or, if he could bring himself to use the blackish stuff, ketchup for jam.*4*

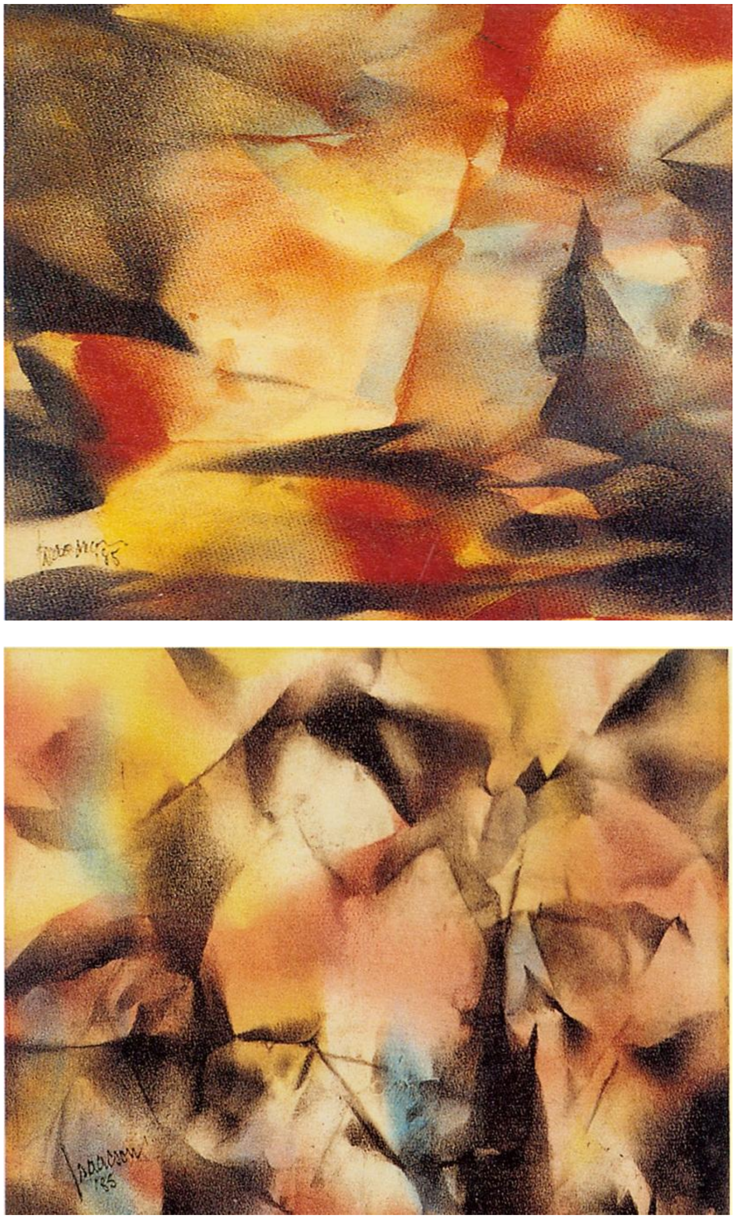
As the months went by, he particularly missed the brilliant colors of spring-he had always loved flowers, but now he could only distinguish them by shape or smell. The blue jays were brilliant no longer,- their blue, curiously, was now seen as pale grey. He could no longer see the clouds in the sky, their whiteness, or off-whiteness as he saw them, being scarcely distinguishable from the azure, which seemed bleached to a pale grey. Red and green peppers were also indistinguishable, but this was because both appeared black. Yellows and blues, to him, were almost white. *5* Mr. I. also seemed to experience an excessive tonal contrast, with loss of delicate tonal gradations, especially in direct sunlight or harsh artificial light; he made a comparison here with the effects of sodium lighting, which at once removes color and tonal delicacy, and with certain black-and-white films-"like Tri-X pushed for speed"-which produce a harsh, contrasty effect.

Sometimes objects stood out with inordinate contrast and sharpness, like silhouettes. But if the contrast was normal, or low, they might disappear from sight altogether.

Thus, though his brown dog would stand out sharply in silhouette against a light road, it might get lost to sight when it moved into soft, dappled undergrowth. People's figures might be visible and recognizable half a mile off (as he himself said in his original letter, and many times later, his vision had become much sharper, "that of an eagle"), but faces would often be unidentifiable until they were close. This seemed a matter of lost color and tonal contrast, rather than a defect in recognition, an agnosia. A major problem occurred when he drove, in that he tended to misinterpret shadows as cracks or ruts in the road and would brake or swerve suddenly to avoid these.

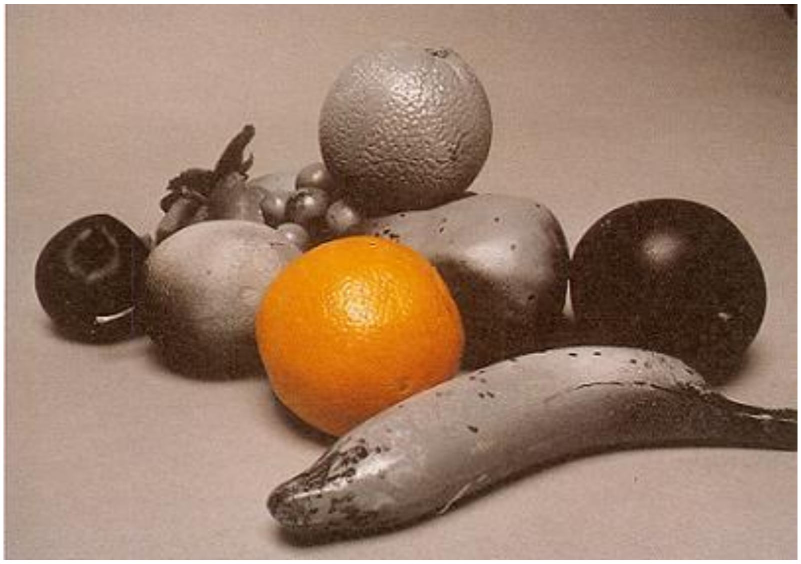
He found color television especially hard to bear: its images always unpleasant, sometimes unintelligible. Black-and-white television, he thought, was much easier to deal with; he felt his perception of black-and-white images to be relatively normal, whereas something bizarre and intolerable occurred whenever he looked at colored images. (When we asked why he did not simply turn off the color, he said he thought that the tonal values of "decolored" color TV seemed different, less "normal," than those of a "pure" black-and-white set.) But, as he now explained, in distinction to his first letter, his world was not really like black-and-white television or film-it would have been much easier to live with had it been so. (He sometimes wished he could wear miniature TV glasses.)

His despair of conveying what his world looked like, and the uselessness of the usual black-and-white analogies, finally drove him, some weeks later, to create an entire grey room, a grey universe, in his studio, in which tables, chairs, and an elaborate dinner ready for serving were all painted in a range of greys. The effect of this, in three dimensions and in a different tonal scale from the "black and white" we are all accustomed to, was indeed macabre, and wholly unlike that of a black-and-white photograph. As Mr. I. pointed out, we accept black-and-white photographs or films because they are representations of the world-images that we can look at, or away from, when we want. But black and white for him was a reality, all around him, 360 degrees, solid and three-dimensional, twenty-four hours a day. The only way he could express it, he felt, was to make a completely grey room for others to experience-but of course, he pointed out, the observer himself would have to be painted grey, so he would be part of the world, not just observing it. More than this: the observer would have to lose, as he himself had, the neural knowledge of color. It was, he said, like living in a world "molded in lead."

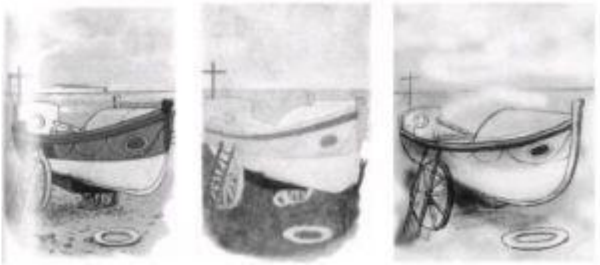


Two paintings done by Mr. I. shortly before his accident.

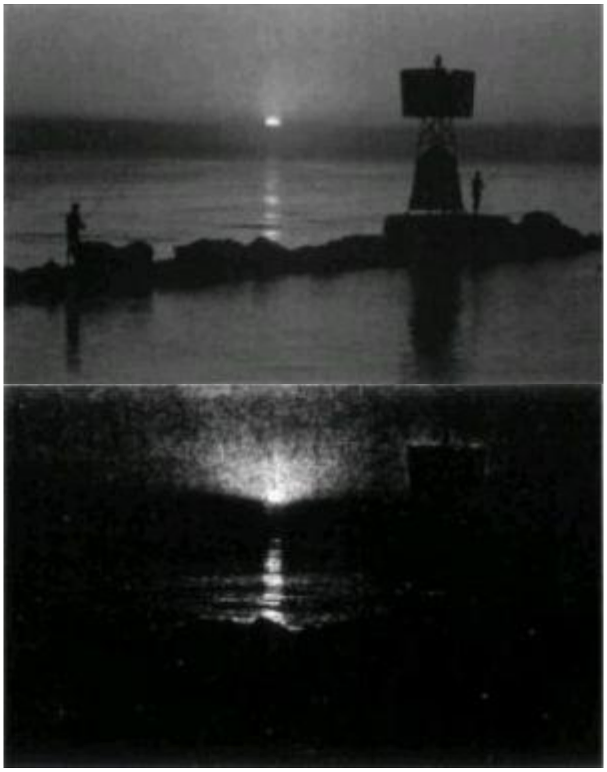
A painting of flowers done four weeks after Mr. I. 's accident. The underlying outlines are clear, but camouflaged by a random application of color.



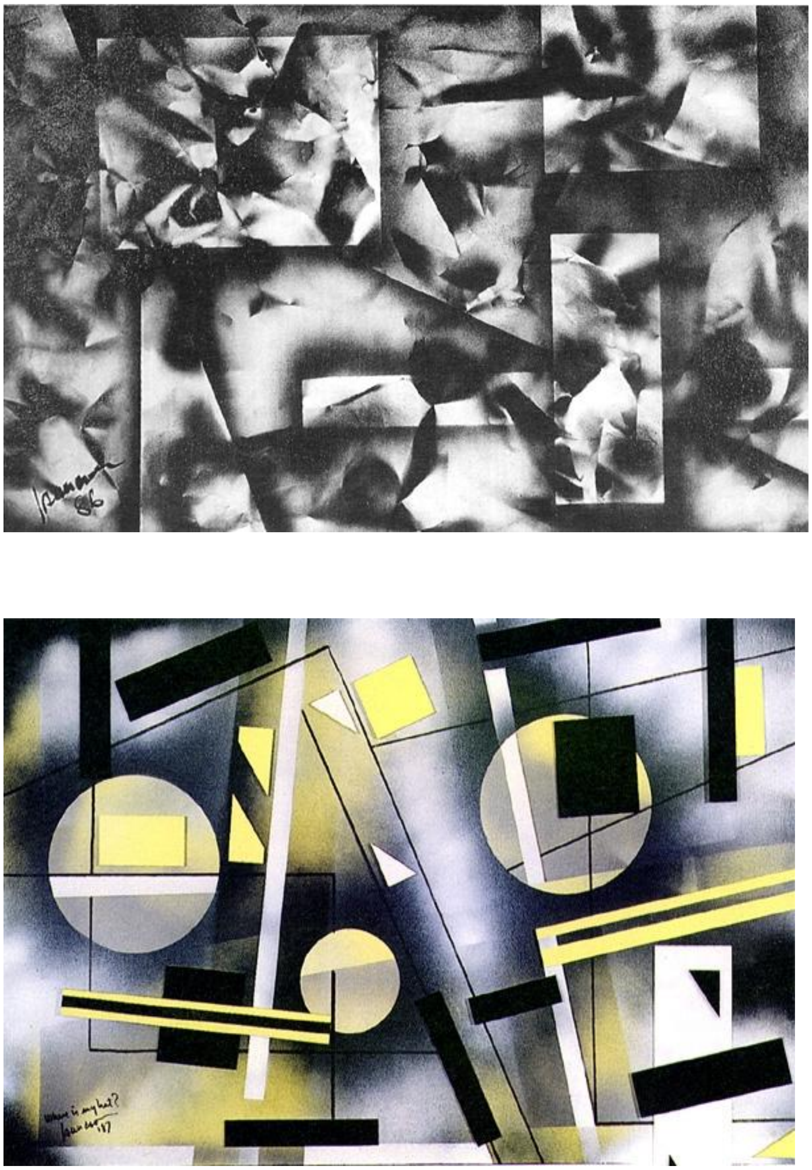
Mr. I. painted pieces of grey fruit to show us the "leaden" universe into which he had fallen.



A test painting from Mary Collins's Colour-Blindness (left), as reproduced by someone with red-green colorblindness, and by Mr. I. (right) (The first two are in color from the original edition).



The sunset scene of which Mr. I could see virtually nothing -an effect simulated by a black-and-white photocopy of it (the first picture is in color in the original edition).



A black-and-white painting done about two months after Mr. I.'s accident, and a painting done two years later-Mr. I. at this time was experimenting with adding single colors, even though he could not see them .

Subsequently, he said neither "grey" nor "leaden" could begin to convey what his world was actually like. It was not "grey" that he experienced, he said, but perceptual qualities for which ordinary experience, ordinary language, hadno equivalent.

Mr. I. could no longer bear to go to museums and galleries or to see colored reproductions of his favorite pictures. This was not just because they were bereft of color, but because they looked intolerably wrong, with washed-out or "unnatural" shades of grey (photographs in black and white, on the other hand, were much more tolerable). This was especially distressing when he knew the artists, and the perceptual debasement of their work interfered with his sense of their identity-this, indeed, was what he now felt was happening with himself.

He was depressed once by a rainbow, which he saw only as a color less semicircle in the sky. And he even felt his occasional migraines as "dull"-previously they had involved brilliantly colored geometric hallucinations, but now even these were devoid of color. He sometimes tried to evoke color by pressing the globes of his eyes, but the flashes and patterns elicited were equally lacking in color. He had often dreamed in vivid color, especially when he dreamed of landscapes and painting; now his dreams were washed-out and pale, or violent and contrasty, lacking both color and delicate tonal gradations.

Music, curiously, was impaired for him too, because he had previously had an extremely intense synesthesia, so that different tones had immediately been translated into color, and he experienced all music simultaneously as a rich tumult of inner colors. With the loss of his ability to generate colors, he lost this ability as well-his internal "color-organ" was out of action, and now he heard music with no visual accompaniment; this, for him, was music with its essential chromatic counterpart missing, music now radicallyimpoverished.*6* A certain mild pleasure came from looking at drawings; he had been a fine draftsman in his earlier years. Could he not go back to drawing again? This thought was slow to occur to him, and it only took hold after being suggested repeatedly by others. His own first impulse was to paint in color. He insisted that he still "knew" what colors to use, even though he could no longer see them. He decided, as a first exercise, to paint flowers, taking from his palette what tints seemed "tonally right." But the pictures were unintelligible, a confusing welter of colors to normal eyes. It was only when one of his artist friends took black-and-white Polaroids of the paintings thatthey made sense. The contours were accurate, but the colors were all wrong.

"No one will get your paintings," one of his friends said, "unless they are as colorblind as you."

"Stop pushing it," said another. "You can't use color now." Mr. I. reluctantly allowed all his colored paints to be put away. It's only temporary, he thought. I'll be back to color soon.

These first weeks were a time of agitation, even desperation; he was constantly hoping that he would wake up one fine morning and find the world of color miraculously restored. This was a constant motif in his dreams at the time, but the wish was never fulfilled, even in his dreams. He would dream that he was about to see in color, but then he would wake and find that nothing had changed. He constantly feared that whatever had happened would happen again, this time depriving him of all his sight completely. He thought he had probably had a stroke, caused by (or perhaps causing) his accident in the car, and feared that there could be another stroke at any moment. In addition to this medical fear, there was a deeper bewilderment and fear that he found almost impossible to articulate, and it was this that had come to a head in his month of attempted color painting, his month of insisting that he still "knew" color. It had gradually come upon him, during this time, that it was not merely color perception and color imagery that he lacked, but something deeper and difficult to define. He knew all about color, externally, intellectually, but he had lost the remembrance, the inner knowledge, of it that had been part of his very being. He had had a lifetime of experience in color, but now this was only a historical fact, not something he could accessand feel directly. It was as if his past, his chromatic past, had been takenaway, as if the brain's knowledge of color had been totally excised, leavingno trace, no inner evidence, of its existence behind.*7*

By the beginning of February, some of his agitation was calming down; he hadstarted to accept, not merely intellectually, but at a deeper level, too, thathe was indeed totally colorblind and might possibly remain so. His initialsense of helplessness started to give way to a sense of resolution-he wouldpaint in black and white, if he could not paint in color; he would try to livein a black-and-white world as fully as he could. This resolution wasstrengthened by a singular experience, about five weeks after his accident, ashe was driving to the studio one morning. He saw the sunrise over the highway, the blazing reds all turned into black: "The sun rose like a bomb, like someenormous nuclear explosion," he said later. "Had anyone ever seen a sunrise inthis way before?"

Inspired by the sunrise, he started painting again-he started, indeed, with ablack-and-white painting that he called Nuclear Sunrise, and then went on tothe abstracts he favored, but now painting in black and white only. The fearof blindness continued to haunt him but, creatively transmuted, shaped thefirst "real" paintings he did after his color experiments. Black-and-whitepaintings he now found he could do, and do very well. He found his only solaceworking in the studio, and he worked fifteen, even eighteen, hours a day. Thismeant for him a kind of artistic survival: "I felt if I couldn't go onpainticng," he said later, "I wouldn't want to go on at all."

His first black-and-white paintings, done in February and March, gave a feelingof violent forces-rage, fear, despair, excitement-but these were held incontrol, attesting to the powers of artistry that could disclose, and yetcontain, such intensity of feeling. In these two months he produced dozens ofpaintings, marked by a singular style, a character he had never shown before.

In many of these paintings, there was an extraordinary shattered, kaleidoscopic surface, with abstract shapes suggestive of faces-averted, shadowed, sorrowing, raging-and dismembered body parts, faceted and held inframes and boxes. They had, compared with his previous work, a labyrinthinecomplexity, and an obsessed, haunted quality-they seemed to exhibit, insymbolic form, the predicament he was in.

Starting in May-it was fascinating to watch-he moved from these powerful butrather terrifying and alien paintings toward themes, living themes, he had nottouched in thirty years, back to representational paintings of dancers andracehorses. These paintings, even though still in black and white, were fullof movement, vitality, and sensuousness; and they went with a change in hispersonal life-a lessening of his withdrawal and the beginnings of a renewedsocial and sexual life, a lessening of his fears and depression, and a turningback to life.

At this time, too, he turned to sculpture, which he had never done before. Heseemed to be turning to all the visual modes that still remained to him-form, contour, movement, depth-and exploring them with heightened intensity. He alsostarted painting portraits, although he found that he could not work fromlife, but only from black-and-white photographs, fortified by his knowledge ofand feeling for each subject. Life was tolerable only in the studio, for herehe could reconceive the world in powerful, stark forms. But outside, in reallife, he found the world alien, empty, dead, and grey.

This was the story Bob Wasserman and I got from Mr. I.-a story of an abruptand total breakdown of color vision, and his attempts to live in ablack-and-white world. I had never been given such a history before, I hadnever met anyone with total colorblindness before, and I had no idea what hadhappened to him-nor whether his condition could be reversed or improved.

The first thing was to define his impairments more precisely with various tests, some quite informal, making use of everyday objects or pictures, whatever came to hand. For instance, we first asked Mr. I. about a shelf ofnotebooks-blue, red, and black-by my desk. He instantly picked out the blueones (a bright medium blue to normal eyes)-"they're pale." The red and theblack were indistinguishable-both, for him, were "dead black."

We then gave him a large mass of yarns, containing thirty-three separatecolors, and asked him to sort these: he said he could not sort them by color, but only by grey-scale tonal values. He then, rapidly and easily, separatedthe yarns into four strange, chromatically random piles, which hecharacterized as 0-2,5 percent, 25-50 percent, 50-75 percent, and 75-100percent on a grey-tone scale (though nothing looked to him purely white, andeven white yarn looked slightly "dingy" or "dirty").

We ourselves could not confirm the accuracy of this, because our color visioninterfered with our ability to visualize a grey scale, just as normallysighted viewers had been unable to perceive the tonal sense of his confusinglypolychromatic flower paintings. But a black-and-white photograph and ablack-and-white video camera confirmed that Mr. I. had indeed accuratelydivided the colored yarns in a grey scale that basically coincided with theirown mechanical reading. There was, perhaps, a certain crudeness in hiscategories, but this went with the sense of sharp contrast, the paucity oftonal gradations, that he had complained of. Indeed, when shown an artist'sgrey scale of perhaps a dozen gradations from black to white, Mr. I. coulddistinguish only three or four categories of tone.[8]

We also showed him the classic Ishihara color-dot plates, in whichconfigurations of numerals in subtly differentiated colors may stand outclearly for the normally sighted, but not for those with various types ofcolorblindness. Mr. I. was unable to see any of these figures (although he wasable to see certain plates that are visible to the colorblind but not tonormally sighted people, and thus designed to catch pretended or hystericalcolorblindness).[9]

We happened to have a postcard that could have been designed for testing achromatopes-a postcard of a coastal scene, with fishermen on a jetty silhouetted against a dark red sunset sky. Mr. I. was totally unable to see the fishermen or the jetty, and saw only the half-engulfed hemisphere of the setting sun.

Though such problems arose when he was shown colored pictures, Mr. I. had nodifficulty describing black-and-white photographs or reproductions accurately; he had no difficulty recognizing forms. His imagery and memory of objects andpictures shown to him were indeed exceptionally vivid and accurate, thoughalways colorless. Thus, after being given a classic test picture of a coloredboat, he looked intensely, looked away, and then rapidly reproduced it inblack and white paint. When asked the colors of familiar objects, he had nodifficul-ties in color association or color naming. (Patients with coloranomia, for instance, can match colors perfectly but have lost the names ofcolors, and might speak, uncertainly, of a banana being "blue." A patient witha color agnosia, by contrast, could also match colors, but would evince nosurprise if given a blue banana. Mr. I., however, had neither of these problems.)[10] Nor did he (now) have any difficulties reading. Testing up tothis point, and a general neurological examination, thus confirmed Mr. I.'stotal achromatopsia.

We could say to him at this point that his problem was real-that he had a trueachromatopsia and not a hysteria. He took this, we thought, with mixedfeelings: he had half hoped it might be merely a hysteria, and as suchpotentially reversible. But the notion of something psychological had alsodistressed him and made him feel that his problem was "not real" (indeed, several doctors had hinted at this). Our testing, in a sense, legitimized hiscondition, but deepened his fear about brain damage and the prognosis for recovery.

Although it seemed that he had an achromatopsia of cerebral origin, we couldnot help wondering whether a lifetime of heavy smoking could have played apart; nicotine can cause a dimming of vision |an amblyopia) and sometimes anachromatopsia-but this is predominantly due to its effects on the cells of theretina. But the major problem was clearly cerebral: Mr. I. could havesustained tiny areas of brain damage as a result of his concussion; he couldhave had a small stroke either following, or conceivably precipitating, theaccident.

The history of our knowledge about the brain's ability to represent color hasfollowed a complex and zigzag course. Newton, in his famous prism experimentin 1666, showed that white light was composite-could be decomposed into, andrecomposed by, all the colors of the spectrum. The rays that were bent most("the most refrangible") were seen as violet, the least refrangible as red, with the rest of the spectrum in between. The colors of objects, Newtonthought, were determined by the "copiousness" with which they reflectedparticular rays to the eye. Thomas Young, in 1802,, feeling that there was noneed to have an infinity of different receptors in the eye, each tuned to adifferent wavelength (artists, after all, could create almost any color theywanted by using a very limited palette of paints) postulated that three typesof receptors would be enough.[11] Young's brilliant idea, thrown off casually inthe course of a lecture, was forgotten, or lay dormant, for fifty years, untilHermann von Helmholtz, in the course of his own investigation of vision, resurrected it and gave it a new precision, so that we now speak of theYoung-Helmholtz hypothesis. For Helmholtz, as for Young, color was a directexpression of the wavelengths of light absorbed by each receptor, the nervoussystem just translating one into the other: "Red light stimulates thered-sensitive fibres strongly, and the other two weakly, giving the sensation red." *12*

In 1884, Hermann Wilbrand, seeing in his neurological practice patients with a range of visual losses-in some predominantly the loss of visual field, inothers predominantly of color perception, and in still others predominantly ofform perception-suggested that there must be separate visual centers in theprimary visual cortex for "light impressions," "color impressions," and "formimpressions," though he had no anatomical evidence for this. Thatachromatopsia (and even hemi-achromatopsia) could indeed arise from damage tospecific parts of the brain was first confirmed, four years later, by a Swissophthalmologist, Louis Verrey. He described a sixty-year-old woman who, inconsequence of a stroke affecting the occipital lobe of her left hemisphere, now saw everything in the right half of her visual field in shades of grey(the left half remained normally colored). The opportunity to examine his patient's brainafter her death showed damage confined to a small portion (the fusiform andlingual gyri) of the visual cortex-it was here, Verrey concluded, that "thecentre for chromatic sense will be found." That such a center might exist, that any part of the cortex might be specialized for the perception orrepresentation of color, was immediately contested and continued to becontested for almost a century. The grounds of this contention go very deep, as deep as the philosophy of neurology itself.

Locke, in the seventeenth century, had held to a "sensationalist" philosophy(which paralleled Newton's physicalist one): our senses are measuringinstruments, recording the external world for us in terms of sensation. Hearing, seeing, all sensation, he took to be wholly passive and receptive.

Neurologists in the late nineteenth century were quick to accept thisphilosophy and to embed it in a speculative anatomy of the brain. Visualperception was equated with "sense-data" or "impressions" transmitted from theretina to the primary visual area of the brain, in an exact, point-to-pointcorrespondence-and there experienced, subjectively, as an image of the visualworld. Color, it was presumed, was an integral part of this image. There wasno room, anatomically, it was thought, for a separate color center-or indeed, conceptually, for the very idea of one. Thus when Verrey published hisfindings in 1888, they flew in the face of accepted doctrine. His observationswere doubted, his testing criticized, his examination regarded as flawed-butthe real objection, behind these, was doctrinal in nature.

If there was no discrete color center, so the thinking went, there could be noisolated achromatopsia either; thus Verrey's case, and two similar ones in the1890s, were dismissed from neurological consciousness-and cerebralachromatopsia, as a subject, all but disappeared for the next seventy-fiveyears. *13* There was not to be another full case study until 1974. *14*

Mr. I. himself was actively curious about what was going on in his brain.

Though he now lived wholly in a world of lightnesses and darknesses, he wasvery struck by how these changed in different illuminations; red objects, forinstance, which normally appeared black to him, became lighter in the longrays of the evening sun, and this allowed him to infer their redness. Thisphenomenon was very marked if the quality of illumination suddenly changed, as, for example, when a fluorescent light was turned on, which would cause animmediate change in the brightnesses of objects around the room. Mr. I. commented that he now found himself in an inconstant world, a world whoselights and darks fluctuated with the wavelength of illumination, in strikingcontrast to the relative stability, the constancy, of the color world he hadpreviously known.*15* All of this, of course, is very difficult to explain in terms of classicalcolor theory-Newton's notion of an invariant relationship between wavelengthand color, of a cell-to-cell transmission of wavelength information from theretina to the brain, and of a direct conversion of this information intocolor. Such a simple process-a neurological analogy to the decomposition and recomposition of light through a prism-could hardly account for the complexityof color perception in real life.

This incompatibility between classical color theory and reality struck Goethein the late eighteenth century. Intensely aware of the phenomenal reality ofcolored shadows and colored afterimages, of the effects of contiguity andillumination on the appearance of colors, of colored and other visualillusions, he felt that these must be the basis of a color theory and declaredas his credo, "Optical illusion is optical truth!" Goethe was centrallyconcerned with the way we actually see colors and light, the ways in which wecreate worlds, and illusions, in color. This, he felt, was not explicable byNewton's physics, but only by some as-yet unknown rules of the brain. He wassaying, in effect, "Visual illusion is neurological truth."

Goethe's color theory, his Farbenlehre (which he regarded as the equal of hisentire poetic opus), was, by and large, dismissed by all his contemporariesand has remained in a sort of limbo ever since, seen as the whimsy, thepseudoscience, of a very great poet. But science itself was not entirelyinsensitive to the "anomalies" that Goethe considered central, and Helm-holtz, indeed, gave admiring lectures on Goethe and his science, on manyoccasions-the last in 1892. Helmholtz was very conscious of "colorconstancy"-the way in which the colors of objects are preserved, so that wecan categorize them and always know what we are looking at, despite greatfluctuations in the wavelength of the light illuminating them. The actualwavelengths reflected by an apple, for instance, will vary considerablydepending on the illumination, but we consistently see it as red, nonetheless.

This could not be, clearly, a mere translation of wavelength into color. Therehad to be some way, Helmholtz thought, of "discounting the illuminant"-andthis he saw as an "unconscious inference" or "an act of judgement" (though hedid not venture to suggest where such judgement might occur). Color constancy, for him, was a special example of the way in which we achieve perceptual constancy generally, make a stable perceptual world from a chaotic sensoryflux-a world that would not be possible if our perceptions were merely passivereflections of the unpredictable and inconstant input that bathes ourreceptors.

Helmholtz's great contemporary, Clerk Maxwell, had also been fascinated by themystery of color vision from his student days. He formalized the notions ofprimary colors and color mixing by the invention of a color top (the colors ofwhich fused, when it was spun, to yield a sensation of grey), and a graphicrepresentation with three axes, a color triangle, which showed how any colorcould be created by different mixtures of the three primary colors. Theseprepared the way for his most spectacular demonstration, the demonstration in1861 that color photography was possible, despite the fact that photographicemulsions were themselves black and white. He did this by photographing acolored bow three times, through red, green, and violet filters. Havingobtained three "color-separation" images, as he called them, he now broughtthese together by superimposing them upon a screen, projecting each imagethrough its corresponding filter (the image taken through the red filter wasprojected with red light, and so on). Suddenly, the bow burst forth in fullcolor. Maxwell wondered if this was how colors were perceived in the brain, bythe addition of color-separation images or their neural correlates, as in hismagic-lantern demonstrations. *16*

Maxwell himself was acutely aware of the drawback of this additive process: color photography had no way of "discounting the illuminant," and its colorschanged helplessly with changing wavelengths of light.

In 1957, ninety-odd years after Maxwell's famous demonstration, Edwin Land-notmerely the inventor of the instant Land camera and Polaroid, but anexperimenter and theorizer of genius-provided a photographic demonstration ofcolor perception even more startling. Unlike Maxwell, he made only twoblack-and-white images (using a split-beam camera so they could be taken atthe same time from the same viewpoint, through the same lens) and superimposedthese on a screen with a double-lens projector. He used two filters to makethe images: one passing longer wavelengths (a red filter), the other passingshorter wavelengths (a green filter). The first image was then projectedthrough a red filter, the second with ordinary white light, unfiltered. Onemight expect that this would produce just an overall pale-pink image, butsomething "impossible" happened instead. The photograph of a young womanappeared instantly in full color-"blonde hair, pale blue eyes, red coat, bluegreen collar, and strikingly natural flesh tones," as Land later describedit. Where did these colors come from, how were they made? They did not seem tobe "in" the photographs or the illuminants themselves. These demonstrations, overwhelming in their simplicity and impact, were color "illusions" inGoethe's sense, but illusions that demonstrated a neurological truth-thatcolors are not "out there" in the world, nor (as classical theory held) anautomatic correlate of wavelength, but, rather, are constructed by the brain.

These experiments hung, at first, like anomalies, concept-less, in midair; they were inexplicable in terms of existing theory, but did not yet pointclearly to a new one. It seemed possible, moreover, that the viewer'sknowledge of appropriate colors might influence his perception of such ascene. Land decided, therefore, to replace familiar images of the natural world with entirely abstract, multicolored displays consisting of geometricpatches of colored paper, so that expectation could provide no clues as towhat colors should be seen. These abstract displays vaguely resembled some ofthe paintings of Piet Mondrian, and Land therefore terms them "colorMondrians." Using the Mondrians, which were illuminated by three projectors, using long-wave (red), middle-wave (green), and short-wave (blue) filters, Land was able to prove that, if a surface formed part of a complexmulticolored scene, there was no simple relationship between the wavelength oflight reflected from a surface and its perceived color.

If, moreover, a single patch of color (for example, one ordinarily seen asgreen) was isolated from its surrounding colors, it would appear only as whiteor pale grey, whatever illuminating beam was used. Thus the green patch, Landshowed, could not be regarded as inherently green, but was, in part, given itsgreenness by its relation to the surrounding areas of the Mondrian.

Whereas color for Newton, for classical theory, was something local andabsolute, given by the wavelength of light reflected from each point, Landshowed that its determination was neither local nor absolute, but dependedupon the surveying of a whole scene and a comparison of the wavelengthcomposition of the light reflected from each point with that of the lightreflected from its surround. There had to be a continuous relating, acomparison of every part of the visual field with its own surround, to arriveat that global synthesis-Helmholtz's "act of judgement." Land felt that thiscomputation or correlation followed fixed, formal rules; and he was able topredict which colors would be perceived by an observer under differentconditions. He devised a "color cube," an algorithm, for this, in effect amodel for the brain's comparison of the brightnesses, at differentwavelengths, of all the parts of a complex, multicolored surface. WhereasMaxwell's color theory and color triangle were based on the concept of coloraddition, Land's model was now one of comparison. He proposed that there were, in fact, two comparisons: first of the reflectance of all thesurfaces in a scene within a certain group of wavelengths, or waveband (inLand's term, a "lightness record" for that waveband), and second, a comparisonof the three separate lightness records for the three wavebands (correspondingroughly to the red, green, and blue wavelengths). This second comparisongenerated the color. Land himself was at pains to avoid specifying anyparticular brain site for these operations and was careful to call his theoryof color vision the Retinex theory, implying that there might be multiplesites of interaction between the retina and the cortex.

If Land was approaching the problem of how we see colors at a psychophysicallevel by asking human subjects to report how they perceived complex, multicolored mosaics in changing illuminations, Semir Zeki, working in London, was approaching the problem at a physiological level, by insertingmicroelectrodes in the visual cortex of anesthetized monkeys and measuring theneuronal potentials generated when they were given colored stimuli. Early inthe 1970s, he was able to make a crucial discovery, to delineate a small areaof cells on each side of the brain, in the prestriate cortex of monkeys (areasreferred to as V4), which seemed to be specialized for responding to color(Zeki called these "color-coding cells"). *17*

Thus, ninety years after Wilbrand and Verrey had postulated a specific centerfor color in the brain, Zeki was finally able to prove that such a centerexisted.

Fifty years earlier, the eminent neurologist Gordon Holmes, reviewing twohundred cases of visual problems caused by gunshot wounds to the visualcortex, had found not a single case of achromatopsia. He went on to deny thatan isolated cerebral achromatopsia could occur. The vehemence of this denial, coming from such a great authority, played a major part in bringing allclinical interest in the subject to an end.[18]

Zeki's brilliant and undeniabledemonstration startled the neurological world, reawakening attention to asubject it had for many years dismissed. Following his 1973 paper, new casesof human achromatopsia began appearing in the literature once again, and thesecould now be examined with new brain-imaging techniques (CAT, MRI, PET, SQUID, etc.) not available to neurologists of an earlier era. Now, for the firsttime, it was possible to visualize, in life, what areas of the brain might beneeded for human color perception. Though many of the cases described hadother problems, too (cuts in the visual field, visual agnosia, alexia, etc.), the crucial lesions seemed to be in the medial association cortex, in areas homologous to V4 in the monkey. [19] It had been shown in the 1960s that there were cells in the primary visual cortex of monkeys (in the area termed V1) that responded specifically to wavelength, but not to color; Zeki now showed, in the early 1970s, that there were other cells in the V4 areas that respondedto color but not to wavelength (these V4 cells, however, received impulsesfrom the V1 cells, converging through an intermediate structure, V2). Thuseach V4 cell received information regarding a large portion of the visualfield. It seemed that the two stages postulated by Land in his theory mightnow have an anatomical and physiological grounding: lightness records for eachwaveband being extracted by the wavelength-sensitive cells in V1, but onlybeing compared or correlated to generate color in the color-coding cells ofV4. Every one of these, indeed, seemed to act as a Landian correlator, or aHelmholtzian "judge."

Color vision, it seemed-like the other processes of early vision: motion, depth, and form perception-required no prior knowledge, was not determined bylearning or experience, but was, as neurologists say, a "bottom-up" process.

Color can indeed be generated, experimentally, by magnetic stimulation of V4, causing the "seeing" of colored rings and halos-so-called chromatophenes.[20] But color vision, in real life, is part and parcel of our total experience, islinked with our own categorizations and values, becomes for each of us a partof our life-world, of us. V4 may be an ultimate generator of color, but itsignals to, it converses with, a hundred other systems in the mind-brain; andperhaps it can also be modulated by these. It is at higher levels thatintegration occurs, that color fuses with memories, expectations, associations, and desires to make a world with resonance and meaning for each of us. [21]

Mr. I. not only presented a rather "pure" case of cerebral achromatopsia(virtually uncontaminated by additional defects in the perception of form, motion, or depth), but was a highly intelligent and expert witness as well, one who was skilled at drawing and reporting what he saw. Indeed, when wefirst met, and he described how objects and surfaces "fluctuated" in differentlights, he was, so to speak, describing the world in wavelengths, not incolors. The experience was so unlike anything he had ever experienced, sostrange, so anomalous, that he could find no parallels, no metaphors, nopaints or words to depict it.

When I phoned Professor Zeki to tell him of this exceptional patient, he wasgreatly intrigued and wondered, in particular, how Mr. I. might do withMondrian testing, such as he and Land had used with normally sighted peopleand with animals. He at once arranged to come to New York to join us-BobWasserman, my ophthalmologist colleague; Ralph Siegel, a neurophysiologist; and myself-in a comprehensive testing of Jonathan I. No patient withachromatopsia had ever been examined in this way before.

We used a Mondrian of great complexity and brilliance, illuminated either bywhite light or by light filtered through narrow-band filters allowing onlylong wavelengths (red), intermediate wavelengths (green), or short wavelengths(blue) to pass. The intensity of the illuminating beam, in every case, was the same.

Mr. I. could distinguish most of the geometric shapes, though only asconsisting of differing shades of grey, and he instantly ranked them on aone-to-four grey scale, although he could not distinguish some colorboundaries (for example, between red and green, which both appeared to him, inwhite light, as black). With rapid, random switching of the filters, thegrey-scale value of all the shapes dramatically changed- some shadespreviously indistinguishable now became very different, and all shades (exceptactual black) changed, either grossly or subtly, with the wavelength of theilluminating beam. (Thus a green area would be seen by him as white inmedium-wavelength light, but as black in white or long-wavelength light.)

All Mr. I.'s responses were consistent and immediate. (It would have been verydifficult, if not impossible, for a normally sighted person to make these instant and invariably "correct" estimations, even with a perfect memory and aprofound knowledge of the latest color theory.) Mr. I., it was clear, coulddiscriminate wavelengths, but he could not go on from this to translate thediscriminated wavelengths into color; he could not generate the cerebral ormental construct of color.

This finding not only clarified the nature of the problem, but also served topinpoint the location of the trouble. Mr. I.'s primary visual cortex wasessentially intact, and it was the secondary cortex (specifically the V4areas, or their connections) that bore virtually the whole brunt of thedamage. These areas are very small, even in man; yet all our perception ofcolor, all our ability to imagine or remember it, all our sense of living in aworld of color, depend crucially on their integrity. A mischance haddevastated these bean-sized areas of Mr. I.'s brain-and with this, his wholelife, his life-world, had been changed.

The Mondrian testing had demonstrated damage in these areas; we wondered now if we could see this, using brain scans. But CAT andMRI scans were entirely normal. This could have been because the scanningtechniques of the time had a resolution inadequate to visualize what may havebeen only a patchy damage to V4; it could have been that the damage sustainedwas metabolic only, not structura; or it could have been that the main damagewas not in V4 itself, but in the structures (the so-called "blobs" in Vi orthe "stripes" in V2) leading up to it.*22*

It has been stressed-by both Zeki and Francis Crick-that these smallstructures, the blobs and stripes, are intensely active metabolically and maybe unusually vulnerable to even temporary reductions of oxygen. Crick, inparticular (with whom I discussed the case in great detail), wondered whetherMr. I. could have suffered from carbon monoxide poisoning, which is known tocause changes in color vision through its effects on the oxygenation of theblood to the color areas. Mr. I. might have been exposed to carbon monoxidethrough a leaky exhaust in his car, Crick speculated-perhaps due to theaccident, conceivably even causing it.*23*

But all this was in a sense academic. Mr. I.'s achromatopsia, after threemonths, remained absolute, and he had persisting impairments of contrastvision, too.*24* Whether these would clear eventually we could not say-somecases of acquired cerebral achromatopsia improve with time, but others do not.

We still did not know what had caused the damage to Mr. I.'s brain, whether itwas a toxin such as carbon monoxide, or the impact of the car accident, or theresult of an impairment of blood flow to the visual areas of the brain. It waspossible that if it had been caused by a stroke, there might be more suchstrokes. The prognosis had to remain uncertain, although his situation by nowseemed to be stable.

We were, however, able to offer a little practical help. Mr. I. hadconsistently seen the boundaries of the Mondrian patches most clearly whenthese were illuminated by medium-wavelength light, and Dr. Zeki thereforesuggested we give him a pair of green sunglasses, transmitting only thiswaveband in which he saw most clearly. A pair of glasses was specially made, and Mr. I. took to wearing them, especially in bright sunlight. The newglasses delighted him, for although they did nothing to restore his lost colorvision, they did seem noticeably to enhance his contrast vision and hisperception of form and boundaries. He could even enjoy color TV with his wifeagain. (The dark-green glasses, in effect, rendered the color setmonochromatic-though he continued to prefer his old black-and-white set whenalone.)

The sense of loss following his accident was overwhelming to Jonathan I., as it must be to anyone who loses color, a sense that interweaves itself in all our visual experiences and is so central in ourimagination and memory, our knowledge of the world, our culture and art. Thissense of loss, in relation to the natural world, has been remarked upon inevery case. For the nineteenth-century physician thrown from his horse, flowers had "lost more than half their beauty," and entering his garden, abruptly bereft of color, was not short of shocking. This sense of loss and ofshock was doubled and redoubled for Mr. I., for he had not only lost thebeauty of the natural world, and the world of people, and of the innumerableobjects whose colors are part of daily life, but he had also lost the world ofart, he felt-the world that, for fifty years or more, had absorbed hisprofoundly visual and chromatic talents and sensibilities. The first weeks ofhis achromatopsia were thus weeks of an almost suicidal depression.[25]

In addition to his sense of loss, Jonathan I. found his changed visual world, atfirst, abhorrent and abnormal. This, too, is the experience of most people inhis position: the concussed physician thrown from his horse found his vision"perverted," one of Damasio's patients found her grey world "dirty." Why, onemust wonder, do all subjects with a cerebral achromatopsia express themselvesin such terms-why should their experience seem so abnormal? Mr. I. was seeingwith his cones, seeing with the wavelength-sensitive cells of V1, but unableto use the higher-order, color-generating mechanism of V4. For us, the outputof V1 is unimaginable, because it is never experienced as such and isimmediately shunted on to a higher level, where it is further processed toyield the perception of color. Thus the raw output of V1 never appears inawareness for us. But for Mr. I. it did-his brain damage had made him privyto, indeed trapped him within, a strange in-between state-the uncanny world ofV1-a world of anomalous and, so to speak, prechromatic sensation, which couldnot be categorized as either colored or colorless. [26]

Mr. I., with his heightened visual and aesthetic sensibilities, found thesechanges particularly intolerable. We know too little about what determinesemotion and aesthetic appeal in relation to color, and indeed in relation toseeing generally-and this is a matter of individual experience and taste. [27]

Color perception had been an essential part not only of Mr. I.'s visual sense, but his aesthetic sense, his sensibility, his creativeidentity, an essential part of the way he constructed his world-and now colorwas gone, not only in perception, but in imagination and memory as well. Theresonances of this were very deep. At first he was intensely, furiouslyconscious of what he had lost (though "conscious," so to speak, in the mannerof an amnesiac). He would glare at an orange in a state of rage, trying toforce it to resume its true color. He would sit for hours before his (to him) dark grey lawn, trying to see it, to imagine it, to remember it, as green. He found himself now not only in an impoverished world, but in an alien, incoherent, and almost nightmarish one. He expressed this soon after hisinjury, better than he could in words, in some of his early, desperatepaintings.

But then, with the "apocalyptic" sunrise, and his painting of this, came thefirst hint of a change, an impulse to construct the world anew, to constructhis own sensibility and identity anew. Some of this was conscious anddeliberate: retraining his eyes (and hands) to operate, as he had in his firstdays as an artist. But much occurred below this level, at a level of neural processing not directly accessible to consciousness or control. In this sense, he started to be redefined by what had happened to him-redefinedphysiologically, psychologically, aesthetically-and with this there came atransformation of values, so that the total otherness, the alienness of his V1world, which at first had such a quality of horror and nightmare, came to takeon, for him, a strange fascination and beauty.

Immediately after his accident, and for a year or more thereafter, Jonathan I. insisted that he still "knew" colors, knew what was right, what wasappropriate, what was beautiful, even if he could no longer visualize them inhis mind. But, thereafter, he became somewhat less sure, as if now, unsupported by actual experience or image, his color associations had startedto give way. Perhaps such a forgetting-a forgetting at once physiological andpsychological, at once strategic and structural-may have to occur, to someextent, sooner or later, in anyone who is no longer able to experience orimagine, or in any way to generate, a particular mode of perception. (Nor isit necessary that the primary damage be cortical; it may occur, after monthsor years, even in those who are peripherally or retinally blind.)[28]

There was a lessening concern with what he had lost, and indeed with the wholesubject of color, which at first had so obsessed him. Indeed, he now spoke ofbeing "divorced" from color. He could still speak fluently about it, but thereseemed to be a certain hollowness to his words, as if he were drawing onlyfrom past knowledge and no longer understood it.

Nordby writes:

> Although I have acquired a thorough theoretical knowledge of the physics ofcolours and the physiology of the colour receptor mechanisms, nothing of thiscan help me to understand the true nature of colours.[29]

What was true for Nordby was now true for Jonathan I., too. He had in someways started to resemble a person born colorblind, even though he had lived ina color world for the first sixty-five years of his life. At once forgettingand turning away from color, turning away from the chromatic orientation andhabits and strategies of his previous life, Mr. I., in the second year afterhis injury, found that he saw best in subdued light or twilight, and not inthe full glare of day. Very bright light tended to dazzle and temporarilyblind him-another sign of damage to his visual systems-but he found the nightand nightlife peculiarly congenial, for they seemed to be "designed," as heonce said, "in terms of black and white."

He started becoming a "night person," in his own words, and took to exploringother cities, other places, but only at night. He would drive, at random, toBoston or Baltimore, or to small towns and villages, arriving at dusk, andthen wandering about the streets for half the night, occasionally talking to afellow walker, occasionally going into little diners: "Everything in diners is different at night, at least if it has windows. The darkness comes into the place, and no amount of light can change it. They are transformed into night places. I love the nighttime," Mr. I. said. "Gradually I am becoming a night person. It's a different world: there's a lot of space- you're not hemmed in by streets, by people& It's a whole new world."

Mr. I., when he was not traveling, would get up earlier and earlier, to workin the night, to relish the night. He felt that in the night world (as hecalled it) he was the equal, or the superior, of "normal" people: "I feelbetter because I know then that I'm not a freak& and I have developed acutenight vision, it's amazing what I see-I can read license plates at night fromfour blocks away. You couldn't see it from a block away." [30]

One wonders whether his night vision might, with time, have taken onheightened function in compensation for the damage to his color system-theremight, at this stage, also have been a heightening of movement sensitivity, perhaps of depth sensitivity, too, possibly going with an increased dependenceon and use of the intact M system. [31]

Most interesting of all, the sense of profound loss, and the sense ofunpleasantness and abnormality, so severe in the first months following hishead injury, seemed to disappear, or even reverse. Although Mr. I. does notdeny his loss, and at some level still mourns it, he has come to feel that hisvision has become "highly refined," "privileged," that he sees a world of pureform, uncluttered by color. Subtle textures and patterns, normally obscuredfor the rest of us because of their embedding in color, now stand out for him. [32] He feels he has been given "a whole new world," which the rest of us, distracted by color, are insensitive to. He no longer thinks of color, pinesfor it, grieves its loss. He has almost come to see his achromatopsia as astrange gift, one that has ushered him into a new state of sensibility andbeing. In this

his transformation is exceedingly similar to that of John Hull, who, after two or three years of experiencing blindness as an affliction andcurse, came to see it as "a dark, paradoxical gift," a "concentrated humancondition& one of the orders of human being."

Once, about three years after his injury, an intriguing suggestion was made(by Israel Rosenfield), that Mr. I. try to regain his color vision. Since themechanism for comparing wavelengths was intact, and only V4 (or itsequivalent) was damaged, it might be possible, at least in theory, Rosenfieldthought, to "retrain" another part of the brain to perform the requisiteLandian correlations, and thus to achieve some restoration of color vision.

What was striking was Mr. I.'s response to this suggestion. In the firstmonths after his injury, he said, he would have embraced such a suggestion, done everything possible to be "cured." But now that he conceived the world indifferent terms, and again found it coherent and complete, he thought thesuggestion unintelligible, and repugnant. Now that color had lost its formerassociations, its sense, he could no longer imagine what its restoration wouldbe like. Its reintroduction would be grossly confusing, he thought, mightforce a welter of irrelevant sensations upon him, and disrupt thenow-reestablished visual order of his world. He had been for a while in a sort of limbo; now he had settled-neurologically and psychologically-for the worldof achromatopia.

In terms of his painting, after a year or more of experiment and uncertainty, Mr. I. has moved into a strong and productive phase, as strong and productiveas anything in his long artistic career. His black-and-white paintings arehighly successful, and people comment on his creative renewal, the remarkableblack-and-white "phase" he has moved into. Very few of them know that his latest phase is anything other than an expression of hisartistic development, that it was brought about by a calamitous loss.

Though it has been possible to define the primary damage in Mr. I.'s brain-theknocking out of an essential part of his color-constructing system-we arestill totally ignorant of the "higher" changes in brain function that musthave occurred in its train. Jonathan I. did not lose just his perception ofcolor, but imagery, and even dreaming in color. Finally he seemed to lose evenhis memory of color, so that it ceased to be part of his mental knowledge, hismind.

Thus, as more and more time elapsed without color vision, he came to resemblesomeone with an amnesia for color-or, indeed, someone who had never known itat all. But, at the same time, a revision was occurring, so that as his formercolor world and even the memory of it became fainter and died inside him, awhole new world of seeing, of imagination, of sensibility, was born.[33]

There is no doubt of the reality of these changes-although it may haverequired a subject as gifted and as articulate as Jonathan I. to bring themout with such clarity. Neuroscience, at this point, can say nothing about thecerebral basis of such "higher" changes. The physiological investigation ofcolor, thus far, has terminated in the color systems of early vision, theLandian correlations that occur in V1 and V4. But V4 is not an end point, itis only a way station, projecting in its turn to higher and higherlevels-eventually to the hippocampus, so essential for the storage ofmemories; to the emotional centers of the limbic system and amygdala; and tomany other parts of the cortex. The cessation of information flow from V4 to the memory systems of the hippocampus and prefrontal cortex, for example, might in part explain Mr. I.'s "forgetting" of color. We do not have the toolsat the moment to map the subtle, higher-level neural consequences of such asensory loss, but a history such as Jonathan I.'s shows how crucial it is todo this.

Work in the last decade has shown how plastic the cerebral cortex is, and howthe cerebral "mapping" of body image, for example, may be drasticallyreorganized and revised, not only following injuries or immobilizations, butin consequence of the special use or disuse of individual parts. We know, forinstance, that the constant use of one finger in reading Braille leads to ahuge hypertrophy of that finger's representation in the cortex. And with earlydeafness and the use of sign language, there may be drastic remappings in thebrain, large areas of the auditory cortex being reallocated for visualprocessing. Similarly, it seemed, with Mr. I.: if entire systems ofrepresentation, of meaning, had been extinguished inside him, entirely newsystems had been brought into being.

On the ultimate question-the question of qualia: why a particular sensationmay be perceived as red-the case of Jonathan I. may not be able to help us atall. After describing "the celebrated phaenomenon of colours," Newton drewback from all speculation about sensation and would hazard no hypothesis as to"by what modes or action light produceth in our minds the phantasms ofcolours." Three centuries later, we still have no hypothesis, and perhaps suchquestions can never be answered at all.

Notes

2. I asked Mr. I. later if he knew Greek or Hebrew; he said no, there was justthe sense of an unintelligible foreign language; perhaps, he added, "cuneiform" would be more accurate. He saw forms, he knew they had to havemeaning, but could not imagine what this meaning might be.

3. Similarly, a patient of Dr. Antonio Damasio, with achromatopsia from atumor, thought everything and everyone looked "dirty," even finding new-fallensnow unpleasant and dirty.

4. In 1688, in Some Uncommon Observations about Vitiated Sight, Robert Boyledescribed a young woman in her early twenties whose eyesight had been normaluntil she was eighteen, when she developed a fever, was "tormented withblisters," and, with this, "deprived of her sight." When she was presentedwith something red, "she look'd attentively upon it, but told me, that to her, it did not seem Red, but of another Colour, which one would guess by herdescription to be a Dark or Dirty one." When "tufts of Silk that were finelyColor'd" were given to her, she could only say that "they seem'd to be aLight-colour, but could not tell which." When asked whether the meadows "didnot appear to her Cloathed in Green," she said they did not, but seemed to be"of an odd Darkish colour," adding that when she wished to gather violets, "she was not able to distinguish them by the Colour from the surroundingGrass, but only by the Shape, or by feeling them." Boyle further observed achange in her habits, that she liked now to walk abroad in the evenings, andthis "she much delighteth to do."

A number of accounts were published in the nineteenth century-many collectedin Mary Collins's Colour-Blindness-one of the most vivid (besides that of anachromatopic house painter) being that of a physician who, thrown from hishorse, suffered a head injury and concussion. "On recovering sufficiently tonotice objects around him," George Wilson recorded in 1853, he found that his perception of colours, which was formerly normal and acute, had become both weakened and perverted& All coloured objects& now seem strange to him& Whilst formerly a student in Edinburgh he was known as anexcellent anatomist; now he cannot distinguish an artery from a vein by itstint& Flowers have lost more than half their beauty for him, and he recallsthe shock which he received on first entering his garden after his recovery, at finding that a favourite damask rose had become in all its parts, petals, leaves, and stem, of one uniform dull colour; and that variegated flowers had lost their characteristic tints.

5. One sees interesting similarities, but also differences, from the vision ofthose with congenital achromatopsia. Thus Knut Nordby, a congenitallycolorblind vision researcher, writes:

I only see the world in shades that colour-normals describe as black, whiteand grey. My subjective spectral sensitivity is not unlike that oforthochro-matic black and white film. I experience the colour called red as avery dark grey, nearly black, even in very bright light. On a grey-scale theblue and green colours I see as mid-greys, somewhat darker greys if they aresaturated, somewhat lighter greys when unsaturated. Yellow typically appearsto me as a rather light grey, but is usually not confused with white. Brownusually appears as a dark grey and so does a very saturated orange.

6. Only one sense could give him any real pleasure at this time, and this wasthe sense of smell. Mr. I. had always had a most acute, erotically chargedsense of smell-indeed, he ran a small perfume business on the side, compounding his own scents. As the pleasures of seeing were lost, thepleasures of smell were heightened (or so it seemed to him), in the first grimweeks after his accident.

7. The question of "knowing" color is very complex and has paradoxical aspectsthat are difficult to dissect. Certainly Mr. I. was intensely aware of aprofound loss with the change in his vision, so clearly some sort ofcomparison with past experience was possible for him. Such a comparison is notpossible if there is a complete destruction of the primary visual cortex onboth sides, say from a stroke, as in Anton's syndrome. Patients with thissyndrome become totally blind, but make no complaint or report of theirblindness. They do not know they are blind; the whole structure ofconsciousness is completely reorganized-instantly so-at the moment they arestricken.

Similarly, patients with massive strokes in the right parietal cortex may losenot only the sensation and use but the very knowledge of their left sides, ofeverything to the left, and indeed of the very concept of leftness. But theyare "anosognosic"-they have no knowledge of their loss; we may say their worldis bisected, but, for them, it is whole and complete.

8. One anomaly showed itself in the yarn-sorting test; he ranked bright saturated blues as "pale" (as he had complained that the blue sky seemed almost white). But was this an anomaly? Could we be sure that the blue wool was not, under its blueness, rather washed-out or pale? We had to have hues that were otherwise identical-identical in brightness, saturation, reflectivity, so we obtained a set of carefully produced color buttons known as the Farnsworth-Munsell test and gave this to Mr. I. He was unable to put the buttons in any order, but he did separate out the blue ones as "paler" than the rest.

9. Further testing with the Nagel anomaloscope and the Sloan achromatopsiacards confirmed Mr. I.'s total colorblindness. With Dr. Ralph Siegel, we didtests of depth and motion perception (using Julesz random-dot stereograms andmoving random-dot fields)-these were normal, as were tests of his ability togenerate structure and depth from motion. There was, however, one interestinganomaly: Mr. I. was unable to "get" red and green stereograms (bicoloranaglyphs), presumably because color vision is needed to segregate the two images. We also obtained electroretinograms, and these were quite normal, indicating that all three cone mechanisms in the retina were intact, and thatthe colorblindness was indeed of cerebral origin.

10. In 1877, Gladstone, in an article entitled "On the Colour Sense of Homer," spoke of Homer's use of such phrases as "the wine-dark sea." Was this just apoetic convention, or did Homer, the Greeks, actually see the sea differently?

There is indeed considerable variation between different cultures in the waythey will categorize and name colors-individuals may only "see" a color (ormake a per-ceptual categorization) if there is an existing cultural categoryor name for it. But it is not clear whether such categorization may actuallyalter elementary color perception.

11. "As it is almost impossible to conceive each sensitive point of the retinato contain an infinite number of particles, each capable of vibrating inperfect unison with every possible undulation," Young wrote, "it becomesnecessary to suppose the number limited, for instance to the three principalcolours, red, yellow, and blue. "

The great chemist John Dalton, just five years earlier, had provided a classicdescription of red-green colorblindness in himself. He thought this was due toa discoloration in the transparent media of the eye-and, indeed, willed an eyeto posterity to test this. Young, however, provided the correct interpretation-that one of the three types of color receptor was missing. (Dalton's eye still resides, pickled, on a shelf in Cambridge. Lindsay T. Sharpe and Knut Nordby discuss this and many other aspects of the history of colorblindness research in "Total Colorblindness: An Introduction."

12. In 1816, the young Schopenhauer proposed a different theory of colorvision, one that envisaged not a passive, mechanical resonance of tunedparticles or receptors, as Young had postulated, but their active stimulation, competition, and inhibition-an explicit "opponens" theory such as Ewald Heringwas to create seventy years later, in apparent contradiction of theYoung-Helmholtz theory. These opponens theories were ignored at the time, andcontinued to be ignored until the 1950s. We now envisage a combination ofYoung-Helmholtz and opponens mechanisms: tuned receptors, which converse withone another, are continually linked in an interactional balance. Thusintegration and selection, as Schopenhauer divined, start in the retina.

13. There is no mention of it in the great 1911 edition of Helmholtz's Physiological Optics, though there is a large section on retinal achromatopsia.

14. There were, however, brief mentions of achromatopsia in these interveningyears, which were ignored, or soon forgotten, for the most part. Even KurtGoldstein, although philosophically opposed to notions of isolatedneurological deficits, remarked that he had seen several cases of purecerebral achromatopsia without visual field losses or other impairments-anobservation thrown off casually in the course of his 1948 book, Langvage andLanguage Disturbances.

15. A perhaps similar phenomenon is described by Knut Nordby. During his firstschool year, his teacher presented the class with a printed alphabet, in whichthe vowels were red and the consonants black.

I could not see any difference between them and could not understand what theteacher meant, until early one morning late in the autumn when the room-lightshad been turned on, and, unexpectedly, I saw that some of the letters, i.e. the AEIOUY ÅÅÖ, were now suddenly a darkish grey, while the others were stillsolid black. This experience taught me that colours may look different underdifferent light-sources, and that the same colour can be matched to differentgrey-tones in different kinds of illumination.

16. Maxwell's demonstration of the "decomposition" and "reconstitution" ofcolor in this way made color photography possible. Huge "color cameras" wereused at first, which split the incident light into three beams and passedthese through filters of the three primary colors (such a camera, reversed, served as a chromoscope, or Maxwellian projector). Though an integral colorprocess was envisaged by Ducos du Hauron in the 1860s, it was not until 1907that such a process (Autochrome) was actually developed, by the Lumièrebrothers. They used tiny starch grains dyed red, green, and violet, in contactwith the photographic emulsion-these acted as a sort of Maxwellian gridthrough which the three color-separation images, mosaicked together, couldboth be taken and viewed. (Color cameras, Lumièrecolor, Dufaycolor, Finlaycolor, and many other additive color processes were still being used inthe 1940s, when I was a boy, and stimulated my own first interest in thenature of color.)

17. He was also able to find cells, in an adjacent area, that seemed torespond solely to movement. A remarkable account and analysis of a patientwith a pure "motion blindness" was given by Zihl, Von Cramon, and Mai in 1983.

The patient's problems are described as follows:

The visual disorder complained of by the patient was a loss of movement visionin all three dimensions. She had difficulty, for example, in pouring tea orcoffee into a cup because the fluid appeared to be frozen, like a glacier. Inaddition, she could not stop pouring at the right time since she was unable toperceive the movement in the cup (or a pot) when the fluid rose. Furthermorethe patient complained of difficulties in following a dialogue because shecould not see the movement of the face and, especially, the mouth of thespeaker. In a room where more than two other people were walking, she feltvery insecure and unwell, and usually left the room immediately, because"people were suddenly here or there but I have not seen them moving." Thepatient experienced the same problem but to an even more marked extent incrowded streets or places, which she therefore avoided as much as possible.

She could not cross the street because of her inability to judge the speed ofa car, but she could identify the car itself without difficulty. "When I'mlooking at the car first, it seems far away. But then, when I want to crossthe road, suddenly the car is very near." She gradually learned to "estimate" the distance of moving vehicles by means of the sound becoming louder.

18. A vivid account of Holmes's negative influence has been provided byDamasio, who also points out that all of Holmes's cases involved lesions inthe dorsal aspect of the occipital lobe, whereas the center for achromatopsialies on the ventral aspect.

19. The work of Antonio and Hanna Damasio and their colleagues at the University of Iowa was particularly important here, both by virtue of the minuteness of the perceptual testing, and the refinement of the neuroimaging they used.

20. Such chromatophenes may occur spontaneously in visual migraines, and Mr. I. himself had experienced these, on occasion, in migraines occurring beforehis accident. One wonders what would have been experienced if Mr. I.'s V4areas had been stimulated-but magnetic stimulation of circumscribed brainareas was not technically possible at *the time. One wonders, too, now thatsuch stimulation is possible, whether it might be tried in individuals withcongenital (retinal) achromatopsia (several such achromatopes have expressedtheir curiosity about such an experiment). It is possible-I am not aware ofany studies on this-that V4 fails to develop in such people, with the absenceof any cone input. But if V4 is present as a functional (though neverfunctioning) unit despite the absence of cones, its stimulation might producean astounding phenomenon-a burst of unprecedented, totally novel sensation, ina brain/mind that had never had a chance to experience or categorize suchsensation. Hume wonders if a man could imagine, could even perceive, a colorhe had never seen before-perhaps this Humean question (propounded in 1738) could And an answer now.*

21. The power of expectation and mental set in the perception of color isclearly shown in those with partial red-green colorblindness. Such people maynot, for example, be able to spot scarlet holly berries against the dark greenfoliage, or the delicate salmon-pink of dawn-until these are pointed out tothem. "Our poor impoverished cone cells," says a dyschromatope of myacquaintance, "need the amplification of intellect, knowledge, expectation, and attention in order to 'see' the colors that we are normally 'blind' to."

22. Malfunction in V4 can be shown by a newer technique, PET scanning (whichpictures the metabolic activity of different brain areas), even if noanatomical lesion is visible on CAT or MRI scans. Unfortunately, this was notavailable to us at the time.

23. Mr. I., fond of spending time in sports clubs and bars, did some researchhere himself and told us that he had spoken to a number of boxers who had hadtransient, and sometimes persistent, losses of color vision following blows tothe head. Partial or total achromatopsia ("greying-out"), also temporary, ischaracteristic of fainting or shock, in which there is a reduction of bloodsupply to the posterior, and especially the visual parts, of the brain.

Greying-out also occurs in transient ischemic attacks, due to arterialinsufficiency-Zeki speculates that this affects the wavelength-selective cellsin the blobs of V1 and the thin stripes of V2. Transient alterations of colorvision-including bizarre instabilities or transformations of color(dyschromatopsia)-may also occur in visual migraines and epilepsies and arewell known to users of mescaline and other drugs. They can be a disquietingside effect of ibuprofen.

24. It was never quite clear from Mr. I.'s descriptions of daily life whetheror not he had some slight impairment of form vision. But, interestingly, whenhe was being tested on the Mondrians, boundaries between rectangles tended todisappear with prolonged fixation, though they would be rapidly restored ifthe stimulus was moved. There are two other systems besides the blob system inearly visual processing: the M system, which deals with movement and depthperception particularly, but not color; and a P-interblob system, whichprobably deals with high-resolution form perception. Zeki thought that thedissolution of boundaries with prolonged fixation suggested a defect in the Psystem, and their rapid restoration with movement "a healthy and active Msystem."

25. This sense of loss is not, of course, experienced by those born totallycolorblind. This is brought out in another letter I received recently from a charming and intelligent woman, Frances Futterman, born totally colorblind. She contrasted her own situation with that of Jonathan I.:

I was struck by how different that kind of experience must be, compared to my own experience of never having seen color before, thus never having lost it-and also never having been depressed about my colorless world& The way I see in and of itself is not depressing. In fact, I am frequently overwhelmed by the beauty of the natural world& People say I must see in shades of gray or in "black and white," but I don't think so. The word gray has no more meaning for me than the word pink or blue-in fact, even less meaning, because I have developed inner concepts of color words like pink and blue; but, for the life of me, I can't conceive of gray.

Though Mrs. Futterman's experience is certainly different from Mr. I.'s, both remark on the meaninglessness of the word "grey, " a word that can no more convey anything to the achromatopic than can "darkness" to the blind, or "silence" to the deaf. Mrs. Futterman remarks, as Mr. I. came to, on the beauty of her world. "I would also be willing to bet," she says, "that if we were tested along with normals in low lighting levels, we would be able to detect far more shades of gray. Black and white photos look far too stark to me. The world I see has so much more richness and variety than black-and-white photos or TV shows& My vision is a lot richer than normals can imagine."

26. We may experience something like this, Zeki has recently shown, by using an inhibitory magnetic stimulation to V4, which produces a temporary achromatopsia.

27. We also know too little about the interactions of the three major systems in early vision-the M, interblob, and blob systems. But Crick wonders whether some of the unpleasantness and abnormality, at least-the "leaden" vision of which Mr. I. complained-might not in part be due to the unmoderated action of the preserved M system, which, he emphasizes, "sees few shades of grey, [so that] its white would correspond to what was (in normal people) a dirty white." This notion gains support from the fact that people with congenital achromatopsia, who have not sustained any damage to their higher visual systems, do not have any such perceptual abnormalities. Thus Knut Nordby writes: "I have never experienced 'dirty,' 'impure,' 'stained,' or 'washed-out' colors, as reported by the artist Jonathan I."

28. J. D. Mollon et al. describe the case of a young police cadet who, following a severe febrile illness (probably cerebral herpes) was left with achromatopsia, hemianopia, and some agnosia and amnesia. Testing him five years after the illness, Mollon reports that "he was able to name (presumably by means of verbal memory] the colours of e.g., grass, traffic lights, and the union jack, but made errors on other common objects (e.g., banana, pillar-box)." Thus here, after five years of total colorblindness, the colors of even the most familiar objects were often forgotten. Such effects have been recorded in ordinary retinal blindness, too, where after some years there may be a widespread loss of all visual memories, including those of color.

29. "A very intelligent blind person," Schopenhauer writes, "could almost [construct] a theory of colours from accurate statements that he heard about them." Diderot, similarly, speaking of Nicholas Saunderson, a famous blind lecturer on optics at Oxford in the early eighteenth century, feels that he had a profound theoretical knowledge and concept of space, although he never had any direct visual percept of it. (See footnote 13, page 139.)

30. With his revulsion from color and brightness, his fondness of dusk andnight, his apparently enhanced vision at dusk and night, Mr. I. sounds likeKaspar Hauser, the boy who was confined in a dimly lit cellar for fifteenyears, as Anselm von Feuerbach described him in 1832 :

As to his sight, there existed, in respect to him, no twilight, no night, nodarkness& At night he stepped everywhere with the greatest confidence; and indark places, he always refused a light when it was offered to him. He oftenlooked with astonishment, or laughed, at persons who, in dark places, forinstance, when entering a house, or walking on a staircase by night, soughtsafety in groping their way, or in laying hold on adjacent objects. Intwilight, he even saw much better than in broad daylight. Thus, after sunset, he once read the number of a house at a distance of one hundred and eightypaces, which, in daylight, he would not have been able to distinguish so faroff. Towards the close of twilight, he once pointed out to his instructor agnat that was hanging in a very distant spider's web. (pp. 83-4)

31. It may be that individuals with congenital achromatopsia developheightened function of the M system, and may be extraordinarily adept atspotting movement. This is currently being investigated by Ralph Siegel andMartin Gizzi.

32. Irecently heard of an achromatopic botanist in England said to be evenbetter than color normals at swiftly identifying ferns and other plants inwoods, hedgerows, and other almost monochromatic environments. Similarly, inWorld War II, people with severe red-green colorblindness were pressed intoservice as bombardiers, because of their ability to "see through" coloredcamouflage and not be distracted by what would be, to the normally sighted, aconfusing and deceiving configuration of colors. One veteran of the Pacifictheater reports that colorblind soldiers were indispensable in spotting themovement of camouflaged troops in the jungle. (All of these things may also beclearer to color normals at twilight.)

33. A similar emergence of new sensibilities and imagination is described in H. G. Wells's great short story "The Country of the Blind": "For fourteengenerations these people have been blind and cut off from all the seeingworld; the names for all the things of sight had faded and changed& Much of their imagination had shrivelled with their eyes, and they had made forthemselves new imaginations with their ever more sensitive ears andfingertips."

The Last Hippie

Such a long, long time to be gone& and a short time to be there

-Robert Hunter "Box of Rain"

Greg F. grew up in the 1950s in a comfortable Queens household, an attractiveand rather gifted boy who seemed destined, like his father, for a professionalcareer-perhaps a career in songwriting, for which he showed a precocioustalent. But he grew restive, started questioning things, as a teenager in thelate sixties; started to hate the conventional life of his parents andneighbors and the cynical, bellicose administration of the country. His needto rebel, but equally to find an ideal and a guide, to find a leader,crystallized in the Summer of Love, in 1967. He would go to the Village andlisten to Allen Ginsberg declaiming all night; he loved rock music, especiallyacid rock, and, above all, the Grateful Dead.

Increasingly he fell out with his parents and teachers; he was truculent withthe one, secretive with the other. In 1968, a time when Timothy Leary wasurging American youth to "tune in, turn on, and drop out," Greg grew his hairlong and dropped out of school, where he had been a good student,- he lefthome and went to live in the Village, where he dropped acid and joined theEast Village drug culture-searching, like others of his generation, forUtopia, for inner freedom, and for "higher consciousness."

But "turning on" did not satisfy Greg, who stood in need of a more codifieddoctrine and way of life. In 1969 he gravitated, as so many young acidheadsdid, to the Swami Bhaktivedanta and his International Society for KrishnaConsciousness, on Second Avenue. And under his influence, Greg, like so manyothers, stopped taking acid, finding his religious exaltation a replacement for acid highs. ("The only radical remedy for dipsomania," William James oncesaid, "is religiomania.") The philosophy, the fellowship, the chanting, therituals, the austere and charismatic figure of the swami himself, came like arevelation to Greg, and he became, almost immediately, a passionate devoteeand convert.[34] Now there was a center, a focus, to his life. In those firstexalted weeks of his conversion, he wandered around the East Village, dressedin saffron robes, chanting the Hare Krishna mantras, and early in 1970, he took up residence in the main temple in Brooklyn. His parents objected atfirst, then went along with this. "Perhaps it will help him," his father said, philosophically. "Perhaps-who knows?-this is the path he needs to follow."

Greg's first year at the temple went well; he was obedient, ingenuous, devoted, and pious. He is a Holy One, said the swami, one of us. Early in1971, now deeply committed, Greg was sent to the temple in New Orleans. Hisparents had seen him occasionally when he was in the Brooklyn temple, but nowcommunication from him virtually ceased.

One problem arose in Greg's second year with the Krish-nas-he complained thathis vision was growing dim, but this was interpreted, by his swami and others, in a spiritual way: he was "an illuminate," they told him; it was the "innerlight" growing. Greg had worried at first about his eyesight, but wasreassured by the swami's spiritual explanation. His sight grew still dimmer, but he offered no further complaints. And indeed, heseemed to be becoming more spiritual by the day-an amazing new serenity hadtaken hold of him. He no longer showed his previous impatience or appetites, and he was sometimes found in a sort of daze, with a strange (some said"transcendental") smile on his face. It is beatitude, said his swami-he isbecoming a saint. The temple felt he needed to be protected at this stage: heno longer went out or did anything unaccompanied, and contact with the outsideworld was strongly discouraged.

Although Greg's parents did not have any direct communication from him, theydid get occasional reports from the temple-reports filled, increasingly, withaccounts of his "spiritual progress," his "enlightenment," accounts at once sovague and so out of character with the Greg they knew that, by degrees, theybecame alarmed. Once they wrote directly to the swami and received a soothing, reassuring reply.

Three more years passed before Greg's parents decided they had to see forthemselves. His father was by then in poor health and feared that if he waitedlonger he might never see his "lost" son again. On hearing this, the templefinally permitted a visit from Greg's parents. In 1975, then, not having seenhim for four years, they visited their son in the temple in New Orleans.

When they did so, they were filled with horror: their lean, hairy son hadbecome fat and hairless; he wore a continual "stupid" smile on his face (thisat least was his father's word for it); he kept bursting into bits of song andverse and making "idiotic" comments, while showing little deep emotion of anykind ("like he was scooped out, hollow inside," his father said); he had lostinterest in everything current; he was disoriented-and he was totally blind.

The temple, surprisingly, acceded to his leaving-perhaps even they felt nowthat his ascension had gone too far and had started to feel some disquietabout his state.

Greg was admitted to the hospital, examined, and transferred to neurosurgery.

Brain imaging had shown an enormous midline tumor, destroying the pituitary gland and the adjacent optic chiasmand tracts and extending on both sides into the frontal lobes. It also reachedbackward to the temporal lobes, and downward to the diencephalon, orforebrain. At surgery, the tumor was found to be benign, a meningioma-but ithad swollen to the size of a small grapefruit or orange, and though thesurgeons were able to remove it almost entirely, they could not undo thedamage it had already done.

Greg was now not only blind, but gravely disabled neurolog-ically andmentally-a disaster that could have been prevented entirely had his firstcomplaints of dimming vision been heeded, and had medical sense, and evencommon sense, been allowed to judge his state. Since, tragically, no recoverycould be expected, or very little, Greg was admitted to Williamsbridge, ahospital for the chronically sick, a twenty-five-year-old boy for whom activelife had come to an end, and for whom the prognosis was considered hopeless.

I first met Greg in April 1977, when he arrived at Williamsbridge Hospital.

Lacking facial hair, and childlike in manner, he seemed younger than histwenty-five years. He was fat, Buddha-like, with a vacant, bland face, hisblind eyes roving at random in their orbits, while he sat motionless in hiswheelchair. If he lacked spontaneity and initiated no exchanges, he respondedpromptly and appropriately when I spoke to him, though odd words wouldsometimes catch his fancy and give rise to associative tangents or snatches ofsong and rhyme. Between questions, if the time was not filled, there tended tobe a deepening silence; though if this lasted for more than a minute, he mightfall into Hare Krishna chants or a soft muttering of mantras. He was still, hesaid, "a total believer," devoted to the group's doctrines and aims.

I could not get any consecutive history from him-he was not sure, for a start, why he was in the hospital and gave different reasons when I asked him aboutthis; first he said, "Because I'm not intelligent," later, "Because I tookdrugs in the past." He knew he had been at the main Hare Krishna temple ("a big red house, 439 Henry Street, in Brooklyn"), but not that he hadsubsequently been at their temple in New Orleans. Nor did he remember that hestarted to have symptoms there-first and foremost a progressive loss ofvision. Indeed he seemed unaware that he had any problems: that he was blind, that he was unable to walk steadily, that he was in any way ill.

Unaware-and indifferent. He seemed bland, placid, emptied of all feeling-itwas this unnatural serenity that his Krishna brethren had perceived, apparently, as "bliss, " and indeed, at one point, Greg used the term himself.

"How do you feel?" I returned to this again and again. "I feel blissful," hereplied at one point, "I am afraid of falling back into the material world."

At this point, when he was first in the hospital, many of his Hare Krishnafriends would come to visit him; I often saw their saffron robes in thecorridors. They would come to visit poor, blind, blank Greg and flock aroundhim; they saw him as having achieved "detachment," as an Enlightened One.

Questioning him about current events and people, I found the depths of hisdisorientation and confusion. When I asked him who was the president, he said"Lyndon," then, "the one who got shot." I prompted, "Jimmy& ," and he said, "Jimi Hendrix," and when I roared with laughter, he said maybe a musical WhiteHouse would be a good idea. A few more questions convinced me that Greg hadvirtually no memory of events much past 1970, certainly no coherent, chronological memory of them. He seemed to have been left, marooned, in thesixties-his memory, his development, his inner life since then had come to astop.

His tumor, a slow-growing one, was huge when it was finally removed in 1976, but only in the later stages of its growth, as it destroyed the memory systemin the temporal lobe, would it actually have prevented the brain fromregistering new events. But Greg had difficulties-not absolute, but partial-even in remembering events from the late sixties, events that he musthave registered perfectly at the time. So beyond the inability to register newexperiences, there had been an erosion of existing memories ja retrogradeamnesia) going back several years before his tumor had developed. There wasnot an absolutely sharp cutoff here, but rather a temporal gradient, so thatfigures and events from 1966 and 1967 were fully remembered, events from 1968or 1969 partially or occasionally remembered, and events after 1970 almostnever remembered.

It was easy to demonstrate the severity of his immediate amnesia. If I gavehim lists of words, he was unable to recall any of them after a minute. When Itold him a story and asked him to repeat it, he did so in a more and moreconfused way, with more and more "contaminations" and misassociations- somedroll, some extremely bizarre-until within five minutes his story bore noresemblance to the one I had told him. Thus when I told him a tale about a lion and a mouse, he soon departed from the original story and had the mousethreatening to eat the lion-it had become a giant mouse and a mini-lion. Bothwere mutants, Greg explained when I quizzed him on his departures. Orpossibly, he said, they were creatures from a dream, or "an alternativehistory" in which mice were indeed the lords of the jungle. Five minuteslater, he had no memory of the story whatever.

I had heard, from the hospital social worker, that he had a passion for music, especially for rock-and-roll bands of the sixties; I saw piles of records assoon as I entered his room and a guitar lying against his bed. So now I askedhim about this, and with this there came a complete transformation-he lost hisdisconnectedness, his indifference, and spoke with great animation about hisfavorite rock bands and pieces-above all, of the Grateful Dead. "I went to seethem at the Fillmore East, and in Central Park," he said. He remembered theentire program in detail, but "my favorite," he added, "is 'Tobacco Road.' "

The title evoked the tune, and Greg sang the whole song with great feeling and conviction-a depth of feeling of which, hitherto, he had not shown the least sign. He seemed transformed, a different person, awhole person, as he sang.

"When did you hear them in Central Park?" I asked.

"It's been a while, over a year maybe," he answered-but in fact they had lastplayed there eight years earlier, in 1969. And the Fillmore East, the famousrock-and-roll theater where Greg had also seen the group, did not survive theearly 1970s. He went on to tell me he once heard Jimi Hendrix at HunterCollege, and Cream, with Jack Bruce playing bass guitar; Eric Clapton, leadguitar; and Ginger Baker, a "fantastic drummer." "Jimi Hendrix," he addedreflectively, "what's he doing? Don't hear much about him nowadays." We spokeof the Rolling Stones and the Beatles-"Great groups," Greg commented, "butthey don't space me out the way the Dead do. What a group," he continued, "there's no one like them. Jerry Garcia-he's a saint, he's a guru, he's agenius. Mickey Hart, Bill Kreutzmann, the drummers are great. There's BobWeir, there's Phil Lesh; but Pigpen-I love him."

This narrowed down the extent of his amnesia. He remembered songs vividly from1964 to 1968. He remembered all the founding members of the Grateful Dead, from 1967. But he was unaware that Pigpen, Jimi Hendrix, and Janis Joplin wereall dead. His memory cut off by 1970, or before. He was caught in the sixties, unable to move on. He was a fossil, the last hippie.

At first I did not want to confront Greg with the enormity of his time loss, his amnesia, or even to let involuntary hints through (which he wouldcertainly pick up, for he was very sensitive to anomaly and tone), so Ichanged the subject and said, "Let me examine you."

He was, I noted, somewhat weak and spastic in all his limbs, more on the left, and more in the legs. He could not stand alone. His eyes showed complete opticatrophy-it was impossible for him to see anything. But strangely, he did notseem to be aware of being blind and would guess that I was showing him a blue ball, a red pen (when in fact it was a green comb and a fobwatch that I showed him). Nor indeed did he seem to "look"; he made no specialeffort to turn in my direction, and when we were speaking, he often failed toface me, to look at me. When I asked him about seeing, he acknowledged thathis eyes weren't "all that good," but added that he enjoyed "watching" the TV.

Watching TV for him, I observed later, consisted of following with attentionthe soundtrack of a movie or show and inventing visual scenes to go with it(even though he might not even be looking toward the TV). He seemed to think, indeed, that this was what "seeing" meant, that this was what was meant by"watching TV," and that this was what all of us did. Perhaps he had lost thevery idea of seeing.

I found this aspect of Greg's blindness, his singular blindness to hisblindness, his no longer knowing what "seeing" or "looking" meant, deeplyperplexing. It seemed to point to something stranger, and more complex, than amere "deficit," to point, rather, to some radical alteration within him in thevery structure of knowledge, in consciousness, in identity itself.[35] I had already had some sense of this when testing his memory, finding hisconfinement, in effect, to a single moment- "the present"-uninformed by anysense of a past (or a future). Given this radical lack of connection andcontinuity in his inner life, I got the feeling, indeed, that he might nothave an inner life to speak of, that he lacked the constant dialogue of pastand present, of experience and meaning, which constitutes consciousness andinner life for the rest of us. He seemed to have no sense of "next" and to lack that eager and anxious tension of anticipation, of intention, thatnormally drives us through life.

Some sense of ongoing, of "next," is always with us. But this sense ofmovement, of happening, Greg lacked; he seemed immured, without knowing it, ina motionless, timeless moment. And whereas for the rest of us the present isgiven its meaning and depth by the past (hence it becomes the "rememberedpresent," in Gerald Edelman's term), as well as being given potential andtension by the future, for Greg it was flat and (in its meager way) complete.

This living-in-the-moment, which was so manifestly pathological, had beenperceived in the temple as an achievement of higher consciousness.

Greg seemed to adjust to Williamsbridge with remarkable ease, considering hewas a young man being placed, probably forever, in a hospital for thechronically ill. There was no furious defiance, no railing at Fate, no sense, apparently, of indignity or despair. Compliantly, indifferently, Greg lethimself be put away in the backwater of Williamsbridge. When I asked him aboutthis, he said, "I have no choice." And this, as he said it, seemed wise andtrue. Indeed, he seemed eminently philosophical about it. But it was aphilosophicalness made possible by his indifference, his brain damage.

His parents, so estranged from him when he was rebellious and well, camedaily, doted on him, now that he was helpless and ill; and they, for theirpart, could be sure, at any time, that he would be at the hospital, smilingand grateful for their visit. If he was not "waiting" for them, so much thebetter- they could miss a day, or a few days, if they were away; he would notnotice, but would be cordial as ever the next time they came.

Greg soon settled in, with his rock records and his guitar, his Hare Krishnabeads, his Talking Books, and a schedule of programs-physiotherapy, occupational therapy, music groups, drama. Soon after admission he was movedto a ward with younger patients, where with his open and sunny personality hebecame popular. He did not actually know any of the other patients or thestaff, at least for several months, but was invariably (if indiscriminately) pleasant to them all. And there were at least two special friendships, notintense, but with a sort of complete acceptance and stability. His motherremembers "Eddie, who had MS& they both loved music, they had adjacent rooms, they used to sit together& and Judy, she had CP, she would sit for hours withhim, too." Eddie died, and Judy went to a hospital in Brooklyn; there has beenno one so close for many years. Mrs. F. remembers them, but Greg does not, never asked for them, or about them, after they had gone-though perhaps, hismother thought, he was sadder, at least less lively, for they stimulated him, got him talking and listening to records and inventing limericks, joking andsinging; they pulled him out of "that dead state" he would otherwise fallinto.

A hospital for the chronically ill, where patients and staff live together foryears, is a little like a village or a small town: everybody gets to meet, toknow, everybody else. I often saw Greg in the corridors, being wheeled todifferent programs or out to the patio, in his wheelchair, with the same odd, blind yet searching look on his face. And he gradually got to know me, atleast sufficiently to know my name, to ask each time we met, "How're youdoing, Dr. Sacks? When's the next book coming out?" (a question that ratherdistressed me in the seemingly endless eleven-year interim between thepublication of Awakenings and A Leg to Stand On).

Names, then, he might learn, with frequent contact, and in relation to them hewould recollect a few details about each new person. Thus he came to knowConnie Tomaino, the music therapist-he would recognize her voice, herfootfalls, immediately-but he could never remember where or how he had mether. One day Greg began talking about "another Connie," a girl called Conniewhom he'd known in high school.

This other Connie, he told us, was also, remarkably, very musical-"How comeall you Connies are so musical?" he teased. The other Connie would conductmusic groups, he said, would give out song sheets, play the piano-accordion atsingsongs at school. At this point, it started to dawn on us that this "other" Connie was in fact Connie herself, and this was clinched when he added, "Youknow, she played the trumpet, too." (Connie Tomaino is a professional trumpetplayer.) This sort of thing often happened with Greg when he put things intothe wrong context or failed to connect them with the present.

His sense of there being two Connies, his segmenting Connie into two, wascharacteristic of the bewilderments he sometimes found himself in, his need tohypothesize additional figures because he could not retain or conceive of anidentity in time. With consistent repetition Greg might learn a few facts, andthese would be retained. But the facts were isolated, denuded of context. Aperson, a voice, a place, would slowly become "familiar," but he remainedunable to remember where he had met the person, heard the voice, seen theplace. Specifically, it was context-bound (or "episodic") memory that was sogrossly disturbed in Greg-as is the case with most amnesiacs.

Other sorts of memory were intact,- thus Greg had no difficulty remembering orapplying geometric truths that he had learned in school. He saw instantly, forexample, that the hypotenuse of a triangle was shorter than the sum of the twosides-thus his semantic memory, so-called, was fairly intact. Again, he notonly retained his power to play the guitar, but actually enlarged his musicalrepertoire, learning new techniques and fingering with Connie; he also learnedto type while at Williamsbridge-so his procedural memory was also unimpaired.

Finally, there seemed to be some sort of slow habituation orfamiliarization-so that he became able, within three months, to find his wayabout the hospital, to go to the coffee shop, the cinema, the auditorium, thepatio, his favorite places. This sort of learning was exceedingly slow, but once it had been achieved, it was tenaciously retained.

It was clear that Greg's tumor had caused damage that was complex and curious. First, it had compressed or destroyed structures of the inner, or medial, side of both the temporal lobes-in particular, the hippocampus and its adjacent cortex, areas crucial for the capacity to form new memories. With such damage, the ability to acquire information about new facts and events is devastated-there ceases to be any explicit or conscious remembrance of these.

But while Greg was so often unable to recall events or encounters or facts to consciousness, he might nonetheless have an unconscious or implicit memory of them, a memory expressed in performance or behavior. Such implicit ability to remember allowed him to become slowly familiar with the physical layout and routines of the hospital and with some of the staff, and to make judgments on whether certain persons (or situations) were pleasant or unpleasant.*36*

While explicit learning requires the integrity of the medial temporal lobe systems, implicit learning may employ more primitive and diffuse paths, as do the simple processes of conditioning and habituation. Explicit learning, however, involves the construction of complex percepts-syntheses of representations from every part of the cerebral cortex-brought together into a contextual unity, or "scene." Such syntheses can be held in mind for only a minute or two-the limit of short-term memory-and after this will be lost unless they can be shunted into long-term memory.

Thus higher-order memorization is a multistage process, involving the transfer of perceptions, or perceptual syntheses, from short-term to long-term memory. It is just such a transfer that fails to occur in people with temporal lobe damage. Thus Greg can repeat a complicated sentence with complete accuracy and understanding the moment he hears it, but within three minutes, or sooner if he is distracted for an instant, he will retain not a trace of it, or any idea of its sense, or any memory that it ever existed.

Larry Squire, a neuropsychologist at the University of California, San Diego, who has been a central figure in elucidating this shunting function of the temporal lobe memory system, speaks of the brevity, the precariousness, of short-term memory in us all; all of us, on occasion, suddenly lose a perception or an image or a thought we had vividly in mind ("Damn it," we may say, "I've forgotten what I wanted to say!"), but only in amnesiacs is this precariousness realized to the full.

Yet while Greg, no longer capable of transforming his perceptions or immediate memories into permanent ones, remains stuck in the sixties, when his ability to learn new information broke down, he has nevertheless adapted somehow and absorbed some of his surroundings, albeit very slowly and incompletely.*37*

Some amnesiacs (like Jimmie, the patient with Korsakov's syndrome whom I described in "The Lost Mariner") have brain damage largely confined to the memory systems of the diencephalon and medial temporal lobe; others (like Mr. Thompson, described in "A Matter of Identity") are not only amnesiac but have frontal lobe syndromes, too; yet others- like Greg, with immense tumors-tend to have a third area of damage as well, deep below the cerebral cortex, in the fore-brain, or diencephalon. In Greg, this widespread damage had created a very complicated clinical picture, with sometimes overlapping or even contradictory symptoms and syndromes. Thus though his amnesia was chiefly caused by damage to the temporal lobe systems, damage to the diencephalon and frontal lobes also played a part.

Similarly there were multiple origins for his blandness and indifference, for which damage to the frontal lobes, diencephalon, and pituitary gland was in varying degrees responsible. In fact, Greg's tumor first caused damage to his pituitary gland; this was responsible not only for his gain in weight and loss of body hair but also for undermining his hor-monally driven aggressiveness and assertiveness, and hence for his abnormal submissiveness and placidity.

The diencephalon is especially a regulator of basic functions-of sleep, of appetite, of libido. And all of these were at a low ebb with Greg-he had (orexpressed) no sexual interest; he did not think of eating, or express anydesire to eat, unless food was brought to him. He seemed to exist only in thepresent, only in response to the immediacy of stimuli around him. If he wasnot stimulated, he fell into a sort of daze.

Left alone, Greg would spend hours in the ward without spontaneous activity.

This inert state was at first described by the nurses as "brooding"; it hadbeen seen in the temple as "meditating"; my own feeling was that it was aprofoundly pathological mental "idling," almost devoid of mental content oraffect. It was difficult to give a name to this state, so different fromalert, attentive wakefulness, but also, clearly, quite different from sleep-ithad a blankness resembling no normal state. It reminded me somewhat of thevacant states I had seen with some of my postencephalitic patients and, aswith them, went with profound damage to the diencephalon. As soon as onetalked to him, or if he was stimulated by sounds (especially music) near him, he would "come to," "awaken," in an astonishing way.

Once Greg was "awakened," once his cortex came to life, one saw that hisanimation itself had a strange quality-an uninhibited and quirky quality ofthe sort one tends to see when the orbital portions of the frontal lobes (thatis, the portions adjacent to the eyes) are damaged, a so-called orbito-frontalsyndrome. The frontal lobes are the most complex part of the brain, concernednot with the "lower" functions of movement and sensation, but the highest onesof integrating all judgment and behavior, all imagination and emotion, intothat unique identity that we like to speak of as "personality" or "self."

Damage to other parts of the brain may produce specific disturbances ofsensation or movement, of language, or of specific perceptual, cognitive, ormemory functions. Damage to the frontal lobes, in contrast, does not affectthese, but produces a subtler and profounder disturbance of identity.

And it was this-rather than his blindness, or his weakness, or hisdisorientation, or his amnesia-that so horrified his parents when they finallysaw Greg in 1975. It was not just that he was damaged, but that he was changedbeyond recognition, had been "dispossessed," in his father's words, by a sortof simulacrum, or changeling, which had Greg's voice and manner and humor andintelligence but not his "spirit" or "real-ness" or "depth"-a changeling whosewisecracking and levity formed a shocking counterpoint to the fearful gravityof what had happened.

This sort of wisecracking, indeed, is quite characteristic of suchorbito-frontal syndromes-and is so striking that it has been given a name untoitself: witzelsucht, or "joking disease." Some restraint, some caution, someinhibition, is destroyed, and patients with such syndromes tend to reactimmediately and incontinently to everything around them and everything withinthem-to virtually every object, every person, every sensation, every word, every thought, every emotion, every nuance and tone.

There is an overwhelming tendency, in such states, to wordplay and puns. Oncewhen I was in Greg's room another patient walked past. "That's Bernie," Isaid. "Bernie the Hernie," quipped Greg. Another day when I visited him, hewas in the dining room, awaiting lunch. When a nurse announced, "Lunch ishere," he immediately responded, "It's time for cheer"; when she said, "ShallI take the skin off your chicken?" he instantly responded, "Yeah, why don'tyou slip me some skin." "Oh, you want the skin?" she asked, puzzled.

"Nah," he replied, "it's just a saying." He was, in a sense, pre-ternaturallysensitive-but it was a sensitivity that was passive, without selectivity orfocus. There is no differentiation in such a sensitivity-the grand, thetrivial, the sublime, the ridiculous, are all mixed up and treated as equal.[38] There may be a childlike spontaneity and transparency about such patients intheir immediate and unpremeditated (and often playful) reactions. And yetthere is something ultimately disquieting, and bizarre, because the reactingmind (which may still be highly intelligent and inventive) loses itscoherence, its inwardness, its autonomy, its "self," and becomes the slave of every passing sensation. The French neurologist François Lhermitte speaks ofan "environmental dependency syndrome" in such patients, a lack ofpsychological distance between them and their environment. So it was withGreg: he seized his environment, he was seized by it, he could not distinguishhimself from it.[39]

Dreaming and waking, for us, are usually distinct- dreaming is enclosed insleep and enjoys a special license because it is cut off from externalperception and action; while waking perception is constrained by reality.[40] But in Greg the boundary between waking and sleep seemed to break down, andwhat emerged was a sort of waking or public dream, in which dreamlike fanciesand associations and symbols would proliferate and weave themselves into thewaking perceptions of the mind. [41] These associations were often startling andsometimes surrealistic in quality. They showed the power of fancy at play and, specifically, the mechanisms-displacement, condensation, "overdetermination," and so on- that Freud has shown to be characteristic of dreams.

One felt all this very strongly with Greg; that he was often in someintermediate, half-dreamlike state in which, if the normal control andselectivity of thinking was lost, there was a half freedom, half compulsion, of fantasy and wit. To see this as pathological was necessary butinsufficient: it had elements of the primitive, the childlike, the playful.

Greg's absurdist, often gnomic utterances, along with his seeming serenity(actually blandness), gave him an appearance of innocence and wisdom combined, gave him a special status on the ward, ambiguous but respected, a Holy Fool.

Though as a neurologist I had to speak of Greg's "syndrome," his "deficits," Idid not feel this was adequate to describe him. I felt, one felt, that he hadbecome another "kind" of person; that though his frontal lobe damage had takenaway his identity in a way, it had also given him a sort of identity orpersonality, albeit of an odd and perhaps a primitive sort.

If Greg was alone, in a corridor, he seemed scarcely alive,-but as soon as hewas in company, he was a different person altogether. He would "come to," hewould be funny, charming, ingenuous, sociable. Everyone liked him; he wouldrespond to anyone at once, with a lightness and a humor and an absence ofguile or hesitation; and if there was something too light or flippant orindiscriminate in his interactions and reactions, and if, moreover, he lostall memory of them in a minute, well, there were worse things; it wasunderstandable, one of the results of his disease. Thus one was very aware, ina hospital for chronic patients like ours, a hospital where feelings ofmelancholy, of rage, and of hopelessness simmer and preside, of the virtue ofa patient such as Greg-who never appeared to have bad moods, and who, whenactivated by others, was invariably cheerful, euphoric.

He seemed, in an odd way, and in consequence of his sickness, to have a sortof vitality or health-a cheeriness, an inventiveness, a directness, anexuberance, which other patients, and indeed the rest of us, found delightfulin small doses. And where he had been so "difficult," so tormented, sorebellious in his pre-Krishna days, all this anger and torment and angst nowseemed to have vanished,- he seemed to be at peace. His father, who had had aterrible time in Greg's stormy days, before he got "tamed" by drugs, byreligion, by tumor, said to me in an unbuttoned moment, "It's like he had alobotomy," and then, with great irony, "Frontal lobes-who needs 'em?"

One of the most striking peculiarities of the human brain is the greatdevelopment of the frontal lobes- they are much less developed in otherprimates and hardly evident at all in other mammals. They are the part of thebrain that grows and develops most after birth (and their development is notcomplete until about the age of seven). But our ideas about the function ofthe frontal lobes, and the role they play, have had a tortuous and ambiguoushistory and are still far from clear. These uncertainties are well exemplifiedby the famous case of Phineas Gage, and the interpretations andmisinterpretations, from 1848 to the present, of his case. Gage was the very capable foreman of a gang of workers constructing a railroad line nearBurlington, Vermont, when a bizarre accident befell him in September 1848. Hewas setting an explosive charge, using a tamping iron (a crowbarlikeinstrument weighing thirteen pounds and more than a yard long), when thecharge went off prematurely, blowing the tamping iron straight through hishead. Though he was knocked down, incredibly he was not killed but onlystunned for a moment. He was able to get up and take a cart into town. Therehe appeared perfectly rational and calm and alert and greeted the local doctorby saying, "Doctor, here is business enough for you."

Soon after his injury, Gage developed a frontal lobe abscess and fever, butthis resolved within a few weeks, and by the beginning of 1849 he was called"completely recovered." That he had survived at all was seen as a medicalmiracle, and that he was seemingly unchanged after sustaining huge damage tothe frontal lobes of the brain seemed to support the idea that these wereeither functionless or had no functions that could not be performed equally bythe remaining, undamaged portions of the brain. Where phrenologists, earlierin the century, had seen every part of the brain surface as the "seat" of aparticular intellectual or moral faculty, a reaction to this had set in duringthe 1830s and 1840s, to such an extent that the brain was sometimes seen asbeing as undifferentiated as the liver. Indeed, the great physiologistFlourens had said, "The brain secretes thought as the liver secretes bile."

The apparent absence of any change in Gage's behavior seemed to support thisnotion.

Such was the influence of this doctrine that, despite clear evidence fromother sources of a radical change in Gage's "character" within weeks of theaccident, it was only twenty years later that the physician who had studiedhim most closely, John Martyn Harlow (now, apparently, moved by the newdoctrines of "higher" and "lower" levels in the nervous system, the higherinhibiting or constraining the lower) provided a vivid description of all thathe had ignored, or at least not mentioned, in 1848:

[Gage is] fitful, irreverent, indulging at times in the grossest profanity(which was not previously his custom), manifesting but little deference forhis fellows, impatient of restraint or advice when it conflicts with hisdesires, at times pertinaciously obstinate, yet capricious and vacillating, devising many plans of future operations, which are no sooner arranged thanthey are abandoned in turn for others appearing more feasible. A child in hisintellectual capacity and manifestations, he has the animal passions of astrong man. Previous to his injury, although untrained in the schools, hepossessed a well-balanced mind, and was looked upon by those who knew him as ashrewd, smart businessman, very energetic and persistent in executing all hisplans of operation. In this regard his mind was radically changed, sodecidedly that his friends and acquaintances said he was "no longer Gage."

It seemed that a sort of "disinhibition" had occurred with the frontal lobe injury, releasing something animal-like or childlike, so that Gage now becamea slave of his immediate whims and impulses, of what was immediately aroundhim, without the deliberation, the consideration of past and future, that hadmarked him in the past, or his previous concern for others and theconsequences of his actions.[42] But excitement, release, disinhibition, are not the only possible effects offrontal lobe damage. David Ferner (whose Gulstonian Lectures of 1879introduced the Gage case to a worldwide medical community) observed adifferent sort of syndrome in 1876, when he removed the frontal lobes ofmonkeys:

Notwithstanding this apparent absence of physiological symptoms, I couldperceive a very decided alteration in the animal's character and behaviour& Instead of, as before, being actively interested in their surroundings, and curiously prying into all that came within the field of their observation, they remained apathetic, or dull, or dozed off to sleep, responding only to the sensations or impressions of the moment, or varying their listlessness with restless and purposeless wanderings to and fro. While not actually deprived of intelligence, they had lost, to all appearance, the faculty of attentive and intelligent observation.

In the 1880s it became apparent that tumors of the frontal lobes could produce symptoms of many sorts: sometimes listlessness, hebetude, slowness of mental activity, sometimes a definite change in character and loss of self-controlsometimes even (according to Gowers) "chronic insanity." The first operation for a frontal lobe tumor was performed in 1884, and the first frontal lobe operation for purely psychiatric symptoms was done in 1888. The rationale here was that in these (probably schizophrenic) patients, the obsessions, the hallucinations, the delusional excitements, were due to overactivity, or pathological activity, in the frontal lobes.

There was to be no repetition of such forays for forty-five years, until the 1930s, when the Portuguese neurologist Egas Moniz devised the operation he called "prefrontal leucotomy" and immediately applied this to twenty patients, some with anxiety and depression, some with chronic schizophrenia. The results he claimed aroused huge interest when his monograph was published in 1936, and his lack of rigor, his recklessness, and perhaps dishonesty were all overlooked in the flush of therapeutic enthusiasm. Moniz's work led to an explosion of "psychosurgery" (the term he had coined) all over the world- Brazil, Cuba, Romania, Great Britain, and especially Italy- but its greatest resonance was to be in the United States, where the neurologist Walter Freeman invented a horrible new form of surgical approach that he called transorbital lobotomy. He described the procedure as follows:

This consists of knocking them out with a shock and while they are under the "anesthetic" thrusting an ice pick up between the eyeball and the eyelid through the roof of the orbit actually into the frontal lobe of the brain and making the lateral cut by swinging the thing from side to side. I have done two patients on both sides and another on one side without running into any complications, except a very black eye in one case. There may be trouble later on but it seemed fairly easy, although definitely a disagreeable thing to watch. It remains to be seen how these cases hold up, but so far they have shown considerable relief of their symptoms, and only some of the minor behavior difficulties that follow lobotomy. They can even get up and go home within an hour or so.

The ease of doing psychosurgery as an office procedure, with an ice pick, aroused not consternation and horror, as it should have, but emulation. More than ten thousand operations had been done in the United States by 1949, and a further ten thousand in the two years that followed. Moniz was widely acclaimed as a "savior" and received the Nobel Prize in 1951-the climax, in Macdonald Critchley's words, of "this chronicle of shame."

What was achieved, of course, was never "cure," but a docile state, a state of passivity, as far (or farther) from "health" than the original active symptoms, and (unlike these) with no possibility of resolution or reversal.

Robert Lowell, in "Memories of West Street and Lepke," writes of the lobotomized Lepke:

Flabby, bald, lobotomized, he drifted in a sheepish calm, where no agonizing reappraisal jarred his concentration on the electric chair-hanging like an oasis in his air of lost connections&

When I worked at a state psychiatric hospital between 1966 and 1990, I sawdozens of these pathetic lobotomized patients, many far more damaged even than Lepke, some psychically dead, murdered, bytheir "cure." *43*

Whether or not there are in the frontal lobes a mass of pathological circuitscausing the torments of mental illness-the simplistic notion first put forwardin the 1880s, and embraced by Moniz-there is certainly a downside to theirgreat and positive powers. The weight of consciousness and conscience andconscientiousness itself, the weight of duty, obligation, responsibility, canpress on us sometimes with unbearable force, so that we long for a releasefrom its crushing inhibitions, from sanity and sobriety. We long for a holidayfrom our frontal lobes, a Dionysiac fiesta of sense and impulse. That this isa need of our constrained, civilized, hyperfrontal nature has been recognizedin every time and culture. All of us need to take little holidays from ourfrontal lobes-the tragedy is when, through grave illness or injury, there isno return from the holiday, as with Phineas Gage, or with Greg. [44]

In a March 1979 note about Greg, I reported that "games, songs, verses, converse, etc. hold him together completely& because they have an organicrhythm and stream, a flowing of being, which carries and holds him." I wasstrongly reminded here of what I had seen with my amnesiac patient Jimmie, howhe seemed held together when he attended Mass, by his relationship to andparticipation in an act of meaning, an organic unity, which overrode orbypassed the disconnections of his amnesia.[45] And what I had observed with apatient in England, a musicologist with profound amnesia from a temporal lobeencephalitis, unable to remember events or facts for more than a few seconds, but able to remember, and indeed to learn, elaborate musical pieces, toconduct them, to perform them, and even to improvise at the organ. [46]

It was similar with Greg as well: he not only had an excellent memory forsongs of the sixties, but was able to learn new songs easily, despite his difficulty in retaining any "facts." It seemedas if wholly different kinds-and mechanisms-of memory might be involved. Gregwas also able to pick up limericks and jingles with ease (and had indeedpicked up hundreds of these from the radio and television that were always onin the ward). Soon after his admission, I tested him with the followinglimerick:

Hush-a-bye baby, Hush quite a lot, Bad babies get rabies And have to be shot.

Greg immediately repeated this, without error, laughed at it, asked if I'd made it up, and compared it with "something gruesome, like Edgar Allan Poe." But two minutes later he could not recall it, until I reminded him of the underlying rhythm. With a few more repetitions, he learned it without cueing and thereafter recited it whenever he met me.

Was this facility for learning jingles and songs a mere procedural orperformative one, or could it provide emotional depth or generalizability of asort that Greg did not normally have access to? There seemed no doubt thatsome music could move him profoundly, could be a door to depths of feeling andmeaning to which he normally had no access, and one felt Greg was a differentperson at these times. He no longer seemed to have a frontal lobe syndrome, but was (so to speak) temporarily "cured" by the music. Even his EEG, so slowand incoherent most of the time, became calm and rhythmical with music.[47]

It is easy to show that simple information can be embedded in songs; thus wecan give Greg the date every day in the form of a jingle, and he can readilyisolate this and say it when asked, without the jingle. But what does it meanto say, "This is July 9, 1995," when one is sunk in the profoundest amnesia, when one has lost a sense of time and history, when one is existing frommoment to moment in a sequenceless limbo? Knowing the date means nothing inthese circumstances. Could one, however, through the evocativeness and powerof music, perhaps using songs with specially written lyrics- songs that relatesomething valuable about himself or the current world-accomplish somethingmore lasting, deeper? Give Greg not only the "facts," but a sense of time andhistory, of the relatedness of events, an entire (if artificial) framework forthinking and feeling?

It seemed natural, at this time, given Greg's blindness and the revelation ofhis potential for learning, that he should be given an opportunity to learnBraille. Arrangements were made with the Jewish Institute for the Blind forhim to enter intensive training, four times a week. It should not have been adisappointment, nor indeed a surprise, that Greg was unwilling to learn anyBraille-that he was startled and bewildered at finding this imposed on him, and cried out, "What's going on? Do you think I'm blind? Why am I here, withblind people all around me?" Attempts were made to explain things to him, andhe responded, with impeccable logic, "If I were blind, I would be the firstperson to know it." The institute said they had never had such a difficultpatient, and the project was quietly allowed to drop. And indeed, with thefailure of the Braille program, a sort of hopelessness gripped us, and perhapsGreg, too. We could do nothing, we felt; he had no potential for change.

Greg by this time had had several psychological and neuropsychologicalevaluations, and these, besides commenting on his memory and attentionalproblems, had all spoken of him as being "shallow," "infantile," "insightless," "euphoric." It was easy to see why these words had been used; Greg was like this for much of the time. But was there a deeper Greg beneathhis illness, beneath the shallowing effect of his frontal lobe loss andamnesia? Early in 1979, when I questioned him, he said he was "miserable& at least in the corporeal part," and added, "It's not much of a life." At suchtimes, it was clear that he was not just frivolous and euphoric, but capableof deep, and indeed melancholic, reactions to his plight. The comatose KarenAnn Quinlan was then very much in the news, and each time her name and fatewere mentioned, Greg became distressed and silent. He could never tell me, explicitly, why this so interested him-but it had to be, I felt, because ofsome sort of identification of her tragedy with his own. Or was this just hisincontinent sympathy, his falling at once into the mood of any stimulus ornews, falling almost helplessly, mimetically, into its mood?

This was not a question I could decide at first, and perhaps, too, I wasprejudiced against finding any depths in Greg, because the neuropsychologicalstudies I knew of seemed to disallow this possibility. But these studies werebased on brief evaluations, not on long-continued observation and relationshipof a sort that is, perhaps, only possible in a hospital for chronic patients, or in situations where a whole world, a whole life, are shared with thepatient.

Greg's "frontal lobe" characteristics-his lightness, his quick-fireassociations-were fun, but beyond this there shone through a basic decency andsensitivity and kindness. One felt that Greg, though damaged, still had apersonality, an identity, a soul.*48*

When he came to Williamsbridge we all responded to his intelligence, his highspirits, his wit. All sorts of therapeutic programs and enterprises werestarted at this time, but all of them-like the learning of Braille-ended infailure. The sense of Greg's incorrigibility gradually grew on us, and withthis we started to do less, to hope less. Increasingly, he was left to his owndevices. He slowly ceased to be a center of attention, the focus of eagertherapeutic activities-more and more he was left to himself, left out ofprograms, not taken anywhere, quietly ignored.

It is easy, even if one is not an amnesiac, to lose touch with current realityin the back wards of hospitals for the chronically ill. There is a simpleround that has not changed in twenty, or fifty, years. One is wakened, fed, taken to the toilet, and left to sit in a hallway; one has lunch, one is takento bingo, one has dinner and goes to bed. The television may indeed be lefton, blaring, in the television room-but most patients pay no attention to it.

Greg, it is true, enjoyed his favorite soap operas and westerns and learned anenormous number of advertising jingles by heart. But the news, for the mostpart, he found boring and, increasingly, unintelligible. Years can pass, in asort of timeless limbo, with few, and certainly no memorable, markers of thepassage of time.

As ten years or so went by, Greg showed a complete absence of development, histalk seemed increasingly dated and répertoriai, for nothing new was beingadded to it, or him. The tragedy of his amnesia seemed to become greater withthe years, although his amnesia itself, his neurological syndrome, remainedmuch the same.

In 1988 Greg had a seizure-he had never had one before (although he had beenon anticonvulsants, as a precaution, since the time of his surgery)-and in theseizure broke a leg. He did not complain of this, he did not even mention it; it was only discovered when he tried to stand up the following day. He had, apparently, forgotten it as soon as the pain eased and as soon as he had founda comfortable position. His not knowing that he had broken a leg seemed to meto have similarities to his not knowing he was blind, his inability, with his amnesia, to hold in mind an absence. When the leg caused pain, briefly, heknew something had happened, he knew it was there; as soon as the pain ceased, it went from his mind. Had he had visual hallucinations or phantoms (as theblind sometimes do, at least in the first months and years after losing theirsight), he could have spoken of them, said, "Look!" or "Wow!" But in theabsence of actual visual input, he could hold nothing in mind about seeing, ornot-seeing, or the loss of a visual world. In his person, and in his world, now, Greg knew only presence, not absence. He seemed incapable of registeringany loss-loss of function in himself, or of an object, or a person.

In June of 1990, Greg's father, who had come every morning before work to seeGreg and would joke and chat with him for an hour, suddenly died. I was awayat the time (mourning my own father), and hearing the news of Greg'sbereavement on my return, I hastened to see him. He had been given the news, of course, when it happened. And yet I was not quite sure what to say-had hebeen able to absorb this new fact? "I guess you must be missing your father," I ventured.

"What do you mean?" Greg answered. "He comes every day. I see him every day."

"No," I said, "he's no longer coming& He has not come for some time. He died last month."

Greg flinched, turned ashen, became silent. I had the impression he wasshocked, doubly shocked, at the sudden, appalling news of his father's death, and at the fact that he himself did not know, had not registered, did not remember. "I guess he musthave been around fifty," he said.

"No, Greg," I answered, "he was well up in his seventies."

Greg grew pale again as I said this. I left the room briefly; I felt he neededto be alone with all this. But when I returned a few minutes later, Greg hadno memory of the conversation we had had, of the news I had given him, no ideathat his father had died.

Very clearly, at least, Greg showed a capacity for love and grief. If I hadever doubted Greg's capacity for deeper feeling, I no longer doubted it now.

He was clearly devastated by his father's death-he showed nothing "flip," no levity, at this time. *49* But would he have the ability to mourn? Mourningrequires that one hold the sense of loss in one's mind, and it was far fromclear to me that Greg could do this. One might indeed tell him that his fatherhad died, again and again. And every time it would come as something shockingand new and cause immeasurable distress. But then, in a few minutes, he wouldforget and be cheerful again, and was so prevented from going through the workof grief, the mourning. *50*

I made a point of seeing Greg frequently in the following months, but I didnot again bring up the subject of his father's death. It was not up to me, Ithought, to confront him with this-indeed it would be pointless and cruel todo so; life itself, surely, would do so, for Greg would discover his father'sabsence.

I made the following note on November 26, 1990: "Greg shows no consciousknowing that his father has died-when asked where his father is, he may say, 'Oh, he went down to the patio/ or 'He couldn't make it today/ or something else plausible. But heno longer wants to go home, on weekends, on Thanksgiving, as he so loved to-hemust find something sad or repugnant in the fatherless house now, even thoughhe cannot (consciously) remember or articulate this. Clearly he hasestablished an association of sadness."

Toward the end of the year Greg, normally a sound sleeper, started to sleeppoorly, to get up in the middle of the night and wander gropingly for hoursaround his room. "I've lost something, I'm looking for something," he wouldsay when asked- but what he had lost, what he was looking for, he could neverexplain. One could not avoid the feeling that Greg was looking for his father, even though he could give no account of what he was doing and had no explicitknowledge of what he had lost. But, it seemed to me, there was perhaps now animplicit knowledge and perhaps, too, a symbolic (though not a conceptual) knowing.

Greg had seemed so sad since his father's death that I felt he deserved aspecial celebration-and when I heard, in August of 1991, that his belovedgroup, the Grateful Dead, would be playing at Madison Square Garden in a fewweeks, this seemed just the thing. Indeed, I had met one of the drummers inthe band, Mickey Hart, earlier in the summer, when we had both testifiedbefore the Senate about the therapeutic powers of music, and he made itpossible for us to obtain tickets at the last minute, to bring Greg, wheelchair and all, into the concert, where a special place would be saved forhim near the soundboard, where acoustics were best.

We made these arrangements at the last minute, and I had given Greg nowarning, not wanting to disappoint him if we failed to get seats. But when Ipicked him up at the hospital and told him where we were going, he showedgreat excitement. We got him dressed swiftly and bundled him into the car. Aswe got into midtown, I opened the car windows, and the sounds and smells ofNew York came in. As we cruised down Thirty-third Street, the smell of hotpretzels suddenly struck him; he inhaled deeply and laughed. "That's the mostNew York smell in the world."

There was an enormous crowd converging on Madison Square Garden, most intie-dyed T-shirts-I had hardly seen a tie-dyed T-shirt in twenty years, and Imyself began to think we were back in the sixties, or perhaps that we hadnever left them. I was sorry that Greg could not see this crowd; he would havefelt himself one of them, at home. Stimulated by the atmosphere, Greg startedto talk spontaneously-very unusual for him-and to reminisce about the sixties:

Yeah, there were the be-ins in Central Park. They haven't had one for a longtime-over a year, maybe, can't remember exactly& Concerts, music, acid, grass, everything& First time I was there was Flower-Power Day& Good times& lots of things started in the sixties-acid rock, the be-ins, the love-ins, smoking& Don't see it much these days& Allen Ginsberg-he's down in theVillage a lot, or in Central Park. I haven't seen him for a long time. It'sover a year since I last saw him&

Greg's use of the present tense, or the near-present tense; his sense of allthese events, not as far distant, much less as terminated, but as having takenplace "a year ago, maybe" (and, by implication, likely to take place again, atany time); all this, which seemed so pathological, so anachronistic inclinical testing, seemed almost normal, natural, now that we were part of thissixties crowd sweeping toward the Garden.

Inside the Garden we found the special place reserved for Greg's wheelchairnear the soundboard. And now Greg was growing more excited by the minute; theroar of the crowd excited him-"It's like a giant animal," he said-and thesweet, hash-laden air. "What a great smell," he said, inhaling deeply. "It'sthe least stupid smell in the world." [51]

As the band came onstage, and the noise of the crowd grew greater, Greg wastransported by the excitement and started clapping loudly and shouting in anenormous voice, "Bravo! Bravo!" then "Let's go!" followed by "Let's go, Hypo," followed, homophonously, by "Ro, Ro, Ro, Harry-Bo." Pausing a moment, Greg said to me, "See the tombstone behind the drums? See Jerry Garcia's Afro?" with such conviction that I was momentarily taken in and looked (in vain) fora tombstone behind the drums-before realizing it was one of Greg'sconfabulations-and at the now-grey hair of Jerry Garcia, which fell in astraight, unhindered descent to his shoulders.

And then, "Pigpen!" Greg exclaimed, "You see Pigpen there?"

"No," I replied, hesitantly, not knowing how to reply. "He's not there& You see, he's not with the Dead anymore."

"Not with them?" said Greg, in astonishment. "What happened-he got busted orsomething?"

"No, Greg, not busted. He died."

"That's awful," Greg answered, shaking his head, shocked. And then a minutelater, he nudged me again. "Pigpen! You see Pigpen there?" And, word for word, the whole conversation repeated itself.

But then the thumping, pounding excitement of the crowd got him-the rhythmicclapping and stamping and chanting possessed him-and he started to chant, "TheDead! The Dead!" then with a shift of rhythm, and a slow emphasis on eachword, "We want the Dead!" And then, "Tobacco Road, Tobacco Road," the name ofone of his favorite songs, until the music began.

The band began with an old song, "Iko, Iko," and Greg joined in with gusto, with abandon, clearly knowing all the words, and especially luxuriating in the African-sounding chorus. The wholevast Garden now was in motion with the music, eighteen thousand peopleresponding together, everyone transported, every nervous system synchronized, in unison.

The first half of the concert had many earlier pieces, songs from the sixties, and Greg knew them, loved them, joined in. His energy and joy were amazing tosee; he clapped and sang nonstop, with none of the weakness and fatigue hegenerally showed. He showed a rare and wonderful continuity of attention, everything orienting him, holding him together. Looking at Greg transformed inthis way, I could see no trace of his amnesia, his frontal lobe syndrome-heseemed at this moment completely normal, as if the music was infusing him withits own strength, its coherence, its spirit.

I had wondered whether we should leave at the break midway through theconcert-he was, after all, a disabled, wheelchair-bound patient, who had notreally been out on the town, at a rock concert, for more than twenty years.

But he said, "No, I want to stay, I want it all"-an assertion, an autonomy, Irejoiced to see and had hardly ever seen in his compliant life at thehospital. So we stayed, and in the interval went backstage, where Greg had alarge hot pretzel and then met Mickey Hart and exchanged a few words with him.

He had looked a little tired and pale before, but now he was flushed, excitedby the encounter, charged and eager to be back for more music.

But the second half of the concert was somewhat strange for Greg: more of thesongs dated from the mid- or late seventies and had lyrics that were unknownto him, though they were familiar in style. He enjoyed these, clapping andsinging along wordlessly, or making up words as he went. But then there werenewer songs, radically different, like "Picasso Moon," with dark and deepharmonies and an electronic instrumentation such as would have been impossible, unimaginable, in the 1960s. Greg was intrigued, but deeplypuzzled. "It's weird stuff," he said, "I never heard anything like it before."

He listened intently, all his musical senses stirred, but with a slightly scared and bewildered look, as if seeing a new animal, a new plant, anew world, for the first time. "I guess it's some new, experimental stuff," hesaid, "something they never played before. Sounds futuristic& maybe it's themusic of the future." The newer songs he heard went far beyond any developmentthat he could have imagined, were so beyond fand in some ways so unlike) whathe associated with the Dead, that it "blew his mind." It was, he could notdoubt, "their" music he was hearing, but it gave him an almost unbearablesense of hearing the future-as late Beethoven would have struck a devotee ifit had been played at a concert in 1800.

"That was fantastic," he said, as we filed out of the Garden. "I will alwaysremember it. I had the time of my life." I played CDs of the Grateful Dead inthe car on the way home, to hold as long as possible the mood and memory ofthe concert. I feared that if I stopped playing the Dead, or talking aboutthem, for a single moment, all memory of the concert would go from his mind.

Greg sang along enthusiastically all the way back, and when we parted at thehospital, he was still in an exuberant concert mood.

But the next morning when I came to the hospital early, I found Greg in thedining room, alone, facing the wall. I asked him about the Grateful Dead-whatdid he think of them? "Great group," he said, "I love them. I heard them inCentral Park and at the Fillmore East."

"Yes," I said, "you told me. But have you seen them since? Didn't you justhear them at Madison Square Garden?"

"No," he said, "I've never been to the Garden." *52*

Notes

34. The swami's unusual views are presented, in summary form, in Easy Journeyto Other Planets, by Tridandi Goswami A. C. Bhaktivedanta Swami, published bythe League of Devotees, Vrindaban (no date, one rupee). This slim manual, inits green paper cover, was handed out in vast quantities by the swami'ssaffron-robed followers, and it became Greg's bible at this stage.

35. Another patient, Ruby G., was in some ways similar to Greg. She too had ahuge frontal tumor, which, though it was removed in 197 3, left her withamnesia, a frontal lobe syndrome, and blindness. She too did not know that shewas blind, and when I held up my hand before her and asked, "How manyfingers?" would answer, "A hand has five fingers, of course."

A more localized unawareness of blindness may arise if there is destruction of the visual cortex, as in Anton's syndrome. Such patients may not know thatthey are blind, but are otherwise intact. But frontal lobe unawarenesses arefar more global in nature-thus Greg and Ruby were not only unaware of beingblind but unaware (for the most part) of being ill, of having devastatingneurological and cognitive deficits, and of their tragic, diminished positionin life.

36. That implicit memory (especially if emotionally charged) may exist inamnesiacs was shown, somewhat cruelly, in 1911, by Edouard Claparède, who, when shaking hands with such a patient whom he was presenting to his students, stuck a pin in his hand. Although the patient had no explicit memory of this, he refused, thereafter, to shake hands with him.

37. A. R. Luria, in The Neuropsychology of Memory, remarks that all his amnesiac patients, if hospitalized for any length of time, acquired "a sense of familiarity" with their surroundings.

38. Luria provides immensely detailed, at times almost novelistic, descriptions of frontal lobe syndromes-in Human Brain and Psychological Processes-and sees this "equalization" as the heart of such syndromes.

39. A similar indiscriminate reactivity is sometimes seen in people withTou-rette's syndrome-sometimes in the automatic form of echoing others' wordsor actions, sometimes in the more complex forms of mimicry, parodying orimpersonating others' behavior, or in incontinent verbal associations(rhymings, pun-nings, clangings).

40. Rodolfo Llinâs and his colleagues at New York University, comparing theelectrophysiological properties of the brain in waking and dreaming, postulatea single fundamental mechanism for both-a ceaseless inner talking betweencerebral cortex and thalamus, a ceaseless interplay of image and feeling, irrespective of whether there is *sensory input or not. When there is sensoryinput, this interplay integrates it to generate waking consciousness, but inthe absence of sensory input it continues to generate brain states, thosebrain states we call fantasy, hallucination, or dreams. Thus wakingconsciousness is dreaming-but dreaming constrained by external reality.*

41. Dreamlike or oneiric states have been described, by Luria and others, withlesions of the thalamus and diencephalon. J.-J. Moreau, in a famous earlystudy, Hashish and Mental Illness (1845), described both madness and hashishtrances as "waking dreams." A particularly striking form of waking dream maybe seen with the severer forms of Tourette's syndrome, where the external andthe internal, the perceptual and the instinctual, burst forth in a sort ofpublic phantasmagoria or dream.

42. Robert Louis Stevenson wrote The Strange Case of Dr. Jekyll and Mr. Hydein 1886. It is not known whether he knew of the Gage case, though this hadbecome common knowledge since the early 1880s-but he was assuredly moved bythe Jacksonian doctrine of higher and lower levels in the brain, the notionthat it was only our "higher" (and perhaps fragile) intellectual centers thatheld back the animal propensities of the "lower."

43. The huge scandal of leucotomy and lobotomy came to an end in the earlyfifties, not because of any medical reservation or revulsion, but because anew tool-tranquillizers-had now become available, which purported (as hadpsychosurgery itself) to be wholly therapeutic and without adverse effects.

Whether there is that much difference, neurologically or ethically, betweenpsychosurgery and tranquillizers is an uncomfortable question that has neverbeen really faced. Certainly the tranquillizers, if given in massive doses, may, like surgery, induce "tranquillity," may still the hallucinations anddelusions of the psychotic, but the stillness they induce may be like thestillness of death-and, by a cruel paradox, deprive patients of the naturalresolution that may sometimes occur with psychoses and instead immure them ina lifelong, drug-caused illness.

44. Though the medical literature of frontal lobe syndromes starts with thecase of Phineas Gage, there are earlier descriptions of altered mental statesnot identifiable at the time-which we can now, in retrospect, see as frontallobe syndromes. One such account is related by Lytton Strachey in "The Life, Illness, and Death of Dr. North." Dr. North, a master of Trinity College, Cambridge, in the eighteenth century, was a man with severe anxieties andtormenting obsessional traits, who was hated and dreaded by the fellows of thecollege for his punctiliousness, his moralizing, and his merciless severity.

Until one day, in college, he suffered a stroke:

His recovery was not complete; his body was paralyzed on the left side; but itwas in his mind that the most remarkable change occurred. His fears had lefthim. His scrupulosity, his diffidence, his seriousness, even his morality-allhad vanished. He lay on his bed, in reckless levity, pouring forth a stream offlippant observations, and naughty stories, and improper jokes. While hisfriends hardly knew which way to look, he laughed consumedly, his paralyzedfeatures drawn up in a curiously distorted grin& Attacked by epilepticseizures, he declared that the only mitigation of his sufferings lay in thecontinued consumption of wine. He, who had been so noted for his austerity, now tossed off, with wild exhilaration, glass after glass of the strongestsherry.

Strachey gives us here a precise and beautifully described picture of afrontal lobe stroke altering the personality in a major and, so to speak, "therapeutic" way.

45. The nature of the "organic unity," at once dynamic and semantic, which iscentral to music, incantation, recitation, and all metrical structures, hasbeen most profoundly analyzed by Victor Zuckerkandl in his remarkable bookSound and Symbol. It is typical of such flowing dynamic-semantic structuresthat each part leads on to the next, that every part has reference to therest. Such structures cannot usually be perceived, or remembered, in part-theyare perceived and remembered, if at all, as wholes.

46. This patient is the subject of a remarkable BBC film made by JonathanMiller, Prisoner of Consciousness (November 1988).

47. Another patient in Williamsbridge, Harry S.-a gifted man, a formerengineer-suffered a huge cerebral hemorrhage from a burst aneurysm, with grossdestruction of both frontal lobes. Emerging from a coma, he started to recoverand eventually recovered most of his former intellectual powers, but remains, like Greg, severely impaired-bland, flat, indifferent emotionally. But allthis changes, suddenly, when he sings. He has a fine tenor voice and lovesIrish songs. When he sings, he does so with a fullness of feeling, atenderness, a lyricism, that are astounding-the more so because one sees no hint of this at any other time and might well think his emotional capacityentirely destroyed. He shows every emotion appropriate to what he sings-thefrivolous, the jovial, the tragic, the sublime-and seems to be transformedwhile he sings.

48. Mr. Thompson ("A Matter of Identity"), who also had both amnesia and afrontal lobe syndrome, by contrast often seemed "desouled." In him thewisecracking was manic, ferocious, frenetic, and relentless; it rushed on likea torrent, oblivious to tact, to decency, to propriety, to everything, including the feelings of everyone around him. Whether Greg's (at leastpartial) preservation of ego and identity was due to the lesser severity ofhis syndrome, or to underlying personality differences, is not wholly clear.

Mr. Thompson's premorbid personality was that of a New York cabbie, and insome sense his frontal lobe syndrome merely intensified this. Greg'spersonality was gentler, more childlike, from the start-and this, it seemed tome, even colored his frontal lobe syndrome.

49. This is in distinction to Mr. Thompson, who with his more severe frontallobe syndrome had been reduced to a sort of nonstop, wisecracking, talkingmachine, and when told of his brother's death quipped "He's always the joker!" and rushed on to other, irrelevant things.

50. The amnesiac musicologist in the BBC film Prisoner of Consciousness showedsomething both similar and different. Every time his wife went out of theroom, he had a sense of calamitous, permanent loss. When she came back, fiveminutes later, he sobbed with relief, saying, "I thought you were dead."

51. Jean Cocteau, in fact, said this of opium. Whether Greg was quoting this, consciously or unconsciously, I do not know. Smells are sometimes even moreevocative than music; and the percepts of smells, generated in a veryprimitive part of the brain-the "smell brain," or rhinencephalon-may not gothrough the complex, multistage memory systems of the medial temporal lobe.

Olfactory memories, neurally, are almost indelible; thus they may beremembered despite an amnesia. It would be fascinating to bring Greg hotpretzels, or hash, to see whether their smells could evoke memories of theconcert. He himself, the next day, spontaneously mentioned the "great" smellof pretzels-it was very vivid for him-and yet he could not locate the smell inplace or time.

52. Greg has no recollection of the concert, seemingly-but when I was sent atape of it, he immediately recognized some of the "new" pieces, found themfamiliar, was able to sing them. "Where did you hear that? " I asked as welistened to "Picasso Moon." He shrugged uncertainly.

But there is no doubt that he has learned it, nonetheless. I have taken now to visiting him regularly, with tapes of ourconcert and of the latest Grateful Dead concerts. He seems to enjoy the visitsand has learned many of the new songs. And now, whenever I arrive, and hehears my voice, he lights up, and greets me as a fellow Deadhead.

A Surgeon's Life

Tourette's syndrome is seen in every race, every culture, every stratum ofsociety; it can be recognized at a glance once one is attuned to it; and casesof barking and twitching, of grimacing, of strange gesturing, of involuntarycursing and blaspheming, were recorded by Aretaeus of Cappadocia almost twothousand years ago. Yet it was not clinically delineated until 1885, whenGeorges Gilles de la Tourette, a young French neurologist-a pupil of Charcot'sand a friend of Freud's-put together these historical accounts withobservations of some of his own patients. The syndrome as he described it wascharacterized, above all, by convulsive tics, by involuntary mimicry orrepetition of others' words or actions (echolalia and echopraxia), and by theinvoluntary or compulsive utterances of curses and obscenities (coprolalia).

Some individuals (despite their affliction) showed an odd insouciance ornonchalance; some a tendency to make strange, often witty, occasionallydreamlike associations,- some extreme impulsiveness and provocativeness, aconstant testing of physical and social boundaries; some a constant, restlessreacting to the environment, a lunging at and sniffing of everything or asudden flinging of objects; and yet others an extreme stereotypy andobsessiveness-no two patients were ever quite the same.

Any disease introduces a doubleness into life-an "it," with its own needs, demands, limitations. With Tourette's, the "it" takes the form of explicitcompulsion, a multitude of explicit impulsions and compulsions: one is drivento do this, to do that, against one's own will, or in deference to the alienwill of the "it." There may be a conflict, a compromise, a collusion betweenthese wills. Thus being "possessed" can be more than a figure of speech forsomeone with an impulse disorder like Tourette's, and no doubt in the MiddleAges it was sometimes literally seen as "possession." (Tourette himself wasfascinated by the phenomenon of possession and wrote a play about the epidemicof demonic possession in medieval Loudun.)

But the relation of disease and self, "it" and "I," can be particularlycomplex in Tourette's, especially if it has been present from early childhood, growing up with the self, intertwining itself in every possible way. TheTourette's and the self shape themselves each to the other, come more and moreto complement each other, until finally, like a long-married couple, theybecome a single, compound being. This relation is often destructive, but itcan also be constructive, can add speed and spontaneity and a capacity forunusual and sometimes startling performance. For all its intrusiveness, Tourette's may be used creatively, too.

Yet in the years after its delineation, Tourette's tended to be seen not as anorganic but as a "moral" disease-an expression of mischievousness or weaknessof the will, to be treated by rectifying the will. From the 1920s to the1960s, it tended to be seen as a psychiatric disease, to be treated bypsychoanalysis or psychotherapy; but this, on the whole, proved ineffective, too. Then, with the demonstration, in the early 1960s, that the drughaloperidol could dramatically suppress its symptoms, Tourette's was regarded(in a sudden reversal) as a chemical disease, the result of an imbalance of aneurotransmitter, dopamine, in the brain. But all these views are partial, andreductive, and fail to do justice to the full complexity of Tourette's.

Neither a biological nor a psychological nor a moral-social viewpoint isadequate; we must see Tourette's not only simultaneously from all threeperspectives, but from an inner perspective, an existential perspective, thatof the affected person himself. Inner and outer narratives here, aseverywhere, must fuse.

Many professions, one would think, would be closed to someone with elaboratetics and compulsions or strange, antic behaviors, but this does not seem to bethe case. Tourette's affects perhaps one person in a thousand, and we findpeople with Tourette's-sometimes the most severe Tourette's-in virtually everywalk of life. There are Tourettic writers, mathematicians, musicians, actors, disc jockeys, construction workers, social workers, mechanics, athletes. Somethings, one might think, would be completely out of the question- above all, perhaps, the intricate, precise, and steady work of a surgeon.

This would havebeen my own belief not so long ago. But now, improbably, I know five surgeonswith Tourette's. *53*

I first met Dr. Carl Bennett at a scientific conference on Tourette's in Boston. His appearance was unexceptionable-he was fiftyish, of middle size, with a brownish beard and mustache containing a hint of gray, and was dressedsoberly in a dark suit-until he suddenly lunged or reached for the ground orjumped or jerked. I was struck both by his bizarre tics and by his dignity andcalm. When I expressed incredulity about his choice of profession, he invitedme to visit and stay with him, where he lived and practiced, in the town ofBranford, in British Columbia-to do rounds at the hospital with him, to scrubwith him, to see him in action. Now, four months later, in early October, Ifound myself in a small plane approaching Branford, full of curiosity andmixed expectations. Dr. Bennett met me at the airport, greeted me-a strangegreeting, half lunge, half tic, a gesture of welcome idiosyncraticallyTourettized-grabbed my case, and led the way to his car in an odd, rapidskipping walk, with a skip each fifth step and sudden Teachings to the groundas if to pick something up.

The situation of Branford is almost idyllic, nestled as it is in the shadow ofthe Rockies, in southeast British Columbia, with Banff and its mountains tothe north, and Montana and Idaho to the south; it lies in a region of greatgentleness and fertility but is ringed with mountains, glaciers, lakes.

Bennett himself has a passion for geography and geology; a few years ago hetook a year off from his surgical practice to study both at the University ofVictoria. As he drove, he pointed out moraines, stratifications, and otherformations, so that what had at first seemed to my eyes a mere pastorallandscape became charged with a sense of history and chthonic forces, ofimmense geological vistas. Such keen, fierce attention to every detail, such constant looking below the surface, such examination and analysis, are characteristic of the restless, questioning Tourettic mind. It is, so to speak, the other side of its obsessive and perseverative tendencies, its disposition to reiterate, to touch again and again.

And, indeed, whenever the stream of attention and interest was interrupted, Bennett's tics and iterations immediately reasserted themselves-in particular, obsessive touchings of his mustache and glasses. His mustache had constantlyto be smoothed and checked for symmetry, his glasses had to be "balanced"-upand down, side to side, diagonally, in and out-with sudden, ticcy touchings ofthe fingers, until these, too, were exactly "centered." There were alsooccasional Teachings and lungings with his right arm; sudden, compulsivetouchings of the windshield with both forefingers ("The touching has to besymmetrical," he commented); sudden repositionings of his knees, or thesteering wheel ("I have to have the knees symmetrical in relation to thesteering wheel. They have to be exactly centered"); and sudden, high-pitchedvocalizations, in a voice completely unlike his own, that sounded like "Hi, Patty," "Hi, there," and, on a couple of occasions, "Hideous!" (Patty, Ilearned later, was a former girlfriend, her name now enshrined in a tic.) *54*

There was little hint of this repertoire until we reached town and gotobstructed by traffic lights. The lights did not annoy Bennett-we were in nohurry-but they did break up the driving, the kinetic melody, the swift, smoothstream of action, with its power to integrate mind and brain. The transitionwas very sudden: one minute, all was smoothness and action; the next, all wasbroken-upness, pandemonium, riot. When Bennett was driving smoothly, one hadthe feeling not that the Tourette's was in any way being suppressed but thatthe brain and the mind were in a quite different mode of action.

Another few minutes, and we had arrived at his house, a charming, idiosyncratic house with a wild garden, perched on a hill overlooking thetown. Bennett's dogs, rather wolflike, with strange, pale eyes, barked, waggedtheir tails, bounded up to us as we drove in. As we got out of the car, hesaid "Hi, puppies!" in the same quick, odd, high, crushed voice he had earlierused for "Hi, Patty!" He patted their heads, a ticlike, convulsive patting, a quick-fire volley of five pats to each, delivered with ameticulous symmetry and synchrony. "They're grand dogs, half-Eskimo, half-malamute," he said. "I felt I should get two of them, so they couldcompanion each other. They play together, sleep together, hunttogethereverything." And, I thought, are patted together: Did he get two dogspartly because of his own symmetrical, symmetrizing compulsions? Now, hearingthe dogs bark, his sons ran out- two handsome teenage kids. I had a suddenfeeling that Bennett might cry "Hi, kiddies!" in his Touretty voice and pattheir heads, too, in synchrony, symmetrically. But he introduced them, Markand David, individually to me. And then, as we entered the house, heintroduced me to his wife, Helen, who was preparing a late-afternoon tea forall of us.

As we sat at the table, Bennett was repeatedly distracted by tics-a compulsivetouching of the glass lampshade above his head. He had to tap the glass gentlywith the nails of both forefingers, to produce a sharp, half-musical click or, on occasion, a short salvo of clicks. A third of his time was taken up withthis ticcing and clicking, which he seemed unable to stop. Did he have to doit? Did he have to sit there?

"If it were out of reach, would you still have to click it?" I asked.

"No," he said. "It depends entirely on how I'm situated. It's all a questionof space. Where I am now, for example, I have no impulse to reach over to thatbrick wall, but if I were in range I'd have to touch it perhaps a hundredtimes." I followed his glance to the wall and saw that it was pockmarked, likethe moon, from his touchings and jabbings; and, beyond it, the refrigeratordoor, dented and battered, as if from the impact of meteorites or projectiles.

"Yeah," Bennett said, now following my glance. "I fling things-the iron, therolling pin, the saucepan, whatever-I fling things at it if I suddenly getenraged." I digested this information in silence. It added a new dimension-adisquieting, violent one-to the picture I was building and seemed completely at odds with the genial, tranquil man before me. *55*

"If the light so disturbs you, why do you sit near it?" I asked.

"Sure, it's 'disturbance,' " Bennett answered. "But it's also stimulation. Ilike the feel and the sound of the click. But, yeah, it can be a greatdistraction. I can't study here, in the dining room-I have to go to my study, out of reach of the lamp."

The sense of personal space, of the self in relation to other objects andother people, tends to be markedly altered in Tourette's syndrome. I know manypeople with Tourette's who cannot tolerate sitting in a restaurant withintouching distance of other people and may feel compelled, if they cannot avoidthis, to reach out or lunge convulsively toward them. This intolerance may beespecially great if the "provoking" person is behind the Touretter. Manypeople with Tourette's, therefore, prefer corners, where they are at a "safe" distance from others, and there is nobody behind them. *56*

Analogous problemsmay arise, on occasion, when driving; there may be a sense that other vehiclesare "too close" or "looming," even that they are suddenly "zooming," when theyare (a non-Tourettic person would judge) at a normal distance. There may also be, paradoxically, a tendency to be "attracted" to other vehicles, todrift or veer toward them-though the consciousness of this, and a greaterspeed of reaction, usually serves to avert any mishaps. (Similar illusions andurges, stemming from abnormalities in the neural basis of personal space, mayoccasionally be seen in parkinsonism, too.)

Another expression of Bennett's Tourette's-very different from the suddenimpulsive or compulsive touching-is a slow, almost sensuous pressing of thefoot to mark out a circle in the ground all around him. "It seems to me almostinstinctual," he said when I asked him about it. "Like a dog marking itsterritory. I feel it in my bones. I think it is something primal, prehuman-maybe something that all of us, without knowing it, have in us. ButTourette's 'releases' these primitive behaviors."*57*

Bennett sometimes calls Tourette's "a disease of disinhibi-tion." He saysthere are thoughts, not unusual in themselves, that anyone might have inpassing but that are normally inhibited. With him, such thoughts perseveratein the back of the mind, obsessively, and burst out suddenly, without hisconsent or intention. Thus, he says, when the weather is nice he may want tobe out in the sun getting a tan. This thought will be in the back of his mindwhile he is seeing his patients in the hospital and will emerge in sudden, involuntary utterances. "The nurse may say, 'Mr. Jones has abdominal pain,' and I'm looking out of the window saying, 'Tanning rays, tanning rays.' Itmight come out five hundred times in a morning. People in the ward must hearit-they can't not hear it-but I guess they ignore it or feel that it doesn'tmatter."

Sometimes the Tourette's manifests itself in obsessive thoughts and anxieties. "If I'm worried about something," Bennett told me aswe sat around the table, "say, I hear a story about a kid being hurt, I haveto go up and tap the wall and say, 'I hope it won't happen to mine.' " Iwitnessed this for myself a couple of days later. There was a news report onTV about a lost child, which distressed and agitated him. He instantly begantouching his glasses (top, bottom, left, right, top, bottom, left, right), centering and recentering them in a fury. He made "whoo, whoo" noises, like anowl, and muttered sotto voce, "David, David-is he all right?" Then he dashedfrom the room to make sure. There was an intense anxiety and overconcern; animmediate alarm at the mention of any lost or hurt child; an immediateidentification with himself, with his own children; an immediate, superstitious need to check up.

After tea, Bennett and I went out for a walk, past a little orchard heavy withapples and on up the hill overlooking the town, the friendly malamutesgamboling around us. As we walked, he told me something of his life. He didnot know whether anyone in his family had Tourette's-he was an adopted child.

His own Tourette's had started when he was about seven. "As a kid, growing upin Toronto, I wore glasses, I had bands on my teeth, and I twitched," he said.

"That was the coup de grâce. I kept my distance. I was a loner; I'd go forlong hikes by myself. I never had friends phoning all the time, like Mark-thecontrast is very great." But being a loner and taking long hikes by himselftoughened him as well, made him resourceful, gave him a sense of independenceand self-sufficiency. He was always good with his hands and loved thestructure of natural things-the way rocks formed, the way plants grew, the wayanimals moved, the way muscles balanced and pulled against each other, the waythe body was put together. He decided very early that he wanted to be a surgeon.

Anatomy came "naturally" to him, he said, but he found medical schoolextremely difficult, not merely because of his tics and touchings, which became more elaborate with the years, but because ofstrange difficulties and obsessions that obstructed the act of reading. "I'dhave to read each line many times," he said. "I'd have to line up eachparagraph to get all four corners symmetrically in my visual field." Besidesthis lining up of each paragraph, and sometimes of each line, he was beset bythe need to "balance" syllables and words, by the need to "symmetrize" thepunctuation in his mind, by the need to check the frequency of a given letter, and by the need to repeat words or phrases or lines to himself. *58*

All thismade it impossible to read easily and fluently. Those problems are still withhim and make it difficult for him to skim quickly, to get the gist, or toenjoy fine writing or narrative or poetry. But they did force him to readpainstakingly and to learn his medical texts very nearly by heart.

When he got out of medical school, he indulged his interest in faraway places, particularly the North: he worked as a general practitioner in the NorthwestTerritories and the Yukon and worked on icebreakers circling the Arctic. Hehad a gift for intimacy and grew close to the Eskimos he worked with, and hebecame something of an expert in polar medicine. And when he married, in1968-he was twenty-eight-he went with his bride around the world and gratifieda boyhood wish to climb Kilimanjaro.

For the past seventeen years, he has practiced in small, isolated communitiesin western Canada-first, for twelve years, as a general practitioner in asmall city. Then, five years ago, when the need to have mountains, wildcountry, and lakes on his doorstep grew stronger, he moved to Branford. ("Andhere I will stay. I never want to leave it.") Branford, he told me, has theright "feel." The people are warm but not chummy; they keep a certain distance. There is a natural well-bredness and civility. Theschools are of high quality, there is a community college, there are theatersand bookstores-Helen runs one of them-but there is also a strong feeling forthe outdoors, for the wilds. There is much hunting and fishing, but Bennettprefers backpacking and climbing and cross-country skiing.

When Bennett first came to Branford, he was regarded, he thought, with acertain suspicion. "A surgeon who twitches! Who needs him? What next?" Therewere no patients at first, and he did not know if he could make it there, butgradually he won the town's affection and respect. His practice began toexpand, and his colleagues, who had initially been startled and incredulous, soon came to trust and accept him, too, and to bring him fully into themedical community. "But enough said," he concluded as we returned to thehouse. It was almost dark now, and the lights of Branford were twinkling.

"Come to the hospital tomorrow-we have a conference at seven-thirty. Then I'lldo outpatients and rounds on my patients. And Friday I operate-you can scrubwith me."

I slept soundly in the Bennetts' basement room that night, but in the morningI woke early, roused by a strange whirring noise in the room next to mine-theplayroom. The playroom door had translucent glass panels. As I peered throughthem, still half-asleep, I saw what appeared to be a locomotive in motion-alarge, whirring wheel going round and round and giving off puffs of smoke andoccasional hoots. Bewildered, I opened the door and peeked in. Bennett, stripped to the waist, was pedaling furiously on an exercise bike while calmlysmoking a large pipe. A pathology book was open before him-turned, I observed, to the chapter on neurofibromatosis. This is how he invariably begins eachmorning-a half hour on his bike, puffing his favorite pipe, with a pathologyor surgery book open to the day's work before him. The pipe, the rhythmicexercise, calm him. There are no tics, no compulsions-at most, a littlehooting. (He seems to imagine at such times that he is a prairie train.) Hecan read, thus calmed, without his usual obsessions and distractions.

But as soon as the rhythmic cycling stopped, a flurry of tics and compulsionstook over; he kept digging at his belly, which was trim, and muttering, "Fat, fat, fat& fat, fat, fat& fat, fat, fat," and then, puzzlingly, "Fat and aquarter tit." (Sometimes the "tit" was left out.)

"What does it mean?" I asked.

"I have no idea. Nor do I know where 'Hideous' comes from-it suddenly appearedone day two years ago. It'll disappear one day, and there will be another wordinstead. When I'm tired, it turns into 'Gideous.' One cannot always find sensein these words; often it is just the sound that attracts me. Any odd sound, any odd name, may start repeating itself, get me going. I get hung up with aword for two or three months. Then, one morning, it's gone, and there'sanother one in its place." Knowing his appetite for strange words and sounds, Bennett's sons are constantly on the lookout for "odd" names-names that soundodd to an English-speaking ear, many of them foreign. They scan the papers andtheir books for such words, they listen to the radio and TV, and when theyfind a "juicy" name, they add it to a list they keep. Bennett says of thislist, "It's about the most valuable thing in the house." He calls its words"candy for the mind."

This list was started six years ago, after the name Oginga Odinga, with itsalliterations, got Bennett going-and now it contains more than two hundrednames. Of these, twenty-two are "current"-apt to be regurgitated at any momentand chewed over, repeated, and savored internally. Of the twenty-two, the nameof Slavek J. Hurka-an industrial-relations professor at the University ofSaskatchewan, where Helen studied-goes the furthest back; it started toecholale itself in 1974 and has been doing so, without significant breaks, forthe last seventeen years. Most words last only a few months. Some of the names(Boris Blank, Floyd Flake, Morris Gook, Lubor J. Zink) have a short, percussive quality. Others

(Yelberton A. Tittle, Babaloo Mandel) are marked byeuphonious polysyllabic alliterations. Echolalia freezes sounds, arrests time, preserves stimuli as "foreign bodies" or echoes in the mind, maintaining an alien existence, like implants. It is only the sound ofthe words, their "melody," as Bennett says, that implants them in his mind; their origins and meanings and associations are irrelevant. (There is asimilarity here to his "en-shrinement" of names as tics.)

"It is similar with the number compulsions," he said. "Now I have to doeverything by threes or fives, but until a few months ago it was fours andsevens. Then one morning I woke up-four and seven had gone, but three and fivehad appeared instead. It's as if one circuit were turned on upstairs, andanother turned off. It doesn't seem to have anything to do with me."

It is always the odd, the unusual, the salient, the caricatur-able, that catchthe ear and eye of the Touretter and tend to provoke elaboration andimitation.*59*

This is well brought out in the personal account cited by Meigeand Feindel in 1902:

I have always been conscious of a predilection for imitation. A curiousgesture or bizarre attitude affected by any one was the immediate signal foran attempt on my part at its reproduction, and is still. Similarly with wordsor phrases, pronunciation or intonation, I was quick to mimic any peculiarity.

When I was thirteen years old I remember seeing a man with a droll grimace ofeyes and mouth, and from that moment I gave myself no respite until I couldimitate it accurately& For several months I kept repeating the oldgentleman's grimace involuntarily. I had, in short, begun to tic.

At 7:25 we drove into town. It took barely five minutes to get to thehospital, but our arrival there was more complicated than usual, becauseBennett had unwittingly become notorious. He had been interviewed by amagazine a few weeks earlier, and the article had just come out. Everyone wassmiling and ribbing him about it. A little embarrassed, but also enjoying it, Bennett took the joking in good part. ("I'll never live it down-I'll be amarked man now.") In the doctors' common room, Bennett was clearly very muchat ease with his colleagues, and they with him.

One sign of this ease, paradoxically, was that he felt free to Tourette with them-to touch or tapthem gently with his fingertips or, on two occasions when he was sharing asofa, to suddenly twist on his side and tap his colleague's shoulder with histoes-a practice I had observed in other Touretters. Bennett is somewhatcautious with his Tourettisms on first acquaintance and conceals or downplaysthem until he gets to know people. When he first started working at thehospital, he told me, he would skip in the corridors only after checking to besure that no one was looking,- now when he skips or hops no one gives it asecond glance.

The conversations in the common room were like those in any hospitals-doctorstalking among themselves about unusual cases. Bennett himself, lyinghalf-curled on the floor, kicking and thrusting one foot in the air, describedan unusual case of neurofibromatosis-a young man whom he had recently operatedon. His colleagues listened attentively. The abnormality of the behavior andthe complete normality of the discourse formed an extraordinary contrast.

There was something bizarre about the whole scene, but it was evidently socommon as to be unremarkable and no longer attracted the slightest notice. But an outsider seeing it would have been stunned.

After coffee and muffins, we repaired to the surgical-outpatients department, where half a dozen patients awaited Bennett. The first was a trail guide fromBanff, very western in plaid shirt, tight jeans, and cowboy hat. His horse hadfallen and rolled on top of him, and he had developed an immense pseudocyst ofthe pancreas. Bennett spoke with the man- who said the swelling wasdiminishing-and gently, smoothly palpated the fluctuant mass in his abdomen.

He checked the sonograms with the radiologist-they confirmed the cyst'srecession-and then came back and reassured the patient. "It's going down byitself. It's shrinking nicely-you won't be needing surgery after all. You canget back to riding. I'll see you in a month." And the trail guide, delighted, walked off with a jaunty step. Later, I had a word with the radiologist.

"Bennett's not only a whiz at diagnosis," he said. "He's the mostcompassionate surgeon I know."

The next patient was a heavy woman with a melanoma on her buttock, whichneeded to be excised at some depth. Bennett scrubbed up, donned sterilegloves. Something about the sterile field, the prohibition, seemed to stir hisTourette's; he made sudden darting motions, or incipient motions, of hissterile, gloved right hand toward the ungloved, unwashed, "dirty" part of hisleft arm. The patient eyed this without expression. What did she think, Iwondered, of this odd darting motion, and the sudden convulsive shakings healso made with his hand? She could not have been entirely surprised, for her G.P. must have prepared her to some extent, must have said, "You need a smalloperation. I recommend Dr. Bennett- he's a wonderful surgeon. I have to tellyou that he sometimes makes strange movements and sounds-he has a thing calledTourette's syndrome-but don't worry, it doesn't matter. It never affects hissurgery."

Now, the preliminaries over, Bennett got down to the serious work, swabbingthe buttock with an iodine antiseptic and then injecting local anesthetic, with an absolutely steady hand. But as soon as the rhythm of action was broken for a moment-he neededmore local, and the nurse held out the vial for him to refill hissyringe-there was once again the darting and near-touching. The nurse did notbat an eyelid; she had seen it before and knew he would not contaminate hisgloves. Now, with a firm hand, Bennett made an oval incision an inch to eitherside of the melanoma, and in forty seconds he had removed it, along with aBrazil-nut-shaped wodge of fat and skin. "It's out!" he said. Then, veryrapidly, with great dexterity, he sewed the margins of the wound together, putting five neat knots on each nylon stitch. The patient, twisting her head, watched him as he sewed and joshed him: "Do you do all the sewing at home?"

He laughed. "Yes. All except the socks. But no one darns socks these days."

She looked again. "You're making quite a quilt."

The whole operation completed in less than three minutes, Bennett cried, "Done! Here's what we took." He held the lump of flesh before her.

"Ugh!" she exclaimed, with a shudder. "Don't show me. But thanks anyway."

All this looked highly professional from beginning to end, and, apart from thedartings and near-touchings, non-Tourettic. But I couldn't decide aboutBennett's showing the excised lump to the patient. ("Here!") One may show agallstone to a patient, but does one show a bleeding, misshapen piece of fatand flesh? Clearly, she didn't want to see it, but Bennett wanted to show it, and I wondered if this urge was part of his Tourettic scrupulosity andexactitude, his need to have everything looked at and understood. I had thesame thought later in the morning, when he was seeing an old lady in whosebile duct he had inserted a T-tube. He went to great lengths to draw the tube, to explain all the anatomy, and the old lady said, "I don't want to know it. Just do it!"

Was this Bennett the Touretter being compulsive or Professor Bennett thelecturer on anatomy? (He gives weekly anatomy lectures in Calgary.) Was itsimply an expression of his meticulousness and concern? An imagining, perhaps, that all patients sharedhis curiosity and love of detail? Some patients doubtless did, but obviouslynot these.

So it went on through a lengthy outpatient list. Bennett is evidently a verypopular surgeon, and he saw or operated on each patient swiftly anddexterously, with an absolute and single-minded concentration, so that whenthey saw him they knew they had his whole attention. They forgot that they hadwaited, or that there were others still waiting, and felt that for him theywere the only people in the world.

Very pleasant, very real, the surgeon's life, I kept thinking- direct, friendly relationships, especially clear with outpatients like this. Animmediacy of relation, of work, of results, of gratification-much greater thanwith a physician, especially a neurologist (like me). I thought of my mother, how much she enjoyed the surgeon's life, and how I always loved sitting in ather surgical-outpatient rounds. I could not become a surgeon myself, becauseof an incorrigible clumsiness, but even as a child I had loved the surgeon'slife, and watching surgeons at work. This love, this pleasure, half-forgotten, came back to me with great force as I observed Bennett with his patients; mademe want to be more than a spectator; made me want to do something, to hold aretractor, to join in the surgery somehow.

Bennett's last patient was a young mechanic with extensive neurofibromatosis, a bizarre and sometimes cancerous disease that can produce huge brownishswellings and protruding sheets of skin, disfiguring the whole body.*60*

Thisyoung man had had a huge apron of tissue hanging down from his chest, so largethat he could lift it up and cover his head, and so heavy that it bowed himforward with its weight. Bennett had removed this a couple of weeks earlier-amassive procedure-with great expertise, and was now examining another hugeapron descending from the shoulders, and great flaps of brownish flesh in the groins and armpits. I was relieved that he did not tic"Hideous!" as he removed the stitches from the surgery, for I feared theimpact of such a word being uttered aloud, even if it was nothing but along-standing verbal tic. But, mercifully, there was no "Hideous!"; there wereno verbal tics at all, until Bennett was examining the dorsal skin flap andlet fly a brief "Hid-," the end of the word omitted by a tactful apocope.

This, I learned later, was not a conscious suppression-Bennett had no memoryof the tic-and yet it seemed to me there must have been, if not a conscious, then a subconscious solicitude and tact at work. "Fine young man," Bennettsaid, as we went outside. "Not self-conscious. Nice personality, outgoing. Most people with this would lock themselves in a closet." I could not helpfeeling that his words could also be applied to himself. There are many peoplewith Tourette's who become agonized and self-conscious, withdraw from theworld, and lock themselves in a closet. Not so Bennett: he had struggledagainst this; he had come through and braved life, braved people, braved themost improbable of professions. All his patients, I think, perceive this, andit is one of the reasons they trust him so.

The man with the skin flap was the last of the outpatients, but for Bennett, immensely busy, there was only a brief break before an equally long afternoonwith his inpatients on the ward. I excused myself from this to take anafternoon off and walk around the town. I wandered through Branford with theoddest sense of déjà vu and jamais vu mixed; I kept feeling that I had seenthe town before, but then again that it was new to me. And then, suddenly, Ihad it-yes, I had seen it, I had been here before, had stopped here for anight in August 1960, when I was hitchhiking through the Rockies, to the West.

It had a population then of only a few thousand and consisted of little morethan a few dusty streets, motels, bars-a crossroads, little more than a truckstop in the long trek across the West. Now its population was twenty thousand,

Main Street a gleaming boulevard filled with shops and cars; there was a town hall, a police station, a regional hospital, severalschools-it was this that surrounded me, the overwhelming present, yet throughit I saw the dusty crossroads and the bars, the Branford of thirty yearsbefore, still strangely vivid, because never updated, in my mind.

Friday is operating day for Bennett, and he was scheduled to do a mastectomy.

I was eager to join him, to see him in action. Outpatients are one thing-onecan always concentrate for a few minutes-but how would he conduct himself in alengthy and difficult procedure demanding intense, unremitting concentration, not for seconds or minutes, but for hours?

Bennett preparing for the operating room was a startling sight. "You shouldscrub next to him," his young assistant said. "It's quite an experience." Itwas indeed, for what I saw in the outpatient clinic was magnified here: constant sudden dartings and Teachings with the hands, almost but never quitetouching his unscrubbed, unsterile shoulder, his assistant, the mirror,sudden lungings, and touchings of his colleagues with his feet; and a barrageof vocalizations-"Hooty-hooo! Hooty-hooo!"-suggestive of a huge owl.

The scrubbing over, Bennett and his assistant were gloved and gowned, and theymoved to the patient, already anesthetized, on the table. They looked brieflyat a mammogram on the X-ray box. Then Bennett took the knife, made a bold, clear incision-there was no hint of any ticcing or distraction-and movedstraightaway into the rhythm of the operation. Twenty minutes passed, fifty, seventy, a hundred. The operation was often complex-vessels to be tied, nervesto be found-but the action was confident, smooth, moving forward at its ownpace, with never the slightest hint of Tourette's. Finally, after two and ahalf hours of the most complex, taxing surgery, Bennett closed up, thankedeverybody, yawned, and stretched. Here, then, was an entire operation withouta trace of Tourette's. Not because it had been suppressed, or held in- therewas never any sign of control or constraint-but because, simply, there wasnever any impulse to tic. "Most of the time when I'm operating, it never even crosses my mind that I haveTourette's," Bennett says.

His whole identity at such times is that of asurgeon at work, and his entire psychic and neural organization becomesaligned with this, becomes active, focused, at ease, un-Tourettic. It is onlyif the operation is broken for a few minutes-to review a special X-ray takenduring the surgery, for example-that Bennett, waiting, unoccupied, remembersthat he is Tourettic, and in that instant he becomes so. As soon as the flowof the operation resumes, the Tourette's, the Tourettic identity, vanishesonce again. Bennett's assistants, though they have known him and worked withhim for years, are still astounded whenever they see this. "It's like amiracle," one of them said. "The way the Tourette's disappears." And Bennetthimself was astonished, too, and quizzed me, as he peeled off his gloves, onthe neurophysiology of it all.

Things were not always so easy, Bennett told me later. Occasionally, if he wasbombarded by outside demands during surgery-"You have three patients waitingin the E.R.," "Mrs. X. wants to know if she can come in on the tenth," "Yourwife wants you to pick up three bags of dog food"-these pressures, thesedistractions, would break his concentration, break the smooth and rhythmicflow. A couple of years ago, he made it a rule that he must never be disturbedwhile operating and must be allowed to concentrate totally on the surgery, andthe O.R. has been tic-free ever since.

Bennett's operating brings up all the conundrums of Tourette's, along withdeep issues such as the nature of rhythm, melody, and "flow," and the natureof acting, role, personation, and identity. A transition from uncoordinated, jerky ticciness to smoothly orchestrated, coherent movement can occurinstantly in Touretters when they are exposed to, called into, rhythmic musicor action. I saw this with the man I described in "Witty Ticcy Ray," who couldswim the length of a pool without tics, with even, rhythmic strokes-but in theinstant of turning, when the rhythm, the kinetic melody, was broken, wouldhave a sudden flurry of tics. Many Touretters are also drawn to athletics, partly (one suspects) because of theirextraordinary speed and accuracy *61* and partly because of their bursting, inordinate motor impulse and energy, which thrust toward some motorrelease-but a release that, happily, instead of being explosive, can becoordinated into the flow, the rhythm, of a performance or a game.

One sees very similar situations with playing or responding to music. Theconvulsive or broken motor or speech patterns that may occur in Tourette's canbe instantly normalized with incanting or singing (this has also long beenknown to occur with stutterers). It is similar with the jerky, brokenmovements of parkinsonism (sometimes called kinetic stutter); these too can bereplaced, with music or action, by a rhythmic, melodic flow.

Such responses seem to involve chiefly the motor patterns of the individual, rather than the persona, the identity, in any higher form. Some of thetransformation while Bennett was operating, I felt, was occurring at thiselementary, "musical" level. At this level, Bennett's operating had becomeautomatic; there were, at every moment, a dozen things to attend to, but these were integrated, orchestrated, into a single seamless stream- and one that, like his driving, had become partly automated with time, so that he could chat with the nurses, make jokes, banter, think, while his hands and eyes and brain performed theirskilled tasks faultlessly, almost unconsciously.

But above this level, coexisting with it, was a higher, personal one, whichhas to do with the identity, the role, of a surgeon. Anatomy (and thensurgery) have been Bennett's constant loves, lying at the center of his being, and he is most himself, most deeply himself, when he is immersed in his work.

His whole personality and demeanor-sometimes nervous and diffident-change whenhe puts on his surgical mantle, takes on the quiet assurance, the identity, ofone who is a master at his work. It seems part of this overall change that theTourette's vanishes, too. I have seen exactly this in Tourettic actors aswell; I know one man, a character actor, who is violently Touretty offstage, but totally free from Tourettisms, totally in role, when he is acting.

Here one is seeing something at a much higher level than the merely rhythmic, quasi-automatic resonance of the motor patterns; one is seeing (however it isto be defined in psychic or neural terms) a fundamental act of incarnation orpersonation, whereby the skills, the feelings, the entire neural engrams ofanother self, are taking over in the brain, redefining the person, his wholenervous system, as long as the performance lasts. *62* Such identitytransformations, reorganizations, occur in us all as we move, in the course ofa day, from one role, one persona, to another-the parental to theprofessional, to the political, to the erotic, or whatever. But they areespecially dramatic in those who move in and out of neurological orpsychiatric syndromes, and in professional performers and actors.

These transformations, the switches between very complex neural engrams, aretypically experienced in terms of "remembering" and "forgetting"-thus Bennettforgets that he is Tourettic while operating ("it never even crosses mymind"), but remembers it as soon as there is an interruption. And in themoment of remembering, he becomes so, for at this level, there is nodistinction between the memory, the knowledge, the impulse, and the act-allcome or go together, as one. (It is similar with other conditions: I once sawa parkinsonian man I know take a shot of apomorphine to help his rigidity and"freezing"-he suddenly unfroze a couple of minutes later, smiled, and said, "Ihave forgotten how to be parkinsonian.")

Friday afternoon is open. Bennett often likes to go for long hikes on Fridays, or cycle rides, or drives, with a sense of the trail, the open road, beforehim. There is a favorite ranch he loves to go to, with a beautiful lake and anairstrip, accessible only via a rugged dirt road. It is a wonderfully situatedranch, a narrow fertile strip perfectly placed between the lake and mountains, and we walked for miles, talking of this and that, with Bennett botanizing orgeologizing as we went. Then, briefly, we went to the lake, where I took aswim; when I came out of the water I found that Bennett, rather suddenly, hadcurled up for a nap. He looked peaceful, tension-free, as he slept; and thesuddenness and depth of his sleep made me wonder how much difficulty heencountered in the daytime, whether he might not sometimes be stressed to thelimit. I wondered how much he concealed beneath his genial surface- how much, inwardly, he had to control and deal with.

Later, as we continued our ramble about the ranch, he remarked that I had seenonly some of the outward expressions of his Tourette's, and these, bizarre asthey occasionally seemed, were by no means the worst problems it caused him.

The real problems, the inner problems, are panic and rage- feelings so violentthat they threaten to overwhelm him, and so sudden that he has virtually nowarning of their onset. He has only to get a parking ticket or see a policecar, sometimes, for scenarios of violence to flash through his mind: madchases, shoot-outs, flaming destructions, violent mutilation, and deathscenarios that become immensely elaborated in seconds and rush through hismind with convulsive speed. One part of him, uninvolved, can watch these scenes with detachment, but another part of him is taken over and impelled toaction. He can prevent himself from giving way to outbursts in public, but thestrain of controlling himself is severe and exhausting. At home, in private, he can let himself go-not at others but at inanimate objects around him. Therewas the wall I had seen, which he had often struck in his rage, and therefrigerator, at which he had flung virtually everything in the kitchen. Inhis office, he had kicked a hole in the wall and had had to put a plant infront to cover it; and in his study at home the cedar walls were covered withknife marks. "It's not gentle," he said to me. "You can see it as whimsical, funny-be tempted to romanticize it-but Tourette's comes from deep down in thenervous system and the unconscious. It taps into the oldest, strongestfeelings we have. Tourette's is like an epilepsy in the subcortex; when ittakes over, there's just a thin line of control, a thin line of cortex,

between you and it, between you and that raging storm, the blind force of thesubcortex. One can see the charming things, the funny things, the creativeside of Tourette's, but there's also that dark side. You have to fight it allyour life."

Driving back from the ranch was a stimulating, at times terrifying, experience. Now that Bennett was getting to know me, he felt at liberty to lethimself and his Tourette's go. The steering wheel was abandoned for seconds ata time-or so it seemed to me, in my alarm-while he tapped on the windshield(to a litany of "Hooty-hoo!" and "Hi, there!" and "Hideous!"], rearranged hisglasses, "centered" them in a hundred different ways, and, with bentforefingers, continually smoothed and evened his mustache while gazing in therear-view mirror rather than at the road. His need to center the steeringwheel in relation to his knees also grew almost frenetic: he had constantly to"balance" it, to jerk it to and fro, causing the car to zigzag erraticallydown the road. "Don't worry," he said when he saw my anxiety. "I know thisroad. I could see from way back that nothing was coming. I've never had anaccident driving."*63*

The impulse to look, and to be looked at, is very striking with Bennett, and, indeed, as soon as we got back to the house he seized Mark and planted himselfin front of him, smoothing his mustache furiously and saying, "Look at me! Look at me!" Mark, arrested, stayed where he was, but his eyes wandered to andfro. Now Bennett seized Mark's head, held it rigidly toward him, hissing, "Look, look at me!" And Mark became totally still, transfixed, as ifhypnotized.

I found this scene disquieting. Other scenes with the family I had foundrather moving: Bennett dabbing at Helen's hair, symmetrically, withoutstretched fingers, going "whoo, whoo" softly. She was placid, accepting; itwas a touching scene, both tender and absurd. "I love him as he is," Helensaid. "I wouldn't want him any other way." Bennett feels the same way: "Funny disease-I don't think of it as a disease but as just me. Isay the word 'disease/ but it doesn't seem to be the appropriate word."

It is difficult for Bennett, and is often difficult for Touretters, to seetheir Tourette's as something external to themselves, because many of its ticsand urges may be felt as intentional, as an integral part of the self, thepersonality, the will. It is quite different, by contrast, with something likeparkinsonism or chorea: these have no quality of selfness or in-tentionalityand are always felt as diseases, as outside the self. Compulsions and ticsoccupy an intermediate position, seeming sometimes to be an expression ofone's personal will, sometimes a coercion of it by another, alien will. Theseambiguities are often expressed in the terms people use. Thus the separatenessof "it" and "I" is sometimes expressed by jocular personifications of theTourette's: one Touretter I know calls his Tourette's "Toby," another "Mr. T"

By contrast, a Tourettic possession of the self was vividly expressed by oneyoung man in Utah, who wrote to me that he had a "Tourettized soul."

Though Bennett is quite prepared, even eager, to think of Tourette's inneurochemical or neurophysiological terms-he thinks in terms of chemicalabnormalities, of "circuits turning on and off," and of "primitive, normallyinhibited behaviors being released"-he also feels it as something that hascome to be part of himself. For this reason (among others), he has found thathe cannot tolerate haloperidol and similar drugs-they reduce his Tourette's, assuredly, but they reduce him as well, so that he no longer feels fullyhimself. "The side effects of haloperidol were dreadful," he said. "I wasintensely restless, I couldn't stand still, my body twisted, I shuffled like aparkinsonian. It was a huge relief to get off it. On the other hand, Prozachas been a godsend for the obsessions, the rages, though it doesn't touch thetics." Prozac has indeed been a godsend for many Touretters, though some havefound it to have no effect, and a few have had paradoxical effects-an intensification of their agitations, obsessions, and rages. *64*

Though Bennett has had tics since the age of seven or so, he did not identifywhat he had as Tourette's syndrome until he was thirty-seven. "When we werefirst married, he just called it a 'nervous habit,' " Helen told me. "We usedto joke about it. I'd say, 'I'll quit smoking, and you quit twitching.' Wethought of it as something he could quit if he wanted. You'd ask him, 'Why doyou do it?' He'd say, 'I don't know why.' He didn't seem to be self-consciousabout it. Then, in 1977, when Mark was a baby, Carl heard this program, 'Quirks and Quarks/ on the radio. He got all excited and hollered, 'Helen, come listen! This guy's talking about what I do!' He was excited to hear thatother people had it. And it was a relief to me, because I had always sensedthat there was something wrong. It was good to put a label on it. He nevermade a thing of it, he wouldn't raise the subject, but, once we knew, we'dtell people if they asked. It's only in the last few years that he's met otherpeople with it, or gone to meetings of the Tourette Syndrome Association."

(Tourette's syndrome, until very recently, was remarkably underdiagnosed andunknown, even to the medical profession, and most people diagnosed themselves, or were diagnosed by friends and family, after seeing or reading somethingabout it in the media. Indeed, I know of another doctor, a surgeon inLouisiana, who was diagnosed by one of his own patients who had seen aTouretter on the Phil Donahue show. Even now, nine out of ten diagnoses aremade, not by physicians, but by others who have learned about it from themedia. Much of this media emphasis has been due to the efforts of the TSA, which had only thirty members in the early seventies but now has more thantwenty thousand.)

Saturday morning, and I have to return to New York. "I'll fly you to Calgaryif the weather's fine," Bennett said suddenly last night. "Ever flown with aTouretter before?"

I had canoed with one, *65* I said, and driven across country with another, butflying with one& "You'll enjoy it," Bennett said. "It'll be a novel experience. I am theworld's only flying Touretter-surgeon."

When I awake, at dawn, I perceive, with mixed feelings, that the weather, though very cold, is perfect. We drive to the little airport in Branford, aveering, twitching journey that makes me nervous about the flight. "It's mucheasier in the air, where there's no road to keep to, and you don't have tokeep your hands on the controls all the time," Bennett says. At the airport, he parks, opens a hangar, and proudly points out his airplane-a tinyred-and-white single-engine Cessna Cardinal. He pulls it out onto the tarmacand then checks it, rechecks it, and re-rechecks it before warming up theengine. It is near freezing on the airfield, and a north wind is blowing. Iwatch all the checks and rechecks with impatience but also with a sense ofreassurance. If his Tourette's makes him check everything three or five times, so much the safer. I had a similar feeling of reassurance about hissurgery-that his Tourette's, if anything, made him more meticulous, moreexact, without in the least damping down his intuitiveness, his freedom.

His checking done, Bennett leaps like a trapeze artist into the plane, revsthe engine while I climb in, and takes off. As we climb, the sun is risingover the Rockies to the east and floods the little cabin with a pale, goldenlight. We head toward nine-thousand-foot crests, and Bennett tics, flutters, reaches, taps, touches his glasses, his mustache, the top of the cockpit.

Minor tics, Little League, I think, but what if he has big tics? What if hewants to twirl the plane in midair, to hop and skip with it, to dosomersaults, to loop the loop? What if he has an impulse to leap out and touchthe propeller? Touretters tend to be fascinated by spinning objects; I have avision of him lunging forward, half out the window, compulsively lunging atthe propeller before us. But his tics and compulsions remain very minor, andwhen he takes his hands off the controls the plane continues quietly.

Mercifully, there is no road to keep to. If we rise or fall or veer fifty feet, what does it matter? We have the whole sky to play with.

And Bennett, though superbly skilled, a natural aviator, is like a child atplay. Part of Tourette's, at least, is no more than this-the release of aplayful impulse normally inhibited or lost in the rest of us. The freedom, thespaciousness, obviously delight Bennett; he has a carefree, boyish look Irarely saw on the ground. Now, rising, we fly over the first peaks, theadvance guard of the Rockies; yellowing larches stream beneath us. We clearthe slopes by a thousand feet or more. I wonder whether Bennett, if he were byhimself, might want to clear the peaks by ten feet, by inches-Touretters aresometimes addicted to close shaves. At ten thousand feet, we move in acorridor between peaks, mountains shining in the morning sun to our left, mountains silhouetted against it to our right. At eleven thousand feet, we cansee the whole width of the Rockies-they are only fifty-five miles acrosshere-and the vast golden Alberta prairie starting to the east. Every so oftenBennett's right arm flashes in front of me, his hand taps lightly on thewindshield. "Sedimentary rocks, look!" He gestures through the window. "Liftedup from the sea bottom at seventy to eighty degrees." He gazes at the steeplysloping rocks as at a friend; he is intensely at home with these mountains, this land. Snow lies on the sunless slopes of the mountains, none yet on theirsunlit faces; and over to the northwest, toward Banff, we can see glaciers onthe mountains. Bennett shifts, and shifts, and shifts again, trying to get hisknees exactly symmetrical beneath the controls of the plane.

In Alberta now-we have been flying for forty minutes-the Highwood River windsbeneath us. Flying due north, we start a gentle descent toward Calgary, thelast, declining slopes of the Rockies all shimmering with aspen. Now, lower, to vast fields of wheat and alfalfa-farms, ranches, fertile prairie-but still, everywhere, stands of golden aspen. Beyond the checkerboard of fields, thetowers of Calgary rise abruptly from the flat plain.

Suddenly, the radio crackles alive-a huge Russian air transport is coming in; the main runway, closed for maintenance, must quickly be opened up. Anothermassive plane, from the Zambian air force. The world's planes come to Calgaryfor special work and maintenance; its facilities, Bennett tells me, are someof the best in North America. In the middle of this important flurry, Bennettradios in our position and statistics (fifteen-foot-long Cardinal, with aTouretter and his neurologist) and is immediately answered, as fully andhelpfully as if he were a 747. All planes, all pilots, are equal in thisworld. And it is a world apart, with a freemasonry of its own, its ownlanguage, codes, myths, and manners. Bennett, clearly, is part of this worldand is recognized by the traffic controller and greeted cheerfully as he taxisin.

He leaps out with a startling, ticlike suddenness and celerity-I follow at aslower, "normal" pace-and starts talking with two giant young men on thetarmac, Kevin and Chuck, brothers, both fourth-generation pilots in theRockies. They know him well. "He's just one of us," Chuck says to me. "Aregular guy. Tourette's-what the hell? He's a good human being. A damn goodpilot, too."

Bennett yarns with his fellow pilots and files his flight plan for the returntrip to Branford. He has to return straightaway; he is due to speak at elevento a group of nurses, and his subject, for once, is not surgery butTourette's. His little plane is refueled and readied for the return flight. We hug and say goodbye, and as I head for my flight to New York I turn to watch him go. Bennett walks to his plane, taxis onto the main runway, and takes off, fast, with a tailwind following. I watch him for a while, and then he is gone.

Notes

53. A further four surfaced (one an ophthalmic surgeon) following the originalpublication of this piece. In addition to these Tourettic surgeons, I now knowof three Tourettic internists, two Tourettic neurologists, but only oneTourettic psychiatrist.

54. Tics can have an ambiguous status, partway between meaningless jerks ornoises and meaningful acts. Though the tendency to tic is innate inTourette's, the particular form of tics often has a personal or historicalorigin. Thus a name, a sound, a visual image, a gesture, perhaps seen yearsbefore and forgotten, may first be unconsciously echoed or imitated and thenpreserved in the stereotypic form of a tic. Such tics are like hieroglyphic, petrified residues of the past and may indeed, with the passage of time, become so hieroglyphic, so abbreviated, as to become unintelligible (as "Godbe with you" was condensed, collapsed, after centuries, to the phoneticallysimilar but meaningless "goodbye"). One such patient, whom I saw long ago, kept making an explosive, guttural, trisyllabic noise, which revealed itself, on analysis, as a very accelerated, crushed rendering of "Verboten 1." in aconvulsive parody of his father's constantly forbidding German voice.

A recent correspondent, a woman with Tourette's, after reading an earlierversion of this piece, wrote that " 'enshrinement'& is the perfect word todescribe the interplay between life and tics-the process by which the formergets incorporated into the latter& It is almost as if the Tourettic bodybecomes an expressive archive-albeit jumbled-of one's life experience."

55. Some people with Tourette's have flinging tics-sudden, seeminglymotiveless urges or compulsions to throw objects-quite different fromBennett's flinging in rage. There may be a very brief premonition-enough, inone case, to yell a warning "Duck!"-before a dinner plate, a bottle of wine, or whatever is flung convulsively across the room. Identical throwing ticsoccurred in some of my postencephalitic patients when they were overstimulatedby L-DOPA. (I see somewhat similar flinging behaviors-though not tics-in mytwo-year-old godson, now in a stage of primal antinomianism and anarchy.)

56. This was comically shown on one occasion when I went to a restaurant fordinner with three Tourettic friends in Los Angeles. All three of them at oncerushed for the corner seat-not, I think, in any competitive spirit, butbecause each saw it as an existential-neural necessity. The lucky one was ableto sit calmly in his place, while the other two were constantly lunging atother diners behind them.

57. Tourette's should not be regarded as a psychiatric disorder, but as aneurobiological disorder of a hyperphysiological sort, in which there mayoccur subcortical excitation and spontaneous stimulation of manyphylogenetically primitive centers in the brain. A similar stimulation orrelease of "primitive" behaviors may be seen with the excitatory lesions ofencephalitis lethargica, such as I describe in Awakenings (pp. 5 5-6). Thesewere often apparent in the early days of the illness and became prominentagain with the stimulation of L-DOPA.

58. Such tendencies, common in Tourette's syndrome, are also seen in patientswith postencephalitic syndromes. Thus my patient Miriam H. had compulsions tocount the number of e's on every page she read; to say, or write, or spellsentences backward; to divide people's faces into juxtapositions of geometricfigures; and to balance visually, to symmetrize, everything she saw.

59. The name of an eminent researcher on Tourette's syndrome-Dr. Abuzzahab-hasan almost diagnostic power, provoking grotesque, perseverative elaborations inTouretters (Abuzzahuzzahab, etc.). The power of the unusual to excite andimpress is not, of course, confined to Touretters. The anonymous author of theancient mnemotechnic text Ad Herennium described it, two thousand years ago, as a natural bent of the mind and one to be exploited for fixing images morefirmly in the mind:

When we see in everyday life things that are petty, ordinary, and banal, wegenerally fail to remember them, because the mind is not being stirred byanything novel or marvellous. But if we see or hear something exceptionallybase, dishonourable, unusual, great, unbelievable, or ridiculous, that we arelikely to remember for a long time& , Ordinary things easily slip from the memory while the striking and the novel stay longer in the mind& Let art, then, imitate nature.

60. This was the condition, grotesquely severe, that afflicted the famous Elephant Man, John Merrick.

61. What most of us call a startling or "abnormal" speed of movement appearsperfectly normal to Touretters when they show it. This was very clear in arecent experiment of target pointing with Shane F., an artist with Tourette's.

Shane showed markedly reduced reaction times, and reaching rates of almost sixtimes normal, combined with great smoothness and accuracy of movement and aim. Such speeds were achieved quite effortlessly and naturally; normal subjects, by contrast, could achieve them, if at all, only by violent effort and withobvious compromise of accuracy and control.

On the other hand, when Shane was asked to stick to (our| normal speeds, hismovements became constrained, awkward, inaccurate, and tic filled. It wasclear that his normal and our normal were very different, that the Touretticnervous system, in this sense, is more highly tuned (though, by the sametoken, given to precipitancy and reaction).

A similar speed and precipitancy were to be seen in many postencephaliticpatients, especially when they were activated by L-DOPA. Thus, as I remarkedof Hester Y., in Awakenings, "If Mrs. Y., before L-DOPA, was the most impededperson I have ever seen, she became, on L-DOPA, the most accelerated person Ihave ever seen. I have known a number of Olympic athletes, but Mrs. Y. couldhave beaten them all in terms of reaction time; under other circumstances shecould have been the fastest gun in the West."

62. The matter is especially complex, for some Touretters are given tomimicry, imitation, and impersonation of a more convulsive kind. (I describean example of this in "The Possessed.") This sort of imitation has notransformative effect; on the contrary, it thrusts the person deeper intoTourette's. The Tourettic character actor was very given to convulsiveimpersonations and other Tourettisms offstage, but these were quite differentfrom the deep and healing role-playing that he was able to do onstage. Thesuperficially imitative or impersonative impulse comes from, and stimulates, asuperficial part of the person (and his neural organization)-it is only adeep, total identification, as with Bennett, that can work the transformation.

63. Driving cross country with another friend with Tourette's was also amemorable experience, for he would twitch the steering wheel violently fromside to side, stamp on the brake or the accelerator suddenly, or pull out theignition key at speed. But he always checked that these Tourettisms were safe, and never had an accident in ten years of driving.

64. This was very clear with another Tourettic physician, an obstetrician, whohad not only tics but panics and rages that, with a great effort, he couldcontain. When he was put on Prozac, this precarious control broke down, and hegot into a violent fight with the police and spent a night in jail.

65. Canoeing with Shane F. one summer on Lake Huron was a remarkable human andclinical experience, for the canoe became an extension of his body, wouldpitch and plunge with each of his Tourettisms, giving me an unforgettablydirect sense of what it must be like to be him. We were constantly flungaround, as in a storm, constantly on the point of overturning, and I longed for the canoe to founder, and sink once and for all, so that I could escapeand swim back to the shore.

To See and Not See

Early in October of 1991, I got a phone call from a retired minister in theMidwest, who told me about his daughter's fiancé, a fifty-year-old man namedVirgil, who had been virtually blind since early childhood. He had thickcataracts and was also said to have retinitis pigmentosa, a hereditarycondition that slowly but implacably eats away at the retinas. But hisfiancée, Amy, who required regular eye checks herself because of diabetes, hadrecently taken him to see her own ophthalmologist, Dr. Scott Hamlin, and hehad given them new hope. Dr. Hamlin, listening carefully to the history, wasnot so sure that Virgil did have retinitis pigmentosa. It was difficult to becertain at this stage, because the retinas could no longer be seen beneath thethick cataracts, but Virgil could still see light and dark, the direction fromwhich light came, and the shadow of a hand moving in front of his eyes, soobviously there was not a total destruction of the retina. And cataractextraction was a relatively simple procedure, done under local anesthesia, with very little surgical risk. There was nothing to lose-and there might bemuch to gain. Amy and Virgil would be getting married soon-wouldn't it befantastic if he could see? If, after a near-lifetime of blindness, his firstvision could be his bride, the wedding, the minister, the church! Dr. Hamlinhad agreed to operate, and the cataract on Virgil's right eye had been removeda fortnight earlier, Amy's father informed me.

And, miraculously, theoperation had worked. Amy, who began keeping a journal the day after the operation-the daythe bandages were removed-wrote in her initial entry: "Virgil can SEE!& Entire office in tears, first time Virgil has sight for forty years& Virgil'sfamily so excited, crying, can't believe it!& Miracle of sight restoredincredible!" But the following day she remarked problems: "Trying to adjust tobeing sighted, tough to go from blindness to sighted. Has to think faster, notable to trust vision yet& Like baby just learning to see, everything new, exciting, scary, unsure of what seeing means."

A neurologist's life is not systematic, like a scientist's, but it provideshim with novel and unexpected situations, which can become windows, peepholes, into the intricacy of nature-an intricacy that one might not anticipate fromthe ordinary course of life. "Nature is nowhere accustomed more openly todisplay her secret mysteries," wrote William Harvey, in the seventeenthcentury, "than in cases where she shows traces of her workings apart from thebeaten path." Certainly this phone call-about the restoration of vision inadulthood to a patient blind from early childhood-hinted of such a case. "Infact," writes the ophthalmologist Alberto Valvo, in Sight Restoration afterLong-Term Blindness, "the number of cases of this kind over the last tencenturies known to us is not more than twenty."

What would vision be like in such a patient? Would it be "normal" from themoment vision was restored? This is what one might think at first. This is thecommonsensical notion- that the eyes will be opened, the scales will fall fromthem, and (in the words of the New Testament) the blind man will "receive" sight. *66*

But could it be that simple? Was not experience necessary to see? Did one nothave to learn to see? I was not well acquainted with the literature on thesubject, though I had read with fascination the great case history published in the Quarterly Journal ofPsychology in 1963 by the psychologist Richard Gregory (with Jean G. Wallace), and I knew that such cases, hypothetical or real, had riveted the attention ofphilosophers and psychologists for hundreds of years.

The seventeenth-centuryphilosopher William Molyneux, whose wife was blind, posed the followingquestion to his friend John Locke: "Suppose a man born blind, and now adult, and taught by his touch to distinguish between a cube and a sphere [be] madeto see: [could he now] by his sight, before he touched them& distinguish andtell which was the globe and which the cube?" Locke considers this in his 1690Essay Concerning Human Understanding and decides that the answer is no. In1709, examining the problem in more detail, and the whole relation betweensight and touch, in A New Theory of Vision, George Berkeley concluded thatthere was no necessary connection between a tactile world and a sightworld-that a connection between them could be established only on the basis ofexperience.

Barely twenty years elapsed before these considerations were put to thetest-when, in 1728, William Cheselden, an English surgeon, removed thecataracts from the eyes of a thirteen-year-old boy born blind. Despite hishigh intelligence and youth, the boy encountered profound difficulties withthe simplest visual perceptions. He had no idea of distance. He had no idea ofspace or size. And he was bizarrely confused by drawings and paintings, by theidea of a two-dimensional representation of reality. As Berkeley hadanticipated, he was able to make sense of what he saw only gradually andinsofar as he was able to connect visual experiences with tactile ones. It hadbeen similar with many other patients in the two hundred and fifty years sinceCheselden's operation: nearly all had experienced the most profound, Lockean confusion and bewilderment. *67*

And yet, I was informed, as soon as the bandages were removed from Virgil'seye, he saw his doctor and his fiancée, and laughed. Doubtless he sawsomething-but what did he see? What did "seeing" for this previouslynot-seeing man mean? What sort of world had he been launched into?

Virgil was born on a small farm in Kentucky soon after the outbreak of theSecond World War. He seemed normal enough as a baby, but (his mother thought) had poor eyesight even as a toddler, sometimes bumped into things, seemed notto see them. At the age of three, he became gravely ill with a tripleillness-a meningitis or meningoencephalitis (inflammation of the brain and itsmembranes), polio, and cat-scratch fever. During this acute illness, he hadconvulsions, became virtually blind, paralyzed in the legs, partly paralyzedin his breathing, and, after ten days, fell into a coma. He remained in a comafor two weeks. When he emerged from it, he seemed, according to his mother, "adifferent person"; he showed a curious indolence, nonchalance, passivity, seemed nothing at all like the spunky, mischievous boy he had been.

The strength in his legs came back over the next year, and his chest grewstronger, though never entirely normal. His vision also recoveredsignificantly-but his retinas were now gravely damaged. Whether the retinaldamage was caused wholly by his acute illness or perhaps partly by acongenital retinal degeneration was never clear.

In Virgil's sixth year, cataracts began to develop in both eyes, and it wasevident that he was again becoming functionally blind. That same year, he wassent to a school for the blind, and there he eventually learned to readBraille and to become adept with the use of a cane. But he was not a starpupil; he was not as adventurous or aggressively independent as some blindpeople are. There was a striking passivity all through his time at school-as, indeed, there had been since his illness.

Yet Virgil graduated from the school and, when he was twenty, decided to leaveKentucky, to seek training, work, and a life of his own in a city in Oklahoma.

He trained as a massage therapist and soon found employment at a YMCA. He wasobviously good at his job, and highly esteemed, and the Y was happy to keephim on its permanent staff and to provide a small house for him across the road, where he lived with a friend, also employed at the Y. Virgil had manyclients-it is fascinating to hear the tactile detail with which he candescribe them-and seemed to take a real pleasure and pride in his job. Thus, in his modest way, Virgil made a life: had a steady job and an identity, wasself-supporting, had friends, read Braille papers and books jthough less, withthe years, as Talking Books came in). He had a passion for sports, especiallybaseball, and loved to listen to games on the radio. He had an encyclopedicknowledge of baseball games, players, scores, statistics. On a couple ofoccasions, he became involved with girlfriends and would cross the city onpublic transport to meet them. He maintained a close tie with home, andparticularly with his mother-he would get hampers of food regularly from thefarm and send hampers of laundry back and forth. Life was limited, but stablein its way.

Then, in 1991, he met Amy-or, rather, they met again, for they had known eachother well twenty or more years before. Amy's background was different fromVirgil's: she came from a cultivated middle-class family, had gone to collegein New Hampshire, and had a degree in botany. She had worked at another Y intown, as a swimming coach, and had met Virgil at a cat show in 1968. Theydated a bit-she was in her early twenties, he was a few years older-but thenAmy decided to go back to graduate school in Arkansas, where she met her firsthusband, and she and Virgil fell out of contact. She ran her own plant nurseryfor a while, specializing in orchids, but had to give this up when she developed severe asthma. She and her firsthusband divorced after a few years, and she returned to Oklahoma. In 1988, outof the blue, Virgil called her, and, after three years of long phone callsbetween them, they finally met again, in 1991. "All of a sudden it was liketwenty years were never there," Amy said.

Meeting again, at this point in their lives, both felt a certain desire forcompanionship. With Amy, perhaps, this took a more active form. She saw Virgilstuck (as she perceived it) in a vegetative, dull life: going over to the Y, doing his massages; going back home, where, increasingly, he listened to ballgames on the radio; going out and meeting people less and less each year.

Restoring his sight, she must have felt, would, like marriage, stir him fromhis indolent bachelor existence and provide them both with a new life.

Virgil was passive here as in so much else. He had been sent to half a dozenspecialists over the years, and they had been unanimous in declining tooperate, feeling that in all probability he had no useful retinal function; and Virgil seemed to accept this with equanimity. But Amy disagreed. WithVirgil being blind already, she said, there was nothing to lose, and there wasa real possibility, remote but almost too exciting to contemplate, that hemight actually get reasonable sight back and, after nearly forty-five years, see again. And so Amy pushed for the surgery. Virgil's mother, fearingdisturbance, was strongly against it. ("He is fine as he is," she said.)

Virgil himself showed no preference in the matter; he seemed happy to go alongwith whatever they decided.

Finally, in mid-September, the day of surgery came. Virgil's right eye had itscataract removed, and a new lens implant was inserted; then the eye wasbandaged, as is customary, for twenty-four hours of recovery. The followingday, the bandage was removed, and Virgil's eye was finally exposed, withoutcover, to the world. The moment of truth had finally come.

Or had it? The truth of the matter (as I pieced it together later), if less"miraculous" than Amy's journal suggested, was infinitely stranger. Thedramatic moment stayed vacant, grew longer, sagged. No cry ("I can see!") burst from Virgil's lips. He seemed tobe staring blankly, bewildered, without focusing, at the surgeon, who stoodbefore him, still holding the bandages. Only when the surgeon spoke-saying"Well?"-did a look of recognition cross Virgil's face.

Virgil told me later that in this first moment he had no idea what he wasseeing. There was light, there was movement, there was color, all mixed up, all meaningless, a blur. Then out of the blur came a voice that said, "Well?"

Then, and only then, he said, did he finally realize that this chaos of lightand shadow was a face-and, indeed, the face of his surgeon.

His experience was virtually identical to that of Gregory's patient S.B., whowas accidentally blinded in infancy, and received a corneal transplant in hisfifties:

When the bandages were removed& he heard a voice coming from in front of himand to one side: he turned to the source of the sound, and saw a "blur." Herealized that this must be a face& He seemed to think that he would not have known that this was a face if he had not previously heard the voice and knownthat voices came from faces.

The rest of us, born sighted, can scarcely imagine such confusion. For we, born with a full complement of senses, and correlating these, one with theother, create a sight world from the start, a world of visual objects andconcepts and meanings. When we open our eyes each morning, it is upon a worldwe have spent a lifetime learning to see. We are not given the world: we makeour world through incessant experience, categorization, memory, reconnection.

But when Virgil opened his eye, after being blind for forty-five years-havinghad little more than an infant's visual experience, and this longforgotten-there were no visual memories to support a perception; there was noworld of experience and meaning awaiting him. He saw, but what he saw had nocoherence. His retina and optic nerve were active, transmitting impulses, but his brain could make no sense of them; he was, as neurologists say, agnosic.

Everyone, Virgil included, expected something much simpler. A man opens hiseyes, light enters and falls on the retina: he sees. It is as simple as that, we imagine. And the surgeon's own experience, like that of mostophthalmologists, had been with the removal of cataracts from patients who hadalmost always lost their sight late in life-and such patients do indeed, ifthe surgery is successful, have a virtually immediate recovery of normalvision, for they have in no sense lost their ability to see. And so, thoughthere had been a careful surgical discussion of the operation and of possiblepostsurgical complications, there was little discussion or preparation for theneurological and psychological difficulties that Virgil might encounter.

With the cataract out, Virgil was able to see colors and movements, to see|but not identify) large objects and shapes, and, astonishingly, to read someletters on the third line of the standard Snellen eye chart-the linecorresponding to a visual acuity of about 20/100 or a little better. Butthough his best vision was a respectable 20/80, he lacked a coherent visualfield, because his central vision was poor, and it was almost impossible forthe eye to fixate on targets; it kept losing them, making random searchingmovements, finding them, then losing them again. It was evident that thecentral, or macular, part of the retina, which is specialized for high acuityand fixation, was scarcely functioning, and that it was only the surroundingparamacular area that was making possible such vision as he had. The retinaitself presented a moth-eaten or piebald appearance, with areas of increasedand decreased pigmentation-islets of intact or relatively intact retinaalternating with areas of atrophy. The macula was degenerated and pale, andthe blood vessels of the entire retina appeared narrowed. Examination, I wastold, suggested the scars or residues of old disease but no current or active disease process; and, this being so, Virgil's vision, such as it was, could be stable for the rest of his life. Itcould be hoped, moreover (since the worse eye had been operated on first), that the left eye, which was to be operated upon in a few weeks' time, mighthave considerably more functional retina than the right.

I had not been able to go to Oklahoma straightaway-my impulse was to take thenext plane after that initial phone call-but had kept myself informed ofVirgil's progress over the ensuing weeks by speaking with Amy, with Virgil'smother, and, of course, with Virgil himself. I also spoke at length with Dr. Hamlin and with Richard Gregory, in England, to discuss what sort of testmaterials I should bring, for I myself had never seen such a case, nor did Iknow anyone (apart from Gregory) who had. I gathered together somematerials-solid objects, pictures, cartoons, illusions, videotapes, andspecial perceptual tests designed by a physiologist colleague, Ralph Siegel; Iphoned an ophthalmologist friend, Robert Wasserman (we had previously workedtogether on the case of the colorblind painter), and we started to plan avisit. It was important, we felt, not just to test Virgil but to see how hemanaged in real life, inside his house, outside, in natural settings andsocial situations; crucial, too, that we see him as a person, bringing his ownlife history-his particular dispositions and needs and expectations-to thiscritical passage; that we meet his fiancée, who had so urged the operation, and with whom his life was now so intimately mingled; that we look not merelyat his eyes and perceptual powers but at the whole tenor and pattern of hislife.

Virgil and Amy-now newlyweds-greeted us at the exit barrier in the airport. Virgil was of medium height, but exceedingly fat; he moved slowly and tendedto cough and puff with the slightest exertion. He was not, it was evident, anentirely well man. His eyes roved to and fro, in searching movements, and whenAmy introduced Bob and me he did not seem to see us straightaway-he lookedtoward us but not quite at us. I had the impression, momentary but strong, that he did not really look at our faces, though he smiled and laughed and listenedminutely.

I was reminded of what Gregory had observed of his patient S.B.-that "he didnot look at a speaker's face, and made nothing of facial expressions." Virgil's behavior was certainly not that of a sighted man, but it was not thatof a blind man, either. It was, rather, the behavior of one mentally blind, oragnosic-able to see but not to decipher what he was seeing. He reminded me ofan agnosic patient of mine, Dr. P. (the man who mistook his wife for a hat), who, instead of looking at me, taking me in, in the normal way, made suddenstrange fixations-on my nose, on my right ear, down to my chin, up to my righteye-not seeing, not "getting," my face as a whole.

We walked out through the crowded airport, Amy holding Virgil's arm, guidinghim, and out to the lot where they had parked their car. Virgil was fond ofcars, and one of his first pleasures after surgery (as with S.B.) had been towatch them through the window of his house, to enjoy their motions, and spottheir colors and shapes-their colors, especially. He was sometimes bewilderedby shapes. "What cars do you see?" I asked him as we walked through the lot.

He pointed to all the cars we passed. "That's a blue one, that's red-wow, that's a big one!" Some of the shapes he found very surprising. "Look at thatone!" he exclaimed once. "I have to look down!" And, bending, he felt it-itwas a slinky, streamlined V-12 Jaguar- and confirmed its low profile. But itwas only the colors and general profiles he was getting; he would have walkedpast their own car had Amy not been with him. And Bob and I were struck by thefact that Virgil would look, would attend visually, only if one asked him toor pointed something out- not spontaneously. His sight might be largelyrestored, but using his eyes, looking, it was clear, was far from natural tohim; he still had many of the habits, the behaviors, of a blind man. [68]

The drive from the airport to their house was a long one; it took us throughthe heart of town, and it gave us an opportunity to talk to Virgil and Amy andto observe Virgil's reactions to his new vision. He clearly enjoyed movement, watching the ever-changing spectacle through the car windows and the movementof other cars on the road. He spotted a speeder coming up very fast behind usand identified cars, buses (he especially loved the bright-yellow schoolbuses), eighteen-wheelers, and, once, on a side road, a slow, noisy tractor.

He seemed very sensitive to, and intrigued by, large neon signs andadvertisements and liked picking out their letters as we passed. He haddifficulty reading entire words, though he often guessed them correctly fromone or two letters or from the style of the signs. Other signs he saw butcould not read. He was able to see and identify the changing colors of thetraffic lights as we got into town.

He and Amy told us of other things he had seen since his operation and of someof the unexpected confusions that could occur. He had seen the moon; it waslarger than he expected.[69] On one occasion, he was puzzled by seeing "a fatairplane" in the sky-"stuck, not moving." It turned out to be a blimp. Occasionally, he had seen birds; they made him jump, sometimes, if theycame too close. (Of course, they did not come that close, Amy explained. Virgil simply had no idea of distance.)

Much of their time recently had been spent shopping-there had been the weddingto prepare for, and Amy wanted to show Virgil off, tell his story to theclerks and shopkeepers they knew, let them see a transformed Virgil forthemselves.[70] It was fun; the local television station had aired a story aboutVirgil's operation, and people would recognize him and come up to shake hishand. But supermarkets and other stores were also dense visual spectacles ofobjects of all kinds, often in bright packaging, and provided good "exercise" for Virgil's new sight. Among the first objects he had recognized, just theday after his bandages came off, were rolls of toilet paper on display. He hadpicked up a package and given it to Amy to prove he could see. Three daysafter surgery, they had gone to an IGA, and Virgil had seen shelves, fruit, cans, people, aisles, carts-so much that he got scared. "Everything rantogether," he said. He needed to get out of the store and close his eyes for abit.

He enjoyed uncluttered views, he said, of green hills and grass-especially after the overfull, overrich visual spectacles of shops-though it was difficult for him, Amy indicated, to connect the visual shapes of hills with the tangible hills he had walked up, and he had no idea of size or perspective. *71* But the first month of seeing had been predominantly positive: "Every day seemslike a great adventure, seeing more for the first time each day," Amy hadwritten, summarizing it, in her journal.

When we arrived at the house, Virgil, caneless, walked by himself up the pathto the front door, pulled out his key, grasped the doorknob, unlocked thedoor, and opened it. This was impressive-he could never have done it at first, he said, and it was something he had been practicing since the day aftersurgery. It was his showpiece. But he said that in general he found walking"scary" and "confusing" without touch, without his cane, with his uncertain, unstable judgment of space and distance. Sometimes surfaces or objects wouldseem to loom, to be on top of him, when they were still quite a distance away; sometimes he would get confused by his own shadow (the whole concept ofshadows, of objects blocking light, was puzzling to him) and would come to astop, or trip, or try to step over it. Steps, in particular, posed a specialhazard, because all he could see was a confusion, a flat surface, of parallelland crisscrossing lines; he could not see them (although he knew them) assolid objects going up or coming down in three-dimensional space. Now, fiveweeks after surgery, he often felt more disabled than he had felt when he wasblind, and he had lost the confidence, the ease of moving, that he hadpossessed then. But he hoped all this would sort itself out with time.

I was not so sure; every patient described in the literature had faced greatdifficulties after surgery in the apprehension of space and distance-formonths, even years. This was the case even in Valvo's highly intelligentpatient H.S., who had been normally sighted until, at fifteen, his eyes werescarred by a chemical explosion. He had become totally blind until a cornealtransplant was done twenty-two years later. But following this, he encounteredgrave difficulties of every kind, which he recorded, minutely, on tape:

During these first weeks [after surgery] I had no appreciation of depth ordistance; street lights were luminous stains stuck to the window panes, andthe corridors of the hospital were black holes. When I crossed the road thetraffic terrified me, even when I was accompanied. I am very insecure whilewalking; indeed I am more afraid now than before the operation.

We gathered in the kitchen at the back of the house, which had a large whitedeal table. Bob and I laid out all our test objects-color charts, lettercharts, pictures, illusions-on it and set up a video camera to record thetesting. As we settled down, Virgil's cat and dog bounded in to greet andcheck us- and Virgil, we noted, had some difficulty telling which was which.

This comic and embarrassing problem had persisted since he returned home fromsurgery: both animals, as it happened, were black and white, and he keptconfusing them-to their annoyance-until he could touch them, too. Sometimes,

Amy said, she would see him examining the cat carefully, looking at its head, its ears, its paws, its tail, and touching each part gently as he did so. Iobserved this myself the next day-Virgil feeling and looking at Tibbies withextraordinary intentness, correlating the cat. He would keep doing this, Amy remarked("You'd think once was enough"), but the new ideas, the visual recognitions, kept slipping from his mind.

Cheselden described a strikingly similar scene with his young patient in the1720s:

One particular only, though it might appear trifling, I will relate: Havingoften forgot which was the cat, and which the dog, he was ashamed to ask; butcatching the cat, which he knew by feeling, he was observed to look at hersteadfastly, and then, setting her down, said, So, puss, I shall know youanother time& Upon being told what things were& he would carefully observethat he might know them again; and (as he said) at first learned to know, andagain forgot, a thousand things in a day.

Virgil's first formal recognitions when the bandages were taken off had beenof letters on the ophthalmologist's eye chart, and we decided to test him, first, on letter recognition. He could not see ordinary newsprint clearly-hisacuity was still only about 20/80-but he readily perceived letters that weremore than a third of an inch high. Here he did rather well, for the most part, and recognized all the commoner letters (at least, capital letters) easily-ashe had been able to do from the moment the bandages were removed. How was itthat he had so much difficulty recognizing faces, or the cat, and so muchdifficulty with shapes generally, and with size and distance, and yet solittle difficulty, relatively, recognizing letters? When I asked Virgil aboutthis, he told me that he had learned the alphabet by touch at school, wherethey had used letter blocks, or cutout letters, for teaching the blind.

I wasstruck by this and reminded of Gregory's patient S.B.: "much to our surprise, he could even tell the time by means of a large clock on the wall. We were sosurprised at this that we did not at first believe that he could have been inany sense blind before the operation." But in his blind days S.B. had used alarge hunter watch with no glass, telling the time by touching the hands, andhe had apparently made an instant "cross-modal" transfer, to use Gregory'sterm, from touch to vision. Virgil too, it seemed, must have been making justsuch a transfer.

But while Virgil could recognize individual letters easily, he could notstring them together-could not read or even see words. I found this puzzling, for he said that they used not only Braille but English in raised or inscribedletters at school-and that he had learned to read fairly fluently. Indeed, hecould still easily read the inscriptions on war memorials and tombstones bytouch. But his eyes seemed to fix on particular letters and to be incapable ofthe easy movement, the scanning, that is needed to read. This was also thecase with the literate H.S.:

My first attempts at reading were painful. I could make out single letters, but it was impossible for me to make out whole words; I managed to do so onlyafter weeks of exhausting attempts. In fact, it was impossible for me toremember all the letters together, after having read them one by one. Nor wasit possible for me, during the first weeks, to count my own five fingers: Ihad the feeling that they were all there, but& it was not possible for me topass from one to the other while counting.

Further problems became apparent as we spent the day with Virgil. He wouldpick up details incessantly-an angle, an edge, a color, a movement-but wouldnot be able to synthesize them, to form a complex perception at a glance. Thiswas one reason the cat, visually, was so puzzling: he would see a paw, thenose, the tail, an ear, but could not see all of them together, see the cat asa whole.

Amy had commented in her journal on how even the most "obvious" connections-visually and logically obvious-had to be learned. Thus, she toldus, a few days after the operation "he said that trees didn't look likeanything on earth," but in her entry for October 21, a month after theoperation, she noted, "Virgil finally put a tree together-he now knows that the trunk andleaves go together to form a complete unit." And on another occasion: "Skyscrapers strange, cannot understand how they stay up without collapsing."

Many-or perhaps all-patients in Virgil's situation had had similardifficulties. One such patient (described by Eduard Raehlmann, in 1891), though she had had a little vision preop-eratively and had frequently handleddogs, "had no idea of how the head, legs, and ears were connected to theanimal." Valvo quotes his patient T.G.:

Before the operation I had a completely different idea of space, and I knewthat an object could occupy only one tactile point. I knew& also that if there were an obstacle or a step at the end of the porch, this obstacleoccurred after a certain period of time, to which I was accustomed. After theoperation, for many months, I could no longer coordinate visual sensationswith my speed of walking& I had to coordinate both vision and the time necessary to cover the distance. That I found very difficult. If any walkingwere too slow or too fast, I stumbled.

Valvo comments, "The real difficulty here is that simultaneous perception ofobjects is an unaccustomed way to those used to sequential perception throughtouch." We, with a full complement of senses, live in space and time; theblind live in a world of time alone. For the blind build their worlds from sequences of impressions (tactile, auditory, olfactory) and are not capable, as sighted people are, of a simultaneous visual perception, the making of aninstantaneous visual scene.

Indeed, if one can no longer see in space, thenthe idea of space becomes incomprehensible-even for highly intelligent peopleblinded relatively late in life (this is the central thesis of von Senden'sgreat monograph.) And it is powerfully conveyed by John Hull in his remarkableautobiography, Touching the Rock, when he speaks of himself, of the blind, as"living in time" almost exclusively. With the blind, he writes, this sense of being in a place is less pronounced& Space is reduced to one'sown body, and the position of the body is known not by what objects have beenpassed but by how long it has been in motion. Position is thus measured bytime& For the blind, people are not there unless they speak& People are inmotion, they are temporal, they come and they go. They come out of nothing; they disappear.

Although Virgil could recognize letters and numbers, and could write them, too, he mixed up some rather similar ones ("A" and "H," for example) and onoccasion, wrote some backward. (Hull describes how, after only five years ofblindness in his forties, his own visual memories had become so uncertain thathe was not sure which way around a "3" went and had to trace it in the airwith his fingers. Thus the numeral was retained as a tactile-motor concept, but no longer as a visual concept.) Still, Virgil's performance was animpressive one for a man who had not seen for forty-five years. But the worlddoes not consist of letters and numbers. How would he do with objects andpictures? How would he do with the real world?

His first impressions when the bandages were removed were especially of color, and it seemed to be color, which has no analogue in the world of touch, thatexcited and delighted him- this was very clear from the way he spoke and fromAmy's journal. (The recognition of colors and movement seems to be innate.) Itwas colors to which Virgil continually alluded, the chromatic unexpectednessof new sights. He had had Greek salad and spaghetti the night before, he toldus, and the spaghetti startled him: "White round strings, like fishing line," he said. "I thought it'd be brown."

Seeing light and shape and movements, seeing colors above all, had beencompletely unexpected and had had a physical and emotional impact almostshocking, explosive. ("I felt the violence of these sensations," wrote Valvo'spatient H.S., "like a blow on the head. The violence of the emotion& was akin to the very strong emotion I felt on seeing my wife for the first time, andwhen out in a car, I saw the huge monuments of Rome.")

We found that Virgil easily distinguished a great array of colors and matchedthem without difficulty. But, confusingly, or confusedly, he sometimes gavecolors the wrong names: yellow, for example, he called pink, but he knew thatit was the same color as a banana. We wondered at first whether he could have a color agnosia or color anomia-defects of color association and color namingthat are due to damage in specific areas of the brain. But his difficulties, it seemed to us, came simply from lack of learning (or from forgetting)-fromthe fact that early and long blindness had sometimes prevented his associatingcolors with their names or had caused him to forget some of the associationshe had made. Such associations and the neural connections that underlay them, feeble in the first place, had become disestablished in his brain, not throughany damage or disease, but simply from disuse.

Although Virgil believed that he had visual memories, including colormemories, from the remote past-on our drive from the airport he had spoken ofgrowing up on the farm in Kentucky ("I see the creek running down the middle,"

"birds on the fences," "the big old white house")-I could not decide whetherthese were genuine memories, visual images in his mind, or mere verbaldescriptions without images (like Helen Keller's).

How was he with shapes? Here matters were more complicated, because in theweeks since his surgery Virgil had been practicing shapes, correlating theirlook and their feel. No such practice had been required with colors. He had atfirst been unable to recognize any shapes visually-even shapes as simple as asquare or a circle, which he recognized instantly by touch. To him, a touchsquare in no sense corresponded to a sight square. This was his answer to theMolyneux question. For this reason, Amy had bought, among other things, achild's wooden formboard, with large, simple blocks-square, triangle, circle, and rectangle-to be fitted into corresponding holes, and had got Virgil topractice with it every day. Virgil found the task impossible at first, but quite easy now, after practicing for amonth. He still tended to feel the holes and shapes before matching them, butwhen we forbade this he fitted them together quite fluently by sight alone.

Solid objects, it was evident, presented much more difficulty, because theirappearance was so variable; and much of the past five weeks had been devotedto the exploration of objects, their unexpected vicissitudes of appearance asthey were seen from near or far, or half-concealed, or from different placesand angles.

On the day he returned home after the bandages were removed, his house and itscontents were unintelligible to him, and he had to be led up the garden path, led through the house, led into each room, and introduced to each chair.

Within a week, with Amy's help, he had established a canonical line-aparticular line up the path, through the sitting room to the kitchen, withfurther lines, as necessary, to the bathroom and the bedroom. It was only fromthis line, at first, that he could recognize anything-though this took a greatdeal of interpretation and inference; thus he learned, for example, that "awhiteness to the right," to be seen as he came obliquely through the frontdoor, was in fact the dining table in the next room, although at this pointneither "table" nor "dining room" was a clear visual concept. If he deviatedfrom the line, he would be totally disoriented. Then, carefully, with Amy'shelp, he started to use the line as a home base, making short sallies andexcursions to either side of it, so that he could see the room, feel its wallsand contents from different angles, and build up a sense of space, ofsolidity, of perspective.

As Virgil explored the rooms of his house, investigating, so to speak, thevisual construction of the world, I was reminded of an infant moving his handto and fro before his eyes, waggling his head, turning it this way and that, in his primal construction of the world. Most of us have no sense of theimmensity of this construction, for we perform it seamlessly, unconsciously, thousands of times every day, at a glance. But this is not so for a baby, itwas not so for Virgil, and it is not so for, say, an artist who wants to experience his elemental perceptions afresh and anew. Cézanne once wrote, "The same subject seen from a different angle gives a subject for study of the highest interest and so varied that I think I could be occupied for months without changing my place, simply bending more to the right or left."

We achieve perceptual constancy-the correlation of all the different appearances, the transforms of objects-very early, in the first months of life. It constitutes a huge learning task, but is achieved so smoothly, so unconsciously, that its enormous complexity is scarcely realized (though it is an achievement that even the largest supercomputers cannot begin to match).

But for Virgil, with half a century of forgetting whatever visual engrams he had constructed, the learning, or relearning, of these transforms required hours of conscious and systematic exploration each day. This first month, then, saw a systematic exploration, by sight and touch, of all the smaller things in the house: fruit, vegetables, bottles, cans, cutlery, flowers, the knickknacks on the mantelpiece-turning them round and round, holding them close to him, then at arm's length, trying to synthesize their varying appearances into a sense of unitary objecthood.*72*

Despite all the vexations that trying to see could entail, Virgil had stuck with this gamely, and he had learned steadily. He had little difficulty now recognizing the fruit, the bottles, the cans in the kitchen, the different flowers in the living room, and other common objects in the house.

Unfamiliar objects were much more difficult. When I took a blood-pressure cuff from my medical bag, he was completely flummoxed and could make nothing of it, but he recognized it immediately when I allowed him to touch it. Moving objects presented a special problem, for their appearance changed constantly. Even his dog, he told me, looked so different at different times that he wondered if it was the same dog.*73* He was utterly lost when it came to the rapid changes in others' physiognomies. Such difficulties are almost universal among the early blinded restored to sight. Gregory's patient S.B. could not recognize individual faces, or their expressions, a year after his eyes had been operated on, despite perfectly normal elementary vision.

What about pictures? Here I had been given conflicting reports about Virgil. He was said to love television, to follow everything on it-and, indeed, a huge new TV stood in the living room, an emblem of Virgil's new life as a seeing person. But when we tried him first on still pictures, pictures in magazines, he had no success at all. He could not see people, could not see objects-did not comprehend the idea of representation.

Gregory's patient S.B. had similar problems. When shown a picture of the Cambridge Backs, showing the river and King's Bridge, Gregory tells us. He made nothing of this. He did not realize that the scene was of a river, and did not recognize water or bridge& So far as we could tell, S.B. had no idea which objects lay in front of or behind others in any of the color pictures& We formed the impression that he saw little more than patches of color.

It was similar, again, with Cheselden's young patient:

We thought he soon knew what pictures represented& but we found afterwards we were mistaken; for about two months after he was couched, he discovered at once they represented solid bodies, when to that time he considered them only as party-coloured planes, or surfaces diversified with variety of paint; but even then he was no less surprised, expecting the pictures would feel like the things they represented,& and asked which was the lying sense, feeling or seeing?

Nor were things any better with moving pictures on a TV screen. Mindful of Virgil's passion for listening to baseball games, we found a channel with a game in progress. It seemed at first as if he were following it visually, because he could describe who was batting, what was going on. But as soon as we turned off the sound he was lost. It became evident that he himself perceived little beyond streaks of light and colors and motions, and that allthe rest (what he seemed to see) was interpretation, performed swiftly, andperhaps unconsciously, in consonance with the sound. How it would be with areal game we were far from sure-it seemed possible to us that he might see andenjoy a good deal; it was in the two-dimensional representation of reality, pictorial or televisual, that he was still completely at sea.

Virgil had now had two hours of testing and was beginning to get tired-bothvisually and cognitively tired, as he had tended to do since the operation-andwhen he got tired he could see less and less, and had more and more difficultymaking sense of what he could see.*74*

Indeed, we were getting restless ourselves and wanted to get out after amorning of testing. We asked him, as a final task before going for a drive, ifhe felt up to some drawing. We suggested first that he draw a hammer. (Ahammer was the first object S.B. drew.) Virgil agreed and, rather shakily, began to draw. He tended to guide the pencil's movement with his free hand. ("He only does that because he's tired now," said Amy.) Then he drew a car(very high and old-fashioned); a plane (with the tail missing: it would havebeen hard put to fly); and a house (flat and crude, like a three-year-old'sdrawing).

When we finally got out, it was a brilliant October morning, and Virgil wasblinded for a minute, until he put on a pair of dark-green sunglasses. Evenordinary daylight, he said, seemed far too bright for him, too glary; he feltthat he saw best in quite subdued light. We asked him where he would like togo, and after thinking for a little he said, "The zoo." He had never been to azoo, he said, and he was curious to know how the different animals looked. Hehad loved animals ever since his childhood days on the farm.

Very striking, as soon as we got to the zoo, was Virgil's sensitivity tomotion. He was startled, first, by an odd strutting movement; it made himsmile-he had never seen anything like it. "What is it?" he asked.

"An emu."

He was not quite sure what an emu was, so we asked him to describe it to us. He had difficulty and could say only that it was about the same size asAmy-she and the emu were standing side by side at that point-but that itsmovements were quite different from hers. He wanted to touch it, to feel itall over. If he did that, he thought, he would then see it better. Buttouching, sadly, was not allowed.

His eye was caught next by a leaping motion nearby, and he immediatelyrealized-or, rather, surmised-that it must be a kangaroo. His eye followed itsmotions closely, but he could not describe it, he said, unless he could feelit. We were wondering by now exactly what he could see-and what, indeed, hemeant by "seeing."

In general, it seemed to us, if Virgil could identify an animal it would beeither by its motion or by virtue of a single feature-thus, he might identifya kangaroo because it leapt, a giraffe by its height, or a zebra by itsstripes-but he could not form any overall impression of the animal. It wasalso necessary that the animal be sharply defined against a background; hecould not identify the elephants, despite their trunks, because they were at aconsiderable distance and stood against a slate-colored background.

Finally, we went to the great-ape enclosure; Virgil was curious to see thegorilla. He could not see it at all when it was half-hidden among some trees, and when it finally came into the open he thought that, though it moveddifferently, it looked just like a large man. Fortunately, there was alife-size bronze statue of a gorilla in the enclosure, and we told Virgil, whohad been longing to touch all the animals, that he could, if nothing else, atleast examine the statue. Exploring it swiftly and minutely with his hands, hehad an air of assurance that he had never shown when examining anything bysight.

It came to me-perhaps it came to all of us at this moment-how skillful and self-sufficient he had been as a blind man, how naturally and easily hehad experienced his world with his hands, and how much we were now, so tospeak, pushing him against the grain: demanding that he renounce all that cameeasily to him, that he sense the world in a way incredibly difficult for him, and alien.[75]

His face seemed to light up with comprehension as he felt the statue. "It'snot like a man at all," he murmured. The statue examined, he opened his eyes, and turned around to the real gorilla standing before him in the enclosure.

And now, in a way that would have been impossible before, he described theape's posture, the way the knuckles touched the ground, the little bandy legs, the great canines, the huge ridge on the head, pointing to each feature as hedid so. Gregory writes of a wonderful episode with his patient S.B., who had alongstanding interest in tools and machinery. Gregory took him to the ScienceMuseum in London to see its grand collection:

The most interesting episode was his reaction to the fine Maudeslay screwcutting lathe which is housed in a special glass case& We led him to the glass case, which was closed, and asked him to tell us what was in it. He wasquite unable to say anything about it, except that he thought the nearest partwas a handle& We then asked a museum attendant (as previously arranged) forthe case to be opened, and S.B. was allowed to touch the lathe. The result was startling& He ran his hands eagerly over the lathe, with his eyestight shut. Then he stood back a little and opened his eyes and said: "Nowthat I've felt it I can see."

So it was with Virgil and the gorilla. This spectacular example of howtouching could make seeing possible explained something else that had puzzledme. Since the operation, Virgil had begun to buy toy soldiers, toy cars, toyanimals, miniatures of famous buildings-an entire Lilliputian world- and tospend hours with them. It was not mere childishness or playfulness that haddriven him to such pastimes. Through touching these at the same time he lookedat them, he could forge a crucial correlation; he could prepare himself to seethe real world by learning first to see this toy world. The disparity of scaledid not matter, any more than it mattered to S.B., who was instantly able totell the time on a large wall clock because he could correlate it with what heknew by touch from his pocket watch.

For lunch, we repaired to a local fish restaurant, and as we ate I stoleglances, from time to time, at Virgil. He started eating, I observed, in thenormal sighted fashion, accurately spearing segments of tomato in his salad.

Then, as he continued, his aim grew worse: his fork started to miss itstargets, and to hover, uncertainly, in the air. Finally, unable to "see," ormake sense of, what was on his plate, he gave up the effort and started to usehis hands, to eat as he used to, as a blind person eats. Amy had already toldme about such relapses and described them in her journal. There had beensimilar reversions, for example, with his shaving, where he would start with amirror, shaving by sight, with tense concentration. Then the strokes of therazor would become slower, and he would start to peer uncertainly at his facein the mirror, or try to confirm what he half saw by touch. Finally, he wouldturn away from the mirror, or close his eyes, or turn the light off, andfinish the job by feel.

That Virgil should have periods of acute visual fatigue following sustainedvisual effort or use was scarcely surprising; all of us have them if too muchis demanded of our vision. Something happens to my own visual system if, forinstance, I look at EEGs nonstop for three hours: I start missing things onthe traces, and seeing dazzling afterimages of the squiggles wherever Ilook-the walls, the ceiling, all over the visual field-and at this point Ineed to stop and do something else, or, even better, close my eyes for anhour. And Virgil's visual system, by comparison with the normal one, must havebeen at this stage labile in the extreme.

Less easy to understand, and alarming, perhaps ominous, were long periods of"blurriness"-impaired vision or gnosis- lasting hours or even days, coming onspontaneously, without obvious reason. Bob Wasserman was very much puzzled byVirgil's and Amy's descriptions of these fluctuations; he had been practicingophthalmology for some twenty-five years and had removed many cataracts, buthe had never encountered fluctuations of this sort.

After lunch, we all went to Dr. Hamlin's office. Dr. Hamlin had taken detailedphotographs of the retina right after surgery, and Bob, examining the eye nowjwith both direct and indirect ophthalmoscopy) and comparing it with thephotographs, could see no evidence of any postoperative complications. (Aspecial test-fluorescein angiography-had shown a small degree of cystoidmacular edema, but this would not have caused the rapid fluctuations that wereso striking.) Because there seemed to be no adequate local or ocular cause forthese fluctuations, Bob wondered whether they could be a consequence of someunderlying medical condition-we had been struck by how unwell Virgil looked assoon as we met him-or whether they could represent a neural reaction of thebrain's visual system to conditions of sensory or cognitive overload. It is noeffort for the normally sighted to construct shapes, boundaries, objects, andscenes from purely visual sensations; they have been making such visualconstructs, a visual world, from the moment of birth, and have developed a vast, effortless cognitive apparatus for doing so. (Normally, half of thecerebral cortex is given over to visual processing.) But in Virgil thesecognitive powers, undeveloped, were rudimentary; the visual-cognitive parts ofhis brain might easily have been overwhelmed.

Brain systems in all animals may respond to overwhelming stimulation, orstimulation past a critical point, with a sudden shutdown. *76* Such reactionshave nothing to do with the individual or his motives. They are purely localand physiological and can occur even in isolated slices of cerebral cortex: they are a biological defense against neural overload.

Still, perceptual-cognitive processes, while physiological, are alsopersonal-it is not a world that one perceives or constructs but one's ownworld-and they lead to, are linked to, a perceptual self, with a will, anorientation, and a style of its own. This perceptual self may itself collapsewith the collapse of perceptual systems, altering the orientation and the veryidentity of the individual. If this occurs, an individual not only becomesblind but ceases to behave as a visual being, offers no report of any changein inner state, is completely oblivious of his own visuality or lack of it.

Such a condition, of total psychic blindness (known as Anton's syndrome), mayoccur if there is massive damage, as from a stroke, to the visual parts of thebrain. But it also seemed to occur, on occasion, with Virgil. At such times, indeed, he might talk of "seeing" while in fact appearing blind and showing novisual behavior whatever. One had to wonder whether the whole basis of visual perception and identity in Virgil was as yet so feeble that under conditionsof overload or exhaustion he might go in and out of not merely physicalblindness but a total Anton-like psychic blindness.

A quite different sort of visual shutdown-a withdrawal- seemed to beassociated with situations of great emotional stress or conflict. And for Virgil this period was indeed as stressful a timeas he had ever known: he had just had surgery, he had just been married; theeven tenor of his blind, bachelor life had been shattered; he was under atremendous pressure of expectation; and seeing itself was confusing, exhausting.

These pressures had increased as his wedding day approached, especially with the convergence of his own family in town; his family had notonly opposed the surgery in the first place but now insisted that he was infact still blind. All this was documented by Amy in her journal:

October 9: Went to church to decorate for wedding. Virgil's vision quiteblurry. Not able to distinguish much. It is as though sight has taken anosedive. Virgil acting "blind" again& Having me lead him around.

October n: Virgil's family arrives today. His sight seems to have gone onvacation& It is as though he has gone back to being blind! Family arrived.

Couldn't believe he could see. Every time he said he could see something theywould say, "Ah, you're just guessing." They treated him as though he wastotally blind-leading him around, giving him anything he wanted& I am verynervous, and Virgil's sight has disappeared& Want to be sure we are doing theright thing.

October 12: Wedding day. Virgil very calm& vision little clearer, but stillblurry& Could see me coming down aisle, but was very blurry& Weddingbeautiful. Party at Mom's. Virgil surrounded by family. They still cannotaccept his sight, he could not see much. Said goodbye to his family tonight. Sight began clearing up right after they left.

In these episodes Virgil was treated by his family as a blind man, his seeingidentity denied or undermined, and he responded, compliantly, by acting, oreven becoming, blind-a massive withdrawal or regression of part of his ego toa crushing, annihilating denial of identity. Such a regression would have tobe seen as motivated, albeit unconsciously-an inhibition on a "functional" basis.

Thus there seemed to be two distinct forms of "blind behavior" or "acting blind"-one a collapse of visual processing and visual identity on anorganic basis (a "bottom-up" or neuropsychological disturbance, inneurological parlance), the other a collapse or inhibition of visual identityon a functional basis (a "top-down" or psychoneurotic disturbance), though noless real for him. Given the extreme organic weakness of his vision-theinstability of his visual systems and visual identity at this point-it wasvery difficult, at times, to know what was going on, to distinguish betweenthe "physiological" and "psychological." His vision was so marginal, so closeto the border, that either neural overload or identity conflict might push himover it. [77]

Marius von Senden, reviewing every published case over a three-hundred-yearperiod in his classic book Space and Sight (1932), concluded that every newlysighted adult sooner or later comes to a "motivation crisis"-and that notevery patient gets through it. He tells of one patient who felt so threatenedby sight (which would have meant his leaving the Asylum for the Blind, and hisfiancée there) that he threatened to tear his eyes out; he cites case aftercase of patients who "behave blind" or "refuse to see" after an operation, andof others who, fearful of what sight may entail, refuse operation (one suchaccount, entitled "L'Aveugle qui refuse de voir," was published as early as1771). Both Gregory and Valvo dilate on the emotional dangers of forcing a newsense on a blind man-how, after an initial exhilaration, a devastating (andeven lethal) depression can ensue.

Precisely such a depression descended on Gregory's patient: S.B.'s period inthe hospital was full of excitement and perceptual progress. But the promisewas not fulfilled. Six months after the operation, Gregory reports, we formed a strong impression that his sight was to him almost entirelydisappointing. It enabled him to do a little more& but it became clear that the opportunities it afforded him were less than he had imagined& He still to a great extent lived the life of a blind man, sometimes not bothering to puton the light at night& He did not get on well with his neighbours [now], whoregarded him as "odd," and his workmates [previously so admiring] playedtricks on him and teased him for being unable to read.

His depression deepened, he became ill, and, two years after his operation, S.B. died. He had been perfectly healthy, he had once enjoyed life; he wasonly fifty-four.

Valvo provides us with six exemplary tales, and a profound discussion, of thefeelings and behavior of early blinded people when they are confronted withthe "gift" of sight and with the necessity of renouncing one world, oneidentity, for another. [78]

A major conflict in Virgil, as in all newly sighted people, was the uneasyrelation of touch and sight-not knowing whether to feel or look. This wasobvious in Virgil from the day of the operation and was very evident the day we saw him, when he could hardly keep his hands off the formboard, longed to touch all the animals, and gave up spearing his food. His vocabulary, his whole sensibility, his picture of the world, were couched in tactile-or, at least, nonvisual-terms. He was, or had been until his operation, a touch person through and through.

It has been well established that in congenitally deaf people (especially if they are native signers) some of the auditory parts of the brain are reallocated for visual use. It has also been well established that in blind people who read Braille the reading finger has an exceptionally large representation in the tactile parts of the cerebral cortex. And one would suspect that the tactile (and auditory) parts of the cortex are enlarged in the blind and may even extend into what is normally the visual cortex. What remains of the visual cortex, without visual stimulation, may be largely undeveloped. It seems likely that such a differentiation of cerebral development would follow the early loss of a sense and the compensatory enhancement of other senses.

If this was the case in Virgil, what might happen if visual function wassuddenly made possible, demanded? One might certainly expect some visuallearning, some development of new pathways in the visual parts of the brain.

There had never been any documentation of the kindling of activity in thevisual cortex of an adult, and we hoped to take special PET scans of Virgil'svisual cortex to show this as he learned to see. But what would this learning, this activation, be like? Would it be like a baby first learning to see? (Thiswas Amy's first thought.) But the newly sighted are not on the same startingline, neurologically speaking, as babies, whose cerebral cortex isequipotential-equally ready to adapt to any form of perception. The cortex ofan early blinded adult such as Virgil has already become highly adapted toorganizing perceptions in time and not in space. *79*

An infant merely learns. This is a huge, never-ending task, but it is not onecharged with irresoluble conflict. A newly sighted adult, by contrast, has tomake a radical switch from a sequential to a visual-spatial mode, and such aswitch flies in the face of the experience of an entire lifetime. Gregoryemphasizes this, pointing out how conflict and crisis are inevitable if "theperceptual habits and strategies of a lifetime" are to be changed. Suchconflicts are built into the nature of the nervous system itself, for theearly blinded adult who has spent a lifetime adapting and specializing hisbrain must now ask his brain to reverse all this. (Moreover, the brain of anadult no longer has the plasticity of a child's brain-that is why learning newlanguages or new skills becomes more difficult with age. But in the case of aman previously blind, learning to see is not like learning another language; it is, as Diderot puts it, like learning language for the first time.)

In the newly sighted, learning to see demands a radical change in neurologicalfunctioning and, with it, a radical change in psychological functioning, inself, in identity. The change may be experienced in literally life-and-deathterms. Valvo quotes a patient of his as saying, "One must die as a sightedperson to be born again as a blind person, " and the opposite is equally true: one must die as a blind person to be born again as a seeing person. It is the interim, the limbo- "between twoworlds, one dead / The other powerless to be born"-that is so terrible. Thoughblindness may at first be a terrible privation and loss, it may become less sowith the passage of time, for a deep adaptation, or reorientation, occurs, bywhich one reconstitutes, reappropriates, the world in nonvisual terms. It thenbecomes a different condition, a different form of being, one with its ownsensibilities and coherence and feeling. John Hull calls this "deep blindness" and sees it as "one of the orders of human being." *80*

On October 31, the cataract in Virgil's left eye was removed, revealing aretina, an acuity, similar to the right. This was a great disappointment, forthere had been hope that it might be a far better eye-enough to make a crucialdifference to his vision. His vision did improve slightly: he fixated better, and the searching eye movements were fewer, and he had a larger visual field.

With both eyes working, Virgil now went back to work, but found, increasingly, that there was another side to seeing, that much of it was confusing, and somedownright shocking. He had worked happily at the Y for thirty years, he said, and thought he knew all the bodies of his clients. Now he found himselfstartled by seeing bodies, and skins, that he had previously known only bytouch; he was amazed at the range of skin colors he saw and slightly disgusted by blemishes and "stains" in skinsthat to his hands had seemed perfectly smooth. *81* Virgil found it a relief, when giving massages, to shut his eyes.

He continued to improve, visually, over the ensuing weeks, especially when hewas free to set his own pace. He did his utmost to live the life of a sightedman, but he also became more conflicted at this time. He expressed fears, occasionally, that he would have to throw away his cane and walk outside, cross the streets, by vision alone; and, on one occasion, a fear that he mightbe "expected" to drive and take up an entirely new "sighted" job. This, then, was a time of great striving and real success-but success achieved, one felt, at a psychological cost, at a cost of deepening strain and splitting inhimself.

There was one outing, a week before Christmas, when he and Amy went to theballet. Virgil enjoyed The Nutcracker: he had always loved the music, and now, for the first time, he saw something as well. "I could see people jumpingaround the stage. Couldn't see what they were wearing, though," he said. Hethought he would enjoy seeing a live baseball game and looked forward to thestart of the season in the spring.

Christmas was a particularly festive and important time- the first Christmasafter his wedding, his first Christmas as a sighted man-and he returned, withAmy, to the family farm in Kentucky. He saw his mother for the first time inmore than forty years-he had scarcely been able to see her, to see anythingmuch, at the time of the wedding-and thought she looked "real pretty." He sawagain the old farmhouse, the fences, the creek in the pasture, which he hadalso not seen since he was a child,- he had never ceased to cherish them inhis mind. Some of his seeing had been a great disappointment, but seeing homeand family was not-it was a pure joy.

No less important was the change in the family's attitude toward him. "He seemed more alert," his sister said. "He would walk, movearound the house, without touching the walls-he would just get up and go." Shefelt that there had been "a big difference" since he was first operated on, and his mother and the rest of the family felt the same.

I phoned them the day before Christmas and spoke to his mother, his sister, and others. They asked me to join them, and I wish I could have done so, forit seemed to be a joyful and affirmative time for them all. The family'sinitial opposition to Virgil's seeing (and perhaps to Amy, too, for havingpushed it) and their disbelief that he could actually see had been somethingthat he internalized, something that could literally annihilate his seeing.

Now that the family was "converted," a major psychological block, one hoped, might dissolve. Christmas was the climax, but also the resolution, of anextraordinary year.

What would happen, I wondered, in the coming year? What might he hope for, atbest? How much of a visual world, a visual life, might still await him? Wewere, frankly, quite unsure at this point. Grim and frightening though thehistories of so many patients were, some, at least, overcame the worst oftheir difficulties and emerged into a relatively unconflicted new sight.

Valvo, normally cautious in expression, lets himself go a little in describingsome of his patients' happier outcomes: Once our patients acquire visual patterns, and can work with themautonomously, they seem to experience great joy in visual learning& a renaissance of personality& They start thinking about wholly new areas ofexperience.

"A renaissance of personality"-this was just what Amy wanted for Virgil. Itwas difficult for us to imagine such a renaissance in him, for he seemed sophlegmatic, so set in his ways. And yet, despite a range of problems-retinal, cortical, psychological, possibly medical-he had done remarkably well in away, had shown a steady increase in his power to apprehend a visual world.

With his predominantly positive motivation, and the obvious enjoyment andadvantage he could get from seeing, there seemed no reason why he should notprogress further. He could never hope to have perfect vision, but he mightcertainly hope for a life radically enlarged by seeing.

The catastrophe, when it came, was very sudden. On February 8, I had a phonecall from Amy: Virgil had collapsed, had been taken, grey and stuporous, tothe hospital. He had a lobar pneumonia, a massive consolidation of one lung, and was in the intensive-care unit, on oxygen and intravenous antibiotics.

The first antibiotics used did not work: he grew worse; he grew critical; andfor some days he hovered between life and death. Then, after three weeks, theinfection was finally mastered, and the lung started to reexpand. But Virgilhimself remained gravely ill, for, though the pneumonia itself was clearing, it had tipped him into respiratory failure-a near-paralysis of the respiratorycenter in the brain, which made it unable to respond properly to levels ofoxygen and carbon dioxide in the blood. The oxygen levels in his blood startedto fall-fell to less than half of normal. And the level of carbon dioxide started to rise-rose to nearly three times normal. He needed oxygenconstantly, but only a little could be given, lest his failing respiratorycenter be further depressed. With his brain deprived of oxygen and poisoned bycarbon dioxide, Virgil's consciousness fluctuated and faded, and on bad days(when the oxygen in his blood was lowest and the carbon dioxide highest) hecould see nothing: he was totally blind.

Much contributed to this continuing respiratory crisis: Virgil's lungsthemselves were thickened and fibrotic; there was advanced bronchitis andemphysema; there was no movement of the diaphragm on one side, a consequenceof his childhood polio; and, on top of all this, he was enormously obese-obeseenough to cause a Pickwick syndrome (named after the somnolent fat boy, Joe, in The Pickwick Papers). In Pickwicksyndrome, there is a grave depression of breathing, and failure to oxygenatethe blood fully, associated with a depression of the respiratory center in thebrain.

Virgil had probably been getting ill for some years; he had gradually beenincreasing in weight since 1985. But between his wedding and Christmas he hadput on a further forty pounds-had shot up, in a few weeks, to two hundred andeighty pounds-partly from fluid retention caused by heart failure, and partlyfrom nonstop eating, a habit of his under stress.

He now had to spend three weeks in the hospital, his blood oxygen stillplummeting to dangerously low levels, despite his being given oxygen-and eachtime the level grew really low he became lethargic and totally blind. Amywould know the moment she opened his door what sort of day he was having-where the blood oxygen was-depending on whether he used his eyes, lookedaround, or fumbled and touched, "acted blind." (We wondered, in retrospect, whether the strange fluctuations his vision had shown from almost the day ofsurgery might also have been caused, at least in part, by fluctuations in hisblood oxygen, with consequent retinal or cerebral anoxia. Virgil had probablyhad a mild Pickwick syndrome for years, and could have been close torespiratory failure and anoxia even before his acute illness.)

There was another, intermediate state, which Amy found very puzzling; at suchtimes, he would say that he saw nothing whatever, but would reach for objects, avoid obstacles, and behave as if seeing. Amy could make nothing of thissingular state, in which he manifestly responded to objects, could locatethem, was seeing, and yet denied any consciousness of seeing. Thiscondition-called implicit sight, unconscious sight, or blindsight-occurs ifthe visual parts of the cerebral cortex are knocked out (as they may be by alack of oxygen, for instance), but the visual centers in the subcortex remainintact. Visual signals are perceived and are responded to appropriately, butnothing of this perception reaches consciousness at all.

At last, Virgil was able to leave the hospital and return home, but to returna respiratory cripple. He was tethered to an oxygen cylinder and could noteven stir from his chair without it. It seemed unlikely at this stage that hewould ever recover sufficiently to go out and work again, and the Y now feltthat it had to terminate his job. A few months later, he was forced to leavethe house where he had lived as an employee of the Y for more than twentyyears. This was the situation that summer: Virgil had lost not only his healthbut his job and his house as well.

By October, however, he was feeling better and was able to go without oxygenfor an hour or two at a time. It had not been wholly clear to me, fromspeaking to Virgil and Amy, what had finally happened to his vision after allthese months. Amy said that it had "almost gone" but that now she felt it wascoming back as he got better. When I phoned the visual-rehabilitation centerwhere Virgil had been evaluated, I was given a different story. Virgil, I wastold, seemed to have lost all the sight restored the previous year, with onlya few bits remaining. Kathy, his therapist, thought he saw colors but littleelse-and sometimes colors without objects: thus he might see a haze or halo ofpink around a Pepto-Bismol bottle without clearly seeing the bottle itself. *82* This color perception, she said was the only seeing that was constant; for therest he appeared almost blind, missed objects, groped, seemed visually lost.

He was showing his old, blind random movements of the eyes. And yet sometimes, spontaneously, out of the blue, he would get sudden, startling moments ofvision, in which he would see objects, quite small ones. But these percepts would then vanish assuddenly as they came, and he was usually unable to retrieve them. For allpractical purposes, she said, Virgil was now blind.

I was shocked and puzzled when Kathy told me this. These were phenomenaradically different from anything he had shown before: What was happening nowwith his eyes and his brain? From a distance, I could not sort out what washappening, especially since Amy, for her part, maintained that Virgil's visionwas now improving. Indeed, she got furious when she heard anyone say thatVirgil was blind, and she maintained that the visual-rehab center was actually"teaching him to be blind." So in February of 1993, a year after the onset ofhis devastating illness, we brought Virgil and Amy to New York to see us againand to get some specialized physiological tests of retinal and brain function.

As soon as I met Virgil at the arrival gate at LaGuardia Airport, I could seefor myself that everything had gone quite terribly wrong. He was now almostfifty pounds heavier than when I had met him in Oklahoma. He was carrying acylinder of oxygen strung over one shoulder. He groped; his eyes wandered; helooked totally blind. Amy guided him, her hand under his elbow, everywherethey went. And yet sometimes as we drove over the Fifty-ninth Street Bridgeinto the city, he would pick up something-a light on the bridge-not guessingbut seeing it quite accurately. But he could never hold it or retrieve it, andso remained visually lost.

When we came to test him in my office-first using large colored targets, thenlarge movements and flashlights-he missed everything. He seemed totallyblind-blinder than he had been before his operations, because then, at least, even through his cataracts he could consistently detect light, its direction, and the shadow of a hand moving before him. Now he could detect nothingwhatever, no longer seemed to have any light-sensitive receptors: it was as ifhis retinas had gone. Yet not totally gone-that was the odd thing. For once ina while he would see something accurately: once, he saw, described, grasped, a banana; on two occasions, he was able to follow a randomly moving light bar with hishands on a computer screen; and sometimes he would reach for objects, or"guess" them correctly, even though he said he saw "nothing" at such times-theblindsight that had first been observed in the hospital.

We were dismayed at his near-uniform failure, and he was sinking into ademoralized, defeated state-it was time to stop testing and take a break forlunch. As we passed him a bowl of fruit, and he felt the fruit with swift, sensitive, skillful fingers, his face lighted up, and he regained hisanimation. He gave us, as he handled the fruit, remarkable tactiledescriptions, speaking of the waxy, slick quality of the plum skin, the softfuzz of peaches and smoothness of nectarines ("like a baby's cheeks"), and therough, dimpled skin of oranges. He weighed the fruits in his hand, spoke oftheir weight and consistency, their pips and stones; and then, lifting them tohis nose, their different smells. His tactile (and olfactory) appreciationseemed far finer than our own. We included an exceedingly clever wax pearamong the real fruit; with its realistic shape and coloring, it had deceivedsighted people completely. Virgil was not taken in for a moment: he burst outlaughing as soon as he touched it. "It's a candle," he said immediately, somewhat puzzled. "Shaped like a bell or a pear." While he may indeed havebeen, in von Senden's words, "an exile from spatial reality," he was deeply athome in the world of touch, in time.

But if his sense of touch was perfectly preserved, there were, it was evident, just sparks from his retinas-rare, momentary sparks, from retinas that nowseemed to be 99 percent dead. Bob Wasserman, too, who had not seen Virgilsince our visit to Oklahoma, was appalled at the degradation of vision andwanted to reexamine the retinas. When he did so, they looked exactly asbefore-piebald, with areas of increased and decreased pigmentation. There wasno evidence of any new disease. Yet the functioning of even the preservedareas of retina had fallen to almost zero. Electroretinograms, designed to record the retina'selectrical activity when stimulated by light, were completely flat, and visualevoked potentials, designed to show activity in the visual parts of the brain, were absent, too-there was no longer anything, electrically, going on ineither the retinas or the brain that could be recorded. (There may have beenrare, momentary sparks of activity, but if so, we failed to catch these in ourrecordings.) This inactivity could not be attributed to the original disease, retinitis, which had long been inactive. Something else had emerged in thepast year and had, in effect, extinguished his remaining retinal function.

We remembered how Virgil had constantly complained of glare, even onrelatively dull, overcast days-how glare seemed to blind him sometimes, sothat he needed the darkest glasses. Was it possible (as my friend KevinHalligan suggested) that with the removal of his cataracts-cataracts that hadperhaps shielded his fragile retinas for decades-the ordinary light of day hadproved lethal, burnt out his retinas? It is said that patients with otherretinal problems, like macular degeneration, may be exceedingly intolerant oflight-not merely ultraviolet but light of all wavelengths-and that light mayhasten the degeneration of their retinas. Was this what had happened withVirgil? It was one possibility. Should we have foreseen it and rationedVirgil's sight, or the ambient light, in some way?

Another possibility-a likelier one-related to Virgil's continuing hypoxia, thefact that he had not had properly oxygenated blood for a year. We had clearaccounts of his vision waxing and waning in the hospital as his blood gaseswent up and down. Could the repeated, or continuing, oxygen-starving of hisretinas (and perhaps also of the visual areas of his cortex) have been thefactor that did them in? It was wondered, at this point, whether raising bloodoxygenation to 100 percent (which would have required sustained artificialrespiration with pure oxygen) might restore some retinal or cerebral function.

But it was decided that this procedure would be too risky, since it might cause long-term or permanent depression of the brain'srespiratory center.

This, then, is Virgil's story, the story of a "miraculous" restoration ofsight to a blind man, a story basically similar to that of Cheselden's youngpatient in 1728, and of a handful of others over the past three centuries-butwith a bizarre and ironic twist at the end. Gregory's patient, so well adaptedto blindness before his operation, was first delighted with seeing, but soonencountered intolerable stresses and difficulties, found the "gift" transformed to a curse, became deeply depressed, and soon after died. Almostall the earlier patients, indeed, after their initial euphoria, wereoverwhelmed by the enormous difficulties of adapting to a new sense, though avery few, as Valvo stresses, have adapted and done well. Could Virgil havesurmounted these difficulties and adapted to seeing where so many others hadfoundered on the way?

We shall never know, for the business of adaptation-and, indeed, of life as heknew it-was suddenly cut across by a gratuitous blow of fate: an illness that, at a single stroke, deprived him of job, house, health, and independence, leaving him a gravely sick man, unable to fend for himself. For Amy, whoincited the surgery in the first place, and who was so passionately investedin Virgil's seeing, it was a miracle that misfired, a calamity. Virgil, forhis part, maintains philosophically, "These things happen." But he has beenshattered by this blow, has given vent to outbursts of rage: rage at hishelplessness and sickness; rage at the smashing of a promise and a dream; andbeneath this, most fundamental of all, a rage that had been smoldering in himalmost from the beginning-rage at being thrust into a battle he could neitherrenounce nor win.

At the beginning, there was certainly amazement, wonder, andsometimes joy. There was also, of course, great courage. It was an adventure, an excursion into a new world, the like of which is given to few. But thencame the problems, the conflicts, of seeing but not seeing, not being able tomake a visual world, and at the same time being forced to give up his own. He found himself between two worlds, at home in neither-a torment from which no escape seemed possible.

But then, paradoxically, a release was given, in the form of a second and now final blindness-a blindness he received as a gift. Now, at last, Virgil is allowed to not see, allowed to escape from the glaring, confusing world of sight and space, and to return to his own true being, the intimate, concentrated world of the other senses that had been his home for almost fifty years.

66. There is a hint of something stranger, more complex, in Mark's descriptionof the miracle at Bethsaida, for here, at first, the blind man saw "men astrees, walking," and only subsequently was his eyesight fully restored (Mark8:22-26).

67. The removal (or, as was first done, the dislocation or "couching" of thecata-racted lens) leaves an eye strongly farsighted and in need of anartificial lens; and the thick lenses used in the eighteenth and nineteenth centuries, and indeeduntil quite recently, markedly reduced peripheral vision. Thus all patientsoperated upon for cataract before the present era of contact and implantedlenses had sig-nificant optical difficulties to contend with. But it was onlythose blind from birth or early childhood who had the special Lockeandifficulty of not being able to make sense of what they saw.

68. One does not see, or sense, or perceive, in isolation-perception is alwayslinked to behavior and movement, to reaching out and exploring the world. Itis insufficient to see; one must look as well. Though we have spoken, withVirgil, of a perceptual incapacity, or agnosia, there was, equally, a lack ofcapacity or impulse to look, to act seeing-a lack of visual behavior. VonSenden mentions the case of two children whose eyes had been bandaged from anearly age, and who, when the bandages were removed at the age of five, showedno reaction to this, showed no looking, and seemed blind. One has the sensethat these children, who had built up their worlds with other senses andbehaviors, did not know how to use their eyes.

Looking-as an orientation, as a behavior-may even vanish in those who becomeblind late in life, despite the fact that they have been "lookers" all theirlives. Many startling examples of this are given by John Hull in hisautobiographical book, Touching the Rock. Hull had lived as a sighted manuntil his midforties, but within five years of becoming totally blind, he hadlost the very idea of "facing" people, of "looking" at his interlocutors.

69. Gregory's patient, too, was startled by the moon: he had expected aquarter moon would be wedge-shaped, like a piece of cake, and was astonishedand amused to find it a crescent instead.

70. Robert Scott, a sociologist and anthropologist at the Institute forAdvanced Behavioral Study at Stanford, has been especially concerned withsocietal reactions to the blind, and the social contempt and stigmatization sooften accorded them. He has also lectured on "miracle cures," the extravaganceof emotion that may attend the restoration of sight. It was Dr. Scott who, some years ago, sent me a copy of Valvo's book.

71. Sensation itself has no "markers" for size and distance; these have to belearned on the basis of experience. Thus it has been reported that if peoplewho have lived their entire lives in dense rain forest, with a far point nomore than a few feet away, are brought into a wide, empty landscape, they mayreach out and try to touch the mountaintops with their hands; they have noconcept of how far the mountains are.

Helmholtz (in Thought in Medicine, an autobiographical memoir) relates how, asa child of two, when walking in a park, he saw what he took to be a littletower with a rail at the top and tiny mannikins or dolls walking around behindthe rail. When he asked his mother if she could reach him down one to playwith, she exclaimed that the tower was a kilometer away, and two hundredmeters high, and these little figures were not mannikins but people on thetop. As soon as she said this, Helmholtz writes, he suddenly realized thescale of everything, and never again made such a perceptual mistake-though thevisual perception of space as a subject never ceased to exercise him. (SeeCahan, 1993.)

Poe, in "The Gold Bug," relates an opposite story: how what appeared to be avast, many-jointed creature on a distant hill turned out to be a tiny bug onthe window.

A personal experience, the first time I used marijuana, comes to mind here: gazing at my hand, seen against a blank wall. It seemed to rush away from me, while maintaining the same apparent size, until it appeared like a vast hand, a cosmic hand, across parsecs of space. Probably this illusion was madepossible by, among other things, the absence of markers or context to indicateactual size and distance, and perhaps some disturbance of body image andcentral processing of vision.

72. There were similar problems with Gregory's subject, S.B., who never ceasedto be "struck by how objects changed their shape when he walked round them& He would look at a lamppost, walk round it, and stand studying it from a different aspect, and wonder why it looked different and yet the same." Allnewly sighted subjects, indeed, have radical difficulties with appearances, finding themselves suddenly plunged into a world that, for them, may be achaos of continually shifting, unstable, evanescent appearances. They may findthemselves completely lost, at sea, in this flux of appearances, which forthem is not yet securely anchored to a world of objects, a world of space. Thenewly sighted, who have previously depended on senses other than vision, arebaffled by the very concept of "appearance," which, being optical, has noanalogue in the other senses. We who have been born into the world ofappearances (and their occasional illusions, mirages, deceptions) have learnedto master it, to feel secure and at home in it, but this is exceedinglydifficult for the newly sighted. The philosopher F. H. Bradley wrote a famousbook called Appearance and Reality (1893]-but for the newly sighted, at first, these have no connection.

73. When Virgil said this I was reminded of a description in Borges's story"Fîmes the Memorious," where Funes's difficulty with general concepts leadshim into a similar situation:

It was not only difficult for him to understand that the generic term dogembraced so many unlike specimens of different sizes and forms; he wasdisturbed by the fact that a dog at three-fourteen (seen in profile] shouldhave the same name as the dog at three-fifteen (seen from the front).

74. Due to his exhaustion at this point, we could not test him on the visualillusions we had brought along. This was unfortunate, because "seeing" or "not seeing" visual illusions provides an objective and replicable way of examiningthe visual-constructive capacities of the brain. No one has explored thisapproach more deeply than Gregory, and his detailed account of S.B.'sresponses to visual illusions is therefore of great interest. One suchillusion consists of parallel lines that, to normal eyes, seem to divergebecause of the effect of diverging lines superimposed on them; no such"gestalt" effect occurred with S.B., who saw the lines as perfectly parallel-asimilar lack of "influence" was seen with other illusions. Particularlyinteresting was S.B.'s response to reversing figures, such as cubes andstaircases drawn in perspective, which are normally seen in depth and reversetheir apparent configuration at intervals; the figures did not reverse for S.B. and were not seen in depth. There was, similarly, no figure-groundfluctuation with ambiguous figures. He did not, apparently, "see" distance/size changes in illusions, nor did he experience the so-calledwaterfall effect, the familiar aftereffect of perceived movement. In all thesecases, the illusion is "seen" (even though the mind may know the perception tobe illusory) by all normally sighted adults. Many of these illusory effectscan also be demonstrated in young children, and some in monkeys, and even inEdelman's artificial "creature," darwin iv. That S.B. failed to "see" themillustrates how rudimentary his brain's powers of visual construction were, inconsequence of the virtual absence of early visual experience.

75. Earlier, Virgil had picked up the distant sound of lions roaring in theirenclosure; he pricked up his ears and turned instantly in their direction.

"Listen!" he said. "It's the lions-they're feeding the lions." The rest of ushad completely missed the sound and, even when Virgil drew our attention toit, found it faint and were unsure which direction it came from. We werestruck by the quality of Virgil's hearing, his auditory attention andacuteness and orientation, how extremely skilled as a listener he was. Such anacuteness and a heightening of auditory sensitivity occur in many blindpeople, but above all in those born blind or blinded early in life; it seemsto go with the constant focusing of attention and affect and cognitive powersin these spheres, and, with this, a hyperdevelopment of auditory-cognitivesystems in the brain.

76. Pavlov, speaking of such responses in dogs, called this "transmarginalinhibition consequent upon supramaximal stimulation," and regarded theseshutdowns as protective in nature.

77. When a specific organic weakness exists, emotional stress can easily presstoward a physical form; thus, asthmatics get asthma under stress, parkinsonians become more parkinsonian, and someone like Virgil, withborderline vision, may get pushed over the border and become (temporarily) blind. It was, therefore, exceedingly difficult at times to distinguishbetween what was physiological vulnerability in him, and what was "motivatedbehavior."

78. In his ironically titled Letter on the Blind: For the Use of Those Who CanSee (1749), the youthful Diderot maintains a position of epistemological andcultural relativism-that the blind may, in their own way, construct a completeand sufficient world, have a complete "blind identity" and no sense ofdisability or inadequacy, and that the "problem" of their blindness and thedesire to cure this, therefore, is ours, not theirs.

He also feels that intelligence and cultivation may make a fundamentaldifference to what the blind may understand; may give them, at least, a formalunderstanding of much that they cannot directly perceive. He is especially drawn to this conclusion by pondering the case of Nicholas Saunderson, thecelebrated blind mathematician and Newtonian, who died in 1740. ThatSaunderson, who never saw light, could conceive it so well, could be (of allthings!) a lecturer in optics, could construct, in his own way, a sublimepicture of the universe, excites Diderot immensely.

79. The Canadian psychologist Donald Hebb was deeply interested in the development of seeing and presented much experimental evidence against its being, in higher animals and man, "innate," as had often been supposed. He wasfascinated, understandably, by the rare "experiment" (if such a term beallowed) of restoring sight in adult life to the congenitally blind andponders at length in The Organization of Behaviour on the cases collected byvon Senden (Hebb himself had no personal experience of such a case). Theseprovided rich confirmation for his thesis that seeing requires experience andlearning; indeed he thought that it required, in man, fifteen years oflearning to reach its full development.

But one caveat must be made (it is also made by Gregory) with regard to Hebb'scomparison of the newly sighted adult to a baby. It may be that the newlysighted adult must indeed go through some of the learning and developmentalstages of infancy; yet an adult, neurologically and psychologically, isnothing like a baby-an adult is already committed to a lifetime of perceptualexperiences-and such cases cannot, therefore (as Hebb supposes), tell us whata baby's world is like, serve as a window into the otherwise inaccessibledevelopment of their perception.

80. If blindness has a positivity of its own, is one of the orders of humanbeing, this is equally (or more) so for deafness, where there is not only aheightening of visual (and, in general, spatial) abilities, but a wholecommunity of deaf people, with their own visuo-gestural language (Sign) andculture. Problems somewhat similar to Virgil's may be encountered bycongenitally deaf, or very early deafened, subjects given cochlear implants.

Sound, for them, at first has no associations, no meaning-so they findthemselves, at least initially, in a world of auditory chaos, or agnosia. Butin addition to these cognitive problems there are identity problems, too; in asense, they must die as deaf people to be born as hearing ones. This, potentially, is much more serious and has ramifying social and culturalimplications; for deafness may be not just a personal identity, but a sharedlinguistic, communal, and cultural one. These very complex issues arediscussed by Harlan Lane in The Mask of Benevolence: Disabling the DeafCommunity.

81. Gregory observes of S.B., "He also found some things he loved ugly(including his wife and himself!), and he was frequently upset by theblemishes and imperfections of the visible world."

82. Semir Zeki has observed in some cases of cerebral anoxia that the color-constructing areas of the visual cortex may be relatively spared, sothat the patient may see color and nothing else-no form, no boundaries, nosense of objects whatsoever.

The Landscape of His Dreams

I first met Franco Magnani in the summer of 1988, when the Exploratorium in San Francisco held a symposium and an exhibit on memory. The exhibit included fifty paintings and drawings by him-all of Pontito, the little Tuscan hill town where he was born but had not seen for more than thirty years. Next to them, in astounding apposition, were photographs of Pontito taken by the Exploratorium's photographer, Susan Schwartzenberg, from exactly the same viewpoints as Magnani's, wherever possible. (This was not always possible, because Magnani sometimes visualized and painted Pontito from an imaginary aerial viewpoint fifty or five hundred feet above the ground; Schwartzenberg sometimes had to hoist her camera aloft on a pole and at one point thought of hiring a helicopter or a balloon.)

Magnani was billed as "A Memory Artist," and one had only to glance at the exhibit to see that he indeed possessed a prodigious memory-a memory that could seemingly reproduce with almost photographic accuracy every building, every street, every stone of Pontito, far away, close up, from any possible angle. It was as if Magnani held in his head an infinitely detailed three-dimensional model of his village, which he could turn around and examine, or explore mentally, and then reproduce on canvas with total fidelity.

My first thought when I saw the resemblance between the paintings and the photographs was that here was that rare phenomenon, an eidetic artist: an artist able to hold in memory, for hours or days (perhaps for years), an entire scene that has been glimpsed in a flash; the commander (or slave) of a prodigious native power of imagery and memory. But an ei-detic artist would scarcely confine himself to a single theme or subject; on the contrary, he would exploit his memory, or display it, in a huge range of subjects, to show that nothing lay beyond its grasp-whereas Magnani seemingly wanted to concentrate it exclusively upon Pontito. This, then, was an exhibit not of "pure" memory but of memory harnessed to a single, overwhelming motive: the recollection of his childhood village. And, I now realized, it was not just an exercise in memory; it was, equally, an exercise in nostalgia-and not just an exercise but a compulsion, and an art.

A few days later, I spoke to Franco and arranged to meet him at his house. He lives in a small community a few miles outside San Francisco. Once I had found his street, I did not need to look for his house number, because his house stood out immediately from its neighbors. In the small front yard was a low stone wall, resembling those in his paintings of Pontito; his car, an aging sedan with vanity plates ("Pontito"), was parked in the street; the garage had been converted into a studio, and its door was wide open, revealing the artist himself, intently at work.

Franco was tall and slim, with enormous horn-rimmed glasses that magnified his eyes. He had thick brown hair, carefully parted on one side; a springy stride; and an air of great exuberance and vitality-he was fifty-four but seemed much younger. He invited me in and showed me around his home. Every room had paintings on every wall, and every drawer and closet seemed stacked full of paintings-it was less like a house than a museum or archive, totally devoted to the recollection, the reproduction, of Pontito.

As we walked through the house, each painting arrested his attention, aroused a flood of reminiscence: what happened here, what there, and how so-and-so stood there once. "Look at this wall here-that's where the priest, he caught me climbing into the garden behind the church. He chase me all the way down the street. Oh, he always chase all the kids away from there." Each reminiscence triggered others, and these still others, so that within minutes we were engulfed in a flood, without any clear direction or center, but all relating to his early life-to Pontito as he had experienced it as a child. He leapt from one story to another, without any connection that I could discern.

This sort of rambling-single-minded and intense but incoherent and unfocused-seemed characteristic of Franco: it showed the quality of his obsession, the fact that he thought of Pontito day and night, to the exclusion of all else.

As Franco talked, I had the impression that his reminiscences were taking him over, that these upsurging memories drove him, dominated him, exerted a huge, irresistible force. He would gesture; he would mime; he would breathe heavily; he would glare-he seemed to be completely transported. Then, with a start, he would come back, smile a little embarrassedly, and say, "That's how it was."

This nonstop verbosity, this reminiscence of concrete episodes, seemed to be in a quite different mode from his painting. When he was alone, he said, the yammer and clatter of memories would die down, and he would get a calm impression of Pontito: a Pontito without people, without incidents, without temporality; a Pontito at peace, suspended in a timeless "once," the "once" of allegory, fantasy, myth, and fairy tale.

By midmorning, I had been enthralled again by Franco's paintings but had had enough of his reminiscences. He had one subject only-could talk of nothing else. What could be more sterile, more boring? Yet out of this obsession he could create a lovely, real, and tranquil art. What was it that served to transform his memories-to remove them from the sphere of the personal, the trivial, the temporal, and bring them into the realm of the universal, the sacred? One encounters boring talkers, reminiscers, by the score, and not one of them will be a true artist, like Franco. Thus it was not just his vast memory or his obsession that was crucial in making him an artist but, rather, something much deeper.

Franco was born in Pontito in 1934. A village of some five hundred souls, it was nestled in the hills of Castelvecchio, in the province of Pistoia, about forty miles west of Florence. Like all Tuscan hill villages, it had an ancient lineage and still had an abundance of Etruscan tombs, as well as traditional patterns of farming, terracing, and olive and vine growing, going back more than two thousand years. Its stone buildings, its steep, winding streets, traversable only by trim mountain donkeys or human feet, had not changed in centuries, nor had the simple, orderly life of its residents. The village was dominated, at its highest point, by the spire of its ancient church, and Franco's house was next to the church-indeed, as a child, he could nearly touch its roof if he leaned far enough out of his bedroom window. Somewhat isolated and inbred, the villagers formed almost a single large family: the Magnanis, the Papis, the Vanuccis, the Tamburis, the Sarpis, were all related. The village's greatest eminence was Lazzaro Papi, an eighteenth-century commentator on the French Revolution; a monument to him still stands in the central square.

Isolated, unchanging, traditional, Pontito was a citadel against the flux of change and time. The earth was fertile, the inhabitants industrious; their farms and orchards sustained them without luxury or want. Life was good, and secure, for Franco, for all the villagers, until the outbreak of the war.

But then came horrors and troubles of every kind. Franco's father died in an accident in 1942, and the following year saw the entry of the Nazis, who took over the village and evicted the townspeople. When the villagers came back, many of their houses had been defaced. Life was never the same after this. The town had been despoiled, the fields and the orchards had been ruined, and, perhaps most important, the old patterns and mores disturbed. Pontito gathered itself together and tried gallantly to recoup after the war, but it failed to recover fully.

It has been in a slow decline ever since. Its orchards and fields, its agrarian economy, were never fully restored; it ceased to be self-sufficient economically, and its young men and women had to leave and go elsewhere. Theonce-thriving village, which had five hundred people before the war, has onlyseventy people now, all elderly or retired. There are no longer any children, and there are few working adults. The once-vital town is depopulated anddying.

All of Franco's paintings represent Pontito, and his life there, prior to1943; they are all recollections of his childhood, of the place where he livedand played and grew up, before his father was killed, before the Germans came, before the occupation of the village and the ruination of its fields.

Franco lived in Pontito until he was twelve, in 1946, when he went to schoolin Lucca. In 1949, he went on to Montepul-ciano, as an apprentice furnituremaker. He was remarkable for his "photographic" memory even before this (aswere his mother and one of his sisters, to a lesser degree): he could remembera page after a single reading or the lesson in church after a single hearing; he could remember all the inscriptions on the gravestones in the cemetery; hecould remember (and add up) long lists of figures at a glance.

But it was onlyin Lucca, away from home for the first time, and markedly homesick, that hestarted to experience another sort of memory: images that darted suddenly intohis mind-images of great personal resonance and intensity, sharp with pleasureor pain. These images were quite different from the "rote" memory that haddistinguished him thus far; they were involuntary and sudden, flashlike andimperative-hallucinatory, almost, in their sound, their texture, their smell, and their feel. This new kind of memory was, above all, experiential orautobiographical, for every image came with its proper personal context andaffect. Each image was a scene, a flashback, from his life. "He painfullymissed Pontito," his sister told me. "It was the church, the street, thefields, that he would 'see'-but as yet he had no impulse to draw."

Franco returned to Pontito in 1953, after his four years of apprenticeship, but found that the village, already declining, could notsupport a woodworker. Unable to make a living in Pontito, or follow his trade, he went to Rapallo, where he worked as a cook-though he remained dissatisfiedand dreamed of a different life and faraway places. At the start of 1960-hewas now twenty-five-he decided, half impulsively, half deliberately, to quithis job, to see the world, to work as a cook on a cruise ship. And as he waspreparing to do this (knowing, perhaps, that he would never return) hecomposed an autobiography-but he flung it into the water as he was boardingthe ship. The need to recollect, to make a picture of his childhood, wasclearly very strong in him at this point; but he had not yet found his medium.

So he set sail. He plied to and fro between the Caribbean and Europe and gotto know Haiti, the Antilles, and the Bahamas well-indeed, in 1963 and '64 hespent fourteen months in Nassau. During this time, he says he "forgot" Pontito-thoughts of it almost never came to his mind.

In 1965, when he was thirty-one, he made a momentous decision: he would not goback to Italy, not go back to Pontito; he would settle in America, in SanFrancisco. The decision was a difficult and troubling one. It threatened aseparation, perhaps irrevocable, from all that he held most valuable and dear: his country, his language, his village, his family, the habits and traditionsthat had bound his people together for hundreds of years. But it promised, orseemed to promise, freedom and perhaps wealth, a new life in a new country, afreedom to be himself, to be independent, such as he had tasted on board ship. (His father, as a young man, had also gone to America and was in business fora few years, but then languished, and returned to Pontito.)

But with the troubling decision a strange illness occurred, which finallybrought him to a sanatorium. It is far from clear what the illness was. Therewas a crisis of decision, and hope and fear, but there was also a high fever, weight loss, delirium, perhaps seizures; there was a suggestion oftuberculosis, of a psychosis, or of some neurological condition. It was neverreally resolved what was going on, and the nature of the illness remains amystery. What is clear is that at the height of the illness, his brain perhapsstimulated by excitement and fever, Franco started to have, nightly and allnight, overwhelmingly vivid dreams. Every night, he dreamed of Pontito, not ofhis family, not of activities or events, but of the streets, the houses, themasonry, the stones-dreams with the most microscopic, veridical detail, adetail beyond anything he could consciously remember. An intense, strangeexcitement possessed him in these dreams: a sense that something had justhappened, or was about to,- a sense of immense, portentous, yet enigmaticsignificance, accompanied by an insatiable, yearning, bittersweet nostalgia.

And when he awoke it seemed to him he was not fully awake, for the dreams werestill present, still before his inward eye, painting themselves on thebedclothes and the ceiling and the walls all around him, or standing on thefloor, like models, solid with exquisite detail.

In the hospital, with these dreamlike images forcing themselves upon hisconsciousness and his will, a new feeling took hold of him-a sense that he wasnow being "called." Though his powers of imagery had always been great, he hadnever seen images of such intensity before-images that suspended themselveslike apparitions in the air and promised him a "repossession" of Pontito. Nowthey seemed to say to him, "Paint us. Make us real."

What happened, one wonders (and Franco has never ceased to ask himself), inthose days and nights in the hospital, that time of crisis, delirium, fever, seizures? Did he crack under the stress of his decision, undergo a "Freudian" splitting of the ego, and become from then on a sort of hypermnesic hysteric? ("Hysterics suffer mainly from reminiscences," Freud wrote.) Did a split-offpart of him seek to provide in memory or fantasy what he had cut himself offfrom, could no longer return to in reality? Were these dreams, these memoryimages, called up by him in response to a deep emotional need? Or were theyforced on him by some strange, physiological bombardment of the brain, aprocess that he (as a person) had nothing to do with, but could not help reacting to?

Franco considered, but rejected, these"medical" possibilities (and never allowed them to be properly explored) andmoved instead to a more spiritual one.[83] A gift, a destiny, had beenvouchsafed to him, he felt, and it was his task to obey, not to question. Itwas in this religious spirit, then, that Franco, after a brief struggle, accepted his visions and now dedicated himself to making them a palpablereality.

Though he had scarcely painted or drawn before, he felt he could take a pen orbrush and trace the outlines that hovered so clearly in the air before him orprojected themselves, as through a camera lucida, on the white walls of hisroom. Above all, in those first nights of crisis, there came to him images ofthe house where he was born, images impossibly beautiful but with a menacingaspect, too.

Franco's first Pontito painting, indeed, was of his house, a painting that, despite his lack of training, had a striking confidence and clarity ofoutline, and a strange, dark emotional force. Franco himself was amazed bythis painting, by the fact that he could paint, could express himself in thiswonderful new way. Even now, a quarter of a century later, he remains amazed.

"Fantastic," he says. "Fantastic. How could I do it? And how could I have hadthe gift and not known it before?" He had occasionally, as a child, imaginedhimself as an artist, but that was a mere fancy, and he had never done morethan play with a pen or a brush-sketch a ship on a postcard, perhaps, or aCaribbean scene. He was also frightened by the power he now felt-a power thathad seized him and taken him over but that he could perhaps control and givevoice to.

And the voice of his paintings, his style, was there from the start, even-orespecially-in the first paintings he did. "The first two paintings are quitedifferent from the later ones," his friend Bob Miller said to me. "There'ssomething ominous in them-you can see something deep and significanthappening."

That Franco did not start thinking obsessively of Pontito- did not dream dayand night of Pontito-until this time is corroborated by his brother-in-law, who did not see him between 1961 and 1987. "Back in '61, Franco would talkabout anything," he told me. "He wasn't obsessed-he was normal. But when I sawhim in '87 he seemed possessed. He constantly had visions of Pontito, and hewouldn't talk about anything else."

Miller says, "His paintings started in this crisis period. He was in thehospital, pretty near a mental breakdown, and the paintings seemed to be asort of solution, or cure. Sometimes he says, 'I have these memories, I havethese dreams, I can't function,' but he seems to function pretty well. It'shard to have a normal conversation with him, though-it's 'Pontito, Pontito, Pontito,' all the time. It's as if he had this 3-D construct, this model ofPontito, he can erect-he moves his head, turns around, to 'see' differentaspects. He seemed to think this sort of 'seeing' was normal, and it was onlyin the late seventies, when Gigi, a friend, came back with photos of Pontito, that he realized for the first time how extraordinary it was& Everything isfresh, excited, as if just recalled. It is not a fixed thing, a répertoriaithing, at all. He remembers scenes. He acts them out, relives the whole thing.

So it is a very concrete, particular memory, which organizes itself in storiesand scenes-a memory of who said what when." One sometimes feels that there issomething theatrical in the paintings, and, to some extent, Franco himselfsees them that way.

The mood that had announced itself in dreams at night now deepened andintensified in Franco's mind. He started to get "visions" of Pontito by day-visions emotionally overwhelming but with a minuteand three-dimensional quality that he compares to holography. These visionsmay come at any time-when he is eating or drinking, taking a stroll, showering. There is no doubt of their reality for him. He is, perhaps, talkingwith you quietly, and suddenly he leans forward, his eyes fixed and staring, in a rapture: an apparition of Pontito is rising before him. "Many of Franco'spaintings," writes Michael Pearce (in a fascinating analysis that appeared inthe Exploratorium Quarterly to coincide with the exhibition), "begin with whathe describes as a kind of memory flash, where a particular scene will suddenlycome into his head. He often feels a great urgency to get the scene down onpaper immediately, and has been known to leave a bar in mid-drink in order tobegin a sketch& Apparently the 'flash' Franco gets of a scene is not astatic, photographic view& He can scan the area and 'see' in several directions. To do this, he must physically reorient his body, turning to theright to envision what would be to the right in the Pontitan scene, to theleft to 'see' to that side& his eyes looking into the distance as though hecan see the stone buildings and archways and streets."

Such apparitions are not only visual. Franco can hear the church bells ("likeI was there"),- he can feel the churchyard wall; and, above all, he can smellwhat he sees-the ivy on the church wall, the mingled smells of incense, must, and damp, and, admixed with these, the faint smell of the nut and olive grovesthat grew around the Pontito of his youth. Sight, sound, touch, smell, at suchtimes are almost inseparable for Franco, and what comes to him is like thecomplex and coe-nesthetic experiences of early childhood-"the instantaneousrecords of total situations," the psychiatrist Harry Stack Sullivan oncecalled them.

It seems likely that there is some sudden and profound change in Franco'sbrain whenever he is "inspired" or "possessed." Certainly when I first sawFranco seized by a vision, and noted his staring eyes, his dilated pupils, hisraptus of attention, I could not help wondering whether he was having a sortof psychic seizure. Such psychic seizures were first recognized a century agoby the great neurologist John Hughlings Jackson, who stressed the commandinghallucinations, the flow of involuntary "reminiscence," the sense ofrevelation, and the strange, half-mystical "dreamy state" that could becharacteristic of these. Such seizures are associated with epileptic activityin the temporal lobes of the brain.

In the last century, Hughlings Jackson, among others, suspected that somepatients with frequent psychical seizures might show strange alterations inthinking and personality with the onset of their disorder. But it was notuntil the 1950s and 1960s that such an "interictal personality syndrome," asit came to be called, received closer attention. In 1956 the Frenchneurologist Henri Gastaut wrote an important memoir on van Gogh, in which hepresented the case for van Gogh having not only temporal lobe seizures but acharacteristic personality change with the onset of these, graduallyintensifying for the rest of his life. In 1961 one of the most gifted ofAmerican neurologists, Norman Geschwind, spoke about the possible role oftemporal lobe epilepsy in Dostoevsky's life and writings, and by the earlyseventies had become convinced that a number of patients with TLE showed apeculiar intensification (but also narrowing) of emotional life, "an increasedconcern with philosophical, religious and cosmic matters." Remarkableproductiveness was seen in many patients: the writing of autobiographies, thefilling of endless diaries, obsessive drawing (in those graphicallyinclined)-and a general sense of illumination, "mission," and "fate," thiseven in poorly educated, "unintellectual" people who had shown no dispositionsin these directions before.

Geschwind's first publications regarding the incidence and nature of thesyndrome were published in 1974 and 1975, with his colleague Stephen Waxman, and galvanized the neurological world. Here, for the first time, a wholeconstellation of symptoms and behaviors traditionally suggestive of eithermental illness or inspiration were attributed to a specific neurological cause, in particular (as David Bear, another colleague, was to stress) a"hyperconnectivity" between the sensory and emotional parts of the brain, resulting in greatly heightened and emotionally charged perceptions, memories, and images. "Personality change in temporal lobe epilepsy," Geschwindobserved, "may well be the most important single set of clues we possess todeciphering the neurological systems that underlie the emotional forces thatguide behavior."

Such changes, Geschwind emphasized, could not be considered either negative orpositive as such; what mattered was the role they came to play in a person'slife, and this could be creative or destructive, adaptive or maladaptive. Hewas, however, especially interested in the (relatively uncommon) situation ofa highly creative use of the syndrome. "When this tragic disease is visitedupon a man of genius," he wrote of Dostoevsky, "he is able to extract from ita depth of understanding& a deepening of emotional response." *84* It was theconjunction of disease, or biological disposition, with individual creativitythat excited Geschwind above all. *85*

The rather dry term "interictal personality syndrome" was to become"Waxman-Geschwind syndrome," or sometimes simply "Dostoevsky syndrome." I hadto wonder whether the illness that Franco had in 1965, with its intenselyvivid dreams, its seizurelike hallucinations, its mystical illuminations andtransports, was not indeed the inauguration of such a Dostoevsky syndrome.

Hughlings Jackson speaks of the "doubling of consciousness" that tends tooccur in such seizures. And this is how it is with Franco: when he is seized by a vision, a waking dream, a reminiscence of Pontito, he is transported-heis, in a sense, there. His reminiscences come suddenly, unannounced, with theforce of revelation. Though he has learned over the years to control them tosome extent, to invoke them or conjure them up-as indeed all artists learn todo-they remain essentially involuntary. It is precisely this characteristicthat Proust holds to be the most valuable: to his mind, voluntary recall isconceptual, conventional, and flat-only involuntary recall, erupting orconjured from the depths, can convey the full quality of childhood experience, in all its innocence, wonder, and terror.

The doubling of consciousness can be confusing for Franco: the vision ofPontito, of the past, competes with the here and now, and on occasion canoverwhelm it completely, so that he is disoriented, no longer knows where heis. And the doubling of consciousness has led to an odd doubling of life.

Franco functions, lives, works in present-day San Francisco, but a large partof him-perhaps the larger part-is living in the past, in Pontito. And withthis heightening and intensification of living in the past there has come a certain impoverishment and depreciationof the here and now. Franco hardly goes out, hardly travels, goes to no filmsor theaters; he has few recreations or interests other than his art; he usedto have many friends but has lost most of them by his endless talking ofPontito. He works long hours as a cook in San Francisco's North Beach,- hewalks around all day, oblivious of the world, in a daze of Pontito,- and allhis relationships have become attenuated with his obsession-all except thatwith his wife, Ruth, and this was based largely on her sharing his obsession.

Thus it was she who opened a gallery in North Beach and named it the PontitoGallery, she who obtained "Pontito" license plates for the car. The cost ofFranco's nostalgia and art, then, has been his reduction to a sort of halfexistence in the present.

The psychoanalyst Ernest Schachtel, speaking of Proust, saw him as "ready torenounce all that people usually consider an active life, to renounceactivity, enjoyment of the present moment, concern with the future, friendship, social intercourse" in his hunt for the "remembrance of thingspast." The sort of memories for which Proust sought, and for which Francoseeks, are elusive, shy, nocturnal; they cannot compete with the full light, the bustle, of daily life-thus they must be invoked, conjured up, like dreams, in quiet and darkness, in a cork-lined room, or a mental state akin to tranceor reverie.

And yet it would be reductive, absurd, to suppose that temporal lobe epilepsy, seizures of "reminiscence," even if they do constitute the final trigger ofFranco's visions, could be the only determinants of his reminiscence and art.

The character of the man-his attachment to his mother, his tendency towardidealization and nostalgia; the actual history of his life, including thesudden loss of his childhood paradise and of his father; and, not least, thedesire to be known, to achieve, to represent a whole culture-all this, surely, is equally important. What seemed to have occurred, by a singular fortuity, was the co-occurrence, the concurrence, of an acute need and a physiological state. For if his sense of exile and loss and nostalgiademanded a sort of world, a substitute for the real world he had lost, hisexperiential seizures now supplied what he needed, an endless supply of imagesfrom the past-or rather, an almost infinitely detailed, three-dimensional"model" of Pontito, an entire theater or simulacrum he could mentally walkabout and explore, capturing new aspects, new views, wherever he looked; this, clearly, depended equally on his prodigious, preexistent powers of memory andimagery.

As I put the events of 1965 together, I was reminded of the epilepticreminiscence that had "attacked" (but so deeply served) my patient Mrs. O'C.-which provided her, while it lasted, with long-forgotten memories of herpast, memories of a most precious and significant kind. But in the case of Mrs. O'C., the epileptic reminiscence tailed off in a few weeks, closing thisstrange, physiologically opened door to the past and leaving her, for betteror worse, "normal" once again. For Franco, however, the reminiscence was notto cease, but, if anything, swelled in intensity and volume, so that he wasnever, after this point, really "normal" again. Such a taking over, apossession or dispossession, occurs in a number of people with temporal lobeepilepsy-sometimes greatly heightening (but more often disrupting ordestroying) their lives. In Franco's case-and here again was a singularfortuity-there was the never-before-realized power to paint his visions, toconvey a child's vision with the powers of maturity, and to make of hispathology, his nostalgia, an art.

One of Franco's older sisters, Antonietta, now in Holland, remembers when thefamily returned to the house in Pontito after the Germans had occupied it, andfound things defaced and changed. Franco's mother was deeply upset, and so wasFranco. This ten-year-old fatherless child said to his mother, "I shall makePontito again for you, I shall create it again for you." And when he did hisfirst painting-of the house where he was born-he sent it to her; in some sensehe was redeeming his promise to reconstruct Pontito for her.

Franco's mother was always seen by him, and by others, as a figure of peculiarpower. "She have the power to cure the children-she taught the secret to mysister Caterina," Franco told me. "She also have the power to hurt the body bylooking." Such magical thinking was common in Pontito. Franco was always veryclose to his mother, her favorite, and became much more so with the death ofhis father, when they seem to have reentered a sort of pre-Oedipal, almostsymbiotic intimacy and closeness. Franco sent copies of all his paintings toher, and when she died, in 1972, he was devastated. With this, he said, "Istopped completely painting." He felt it was the end of him, of his life, ofhis art. He did not paint for nine months. Then as he emerged, there came anurgent need to find another woman, to marry, and now he met his future wife, ayoung Irish-American artist. "When I met Ruth, I wanted to go back to Italy. Ruth, she pull me back. I said 'No more reason to paint now.' But Ruth, shereplace my mother. If not for Ruth, I never have painted no more."

Franco had a perpetual fantasy of going back to Pontito; he constantly talkedabout "a reunion" and "going home," and sometimes talked as if his mother werestill mysteriously alive, waiting for him in their home, waiting for hisreturn. Yet though he had many opportunities to go back, he managed tosabotage them all. "There is something preventing his going back to Pontito," Bob Miller said. "Some force, some fear-I don't know what it is." Franco wasshocked when he saw photographs of Pontito in the late seventies-the loss ofthe fields and orchards, the overgrowth, appalled him-and he could hardly bearto look at the photographs that Susan Schwartzenberg took in 1987. None ofthis was his Pontito, the Pontito of his youth, the Pontito he hadhallucinated and dreamed about and painted for more than twenty years.

There was an irony and a paradox here: Franco thought of Pontito constantly, saw it in fantasy, depicted it, as infinitely desirable-and yet he had aprofound reluctance to return. But it is precisely such a paradox that lies atthe heart of nostalgia-for nostalgia is about a fantasy that never takes place, one that maintains itself by not being fulfilled. And yet suchfantasies are not just idle daydreams or fancies; they press toward some sortof fulfillment, but an indirect one-the fulfillment of art. These, at least, are the terms that D. Geah-chan, the French psychoanalyst, has used. Withreference in particular to the greatest of nostalgies, Proust, thepsychoanalyst David Werman speaks of an "aesthetic crystallization ofnostalgia"-nostalgia raised to the level of art and myth.

There is no doubt that Franco is at once the victim and the possessor of animagery whose power is difficult for us to conceive. He is not at liberty tomisremember, nor is he at liberty to stop remembering. There beats down onhim, night and day, whether he likes it or not, a reminiscence of almostintolerable power and exactness. "No one& has felt the heat and pressure of areality as indefatigable as that which day and night converged upon thehapless Ireneo," Borges writes in a sketch entitled "Funes the Memorious."

Such an intolerably vivid reality converges upon Franco, too.

One may be born with the potential for a prodigious memory, but one is notborn with a disposition to recollect; this comes only with changes andseparations in life-separations from people, from places, from events andsituations, especially if they have been of great significance, have beendeeply hated or loved. It is, thus, discontinuities, the great discontinuitiesin life, that we seek to bridge, or reconcile, or integrate, by recollectionand, beyond this, by myth and art. Discontinuity and nostalgia are mostprofound if, in growing up, we leave or lose the place where we were born andspent our childhood, if we become expatriates or exiles, if the place, or thelife, we were brought up in is changed beyond recognition or destroyed. All ofus, finally, are exiles from the past. But this is particularly true forFranco, who feels himself the sole survivor and rememberer of a world forever past.

Whatever Franco's personal gifts and pathologies-his memory, his gift forpainting, his seizures (perhaps), his nostalgia-he is also moved, and has beenmoved throughout, by a feeling and motive that transcend the personal; by acultural need to remember the past, to preserve its meaning, or give it new meaning, ina world that has forgotten it. In brief, we see in Franco's work the art ofthe exile. Much art-much mythology, indeed-stems from exile. *86*

Exile (from theGarden, from Zion) is a central myth in the Bible, perhaps in every religion. Exile, of course-and perhaps, though hugely transformed, a sort ofnostalgia-are central dynamics in Joyce's life and work. He left Dublin, neverto return, as a very young man, but the image of Dublin haunts everything hewrote: first as the literal background of Stephen Hero, Dubliners, and Exiles, and then as the increasingly mythologized and universalized backdrop ofUlysses and Finnegans Wake. Joyce's memory of Dublin was prodigious and wascontinually amplified and complemented by meticulous research; but it was theDublin of his youth that inspired him-he had little interest in its laterdevelopment. And so, in a more modest way, it is with Franco: Pontito is thebackground of all his thoughts, from the most personal, quotidianrecollections to allegorical visions of Pontito as the center of a cosmicstruggle between the eternal forces of good and evil.

In March of 1989, I went to Pontito, to see the village for myself and to talkto some of Franco's relatives there. I found the village itself, compared withthe paintings, at once extraordinarily similar and totally different. There isan almost photographic fidelity, an amazing microscopic power of reproduction, in the way Franco recollects, thirty years later, the details of Pontito. Andyet, at the same time, I was struck by the differences: Pontito is muchsmaller than one would think from his paintings-the streets are narrower, thehouses more irregular, the church tower shorter and more squat. There are manyreasons for this, one of which is that Franco paints what he saw with achild's eye, and to a child everything is taller and more spacious. Theliteralness of this child's-eye vision made me wonder whether, through somelegerdemain of the brain, Franco was able, or even forced, to reexperiencePontito exactly as he had experienced it as a child; whether he was givenaccess, a convulsive access, to the child's memories within him.

Franco's first paintings of Pontito, done soon after his illness in 1965-theone at left is of the house where he was born.

One of Pontito's many steep, angled stairways. Though very accurate, Franco'spainting (below) broadens the perspective, adding elements that a photograph(left) is unable to do (the original version were in color).

The view from Franco's window, again showing composite perspectives.

Two of Franco's apocalyptic or "science-fiction" paintings, showing Pontito"preserved for eternity in infinite space." The first shows the intimate viewfrom his bedroom window; the second, a green-and-gold fragment of the churchgarden beneath a looming planet (the original version was in color).

Precisely such an access to the past-a past preserved unchanged in the brain'sarchives-was described to Wilder Penfield, so he thought, by some of hispatients with temporal lobe epilepsy. These memories could be evoked, duringsurgery, by stimulating the affected part of the temporal lobes with anelectrode; while the patients remained perfectly conscious of being in theoperating room, questioned by their surgeon, they would also feel themselvestransported to a time in the past, always the same time, the same scene, forany particular individual. The actual experiences evoked during such seizuresvaried enormously from patient to patient: one might reexperience a time of"listening to music," another "looking at the door of a dance hall," or "lying in the delivery room at birth," or "watching people enter the room with snowon their clothes." Because the reminiscence remained constant for each patientwith every seizure or stimulation, Penfield speaks of them as "experientialseizures." *87* He conceives that memory forms a continuous and complete recordof life experience, and that a segment of this is evoked and playedconvulsively, involuntarily, during the seizures. For the most part, he feelsthat the particular memories activated in this way lack special significance, and are merely inconsequential segments activated at random. But on occasion, he grants that such segments might be more-might be particularly prone to activation because they are so important, so massively represented, in the brain. Was this, then, what was happening to Franco? Was he being forced to see, convulsively, frozen segments of his own past, "photographs" from his brain's archive?

The notion that past memories endure in the brain, though in a somewhat lessliteral, less mechanical form, is an idea that haunts psychoanalysis-and thegreat autobiographers, as well. Thus Freud's favorite image of the mind was asan archaeological site, filled, layer by layer, with the buried strata of thepast (but one where these layers may rise into consciousness at any time). AndProust's image of life was as "a collection of moments," the memories of whichare "not informed of everything that has happened since" and remain"hermetically sealed," like jars of preserves in the mind's larder. *88* (Proustis only one of the great meditators on memory- wondering about memory goesback at least to Augustine, without any resolution, finally, as to what memory"is.")

This notion of memory as a record or store is so familiar, so congenial, to usthat we take it for granted and do not realize at first how problematic it is.

And yet all of us have had the opposite experience, of "normal" memories, everyday memories, being anything but fixed-slipping and changing, becomingmodified, whenever we think of them. No two witnesses ever tell the samestory, and no story, no memory, ever remains the same. A story is repeated, gets changed with every repetition.

It was experiments with such serialstorytelling, and with the remembering of pictures, that convinced FredericBartlett, in the 1920s and 1930s, that there is no such entity as "memory," but only the dynamic process of "remembering" (he is always atpains, in his great book Remembering, to avoid the noun and use the verb).

Hewrites.

Remembering is not the re-excitation of innumerable fixed, lifeless andfragmentary traces. It is an imaginative reconstruction, or construction, built out of the relation of our attitude towards a whole active mass of organized past reactions or experience, and to a little outstanding detailwhich commonly appears in image or in language form. It is thus hardly everreally exact, even in the most rudimentary cases of rote recapitulation, andit is not at all important that it should be so.

Bartlett's conclusion now finds the strongest support in Gerald Edelman'sneuroscientific work, his view of the brain as a ubiquitously active systemwhere a constant shifting is in process, and everything is continually updatedand recorrelated. There is nothing cameralike, nothing mechanical, inEdelman's view of the mind: every perception is a creation, every memory are-creation-all remembering is relating, generalizing, recategorizing. In sucha view there cannot be any fixed memories, any "pure" view of the pastuncolored by the present. For Edelman, as for Bartlett, there are alwaysdynamic processes at work, and remembering is always reconstruction, notreproduction.

And yet one wonders whether there are not extraordinary forms, or pathologicalforms, of memory where this does not apply. What, for example, of theseemingly permanent and totally replicable memories of Luria's "Mnemonist," soakin to the fixed and rigid "artificial memories" of the past? What of thehighly accurate, archival memories found in oral cultures, where entire tribalhistories, mythologies, epic poems, are transmitted faithfully through a dozengenerations? What of the capacity of "idiot savants" to remember books, music, pictures, verbatim, and to reproduce them, virtually unchanged, years later? What of traumatic memories that seem to replay themselves, unbearably, without changing a single detail- Freud's"repetition-compulsion"-for years or decades after the trauma? What ofneurotic or hysterical memories or fantasies, which also seem immune to time? In all of these, seemingly, there are immense powers of reproduction at work, but very much less in the way of reconstruction-as with Franco's memories. Onefeels that there is some element of fixation or fossilization or petrificationat work, as if they are cut off from the normal processes of recategorizationand revision. *89*

It may be that we need to call upon both sorts of concept-memory as dynamic, as constantly revised and represented, but also as images, still present in their original form, though written over and over again bysubsequent experience, like palimpsests.

In this sense, with Franco, howeversharp and fixed the original, there is always some reconstruction in his workas well, particularly in the most personal pictures, such as the view from hisbedroom window. Here Franco brings into an intensely personal and aestheticunity a range of buildings that cannot be seen (or photographed) all at once, but that he has observed, lovingly, at different times. He has constructed anideal view, which has the truth of art and transcends factuality. Whateverphotographic or eidetic power Franco brings to it, such a painting always hasa subjectivity, an intensely personal cast, as well.

Schachtel, speaking as a psychoanalyst, discusses this in relation to childhood memories:

Memory as a function of the living personality can be understood only as acapacity for the organization and reconstruction of past experiences andimpressions in the service of present needs, fears, and interests& Just as there is no such thing as impersonal perception and impersonal experience, there is also no impersonal memory.

Kierkegaard goes still further, in the opening of Stages on Life's Way:

Memory is merely a minimal condition. By means of memory the experiencepresents itself to receive the consecration of recollection& For recollection is ideality& it involves effort and responsibility, which the indifferent actof memory does not involve& Hence it is an art to recollect.

Franco's Pontito is minutely accurate, in the tiniest details, and yet it isalso serene and idyllic. There is a great stillness in it, a sense of peace, not least because his Pontito is depopulated, its buildings and streets areempty; the bustling, transitory people have been removed. There is somethingof a desolate, a postnuclear, quality. But there is also a deeper, morespiritual stillness. One cannot help feeling that something is strange here, that what is being recalled is not the actuality of childhood, as with Proust, but a denying and transfiguring vision of childhood, with the place, Pontito, taking the place of the people- the parents, the living people- who must havebeen so important to the child. *90* Franco is not unaware of this and will in some moods talk of the reality of childhood as heknew it-its complexities, its conflicts, its griefs, and its pains. But allthis is edited out in his art, where a paradisiacal simplicity prevails. Onefinds the belief in a happy childhood "even in people who have undergone cruelexperiences as children," Schachtel writes. "The myth of happy childhood takesthe place of the lost memory of the actual& experience."

And yet, we cannot reduce Franco's vision to mere fantasy or obsession. Thereis not just a neurotic deletion in his Pontito paintings, but an imaginativebringing-out, an intensification. Eva Brann, the philosopher, likes to callmemory "the storehouse of the imagination," and (like Edelman) to see memoriesas imaginative, as creative, from the start: *91*

Imaginative memory not only stores for us the passing moments of perception; it also transfigures, distances, vivifies, defangs-reshapes formedimpressions, turns oppressive immediacies into wide vistas& loosens the rigidgrip of an acute desire and transforms it into a fertile design.

And it is at this point that Franco's personal, nostalgic feelings becomecultural, transcendent ones. Pontito, he feels, is special in God's eyes andmust be preserved from destruction and corruption. It is special, too, in embodying a precious culture-a mode ofbuilding, a mode of living, that has almost vanished from the earth. He seeshis mission as one of preservation: to preserve Pontito exactly as it was, above and beyond all vicissitudes and contingencies. That this is a centraldynamic, or the central dynamic, is shown by a series of remarkableapocalyptic or "science-fiction" paintings, which he seems to do in periods ofmental stress or distress. In these, the earth is menaced by another planet ora comet, by imminent or actual destruction, but Pontito survives: Franco showsthe old church, or a garden, all green and gold, radiant, transfigured, in abeam of sunlight, miraculously surviving the all-encompassing destruction. (Inanother allegorical picture, he put a satellite dish on the church: a dishaimed at the stars-and at God.) These apocalyptic paintings have titles likePontito Preserved for Eternity in Infinite Space.

Franco gets up early each morning and knows what he has to do. He has histask, his mission: to recollect-to consecrate the memory of Pontito. Hisvisions, when they come, are full of emotion and excitement-no less so thanthey were when they first came to him, twenty-five years ago. And the activityof painting-of walking again in recollection through the so-loved paths andstreets, and being able to articulate this, in so masterly a fashion, withsuch richness and detail-gives him a sense of identity and accomplishment bygiving his visions a controlled and artistic form.

"I don't feel that I deserve the credit for these paintings," Franco wrote mein a letter. "I did them for Pontito& I want the whole world to know how fantastic and beautiful it is. In this way maybe it won't die, although it isdying. Maybe my paintings will at least keep its memory alive."

Up to early 1989, I had seen Franco and visited him at his house in SanFrancisco several times; I had spoken with his friends there; I had met two ofhis sisters in Holland; and, above all, I had visited Pontito, which excitedand teased Franco, for he was thinking now, more than at any time in the past twenty years, of visiting Pontito himself. His life had had, until now, astrange sort of stability, with living, eating, functioning-somewhatabsentmindedly-in the present, but with his mind and art constantly fixed onthe past. In this he had been greatly aided by Ruth, who, though herself anartist, had identified herself in the deepest way with Franco's Pontitanrelationship and art and did all she could to take care of the mundanenecessities of life and to give him the protection and insulation he needed todwell and work uninterrupted in his nostalgic art. But in 1987, tragically, she became sick, and, after a painful fight with cancer, she died, just threemonths before Franco's Exploratorium exhibit. This was his first big show, and, along with his wife's death, it stirred feelings that he could no longergo on as he had in the past-something new must happen, new decisions must bemade. He sounded these themes in a letter he wrote me a month later:

Very shortly I may be moving. Probably to San Francisco, but maybe back toItaly for good& My situation since my wife died has been difficult for me. I'm not sure what I should do& I must sell my house, look for a new place andjob in San Francisco, or in the future go back to Pontito. So that will be theend of the Pontito memory- but not the end of my life! I'll start a new memory.

I was struck by the way in which he equated a return to Pontito with the endof his memory, his identity, the end of his singular reminiscence and art. Onesaw now why he had sabotaged all previous opportunities to go there. Could thefairy tale, the myth, survive reality?

In March of 1989, I spoke of Franco and his art at a conference in Florence.

Invitations started to pour in on Franco-to give interviews, to send slides, to allow an exhibit, and, above all, to return to Pontito. Pescia, the nearestbig town to Pontito, organized an exhibit of his paintings, to be held inSeptember 1990. His long-standing inner conflict was magnified by this outsidenotice; a state of excitement and ambivalence and agitation grew. Finally, that summer, he decided to go.

He had envisaged walking from Pescia-walking up the winding mountain road toPontito, carrying on his back a wooden cross he had made, which he would placein the old church at Pontito. He would be alone, utterly alone, in thisconsecrated walk. He would stop at a spring, an ancient spring of fresh water, just outside Pontito, and put his face in the gushing waters. Perhaps afterdrinking the waters, he thought, he would lie down and die. Or perhaps, purified, born again, he would reenter Pontito. No one would recognize him, the grizzled stranger from afar, until an old dog-the old dog he had known asa child, now so old it could scarcely move (the dog, indeed, would have to bethe same age as Franco himself)-until his old dog, recognizing him, wouldfeebly lick him and then, its waiting over, would wag its tail and die. It wassingular to hear this elaborate fantasy from Franco, this fantasy withelements of Sophocles and Homer no less than the New Testament, for he hadnever read, never heard of, Sophocles or Homer.

In the event, his return was nothing like this.

He had phoned me in a panic the evening before his flight. Innumerablethoughts and desires and fears were colliding inside him: Should he go, orshouldn't he? He kept changing his mind. Since his art was based on fantasyand nostalgia, on a memory uncontaminated by updating, he was terrified thathe would lose it if he returned to Pontito. I listened carefully, like ananalyst, offering no suggestions. "You have to decide," I said, finally. Hetook the red-eye flight later that evening.

He had hoped that, first, he might meet the Pope and have his cross blessedbefore he walked with it to Pontito. But the Pope was away, in Africa. Nor wasthe Via Dolorosa walk to Pontito possible. The mayor of Pescia and otherofficials were at this moment, he was told, awaiting him in Pontito, and hewas whisked off there, at high speed, in a car.

The ceremony over, Franco took off by himself, going to his boyhood home. His first impression: "Oh my God, it was so small I had tocrouch to look through my window. I see changes outside-but to me is nochange." As he walked around the town, it seemed uncannily quiet, deserted, "like everybody is left, like the town is mine." He savored, for a little, this sense that it was his, and then got a sense of grievous loss: "I missedthe chickens, the donkey shoes. Like a dream. Everybody left. You used to heara lot of noise-the children coming up, the women, the donkey shoes. All gone."

No one greeted him, no one recognized him, no one was to be seen on thestreets during this first walk. He saw no curtains in the windows and nolaundry hanging, heard no sounds of life coming from the empty, shutteredhouses. He encountered only half-feral cats slinking in the alleys. Thefeeling grew on him that Pontito was indeed dead, and he himself a revenantreturning to a ghost town.

He wandered out beyond the houses, into the areas that used to be lush withwell-tended fields and orchards. Everywhere the ground was cracked and dry; there was neglect, and a huge overgrowth of parasites and weeds. Now, itseemed to him, not only Pontito but the whole enterprise of civilization wasin ruins. He thought of his own apocalyptic visions: "Someday it will bepolluted, overgrown. There will be nuclear war. So I will put it in Space, tobe preserved for Eternity."

But then, as the sun rose, the sheer beauty of the scene made him catch hisbreath: "I can't believe it, it's so beautiful." There, rising up tier by tieron the mountain, was Pontito, his Pontito, all green and gold, the churchtower at its crest glinting now in the early morning sun-his church, completely unchanged. "I went up in the tower. I touched the stones. Its ageto me is like a thousand years. All different colors-the copper, the green."

Touching the stones, stroking them, caressing them, Franco grounded himself, started to feel again that Pontito was real. Stones have always played acrucial role in his paintings; they are portrayed with the utmostaccuracy-every shade, every color, every convexity or crack, lovingly dwelt on and delineated. There is an extraordinary tactile orkinesthetic quality in Franco's stones. Now, as he touched them, the actualityof "coming home" started to return, and for the first time during his visitFranco started to rejoice. The stones, at least, had not changed. Nor had thechurch, or the buildings, or the streets. Their feel, at least, was still whatit had been. And now the villagers, many of them relatives, came out of theirhouses, excitedly greeting him, bombarding him with questions. Everyone wasproud of him: "We've seen your paintings, we've been hearing about you-you'recoming back to us now?" And now he started to feel like the prodigal son.

This, he said later, was a high point of his trip: "As a young child inPontito, I thought, One day I'm going to grow up. Do something, be somebody, for my madre. Show the people in Pontito. After my father died, I had noshoes, all broke. I used to feel shame. We were despised."

His childhood fantasy was coming true: Franco had done something, wassomebody, and now people-not just people in America or Italy, but his ownpeople, the Pontitans-loved and admired him. A tender feeling for thepeople-"my people"-seized him. They could not remember the past as hedid-their memories lacked the power of his or had been updated, effacing thepast. This was evident whenever he spoke to them. He, then, would be theirarchive, their memory: "I bring back the memory to these people." And he latersaid to the mayor, "I'm going to build a gallery, a little museum, somethingto bring the people back to the town."

On the surface, returning to Pontito was not as intense an experience as hehad expected-there had been no mystical revelations, no ecstasies on theheights-but neither had he dropped dead from poisoned waters or had a heartattack, as he had also more than half expected. It was when he left that hereally felt the impact.

Back in San Francisco, he found himself in a crisis. First, there was anoverwhelming sensory confusion: he seemed to see two pictures of Pontito-two"newsreels," as he put it- running simultaneously in his head, with the morerecent, the new, tending to blot out the old. He could do nothing to stop this perceptualconflict, and when he tried to paint Pontito he found that he no longer knewwhat to do: "I get confused, I see these two pictures at once," he told me. "Ithought I would paint Pontito as it was, but I 'see' it as it is now. Ithought I would go crazy. What could I do? Maybe I could never paint Pontitoagain. I got scared. My God, now-start all over again?& It took me ten daysto come back."

It took ten days for the hallucinatorily vivid pictures of the new Pontito todie down, to stop competing with the old Pontito; ten days for the merelysensory conflict to resolve; and, as for his emotions, they were so confusedhe hardly dared think about them. At this point, almost desperate, he said, "Iwish I never went back. I work best with my fantasy. I can't work now." It wasa month before he started to draw Pontito again. These new drawings andpaintings, just a few inches square, took on an unusually tender and intimatequality: corners, nooks where a boy might sit, nooks where he had sat anddreamt as a child. These little scenes, though they did not contain humanfigures, had an intensely human feel, as if their occupants had just left orwere just about to arrive-very different from the idealized yet desertedscenes he had usually painted.

Thinking over the experience, Franco felt that it had been both enjoyable andexhausting, but compromised, at a deeper level, in his three weeks there, because he had had no time to himself-he had been followed and interviewed every day in Pontito and had had no time to sketch or think. He felt a need togo back a second time, to confront the deeper issues, to spend time alone inPontito.

In March 1991, there was a second exhibit of Franco's paintings in Italy-thisone in the Palazzo Medici-Riccardi in Florence-and I accompanied Franco to theexhibit. He was abashed by the splendid surroundings, by seeing his paintingsin vast, palatial rooms. "I feel like an intruder," he said. "They do notbelong." He and his paintings, he feels, are rooted in the hilly Tuscan countryside; he feels uncomfortable in thecosmopolitan grandeur of Florence.

The next morning, Franco and I are off to Pontito; for the first time, we willsee his town together. We pass the Duomo and the Baptistry in the center ofFlorence, pass the old children's hospital, the Innocenti, driving through themiraculously preserved old city, unspoiled and deserted now, near dawn on aSunday. Franco, beside me, is rapt, absorbed in his thoughts.

We pass the road for Pistoia and head toward Montecatini, the slopes on eitherside of us dotted with old hill towns. "There is at the back of every artist'smind something like a pattern or a type of architecture," G. K. Chestertonwrote. "It is a thing like the landscape of his dreams; the sort of world hewould wish to make or in which he would wish to wander; the strange flora andfauna of his own secret planet." For Auden, this landscape was limestone andlead mines; for Franco, it is this old, gnarled, unchanging Tuscan landscape.

A sign warning motorists of snow prompts me to ask Franco whether there wasever snow in Pontito, or whether he had ever painted a snow-whitened Pontito.

Yes, there was snow, he says, and he once started a snowscape, but almost allhis paintings are of Pontito in primavera, in spring.

As we reach Pescia, at the bottom of the mountain, below Pontito, Francorecognizes people and places: the shop where he used to buy paints forty yearsago; a subterranean bar. Little has changed in this slow-paced town. Herecognizes the mailman from the 1940s: they throw their arms around each otherin the street. Everyone is welcoming; there are smiles everywhere for theprodigal son come home once more. We move on to the city hall, where Francowas given the honors of the city during his first visit. A prophet is honorednow in his own land. This pleases him, this local fame; he belongs here, as hedoes not belong in Florence.

From Pescia the road is narrow and steep. We wind up in second gear afternearly ditching ourselves on the first turn, past Pietrabuona, a town namedafter its fine stone, with its church and oldest buildings perched on its highest hill. We pass its terracedhills, softly lit, with gnarled olive trees and vines upon them; theseterraces are ancient, dating from Etruscan times. We wind around past manysmall villages-Castelvecchio, Stiappa, San Quirico. Finally, we round anotherbend in the road and catch our first sight of Pontito. "My God, look at it!"

Franco exclaims, sotto voce. "Jesus Christ! I can see my home. No, I can't& This overgrowth is bad, parasites everywhere. Used to be cherry, pear, fruittrees. Chestnuts, grains, corn, lentils." He tells me how, as a lanky, long-legged youth, he used to stride from one village to another. As weapproach Pontito, Franco's eyes grow moist. He stares intensely and murmurs tohimself as he takes everything in. "This is the bridge, the stream where wedid the washing. Down the path, here, the women would walk with baskets ontheir heads."

We stop the car, and Franco leaps out, seeing and remembering more details allthe time. And, along with this pure topographic memory, there is also acultural one. He describes how the villagers would take hemp and immerse it inthe stream for a year, anchored by rocks, and then take it out to be dried andwoven into fabric for sheets and towels, and for sacks for chestnuts: a wholelocal industry, a tradition, now nearly forgotten, except by Franco. Suddenly, indignant at new growth obscuring the path, he tears it out in giant armfuls.

Angry at some new building, he tells me in detail exactly how it used to be:

"There was a big rock there, the water ran here." There is no doubt that everystone, every inch, is engraved in his memory.

"Come sta?" Climbing up the steep cobbled street, Franco greets a stoutmiddle-aged man in a green coat. ("His father gave us candies.") Franco has abardic memory, but the trivial and the momentous, the personal and the mythic, are indiscriminately mixed. He stops at the house where his mother was born.

"Sabatoni!"

"Franco!" An old man emerges. ("It's my uncle.") "You've been in America. Whatbrings you back? I heard there was a show in Florence." The old man mentionsthe drying of chestnuts. He forgets the details, but Franco does not. The oldman points out that the four houses next to his, so full of life once, are nowempty. "When I am dead, it will be empty here, too."

We visit Franco's sister Caterina. She and her husband have retired to Pontito, and Franco is distressed to see her looking older than he remembers.

Caterina feeds us a magnificent Tuscan lunch-cheese, bread, olives, wine, tomatoes preserved from her garden-and then Franco takes me off to look at thechurch. It is a beautiful spot, atop the hill and overlooking the rest of thevillage. In the cemetery, Franco points out the graves of his mother, hisfather, this relative and that. "There are more people in the graveyard thanin the town," he says softly. Franco plans to stay in Pontito for three moreweeks, to do some quiet sketching. He says, "I'm going to put my roots backhere." But, as I leave, my final image is of Franco standing by himself in thecemetery, gazing over the depopulated town, alone.

Franco's three weeks in Pontito seemed to recharge him; at least, he has beenincessantly active since his return. His garage-studio is crackling with life.

There are pictures everywhere, old and new-the new ones based on sketches hedid in March, and the old ones, started in 1987 but left unfinished withRuth's death, now being completed in a burst of new decision and energy.

Seeing Franco once again at work, his renewed fury of recollective andcreative energy, raises anew all the questions one has about his singularenterprise, the meaning of Pontito for him. His "new" paintings are not reallynew-he may add the new here and there (a fence, a gate, a new tree perhaps), but they remain essentially the same. His project, in a fundamental sense, remains unchanged. When I visited Franco last summer, I saw a pair of sneakershanging from the rafters of his garage, with an elaborately calligraphed notice tied to them, saying, inItalian, "With these shoes, after 34 years, I first set foot in what had beenthe Promised land." Now that he had set foot in it, it had lost some of itsglamour, its promise. "Sometimes I wish I never went back," he said as he sawme looking at the shoes. "Fantasy, memory, that is the most beautiful." Andthen he added, musingly, "Art is like dreaming."

Seeing the current reality of Pontito was very disturbing to Franco, althoughhe was able to recover from the derailment it caused. But it heightened hissense that the Pontito of here and now is a threat to his own vision and showed him that he must ration any further exposure to it. There have beenmany subsequent invitations, but he has not returned, even for an exhibit ofhis own work in the streets of Pontito. Other artists now are flocking toPontito, but for them it is just another charming Tuscan hill town. Franco, fleeing all this, has returned to his garage, returned to the project that hasconsumed him for twenty-nine years. It is a project that has no end, can neverbe brought to a conclusion or completion, and he paints now, one sometimesfeels, in a sort of frenzy, barely finishing one canvas before moving on toanother.

He is experimenting with other forms of representation as well: cardboard models of Pontito, which he fashions with his long agile fingers, and videotapes of his paintings (accompanied by music) to simulate a walkthrough the town. He is fascinated by the idea of computer simulations ofPontito and the thought that one might don helmet and gloves-and not only see, but touch its virtual reality, too.

When I met him originally, Franco was billed as "A Memory Artist," implyinghis affinity to Proust, "the poet of memory." At first I thought there wasindeed a similarity-both men, both artists, withdrawing themselves from theworld, in order to recapture the lost world of childhood. But now one sees, increasingly with each year, how totally Franco's project differs fromProust's. Proust, too, was haunted by the lost, the forgotten past, and hisquest was to find if the door to it could be opened. As he succeeded in this, partly through the grace of "involuntary memories," partly through vast intellectual labor, his work couldreach its completion and conclusion (a completion at once psychological andartistic).

But this is not possible for Franco, who instead of achieving a penetrationinto the inwardness, the "meaning," of Pontito, makes a vast, even infiniteenumeration of all its outward aspects-its buildings, its streets, its stones, its topography-as if these could in some way compensate for the human voidwithin. He half knows this, yet does not know it, and in any case has nochoice. He has no time for, no taste for, no power of introspection and maysuspect, indeed, that it would be fatal to his art.

Franco feels he has twenty, thirty years of work still ahead of him, for thethousand-odd paintings he has done since 1970 convey only a part of thereality he seeks to portray. He has to have paintings, or simulations, ofevery detail, from every viewpoint-from the village in the distance, as onedrives up to it from Pistoia, to the finest details of the lichened stones inthe church. He envisions the building of a museum overlooking the town, whichwill house a vast archive of Pontito, his Pontito-the thousands of paintingshe has made and the thousands more he still intends to make. It will be the culmination of his life's work, and the redemption of his promise to hismother: "I shall create it again for you."

Notes

83. Giorgio De Chirico, the painter, was subject to classical migraines andmigraine auras of great severity-he gave vivid circumstantial accounts ofthese- and sometimes incorporated their geometric patterns, their zigzags, their blinding lights and darknesses, into his pictures (this has beendescribed in detail by G. N. Fuller and M. V. Gale in the British MedicalJournal). But De Chirico was also reluctant to acknowledge a purely medical orphysical cause for his visions, since, he felt, their spiritual quality was sostrong. His final term for them was a compromise-"spiritual fevers."

84. This, too, was Dostoevsky's attitude. "What if it is disease," he asks, through Prince Mishkin. "What does it matter that it is an abnormal intensity, if the result, if the minute of sensation, remembered and analysed afterwardsin health, turns out to be the acme of harmony and beauty& of completeness, of proportion? "

85. Although the interpretation of the lives and works and personalities ofeminent figures in terms of their supposed neurological or psychiatricdispositions is not new, it has become an obsession, almost an industry, atthe present time. Eve LaPlante, in her book Seized, speaks of thecharacteristic "marks" of TLE and Geschwind syndrome not only in van Gogh andDostoevsky, but in figures as various as Poe, Tennyson, Flaubert, Maupassant, Kierkegaard, and Lewis Carroll (to say nothing of such contemporaries asWalker Percy, Philip Dick, and Arthur Inman of the 155-volume diary). WilliamGordon Lennox (author of a massive 2-volume standard work on epilepsy) addsscores of others to this list, from Socrates, Paul, and the Buddha to Newton, Strindberg, Rasputin, Paganini, and Proust. The famous, sudden returns ofmemory in The Remembrance of Things Past are all seen by Lennox as hypermnesicor experiential seizures, brought on by particular stimuli evocative of thepast.

Other books and articles attribute Tourette's syndrome to Samuel Johnson andMozart, autism to Bartok and Einstein, and manic-depressive illness tovirtually every creative artist: Kay Redfleld Jamison, in Touched with Fire, citesBalzac, Baudelaire, Beddoes, Berlioz, Blake, Boswell, Brook, Bruckner, Bunyan, Burns, and all the Byrons and Brontes as manic-depressive, to name only the"B"s. It may well be that many of these attributions are correct. The dangeris that we may go overboard in medicalizing our predecessors (andcontemporaries), reducing their complexity *to expressions of neurological orpsychiatric disorder, while neglecting all the other factors that determine alife, not least the irreducible uniqueness of the individual.*

86. Exile-from the tropical paradise where he had spent his earliest years-wasto haunt Gauguin throughout his adult life, until, finally, he went to Tahitiand tried there to reclaim the childhood Eden he had once known.

87. It is now clear that though there are repetitive or reiterative elements in such seizures, there are always elements of a fantastic or dreamlike kind as well. (One such patient, described at the turn of the century by Gowers, would always see "a sudden vision of London in ruins, herself the sole spectator in this scene of desolation," before having a convulsion or losing consciousness.) Penfield's findings are discussed, and submitted to a radically different interpretation by Israel Rosenfleld, in The Invention of Memory.

88. In Remembrance of Things Past, Proust writes:

A great weakness, no doubt, for a person to consist entirely in a collectionof moments;a great strength also; it is dependent upon memory, and our memoryof a moment is not informed of everything that has happened since; this momentwhich it has registered endures still, lives still, and with it the personwhose form is outlined in it.

89. Memory can take many forms-all, in their different ways, invaluableculturally-and we should only speak of "pathology" if these become extreme.

Some people have remarkable perceptual memories, for example; they seem totake in automatically and to recollect without the least difficulty all therich details of a summer holiday, the scores of people met, the way theydressed, their talk-the thousand incidents that make up a day on the beach.

Others retain no memories (and perhaps lay down no memories) of such matters, but have huge conceptual memories, in which vast amounts of thought andinformation are retained, in highly abstract, logically ordered form. The mindof the novelist, the representational painter, perhaps tends to the former; the mind of the scientist, the scholar, perhaps to the latter |and, of course, one may have both sorts of memory, or varying combinations). Pure perceptualmemory, with little or no conceptual disposition or capacity, may becharacteristic of some autistic savants.

90. In a late paper, "Constructions in Analysis," Freud speaks of the factthat patients' memories of certain highly significant events may show astrange conjunction of excessive sharpness and detail in some respects, andtotal deletion in others, with crucial elements (especially human ones) missing. Thus patients may recollect "with abnormal sharpness" the rooms inwhich an event of great importance happened, or the furniture-but not theevent itself. He sees this as the result of a conflict and compromise in theunconscious, whereby important memory traces are brought into consciousness, but displayed onto adjacent objects of minor significance. He stresses thatsuch reminiscences often emerge in dreams (and thereafter daydreams), as soonas the charged subject is forced upon the mind.

91. T. J. Murray cites a similar observation made by the painter Robert Pope, who stresses also the time which must elapse between the original experienceand its re-creation-a time which, for him, averaged five years, but which, forFranco, was a quarter century or more:

During this gestation period [writes Pope], the creative faculties act as afilter where personal opaque and chaotic data is made public, transparent andordered. This is a process of mythologizing. Myth and dream are similar: thedifference is that dreams have private, personal meaning while myths havepublic meanings.

Prodigies

The Fayetteville Observer of May 19, 1862, contained an unusual letter fromits correspondent Long Grabs, stationed in Camp Mangum:

The blind negro Tom has been performing here to a crowded house. He iscertainly a wonder& He resembles any ordinary negro boy 13 years old and isperfectly blind and an idiot in everything but music, language, imitation, andperhaps memory. He has never been instructed in music or educated in any way.

He learned to play the piano from hearing others, learns airs and tunes fromhearing them sung, and can play any piece on first trial as well as the mostaccomplished performer& One of his most remarkable feats was the performanceof three pieces of music at once. He played Fisher's Hornpipe with one handand Yankee Doodle with the other and sang Dixie all at once. He also played apiece with his back to the piano and his hands inverted. He performs manypieces of his own conception-one, his "Battle of Manassas, " may be calledpicturesque and sublime, a true conception of unaided, blind musical genius& This poor blind boy is cursed with but little of human nature,-he seems to bean unconscious agent acting as he is acted on, and his mind a vacantreceptacle where Nature stores her jewels to recall them at her pleasure.

We learn more of Blind Tom from Edouard Séguin, the French physician whose1866 book, Idiocy and Its Treatment by the Psychological Method, contained many penetrating descriptions ofindividuals later to be termed "idiots savants"; and from an intellectualdescendant of Séguin, Darold Treffert, whose book Extraordinary People: Understanding "Idiot Savants" was published in 1989.

Born nearly blind, thefourteenth child of a slave, sold to a Colonel Bethune, Tom was, from infancy, Treffert writes, "fascinated by sounds of all sorts-rain on the roof, thegrating of corn in the sheller, but most of all music-Tom would listenintensely to the colonel's daughters practicing their sonatas and minuets onthe piano."

"Till five or six years old," Séguin writes, "he could not speak, scarce walk, and gave no other sign of intelligence than this everlasting thirst for music.

At four years already, if taken out from the corner where he lay dejected, andseated at the piano, he would play beautiful tunes; his little hands havingalready taken possession of the keys, and his wonderful ear of any combinationof notes they had once heard." At the age of six, Tom started to improvise onhis own account. Word of the "blind genius" spread, and at seven Tom gave hisfirst concert-and went on to earn a hundred thousand dollars in his eighthyear. At eleven, he played before President Buchanan at the White House. Apanel of musicians, who thought that he had tricked the president, tested hismemory the following day, playing two entirely new compositions to him, thirteen and twenty pages in length-he reproduced them perfectly and withoutthe least apparent effort.

Séguin, describing Tom listening to a new piece, adds further tantalizingdetails in regard to his expressions, postures, and movements:

[He] shows his satisfaction by his countenance, a laughing, stooping, withvarious rubbings of the hand, alternating with an increase of the sidewayswinging of his body, and some uncouth smiles. As soon as the new tune begins, Tom takes some ludicrous posture [with one leg outstretched, while he slowlypirouettes on the other]& long gyrations& ornamented with spasmodic movementsof the hands.

Although Tom was usually called an idiot or imbecile, such posturing andstereotypies are more characteristic of autism- but autism was only identifiedin the 1940s and was not a term, or even a concept, in the 1860s.

Autism, clearly, is a condition that has always existed, affecting occasionalindividuals in every period and culture. It has always attracted in thepopular mind an amazed, fearful, or bewildered attention (and perhapsengendered mythical or archetypal figures-the alien, the changeling, the childbewitched). It was medically described, almost simultaneously, in the 1940s, by Leo Kanner in Baltimore and Hans Asperger in Vienna. Both of them, independently, named it "autism."

Kanner's and Asperger's accounts were in many ways strikingly (at timesuncannily) similar-a nice example of historical synchronicity. Both emphasized"aloneness," mental aloneness, as the cardinal feature of autism; this, indeed, was why they called it autism. In Kanner's words, this aloneness"whenever possible, disregards, ignores, shuts out anything that comes to thechild from the outside." This lack of contact, he felt, was only in regard topeople; objects, by contrast, might be normally enjoyed.

The other definingfeature of autism, for Kanner, was "an obsessive insistence on sameness," inthe form of repetitive, stereotyped movements and noises, or stereotypies, most simply; then in the adoption of elaborate rituals and routines; finally, in the appearance of strange, narrow preoccupations-highly focused, intensefascinations and fixations. The appearance of such fascinations, and theadoption of such rituals, often before the age of five, were not to be seen, Kanner and Asperger thought, in any other condition. Asperger brought outother striking features, stressing, they do not make eye contact& they seem to take in things with short, peripheral glances& [there is] a poverty of facial expressions and gestures& the use of language appears abnormal, unnatural& the children follow their own impulses, regardless of the demands of the environment.

Singular talents, usually emerging at a very early age and developing withstartling speed, appear in about 10 percent of the autistic (and in a smallernumber of the retarded-though many savants are both autistic and retarded). Acentury before Blind Tom there was Gottfried Mind, a "cretinous imbecile," born in Berne in 1768, who showed from an early age a striking talent fordrawing. He had, according to A. F. Tredgold's classic 1908 Text-Book ofMental Deficiency, "such a marvellous faculty for drawing pictures of catsthat he was known as 'The Cats' Raphael/ " but he also made drawings andwater-color sketches of deer, rabbits, bears, and groups of children. He soonacquired fame throughout Europe, and one of his pictures was purchased byGeorge IV.

Prodigious calculators attracted attention in the eighteenth century-JedediahBuxton, a simpleminded laborer, had perhaps the most tenacious memory ofthese. When asked what would be the cost of shoeing a horse with a hundred andforty nails if the price was one farthing for the first nail, then doubled foreach remaining nail, he arrived at the (nearly correct) figure of725,958,096,074,907,868,531,656,993,638,851,106 pounds, 2 shillings, and 8pence. When he was then asked to square this number (that is, 2139 squared), he came up with (after two and a half months) a seventy-eight digit answer.

Though some of Buxton's calculations took weeks or months, he was able towork, to hold conversations, to live his life normally, while doing them. Theprodigious calculations proceeded almost automatically, only throwing theirresults into consciousness when completed.

Child prodigies, of course, are not necessarily retarded or autistic-therehave been itinerant calculators of normal intelligence as well. One such wasGeorge Parker Bidder, who as a child and youth gave exhibitions in England andScotland. He could mentally determine the logarithm of any number to seven or eight places and, apparently intuitively, could divine the factorsfor any large number. Bidder retained his powers throughout life (and indeedmade great use of them in his profession as an engineer) and often tried todelineate the procedures by which he calculated. In this, however, he wasunsuccessful; he could only say of his results that "they seem to rise withthe rapidity of lightning" in his mind, but that their actual operations werelargely inaccessible to him. *92* His son, also intellectually gifted, was anatural calculator as well, though not as prodigious.

Besides these major domains of savant expertise, some savants have astonishingverbal powers-the last thing one might expect in intellectually defectiveindividuals. Thus there are savants who are able, by the age of two, to readbooks and newspapers with the utmost facility but without the leastcomprehension (their expertise, their decoding, is wholly phonological andsyntactic, without any sense of meaning).

Almost all savants have prodigious powers of memory. Dr. J. Langdon Down, oneof the greatest observers in this realm, who coined the term "idiot savant" in1887, remarked that "extraordinary memory was often associated with very greatdefect of reasoning power." He describes giving one of his patients Gibbon'sDecline and Fall of the Roman Empire. The patient had read the entire book andin a single reading imprinted it in memory. But he had skipped a line on one page, an error at once detected and corrected. "Ever after," Down tells us, "when reciting from memory the stately periods of Gibbon, he would, on comingto the third page, skip the line and go back and correct the error with asmuch regularity as if it had been part of the regular text."

Martin A., asavant I wrote about in "A Walking Grove," could recall the entire ninevolumes of Grove's 1954 Dictionary of Music and Musicians. This had been readto him by his father, and the text would be "replayed" in his father's voice.

There is a large variety of minor savant skills, frequently described byphysicians like Down and Tredgold, who consulted at institutions for the"mentally defective." Tredgold describes]. H. Pullen, "the Genius ofEarlswood Asylum," who for more than fifty years made extremely intricatemodels of ships and machines, as well as a very real guillotine, which almostkilled one of his attendants. Tredgold writes of an otherwise retarded savantwho could "get" a complex mechanism like a watch and disassemble andreassemble it swiftly, with no prior instruction. More recently, physicianshave described idiot savants with extraordinary bodily skills, able to performacrobatic maneuvers and athletic feats with the greatest facility-again, withno formal training. (In the 1960s, I saw, on a back ward, such a savantmyself-he had been described to me as "an idiot Nijinsky.") *93*

While early medical observers sometimes conceived of savant skills as thehypertrophy of a single mental faculty, there was little sense that savanttalents were of much more than anecdotal interest. An exception here was theeccentric psychologist F. W. H. Myers, who, in his great turn-of-the-centurybook, Human Personality, tried to analyze the processes by which prodigious calculators arrived at their results. He was unable to do so, any more than could the calculators themselves, but he believed that a processof "subliminal" mentation or computation was involved, which threw its resultsinto consciousness when complete. Their methods of calculation seemed tobe-unlike the formal or formulary methods taught in primers andschools-idiosyncratic and personal, achieved by each calculator through anindividual path. Myers was one of the first to write about unconscious orprecon-scious cognitive processes and foresaw that an understanding of idiotssavants and their gifts could open not only into a general understanding ofthe nature of intelligence and talent but into that vast realm that we nowcall the cognitive unconscious.

In the 1940s, when autism was first delineated, it became evident that themajority of idiot savants were in fact autistic and that the incidence ofsavantism in the autistic-nearly 10 percent-was almost two hundred times itsincidence in the retarded population, and thousands of times that of thepopulation at large. Furthermore, it became clear that many autistic savantshad multiple talents-musical, mnemonic, visual-graphic, computational, and so on.

In 1977, the psychologist Lorna Seife published Nadia: A Case of ExtraordinaryDrawing Ability in an Autistic Child. Nadia suddenly started drawing at theage of three and a half, rendering horses, and later a variety of othersubjects, in a way that psychologists considered "not possible." Her drawings, they felt, were qualitatively different from those of other children: she hada sense of space, an ability to depict appearances and shadows, a sense ofperspective such as the most gifted normal child might only develop at threetimes her age. She constantly experimented with different angles andperspectives. Whereas normal children go through a developmental sequence fromrandom scribbling to schematic and geometric figures to "tadpole" figures, Nadia seemed to bypass these and to move at once into highly recognizable, detailed representational drawings. The development of drawing in children, it was felt at the time, paralleled the development of conceptual powers andlanguage skills; but Nadia, it seemed, just drew what she saw, without theusual need to "understand" or "interpret" it. She not only showed enormousgraphic gifts, an unprecedented precocity, but drew in a way that attested toa wholly different mode of perception and mind. *94*

The case of Nadia-set out at monographic length and minutelydocumented-aroused great excitement in the neurological and psychologicalcommunities and suddenly focused a belated attention on savant talents and onthe nature of talents and special abilities in general. Where, for a centuryor more, neurologists had confined their attention to failures and breakdownsof neural function, there was now a move in the other direction, to exploringthe structure of heightened powers, of talents, and their biological basis inthe brain. Here idiot savants provided unique opportunities, for they seemedto exhibit a large range of inborn talents-raw, pure expressions of thebiological: much less dependent upon, or influenced by, environmental andcultural factors than the talents of "normal" people.

In June of 1987, I received a large packet from a publisher in England. It wasfull of drawings, drawings that delighted me greatly because they portrayedmany of the landmarks I had grown up with in London: monumental buildings like St. Paul's, St. Paneras Station, the Albert Hall, the Natural History Museum; andothers, odd, sometimes out of the way, but dear and familiar places, like thePagoda in Kew Gardens. They were very accurate, but not in the leastmechanical-on the contrary, they were full of energy, spontaneity, oddity, life.

In the packet, I discovered a letter from the publisher: the artist, StephenWiltshire, was autistic and had shown savant abilities from an early age. HisLondon Alphabet, a sequence of twenty-six drawings, had been done when he wasten; an amazing elevator shaft, with a vertiginous perspective, when he waseight. One drawing was an imagined scene, of St. Paul's surrounded by flamesin the Great Fire of London. Stephen was not merely a savant but a prodigy.

Sixty of his drawings, a mere fraction of what he had done, were to bepublished, the letter informed me; the author was just thirteen.

Stephen's drawings reminded me, in many ways, of drawings by my patientJosé-"The Autist Artist" whom I had known and written about, years before-withan extraordinary eye and gift for drawing. Though José and Stephen came fromsuch different backgrounds, the similarity of their drawings was so uncanny asto make me wonder whether there might not be a distinctive "autistic" form ofperception and art. But José, despite his fine gifts (not, perhaps, as greatas Stephen's, but quite remarkable nonetheless), was wasting away in a statepsychiatric hospital; Stephen had somehow been luckier.

A few weeks later, visiting family and friends in England, I mentioned Stephenand his drawings to my brother, David, a general practitioner in northwestLondon. "Stephen Wiltshire!" he exclaimed, very startled. "He's a patient ofmine- I've known Stephen since he was three."

David told me something of Stephen's background. He was born in London inApril of 1974, the second child of a West Indian transit worker and his wife.

Unlike his older sister, Annette, born two years earlier, Stephen showed somedelay in the motor landmarks of infant life-sitting, standing, hand control, walking-and a resistance to being held. In his second and thirdyears, more problems appeared. He would not play with other children andtended to scream or hide in a corner if they approached. He would not make eyecontact with his parents or anyone else. Sometimes he seemed deaf to people'svoices, though his hearing was normal (and thunder terrified him). Perhapsmost disquieting, he did not use language; he was virtually mute.

Just before Stephen's third birthday, his father was killed in a motorcycleaccident. Stephen had been strongly attached to him and after his death grewmuch more disturbed. He started screaming, rocking, and flapping his hands andlost what little language he had. At this point the diagnosis of infantileautism had been made, and arrangements made for him to attend a special schoolfor developmentally disabled children.

Lorraine Cole, the headmistress atQueensmill, observed that Stephen was very remote when he started school atthe age of four. He seemed unaware of other people and showed no interest inhis surroundings. He would simply wander about aimlessly or occasionally runout of the room. As Cole writes:

> He had virtually no understanding of or interest in the use of language. Otherpeople held no apparent meaning for him except to fulfill some immediate, unspoken need; he used them as objects. He could not tolerate frustration, norchanges in routine or environment and he responded to any of these withdesperate, angry roaring. He had no idea of play, no normal sense of dangerand little motivation to undertake any activity except scribbling.

She later wrote to me, "Stephen would climb onto a play-bike, pedal itfuriously, then hurl himself off it, roaring with laughter, and sometimesscreaming."

Yet at this point the first evidence of his visual preoccupation, and talent, appeared. He seemed fascinated by shadows, shapes, angles, and by the age offive he was fascinated by pictures, too. He would make "sudden dashes to other rooms, where he would stare intently at pictures which fascinated him," Cole writes. "He would find paper and pencil and scribble, totally absorbed for long periods."

Stephen's "scribblings" were largely of cars and occasionally of animals and people. Lorraine Cole speaks of his doing "wickedly clever caricatures" of some of the teachers. But his special interest, his fixation, which developed when he was seven, was the drawing of buildings-buildings in London he had seen on school trips or that he had seen on television or in magazines. Why he developed this sudden, special interest and preoccupation so powerful and exclusive that he now had no impulse to draw anything else is not wholly clear.

Such fixations are exceedingly common in autistic people. Jessy Park, an autistic artist, is obsessed with weather anomalies and constellations in the night sky; *95* Shyoichiro Yamamura, an autistic artist in Japan, drew insects almost exclusively; and Jonny, an autistic boy described by the pioneer psychologist Mira Rothenberg, for a period drew only electric lamps, or buildings and people composed of electric lamps.

Stephen, from this very early age, had been almost exclusively preoccupied with buildings-buildings, by preference, of great complexity and size-and also with aerial views and extremities of perspective. He had one other interest at the age of seven: he was fascinated by sudden calamities, and above all by earthquakes.

Whenever Stephen drew these, or saw them on television or in magazines, he grew strangely excited and overwrought- nothing else disturbed him in quite this way. One wonders whether his earthquake obsession (like the apocalyptic fantasies of some psychotics) represented a sense of his own inner instability, which in drawing he could try to master.

When Chris Marris, a young teacher, came to Queensmill in 1982, he was astonished by Stephen's drawings. Marris had been teaching disabled children for nine years, but nothing he had ever seen had prepared him for Stephen. "I was amazed by this little boy, who sat on his own in a corner of the room, drawing," he told me. "Stephen used to draw and draw and draw and draw-the school called him 'the drawer.' And they were the most unchildlike drawings, like St. Paul's and Tower Bridge and other London landmarks, in tremendous detail, when other children his age were just drawing stick figures. It was the sophistication of his drawings, their mastery of line and perspective, that amazed me-and these were all there when he was seven."

Stephen was one of a group of six in Chris's class. "He knew the names of all the others," Chris told me, "but there was no sense of interaction or friendship with them. He was such an isolated little chap." But his native gift was so great, Chris felt, that he did not need to be "taught," in the ordinary way. He had apparently worked out by himself, or had an innate grasp of, drawing techniques and perspective. Along with this, he showed a prodigious visual memory, which seemed able to take in the most complex buildings, or cityscapes, in a few seconds, and to hold them in mind, in the minutest detail- indefinitely, it seemed, and without the least apparent effort. Nor did the details need to be coherent, to be integrated into a conventional structure; among the most startling early drawings, Chris felt, were ones of demolition sites and earthquake scenes, with girders lying everywhere, exploded in all directions, everything in complete, almost random disarray. Yet Stephen remembered these scenes and drew them with the same fidelity and ease with which he drew classical models. It seemed to make no difference whether he drew from life or from the images in his memory. He needed no aide-mémoire, no sketches or notes-a single sidelong glance, lasting only a few seconds, was enough.

Stephen also showed abilities in spheres besides the visual. He was very good at mime, even before he was able to speak. He had an excellent memory for songs and would reproduce these with great accuracy. He could copy any movement to perfection. Thus Stephen, at eight, showed an ability to grasp, retain, and reproduce the most complex visual, auditory, motor, and verbal patterns, apparently irrespective of their context, significance, or meaning.

It is characteristic of the savant memory (in whatever sphere-visual, musical, lexical) that it is prodigiously retentive of particulars. The large andsmall, the trivial and momentous, may be indifferently mixed, without anysense of salience, of foreground versus background. There is littledisposition to generalize from these particulars or to integrate them witheach other, causally or historically, or with the self. In such a memory theretends to be an immovable connection of scene and time, of content and context(a so-called concrete-situational or episodic memory)-hence the astoundingpowers of literal recall so common in autistic savants, along with difficultyextracting the salient features from these particular memories, in order tobuild a general sense and memory. Thus the savant twins, calendricalcalculators whom I described in The Man Who Mistook His Wife for a Hat, whileable to itemize every event of their lives from about their fourth year on, had no sense of their lives, of historical change, as a whole. Such a memorystructure is profoundly different from the normal and has both extraordinarystrengths and extraordinary weaknesses.

Jane Taylor McDonnell, author of Newsfrom the Border: A Mother's Memoir of Her Autistic Son, says of her son: "Pauldoesn't generalize the particulars of his experience into the habitual, theongoing, as many (most) other people do. Each moment seems to stand outdistinctly, and almost unconnected with others, in his mind. So nothing seems to get lost, repressed, in the process." So it was, Ioften thought, with Stephen, whose life experience seemed to consist of vivid, isolated moments, unconnected with each other or with him, and so devoid ofany deeper continuity or development.

Though Stephen would draw incessantly, he did not seem to take any interest inthe finished drawings, and Chris might find them in the wastebasket or justleft on a desk. Stephen did not even seem to concentrate on his subject whilehe was drawing. "Once," Chris related to me, "Stephen was sitting opposite theAlbert Memorial: he was doing a fabulous picture of that, but at the same timelooking all around-at buses, the Albert Hall, whatever."

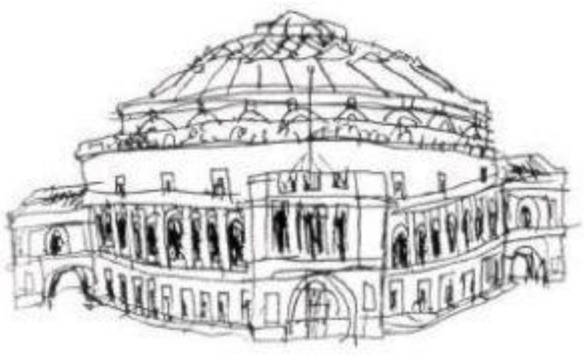
Though he did not think that Stephen needed to be "taught," Chris devotedhimself as much as possible to Stephen and his drawing, providing him withmodels, with encouragement. This was not always easy, because Stephen did notshow much personal feeling. "In a way, he was responsive to us, the adults-hewould say, 'Hullo, Chris,' or 'Hullo, Jean.' But it was difficult to reachhim, to know what was in his mind." He seemed not to understand differentemotions and would laugh if one of the children had a temper tantrum orscreamed. (Stephen himself rarely had tantrums at school, but when he waslittle, he would sometimes have them at home.)

Chris was central in Stephen's life between 1982 and 1986. He would often takeStephen, along with his class, on outings in London, to see St. Paul's, tofeed the pigeons in Trafalgar Square, to see Tower Bridge being raised andlowered. These outings finally incited Stephen to words in his ninth year. Hewould recognize all the buildings and places they passed, traveling in theschool bus, and excitedly call out their names. (When he was six he hadlearned to ask for "paper" when he needed it-for many years, he had notunderstood how to ask for anything, even by gesture or pointing. Thistherefore was not only one of his first words, but the first time heunderstood how to use words to address others-the social use of language, something normally achieved by the second year of life.)

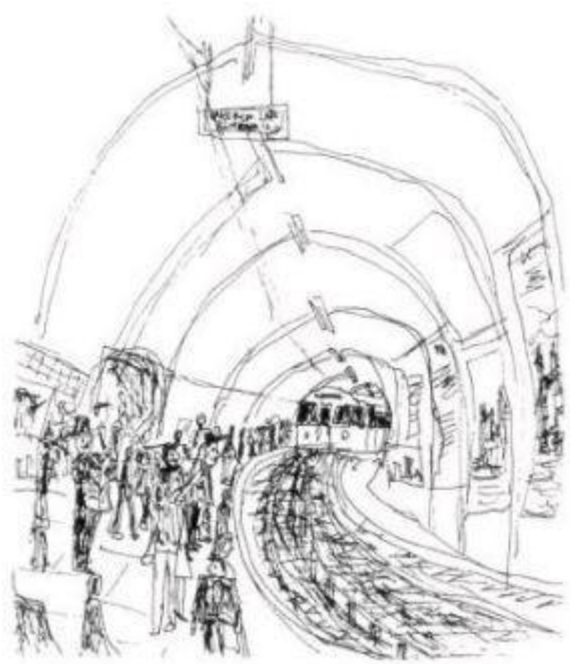
There were some fears that if Stephen began to acquire language he might losehis astounding visual gifts, as had happened, coincidentally or otherwise, with Nadia. But both Chris and Lorraine Cole felt that they had to do theirutmost to enrich Stephen's life, to bring him from his wordless isolation intoa world of interaction and language. They concentrated on making language moreinteresting, more relevant, to Stephen, by linking it with the buildings andplaces he loved, and got him to draw a whole series of buildings based onletters of the alphabet ("A" for Albert Hall, "B" for Buckingham Palace, "C" for County Hall, and so on, right up to "Z" for London Zoo).

Chris wondered if others would find Stephen's drawings as extraordinary as hedid. Early in 1986, he entered two of them in the National Children's ArtExhibition; both were exhibited, and one of them won a prize. Around thistime, Chris also sought an expert opinion on Stephen's abilities from BeateHermelin and Neil O'Connor, psychologists who were well known for their workon autistic savants. They found Stephen one of the most gifted savants theyhad ever tested, immensely proficient in both visual recognition and drawingfrom memory. On the other hand, he did rather poorly in general intelligencetests, scoring a verbal IQ of only 52.

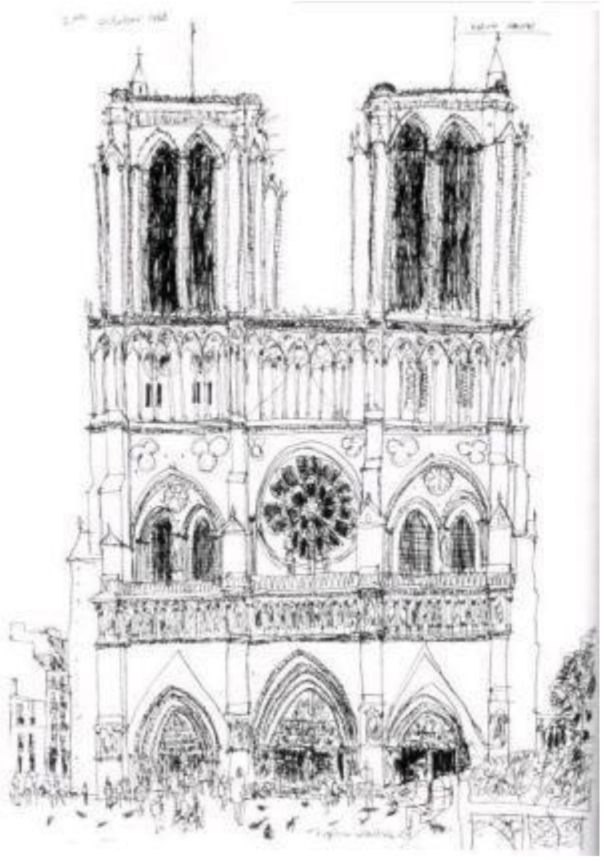
Word of Stephen's extraordinary talents started to spread, and arrangementswere made to film him as part of a BBC program on savants, titled "The FoolishWise Ones." Stephen took the filming very calmly, not at all fazed by camerasand crews-possibly even enjoying it slightly. He was asked to draw St. PanerasStation ("a very 'Stephen' building," as Lorraine Cole emphasized, "elaborate, detailed and incredibly complicated"). The accuracy of his drawing is attestedby a photograph taken at the same time. (There is, however, a curious error: Stephen makes a mirror reversal of the clock and the whole top of thebuilding.) His accuracy was astounding, as were the speed with which he drew, the economy of line, the charm and style of his drawings-it was these that wonviewers' hearts. The BBC program was shown in February of 1987 and aroused astorm of interest-letters poured in, asking where Stephen's drawings could be seen, and publishers offered contracts. Very soon a collection of his work, tobe called simply Drawings, was slated for publication; and it was this Ireceived the proofs of, in June of 1987.



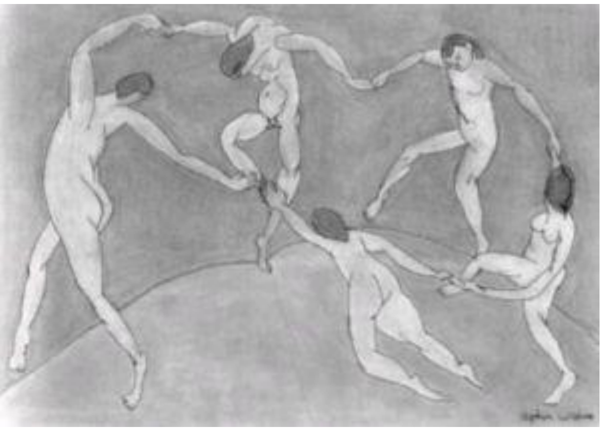
"A is for Albert Hall"



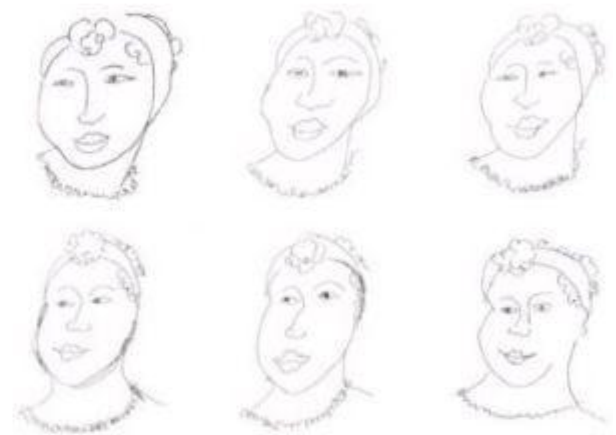
"U is for Underground Train" Part of Stephen's London Alphabet, drawn when hewas ten.



Notre Dame, drawn when Stephen was fourteen.



Stephen's rendition of Matisse's Dance conflates the drawing of the Hermitageversion with the colors of the Museum of Modern Art version (the original version is in color)



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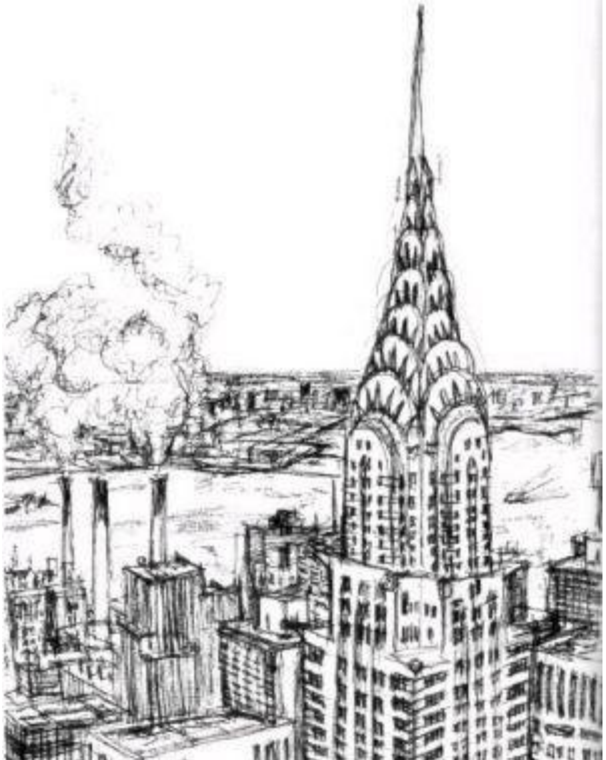
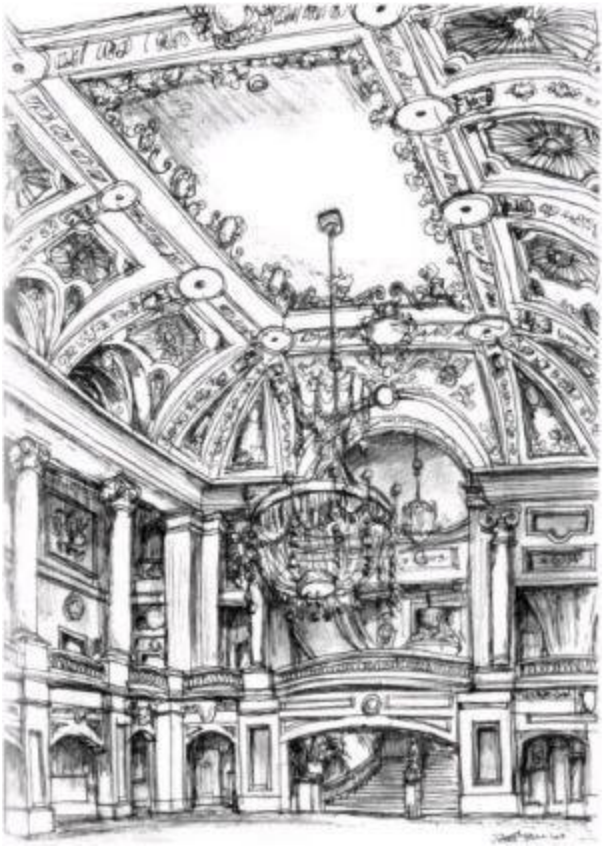
A Matisse face (upper left), reproduced by Stephen directly, and then by memory at hourlyintervals.

The old houses on the Herengracht in Amsterdam, as seen from Stephen's hotel window; and the Doge's Palace in Venice.

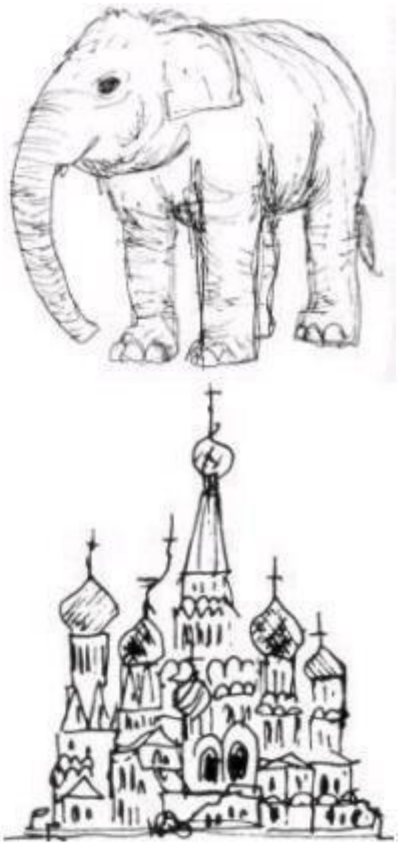
One of several drawings Stephen made of St. Basil's, in Red Square (the original version is in color).



An aerial view of the Chrysler Building in New York, from the top of the Pan Am Building.



A lavish interior at the Chicago Theater.



Three tiny sketches, done at speed: an Arizona landscape, an elephant at the London Zoo, and St. Basil's.

Stephen, only thirteen, was now famous throughout England-but as autistic, asdisabled, as ever. He could draw, with the greatest ease, any street he hadseen; but he could not, unaided, cross one by himself. He could see all Londonin his mind's eye, but its human aspects were unintelligible to him. He couldnot maintain a real conversation with anyone, though, increasingly, he nowshowed a sort of pseudosocial conduct, talking to strangers in anindiscriminate and bizarre way.

Chris had been away for some months in Australia and returned to find hisyoung pupil famous-but, he thought, completely unchanged. "He recognized thathe'd been on TV, and that he'd had a book published, but he didn't gooverboard, as many children would have done. He wasn't affected; he was stillthe Stephen I knew." Stephen had not seemed to miss Chris too much during hisabsence, but seemed glad to see him back, said "Hullo, Chris!" with a bigsmile on his face.

None of this quite added up for me. Here was Stephen being exhibited as asignificant artist-the former president of the Royal Academy of Arts, Sir HughCasson, had called him "possibly the best child artist in Britain"-but Chrisand others, even the most sympathetic, seemed to see him as greatly lacking inboth intellect and identity. The tests that had been given to him seemed toconfirm the severity of his emotional and intellectual defect. Was there, nonetheless, a mental and personal dimension, a depth and sensibility, in himthat could emerge (if nowhere else) in his art? Was not art, quintessen-tially, an expression of a personal vision, a self? Could one be anartist without having a "self"? All these questions had been in my mind sinceI had first seen Stephen's pictures, and I was eager to meet him.

The opportunity came in February of 1988, when Stephen came to New York, accompanied by Chris, to make another television documentary. Stephen had been in New York for a couple of days, seeing and drawing the sights of the city, and- his greatest thrill-flying over it in a helicopter. I thought he mightlike to see City Island, the little island off New York where I live, andinvited him to come to my house. He and Chris arrived in the middle of asnowstorm. Stephen was a demure, grave little black boy, though clearly withan impish side. He looked young to me, closer to ten than thirteen, with asmallish head, tilted to one side. He reminded me somewhat of the autisticchildren I had seen before, with a head-nodding mannerism or tic, and some oddflapping movements of the hands. He never looked at me directly but seemed toglance at me, briefly, out of the corners of his eyes.

I asked him how he was finding New York, and he said "Very nice" with a strongCockney accent. I have little recollection of his saying much else; he tendedto be very quiet, almost mute. But his language had developed a good dealsince the early days, and there were times, Chris said, when he would getexcited and almost babble. He had been very excited on the plane-he had neverflown before-and, Chris told me, "talked with the cabin crew and otherpassengers, showing his book around on the flight." *96*

Stephen wanted to show me his latest drawings, of New York-they were all in aportfolio Chris was carrying-and I admired them (especially the aerial ones hehad done from the helicopter) as he showed them to me. He nodded emphaticallyas he displayed them, calling some of them "good" and "nice." He seemed tohave no sense of either vanity or modesty, but showed me his drawings, commented on them, in an ingenuous way and with a total absence of self-consciousness.

After he had shown me these, I asked him if he would draw something for me, perhaps my house. He nodded, and we wandered outside. It was snowing, cold andwet, not a day to linger. Stephen bestowed a quick, indifferent look at myhouse-there hardly seemed to be any act of attention- glanced then at the restof the road and the sea at the end of the road, then asked to come in. As hetook up his pen and started drawing, I held my breath. "Don't worry," Chrisbroke in, "you can talk at the top of your voice if you want to. It won't makeany difference-you can't interrupt him-he could concentrate if the house wasfalling down." Stephen did not make any sketch or outline, but just started atone edge of the paper (I had a feeling he might have started anywhere at all) and steadily moved across it, as if transcribing some tenacious inner image orvisualization. As he was putting in the porch railings, Chris remarked, "Ididn't see any of that detail there."

"No," said Stephen, his expression implying, "No, you wouldn't."

Stephen had not studied the house, had made no sketches, had not drawn it fromlife, but had, in a brief glance, taken everything in, extracted its essence, seen every detail, held it all in his memory, and then, in a single, swiftline, drawn it. And I did not doubt that, had we let him, he could have drawnthe entire street.

Stephen's drawing was accurate in some ways, but took various liberties inothers-he gave my house a chimney where there was none, but omitted the threefir trees in front of the house, the picket fence around it, and theneighboring houses. He focused on the house to the exclusion of anything else.

It has often been said that savants have photographic or eidetic memories, butas I photocopied Stephen's drawing I thought how unlike a Xerox machine hewas. His pictures in no sense resembled copies or photographs, somethingmechanical and impersonal-there were always additions, subtractions, revisions, and, of course, Stephen's unmistakable style. They were images and showed us some of the immensely complex neural processes that areneeded to make a visual and graphic image. Stephen's drawings were individualconstructions, but could they be seen, in a deeper sense, as creations?

His drawings (like those of my patient José) had a closeness to the actual, aliteralness and naïveté. Clara Park, the mother of an autistic artist, hascalled this an "unusual capacity to render the object as perceived" (notconceived). She also writes of an "unusual capacity for delayed rendition" ascharacteristic of savant artists; this indeed was very striking in Stephen, who, after a single glance at a building, would retain it effortlessly fordays or weeks, and then draw it as if from life.

Sir Hugh Casson wrote in his introduction to Drawings:

Unlike most children, who tend to draw less from direct observation than fromsymbols or images seen secondhand, Stephen Wiltshire draws exactly what hesees-no more, no less.

Artists are full of symbols and images seen second hand and bring to theirdrawings not only the conventions of representation they acquired as children, but the entire history of Western art. It may be necessary to leave thesebehind, to leave behind even the primal category of "objecthood." As Monet putit:

Whenever you go out to paint, try to forget what objects you have in front ofyou-a tree, a house, a field, or whatever& Merely think, here is a littlesqueeze of blue, here an oblong of pink, here a streak of yellow, and paint itjust as it looks to you, the exact color and shape, until it gives your ownnaive impression of the scene before you.

But Stephen (if Casson is right) and José, and Nadia and other savants, maynot have to make such "deconstructions," may not have to relinquish suchconstructs, because (at many levels, from the neural to the cultural) theynever made them in the first place or made them to a far smaller extent. In this way theirsituation is radically different from that of the "normal"-though this doesnot mean that they cannot be artists, too.

I started to wonder, too, about the relationships in Stephen's life: howimportant they were, to what extent they had developed, in the face of hisautism (and devastating early loss). His relationship with Chris Marris, perhaps the most crucial during his last five years at Queensmill, hadthreatened to end when, in July of 1987, Stephen had to leave Queensmill for a secondary school. For a while, Chris had arranged to continue seeing Stephenon weekends, to take him on drawing outings around London, and even on hisfirst trips to New York and Paris. But by May 1989 these expeditions had cometo an end, and Stephen seemed to lack the initiative to do much drawing on hisown. It seemed as if he needed another person to get him going, to"facilitate" his drawing. Whether he missed, or mourned, Chris in a morepersonal way was far less clear.

When I later spoke of Chris to Stephen, hewould talk about him (always as "Chris Marris" or "Mr. Marris") in a very flatand factual way, without any apparent emotion. A normal child would be deeplydistressed at the loss of someone who had been so close for many years, but nosuch distress was apparent in Stephen. I wondered if he was repressing painfulfeelings, or distancing himself from them, but I was not sure whether, in hisautistic way, he even had any personal emotion here at all. ChristopherGillberg writes of a fifteen-year-old autistic boy whose mother had died ofcancer. Asked how he was doing, the boy replied, "Oh, I am all right. You seeI have Asperger syndrome which makes me less vulnerable to the loss of lovedones than are most people." Stephen, of course, would never have been able toarticulate his inner state in this way, and yet one had to wonder whether hetook the loss of Chris with some of the same flatness as Gillberg's youngpatient-and whether such a flatness might not characterize most of the humanrelationships in his life.

Into this void irrupted Margaret Hewson. Margaret had been Stephen's literaryagent since the BBC program two years before and had developed an increasingpersonal and artistic interest in him. I had first met her in 1988, when, withStephen, we roved around London on a drawing expedition. Margaret and Stephen, it was evident to me, got on very well. Stephen, though perhaps incapable atthis point of any depth of feeling or caring, nevertheless showed stronginstinctive responses to different people. He had taken to Margaret from thestart-attracted, I think, by her enormous energy and impetus, theexhilarating, whirlwind atmosphere she seemed to create all around her, and byher obvious feeling for him and his art. Margaret seemed to know everyone andhave been everywhere, and perhaps this gave Stephen a sense of a larger world, of horizons far beyond the narrow ones that had confined his life hitherto.

Margaret, finally, was very knowledgeable about art, a knowledge that extendedfrom art history to the technical details of drawing.

In the fall of 1989, Margaret began obtaining drawing commissions for Stephenand taking him out drawing every weekend, along with her husband and partnerin the literary agency, Andrew. She instantly abolished the use of tracingpaper and rulers (such as he had used for some of the drawings in his secondbook, Cities, published in 1989), and insisted he draw freehand in ink. "Onecan learn the value of a line only by going straight into ink and makingmistakes," she declared. Under Margaret's impetus and guidance, Stephenstarted to draw regularly once again, and to draw more boldly than he had everdone. (And yet even in Cities there had been some extraordinary freehandimprovisations-imaginary cities, which Stephen had conceived, conflating thefeatures of several real ones.)

After a morning of traveling and drawing, they would all return to the Hewsonhouse for lunch, where they would often be joined by the Hewsons' daughter, Annie, only a few years older than Stephen. He seemed to look forward to these outings and wouldbecome excited on Sunday mornings, waiting for Margaret and Andrew to collecthim. For their part, the Hewsons felt a real affection for Stephen, eventhough they were not sure he felt any actual affection for them. They startedtaking him on occasional longer excursions-a trip to Salisbury, and twoweekends in Scotland.

Stephen's obvious fondness for the visual effects of water-he lived near acanal in London and would sometimes walk along it with his mother or sisterand do little sketches of the boats and locks-suggested to Margaret a themefor a new book. Together they would visit cities built around canals, "floating cities"-Venice, Amsterdam, and Leningrad- and draw these.

Late in the fall of 1989, Margaret impulsively phoned up Mrs. Wiltshire andsuggested that Stephen and his sister, Annette, come to Venice with them fortheir Christmas holiday. The trip went exceedingly well. Stephen, now fifteen, seemed to cope easily with the uncertainties of travel, which would havethrown him only a few years before. He portrayed, as Margaret hoped he might, St. Mark's, the Doge's Palace, the great monuments of Venetian culture, andobviously enjoyed drawing them. But when asked what he thought of Venice, after a week in this high point of European civilization, he could only say, "I prefer Chicago" (and this not because of its buildings but its Americancars-Stephen had a passion for these and could identify, name, and draw everypostwar model ever made in the United States).

A few weeks later, plans were made for his next trip, to Amsterdam. Stephenapproved of the trip for a very specific reason: he had seen photographs ofthe city, and said, "I prefer Amsterdam to Venice because it has cars." Onceagain, Stephen captured perfectly the feeling of the city, from his formaldrawings of the Westerkerk and the Begijnhof to his tiny, charming sketch ofan odd statue with a street organ. Stephen seemed very much alive, and in highhumor, in Amsterdam and started to show new aspects of himself. Lorraine Cole, who came along on the trip, was particularly startled at the changes she saw:

When he was little, nothing was amusing to Stephen. He now finds all manner ofthings funny and his laughter is incredibly infectious. He has gone back tocaricaturing people around him, and he takes great pleasure watching hisvictims' reactions.

One evening in Amsterdam, when Stephen was due to give an interview for atelevision show, Margaret developed a severe attack of asthma and had to stayin her hotel room. Stephen was very distressed, refused to do the TV show, andcould not be budged from the end of Margaret's bed. "I'm going to stay withyou till you get better," he declared. "You're not going to die." Margaret andAndrew were very touched by this.

"This was the first time we saw that he cared," she told me. *97*

Was it possible that Stephen was starting to show some belated personaldevelopment, in spite of his autism? Intrigued by Margaret's report on theAmsterdam trip, I arranged to come along on the next visit, to Moscow andLeningrad, planned for May of 1990. I flew to London, met Stephen and Margaretthere, and did some testing with Stephen. These tests, devised by Uta Frithand her colleagues, require one to react to various cartoons, some of whichrelate simple sequences of events while others cannot be understood withoutattributing different intentions, perspectives, beliefs, or states of mind(and sometimes dissemblings) to the characters involved. Stephen, it wasclear, had a very limited ability to imagine others' states of mind. (Frith writes that one researcher "carried outan informal survey in America using cartoons from The New Yorker. Very ableand highly educated autistic people failed to understand them, or find themfunny.")

I also gave him a large jigsaw puzzle, which he put together very swiftly. Ithen gave him a second puzzle, this time face down, so that he did not havethe picture to assist him. He did this just as quickly as the first. Thepicture-meaning- it seemed, was not necessary to him; what was preeminent, andspectacular, was his ability to apprehend a large number of abstract shapes, and to see in a trice how they fitted together.

Such performances are characteristic of autistic people, who also excel intests of block design and especially in finding embedded figures. Thus thepsychologist Lynn Waterhouse, testing one visual savant, J.D. (who as a boy, his parents said, was able to complete a five-hundred-piece jigsaw puzzle inabout two minutes and thereafter had to be given five-thousand-piece puzzles), found he performed "phenomenally well" on almost every visual-perception testshe could give him: on tests of line orientation, visual gestalt closure, block design, and so on, he obtained nearly perfect results, in each caseperforming the tests at many times the normal rate. Stephen, like J.D., hadprodigious powers of abstract-pattern recognition and visual analysis. Butthis alone could not explain his drawing-J.D., despite his perceptual powers, was not especially gifted in drawing.

Stephen, then, was calling on another sort of power, of vividrepresentation-representation that created an external form for hisperceptions, and that bore a very recognizable and personal style. Whetherthis power of representation entailed any depth of inner resonance or responseremained completely unclear.

Given Stephen's powers of abstract visual analysis, how important was"meaning" to him? How much did he get the meaning of what he drew? And howmuch did it matter whether he did or not? I showed Stephen a portrait byMatisse and asked if he would draw it. (Margaret and Andrew are very fond ofMatisse, and it was a print of theirs that I showed Stephen.) He drew it, fromthe original, swiftly and confidently; it was not wholly, literally accurate, but it was very Matisse-like. When I asked him to draw it again, from memory, an hour later, he drew it differently, and, another hour after this, yetdifferently again; but all his drawings (he did five in all), while differentin detail, were strikingly evocative of the original. In some sense, therefore, Stephen had extracted the drawing's "Matisseness," had permuted itvarious ways, and had made this central in all his copies. Was this purelyformal, cognitive, a matter of getting Matisse's "style" in a formulaic way-orwas he responding, at a deeper level, to Matisse's vision, his sensibility andart?

Stephen's first drawing of my house was done from memory, after taking a quickglance on his first visit in February 1988. The second, also from memory, wasdone more than two years later; the third a year after this. Although he haschanged various details with the passage of time, he manages to extract the"style" of the house in each version.

I asked Stephen if he remembered my house, which he had visited more than twoyears before, and if he would draw it again for me. He nodded and again drewthe house, but with various revisions. He now gave it one lower window insteadof two; he removed a pillar from the porch and made the steps more prominent.

He kept the (fictitious) chimney, and now he added a fictitious American flagon a tall flagstaff as well-I think he felt these as the ingredients of aformulary "American" house. Thus the Matisse and my house were conceived, andrepresented, in a variety of versions. In both cases, he got the style atonce, and his later drawings were improvisations within this style.

After all this testing, I was still bewildered. Stephen seemed so defective, and so gifted, simultaneously; were his defects and his gifts totallyseparate, or were they, at a deeper level, integrally related? Were therequalities, like autistic literal-ness and concreteness, that might in some contexts be gifts, in others deficits? The tests also gave me a feeling ofdisquiet, as if I had spent days reducing Stephen to defects and gifts and notseeing him as a human being, as a whole. I had just reread Uta Frith's bookAutism: Explaining the Enigma and wrote to her, "Tomorrow I go with Stephen toRussia& I have seen something of his odd skills and defects-I have yet to seehim as a mind and person. Perhaps a week of being with him will show me this."

With these hopes, then, I set out with Stephen for Russia. Sitting at Gatwickairport, waiting for our flight, I was impressed by his deep concentration. Hesat enthralled with the magazine Classic Cars. He looked at the pictures withextraordinary intentness-he did not raise his head from the magazine for morethan twenty minutes. Occasionally he bent closer to inspect a detail-what hesaw, I thought, would be forever imprinted on his cortex. Once in a while, hesuddenly laughed. What, in this abstract exercise, excited his amusement?

In flight, Stephen immersed himself in a drawing of Balmoral, after studying apostcard of the castle. He was oblivious of the conversations going on aroundhim, the magnificent landscapes and seascapes below.

At Moscow airport, Stephen, very quiet, looked at the cars- yellow cabs andblack Zils with license plates starting with "MK." A hideous smell ofunrefined gas hung over the airport. Stephen sniffed, wrinkled his nose; he isextremely sensitive to smells. As we drove into the city, at 2 a.m., we sawtall, silvery birches by the side of the road and an immense, low moon. EvenStephen, seemingly oblivious of his surroundings before, gazed at the vastmoonlit landscape with delight, his nose pressed against the cold window ofthe bus.

The next morning, as we walked around Red Square, Stephen was activelycurious, taking snapshots, peering at buildings, struck by their novelty.

Other people turned around and stared at him in the street-black people, apparently, were unusual in Moscow. He found a spot from which he wanted todraw the Spassky Tower and had Margaret set his stool in precisely this place.

Not there, or there, but here-passive in so many ways, he was entirely masternow. In the middle of Red Square, he was a tiny figure, wearing a fur cap andnavy-blue woolen gloves. Dozens of tourists swarmed around in the brilliantMay sun; many of them peered at Stephen's drawing.

Stephen ignored them, or was unconscious of them, and drew on undisturbed. Hehummed to himself as he drew, holding his pen, characteristically, awkwardly, childishly, between his third and fourth fingers. At one point he broke intogiggles and laughter-but this, it turned out, was because a scene in Rain Man("Don't you dare drive!" he said) kept entering his mind. Margaret sat to oneside as he drew, encouraging- "Good! Clever boy!"-advising him on aestheticpoints and architectural details. At her suggestion, for instance, Stephenexamined the tower's crenellation. She is almost a collaborator in a way, andthough his talent is so personal and indigenous, he clearly looks to her foraffectionate and always affirmative comments.

Later, we visited the History Museum, an eclectic red brick building, designedby an English architect. Margaret instructed Stephen, "Have a jolly good lookat that building. Study it. Take in the vocabulary of that building now-I wantyou to draw it from memory afterward. " But what Stephen actually drew laterwas different from the History Museum and bore half a dozen onion domes, notpresent in the original.

I first wondered whether this was a defect of memory and asked him if he woulddraw St. Basil's from memory. He did this instantly, a very accurate and quitecharming sketch, in all of two minutes. Later in the day, he started a drawingof the vast shopping arcade at GUM, which he finished at leisure over a Cokein the hotel. He had retained by memory even the shop signs, although theywere, to him, unintelligible Cyrillic letters. There was no faulting hismemory, clearly.

Margaret and I tried to think what had happened with the History Museum; Stephen was distracted when asked to memorize it (the police in Red Squaremade him nervous) and when asked how he felt about it would only say, "It'sall right" (which meant he did not like it). He tried to make it moreattractive, I think, by crowning it with onion domes, but these were so out ofkeeping with the base that the resulting building looked hardly possible.

The next morning, as we met for breakfast in the hotel dining room, Stephen greeted me with a booming "Hullo, Oliver!" shouted with great friendliness andwarmth, or so I thought. But then I was not sure-was it merely a socialautomatism? The great neurologist Kurt Goldstein wrote of another autisticboy:

He becomes fond of some people& At the same time, however, his emotionalresponses and human attachments remain shallow and perfunctory. Meeting him atintervals of several months, one is welcomed and bid goodbye with the sameimpersonal kindness as if contact were only real as long as it lasted duringconcrete presence& it is a presence without emotional content.

At an Intourist shop, I bought a piece of amber. Stephen glanced at itindifferently-it held no visual appeal for him- until I rubbed it and showedhim how it became electrically charged. It attracted tiny pieces of paper now, so that when I put the amber a few inches away they suddenly flew up to it.

His eyes opened wide in astonishment; he took the amber from me and repeatedthe electrification by himself. But then his wonder seemed to fade. He did notask what happened or why, and he seemed uninterested when I explained it. Iwas excited at seeing his initial astonishment-I had never seen him trulyastonished before-but then it faded, died out. And this, to me, seemed ratherominous.

At dinner, chortling, Stephen drew a cartoon of us all at the table, withhimself fanning me. (I am sensitive to heat and always carry a Japanese fan, which he had often seen me use.) He portrayed me as cowering under the impactof the fan, and himself as large, powerful, in command-this was a symbolicrepresentation, the first one I had seen him make.

Traveling, living with Stephen-we had now been together for five days-I becamevery conscious of how brittle he was physiologically, of the profoundfluctuations in his state. There were times when he was animated and interested in his surroundings and could do brilliant, funny impersonationsand cartoons; and there were times when he would revert to the deepest autism and respond, if at all, like an automaton, echolalically.

Such fluctuations, usually lasting a few hours, rarely days, are common inchildren with classical autism, though their cause is not understood. They hadbeen much worse, I was told, when Stephen was younger.

The next day we boarded a train for the daylong journey to Leningrad. Margarethad put together a huge hamper of provisions, more than enough for ourselvesand any fellow passengers in the compartment. As the train got under way, westarted with an early breakfast-we had left the hotel at five to make thisearly train. As she unpacked the basket, Stephen, half convulsively, swoopedhis head and sniffed everything as it came out. I was reminded of some of mypostencephalitic patients, and some people with Tourette's syndrome, whom Ihad also seen with olfactory behaviors of this sort. I suddenly realized thatStephen's smell-world might be as vivid as his visual one; but we do not havethe language, the means, to convey such a world.

Stephen gazed uncertainly at our hard-boiled eggs-was it possible that he hadnever cracked one open? Playfully, I took one and cracked it on my head; Stephen was delighted and burst out laughing. He had never seen a hard-boiledegg cracked in this way, and he gave me a second egg to see if I would do itagain, and then, reassured, cracked one on his own head. There was somethingspontaneous in this egg cracking, and I think Stephen felt easier with meafter this, because I had shown him how playful, how silly, I could be.

After breakfast, Stephen and I played some word games. He was quite good at ISpy, and when I prompted him with "I spy with my little eye somethingbeginning with 'c,' " he quickly reeled off "Coat, cat, café, coffee, cool, cup, cigarette." He was very good at filling in letters in incomplete words.

And yet, at sixteen, he was still unable, despite repeated demonstrations, tojudge the constancy of volume, despite differing heights, in differentvessels-a concept that, as Piaget showed, most children grasp at seven.

The train passed through tiny villages of wooden houses and painted churches, giving me the sense of a Tolstoyan world, unchanged in a hundred years. AsStephen watched all this intently, I thought of the thousands of images hemust be registering, constructing-all of which he could convey in vividpictures and vignettes, but none of them, I suspected, synthesized into anygeneral impression in his mind. I had the feeling that the whole visible worldflowed through Stephen like a river, without making sense, without beingappropriated, without becoming part of him in the least. That though he mightretain everything he saw, in a sense, it was retained as something external, unintegrated, never built on, connected, revised, never influencing orinfluenced by anything else.

I thought of his perception, his memory, asquasi-mechanical- like a vast store, or library, or archive-not even indexedor categorized, or held together by association, yet where anything might beaccessed in an instant, as in the random-access memory of a computer. I foundmyself thinking of him as a sort of train himself, a perceptual missile, traveling through life, noting, recording, but never appropriating, a sort oftransmitter of all that rushed past-but himself unchanged, unfed, by theexperience.

As we approached Leningrad, Stephen decided it was time to draw. "Pencil, Margaret, dahhling!" he said. I was amused by the "dahhling," a Margaretismthat he had adopted, and I could not decide whether it was automatic or moreconscious, a humorous parody. The train was very jolty, and I was able to makeonly brief notes. But Stephen was perfectly able to draw, with his usual speedand fluency,- I had been amazed by this earlier, on the airplane. (He lookedclumsy, but he picked up some motor skills, it seemed, almost instantly, assome autistic people seem to do. In Amsterdam, he had had no hesitation inwalking a narrow gangway to a houseboat, something he had never done before, and this reminded me of another autistic youngster I had met, who suddenlywalked a tightrope, expertly and fearlessly, the day after seeing it done at the circus.)

Finally, after eleven hours of slow traveling-rural Russia slowly unrollingbefore us-we arrived at a grand station in Leningrad, a station of faded, prerevolutionary, czarist splendor. The whole panorama of the city, with itsfine, low, eighteenth-century buildings, its sense of European cosmopolitancivilization, could be seen from our hotel windows, glittering in the northernwhite night. Stephen was eager to see it in full daylight and decided he woulddraw it the next morning, first thing. I was not in the room when he started, but Margaret told me later that he made an interesting false start. There wasa famous old cruiser, the Aurora, moored in the Neva, and Stephen had drawn itway out of proportion to the buildings on the other side. When he realizedwhat he had done, he said, "I'll just start again. It's no good. It won'twork." He tore off another sheet of paper and started again.

The flagrant incongruity, initially, between boat and buildings made me thinkof other, smaller incongruities in his work, the fact that he might usemultiple perspectives in his drawings and that these did not always precisely coincide. *98*

Later that day, we went to the Alexander Nevsky Monastery and found ourselves, unexpectedly, in the middle of a Russian Orthodox wedding. The choir consistedof a gaunt, ragged huddle, led by a blind woman with blazing blue eyes. Buttheir voices were marvelous, almost beyond bearing, especially that of thebasso profundo, who looked, Margaret and I felt, like an escapee from theGulag. Margaret thought that Stephen was unaffected by their voices, but Ifelt the opposite, that he was profoundly affected-a measure of how difficultit was, at times, to know what he was feeling.

The climax of our time in Leningrad was a visit to the Hermitage, but Stephenshowed a somewhat childish reaction to the incredible paintings there. "Seehow it's built up in blocks?" Margaret said of one Picasso, a woman with atilted head. Stephen merely asked, "Has she got a pain?"

Margaret told Stephen to take special note of the Matisse Dance, and Stephengazed at it, without much sign of interest, for a full thirty seconds. Back inLondon, Margaret suggested he draw it, and he did-unhesitatingly, brilliantly.

It was only later that a curious conflation was noted (again by the observantMr. Williamson): Stephen had used the forms of the dancers in the Hermitagepainting but had given them the colors of another version of the painting(which hangs in the Museum of Modern Art in New York). His sister, Annette, itturned out, had given him a poster of the MOMA Dance years before, and now hegave the "American" colors to the "Russian" picture. One might wonder whetherthis was a lapse of memory or a confusion, but Stephen, I suspect, was beingplayful, and decided to give the Hermitage picture the MOMA colors, as hedecided to give the History Museum onion domes (or, for that matter, my housea chimney, or, in another drawing, the Rockefeller Center Prometheus a penis).

Weary from a day of touring and drawing, we left the Hermitage and headed backto our hotel for tea. Seeing that Stephen needed some diversion, Margaret saidto him, "You be the teacher now& You, Oliver, the pupil."

A glint appeared in Stephen's eye. "What is two take away one?" he asked.

"One," I said promptly.

"Good! Now twenty minus ten?"

I pretended to think for a bit, then said, "Ten."

"That's very good," Stephen said. "Now sixty minus ten?"

I cogitated hard, screwed up my face. "Forty?" I said.

"No," said Stephen. "Wrong. Think!"

I tried to help myself by holding up my fingers in multiples of ten. "I've gotit-fifty."

"Right," said Stephen, with an approving smile. "Very good. Now, forty minustwenty."

That was really difficult. I thought for a full minute. "Ten?" "No," saidStephen. "You must concentrate! But you did pretty well," he added kindly.

The episode was a stunning imitation of an arithmetic lesson such as one mightgive to a retarded child. Stephen's voice, his gestures, mimicked toperfection those of a well-meaning but condescending teacher, specifically (Ifelt with some discomfort) mine when I had tested him in London. He had notforgotten this. It was a lesson to me, to all of us, never to underestimatehim. Stephen delighted in reversing roles, just as in his cartoon of himselffanning me.

The Russia trip was in some ways delightful, exciting, in others saddening, disappointing, disillusioning. I had hoped to get behind Stephen's autism, tosee the person underneath, the mind; but there had been only the merestintimation of this. I had hoped, perhaps sentimentally, for some depth offeeling from him; my heart had leapt at the first "Hullo, Oliver!" but therehad been no follow-up. I wanted to be liked by Stephen, or at least seen as adistinct person-but there was something, not unfriendly, butde-differentiating in his attitude, even in his indifferent, automatic goodmanners and good humor. I had wanted some interaction,- instead, I got aslight sense, perhaps, of how parents of autistic children must feel when theyfind themselves faced with a virtually unresponsive child. I had still, insome sense, been expecting a relatively normal person, with certain gifts andcertain problems-now I had the sense of a radically different, almost alienmode of mind and being, proceeding in its own way, not to be defined by any of my own norms.

Yet there were times-the egg cracking, the pupil-and-teacher gametogether-when I felt a current between us, so I still hoped for some sort ofrelationship with him and made a point of visiting him each time I went toLondon, generally a few times a year. On one or two occasions I was ablesimply to go for a walk with Stephen. I hoped, still, that he might unwind, show me something of his spontaneous, "real" self. But though he would always greet me with his cheery "Hullo, Oliver!" he remainedas courteous, as grave, as remote as ever.

There was, however, one enthusiasm we shared-a fondness for car spotting.

Stephen especially liked the grand convertibles of the 1950s and 1960s. Myfavorite cars, by contrast, were the sports cars of my youth-Bristols, Frazer-Nashes, old Jags, Aston Martins. Between us we could identify most ofthe cars on the road, and Stephen, I think, came to see me as an ally orcomrade in the game of car spotting-but this was as close as we ever got.

Floating Cities was published in February of 1991, and quickly went to the topof the best-seller list in England. Stephen was told this, and said, "Verynice!" He seemed unaffected or uncomprehending, and that was the sum of it. Hewas, at this point, going to a new technical school, learning to be a cook, taking public transport, and beginning to acquire some of the skills ofindependent life. But Sundays remained consecrated to drawing, and his work, commissioned and uncommissioned, multiplied each weekend.

The question of Stephen's artistic talents often reminded me of Martin, aretarded musical and mnemonic savant whom I saw in the 1980s. Martin loved operas-his father had been a famous opera singer-and could retain them after asingle hearing. ("I know more than two thousand operas," he once told me.) Buthis greatest passion was for Bach, and I thought it curious that this simpleman should have such a passion. Bach seemed so intellectual, and Martin was aretardate. What I did not realize-until I started bringing in cassettes of thecantatas, of the Goldberg Variations, and once of the Magnificat-was that, whatever his general intellectual limitations, Martin had a musicalintelligence fully up to appreciating all the structural rules andcomplexities of Bach, all the intricacies of contrapuntal and fugal writing; he had the musical intelligence of a professional musician.

I had never before properly recognized the cognitive structure of savanttalents. I had, by and large, taken them to be an expression of rote memory and little else. Martin, indeed, had a prodigiousmemory, but it was clear that this memory, in relation to Bach, was structuralor categorical (and specifically architectonic)-he understood how the musicwent together, how this variation was an inversion of that, how differentvoices could take up a line and combine them in a canon or fugue, and he couldconstruct a simple fugue himself. He knew, for at least a few bars ahead, howa line would go. He could not formulate this, it was not explicit orconscious, but there was a remarkable implicit understanding of musical form.

Having seen this in Martin, I could now see analogues in the artistic, calendrical, and calculating savants I had also worked with. All of them had agenuine intelligence, but intelligence of a peculiar sort, confined to limitedcognitive domains. Indeed, savants provide the strongest evidence that therecan be many different forms of intelligence, all potentially independent ofeach other. The psychologist Howard Gardner expresses this in Frames of Mind:

In the case of the idiot savant & we behold the unique sparing of oneparticular human ability against a background of mediocre or highly retardedhuman performances in other domains& the existence of these populationsallows us to observe the human intelligence in relative-evensplendid-isolation.

Gardner postulates a multitude of separate and separable intelligences-visual, musical, lexical, etc.-all of them autonomous and independent, with their ownpowers of apprehending regularities and structures in each cognitive domain, their own "rules," and probably their own neural bases. *99*

In the early 1980s this notion was put to the test by Beate Hermelin and hercolleagues, exploring the powers of many different forms of savant talents.

They found that visual savants were far more efficient than normal people atextracting the essential features from a scene or design, and at drawingthese, and that their memory was not photographic or eidetic, but, rather,

categorical and analytic, with a power to select and seize on "significantfeatures," using these to build their own images.

It was also evident that once a structural "formula" had been extracted, itcould be used to generate permutations and variations. Hermelin and hercolleagues, along with Treffert, also worked with the blind, retarded, andenormously gifted musical prodigy Leslie Lemke, who, like Blind Tom a centuryago, is as renowned for his improvisational powers as for his incrediblemusical memory. Lemke catches the style of any composer, from Bach to Bartok, after a single hearing, and can thereafter play any piece or improvise, effortlessly, in that style.

These studies seemed to confirm that there were indeed a number of separate, autonomous cognitive powers or intelligences, each with its own algorithms andrules, precisely as Gardner had hypothesized. There had been a certaintendency before this to see savant abilities as extraordinary, as freakish; but now they seemed to be brought back into the realm of the "normal," differing from ordinary abilities only by being isolated and heightened indegree.

But do savant powers really resemble normal ones? One cannot have contact witha Stephen, a Nadia, a Martin, with any savant, without sensing somethingdeeply other in action. It is not just that savant performances are off thescale, statistically, or incredibly precocious in their first appearance(Martin could sing bits of operas before he was two)-but that they seem todeviate radically from normal developmental patterns. This was particularlyclear with Nadia, who seemingly skipped the normal scribbling, schematic, andtadpole stages, and when she drew did so in a way unlike any normal child. So it was with Stephen, who at seven, we know from Chris, did "the mostunchildlike drawings" he had ever seen.

The other side of the prodigiousness and precocity, the unchildlikeness, ofsavant gifts is that they do not seem to develop as normal talents do. Theyare fully fledged from the start. Stephen's art at seven was clearlyprodigious, but at nineteen, though he may have developed a bit socially andpersonally, his talent itself had not developed too greatly. Savant talents insome ways resemble devices, ready-made, preset, and ready to go off. And thisis how Gardner speaks of them: "Assume that the human mind consists of aseries of highly tuned computational devices& and that we differ vastly fromone another in the extent to which each of these devices is 'primed' to gooff."

Savant talents, further, have a more autonomous, even automatic quality thannormal ones. They do not seem to occupy the mind or attention fully-Stephenwill look around, listen to his Walkman, sing, or even talk while he isdrawing; Jede-diah Buxton's huge calculations moved ahead at their own fixed, imperturbable rate while he went on with his daily life. Savant talents do notseem to connect, as normal talents do, to the rest of the person. All this isstrongly suggestive of a neural mechanism different from that which underliesnormal talents.

It may be that savants have a highly specialized, immensely developed systemin the brain, a "neuromodule, " and that this is "switched on" at particulartimes-when the right stimulus (musical, visual, whatever) meets the system atthe right time-and immediately starts to operate full blast. Thus, for thetwin calendar savants, seeing an almanac at the age of six set off theirextraordinary calendrical skill-they were able, straightaway, to seelarge-scale structural regularities in the calendar, perhaps to extractunconscious rules and algorithms, to see how the correspondence of dates anddays could be predicted, which the rest of us, if we could do at all, could doonly with consciously worked out algorithms and a great deal of time andpractice.

The converse of this sudden kindling or turning on is also seen on occasion inthe sudden disappearance of savant talents, whether in retarded or autisticsavants, or normal individuals with savant capacities. Vladimir Nabokov possessed, in addition to his many other talents, a prodigious calculatinggift, but this disappeared suddenly and completely, he wrote, following a highfever, with delirium, at the age of seven. Nabokov felt that the calculatinggift, which came and went so mysteriously, had little to do with "him" andseemed to obey laws of its own-it was different in kind from the rest of his powers.

Normal talents do not come and go in this way; they show development, persist, enlarge, take on a personal style as they establish connections, and embedthemselves, increasingly, in the mind and personality. They lack the peculiarisolation, uninfluenceability, and automaticity of savant talents.[100]

But a mind is not just a collection of talents. One cannot maintain a purelycomposite or modular view of the mind, as many neurologists and psychologistsnow do. This removes that general quality of mind-call it reach or range orsize or spaciousness-that is always instantly recognizable in normal people.

It is a capacity that seems to be supramodal, and that shines through whateverparticular talents there are. This is what we mean when we say that someone has "a fine mind." A modular view of themind, no less importantly, also removes the personal center, the self, the"I." Normally, there is a cohering and unifying power (Coleridge calls it an"esemplastic" power) that integrates all the separate faculties of mind, integrates them, too, with our experiences and emotions, so that they take ona uniquely personal cast. It is this global or integrating power that allowsus to generalize and reflect, to develop subjectivity and a self-consciousself.

Kurt Goldstein was especially interested in such a global capacity, which hereferred to as the organism's "abstract-categorical capacity," or "abstractattitude." Part of Goldstein's work was concerned with the effects of brain damage, and he found that whenever there was extensive damage, or damageinvolving the frontal lobes of the brain, there tended to be, over and abovethe impairments of specific abilities (linguistic, visual, whatever), animpairment of abstract-categorical capacity-often as damaging as, sometimesfar more damaging than, the specific impairments. Goldstein also exploredvarious developmental problems and (with his colleagues Martin Scheerer andEva Rothmann) published the deepest study ever made of an idiot savant. Theirsubject, L., was a profoundly autistic boy, with remarkable musical, "mathematical," and memorial talents. In their 1945 paper "A Case of 'IdiotSavant': An Experimental Study of Personality Organization," they comment onthe limitations of a multifactorial, or composite, theory of mind:

[If] there exists& only a composite of individual capabilities which are soindependent from each other& L. should have theoretically been able to becomea proficient musician and mathematician& Since this contradicts the facts of the case, we have to explain [why he did not]& despite his "interests" and"training."

He did not, they conclude, because, for all his impressive and real talents, there was something else, something global, irremediably missing:

L. suffers from an impairment of abstract attitude affecting his totalbehaviour throughout. This expresses itself in the linguistic sphere by his"inability" to understand or to use language in its symbolic or conceptualmeaning; to grasp or formulate properties of objects in the abstract& to raise the question "why" regarding real happenings, to deal with fictitioussituations, to comprehend their rationale& The same impairment underlies hislack of social awareness and of curiosity in people, his limited values; hisinability to register or absorb anything of the socio-cultural and interhumanmatrix around him& The same impairment to abstract is evidenced in his[savant] performance& [which] cannot be lifted out of its concrete contextfor reflection and verbalization& Owing to his impaired abstract attitude, L. cannot develop his endowment, actively and creatively& [It remains] abnormally concrete, specific and sterile; it cannot become integrated with abroader meaning of the subject, nor with social insight& [It] approachesrather a caricature of a normal talent.

If Goldstein's formulations about idiot savants and autism are generallyvalid, and if Stephen is indeed lacking, or relatively lacking, in abstractattitude, how much of an identity, or a self, might he be able to acquire?

What power of reflective consciousness might be possible for him? To whatextent can he learn or be influenced by personal or cultural contact? To whatextent can he make such contact? How much can he develop a genuine sensibilityor style? How much is any personal (as opposed to technical) developmentpossible for him? What might be the resonances of all this for his art? Theseand many other questions, which one encounters with the paradox of an immensetalent attached to a relatively rudimentary mind and identity, become sharperin the light of Goldstein's considerations.

In October 1991, I met Stephen in San Francisco. I was struck by how much hehad changed since I last saw him-now seventeen, he was taller, handsomer, and his voice deeper. He was excited to be in San Francisco and kept describing the scenes he had seen on television of the 1989 earthquake, in short, haiku-like phrases: "Bridges snapped. Cars crushed. Gas bursting. Hydrants flowing. Gaps opening. People flying."

On the first day, we climbed to the top of Pacific Heights. Stephen started drawing Broderick Street, which snakes up to the top of the hill. He looked around vaguely while he was drawing, but was mostly engrossed in listening to his Walkman. We had asked him earlier why Broderick snaked, instead of going straight up. He could not say, or see, that it was because of its steepness, and when Margaret said "steep" to him, he just repeated it, echolalically. He still seemed clearly retarded or cognitively defective.

As we walked, we came upon a sudden enchanting revelation of the bay, dotted with ships, and with Alcatraz set like a gem in the middle. But, for a moment, I did not "see" this, I did not see a scene at all, just an intricate pattern of many colors, a highly abstract, uncategorized mass of sensations. Was this how Stephen saw it?

Stephen's favorite building in San Francisco was the Transamerica Pyramid. When I asked him why, he said, "Its shape," and then, with an uncertain air, "It's a triangle, an isosceles triangle& I like that!" I was struck by the fact that Stephen, with his often primitive language, should use the word "isosceles"-though it is typical of autistic people, sometimes in early childhood, that they may acquire geometrical concepts and terms to a far greater degree than personal or social ones. *101*

He has very little explicit understanding of autism-this came out in an unlikely incident on Polk Street. We had, by a million-to-one chance, got behind a car with a license plate that spelled "autism." I pointed it out to Stephen. "What does that say?" I asked. He spelled it out, laboriously, "A-U-T-I-S-M-2."

"Yes," I said, "and that reads?"

"U& U& Utism," he stuttered.

"Almost, not quite. Not utism-autism. What is autism?"

"It's what's on that license plate," he answered, and I could get no further.

Clearly, he recognizes that he is different, that he is special. He has a veritable passion for Rain Man and, one must suspect, identifies with the Dustin Hoffman character, perhaps the only autistic hero ever widely portrayed. He has the entire soundtrack of the film on tape and plays it continually on his Walkman. Indeed, he can recite large portions of the dialogue, taking every part, with perfect intonation. (His preoccupation with the film and his constant playing of the cassette have not distracted him at all from his art-he can draw wonderfully even though his attention seems to be elsewhere-but it has made him far less accessible to conversation and social contact.)

Going along with Stephen's obsession with Rain Man is his fervent desire to visit Las Vegas. He wanted, when we got there, to spend time in a casino, as Rain Man had, and not, in his usual way, to see the buildings in town. So we spent a single night there and then, in a 1991 Lincoln Continental, set out across the desert, for Arizona. "He would have preferred a 1972 Chevrolet Impala," Margaret told me, but this, to Stephen's disappointment, was not available.

We pulled up to a parking lot near the Grand Canyon- part of the canyon was visible from here, but Stephen's attention was immediately distracted by the other cars in the lot. When I asked what he thought of the canyon, he said, "It's very, very nice, a very nice scene."

"What does it remind you of?"

"Like buildings, architecture," Stephen answered.

We found a spot for Stephen to draw the North Rim of the canyon. He started to draw, less fluently and assuredly, perhaps, than he would draw a building; but he seemed to extract the basic architecture of the rocks nonetheless. "You're a genius, Stephen," Margaret remarked.

Stephen nodded, smiled. "Ya, ya."

Knowing Stephen's love of aerial views, we decided to fly over the GrandCanyon in a helicopter. Stephen was excited and kept craning his head in alldirections as we flew low through the canyon, skimming the North Rim, and thenhigher and higher to get a bird's-eye view of the whole. Our pilot kepttalking about the geology and history of the canyon, but Stephen ignored him, and, I think, saw only shapes-lines, boundaries, shadows, shadings, colors, perspectives. And I, sitting next to him, following his gaze, started, Iimagined, to see it through his eyes, relinquishing my own intellectualknowledge of the rock strata below, and seeing them in purely visual terms.

Stephen had no scientific knowledge or interest, could not, I suspect, havegrasped any of the concepts of geology, and yet such was the force of hisperceptual power, his visual sympathy, that he would be able to get, and laterdraw, the canyon's geological features with absolute precision, and with aselectivity not to be obtained in any photograph. He would get the canyon'sfeel, its essence, as he had got the essence of the Matisse.

We set out across the desert once again, and as we climbed toward Flagstaff, the saguaros grew rarer-the last one, a bold loner, stood out at twenty-eighthundred feet. The bleak Brad-shaw Range, where silver and gold were found inthe eighties, rose to our left. We entered a flat plain covered with prickly pear, withoccasional cattle roaming. Horses and burros, and occasionally pronghornantelope, still roam these plains. The San Francisco Peaks floated high, likevast ships, on the horizon.

"Very nice landscape to put motorcars into," Stephen remarked. (He had earlierdrawn a big green Buick against a backdrop of Monument Valley.) I wasamused-and outraged: faced with the sublimest, grandest vista on the planet, Stephen could only think to put motorcars into it!

While I scribbled, Stephen drew cacti; he had seized on them as an emblem ofthe West, as he had seized on gondolas for Venice, skyscrapers for New York.

An animal, probably a rabbit, darted across the road in front of us. Somethinggot into me, and impulsively I cried, "Coypu!" Stephen was taken by the word, its acoustic contours, and repeated it with obvious pleasure a number oftimes.

The Arizona trip showed us that Stephen could get desert, canyons, cacti, natural scenes, in the same uncanny way as he could get buildings and cities.

Most startling of all, perhaps, was an afternoon at the Canyon de Chelly, which Stephen descended with a Navajo artist, who showed him a special, sacredvantage point from which to draw and plied him with the myths and history ofhis people, how they had lived in the canyon centuries before. Stephen wasindifferent to all this but went ahead in his nonchalant way-looking around, muttering and humming to himself-while the Navajo artist sat, hardly moving, consecrated to the act of drawing. And yet, despite their so differentattitudes, Stephen's drawing was manifestly the better and seemed (even to theNavajo artist) to communicate the strange mystery and sacredness of the place.

Stephen himself seems almost devoid of any spiritual feeling; nonetheless hehad caught, with his infallible eye and hand, the physical expression of whatwe, the rest of us, call the "sacred."

Did Stephen somehow imbibe a sense of the sacred and project this into hisdrawing, or do we, looking at his drawing, project this ourselves? There was often disagreement between Margaret andmyself as to what Stephen actually felt, as with the wedding music at themonastery in Leningrad. But here, in the Canyon de Chelly, our roles werereversed: Margaret felt that Stephen had indeed been awed by the sacredness ofthe place, while I was skeptical. This deep uncertainty about what Stephenactually thinks and feels comes up constantly, with everyone who knows him.

I sometimes wondered whether "emotion" or "emotional response" might beradically different in Stephen: no less intense, but somehow more localizedthan in the rest of us- object-bound, scene-bound, event-bound, without evercoalescing or extending into anything more general, without becoming a part ofhim. I sometimes felt that he picked up the mood or the atmosphere of places, people, scenes, by a sort of instant sympathy or mimicry, rather than throughwhat would usually be called a sensibility. Thus he might echo, or reproduce, or reflect, the world's beauties, yet not have any "aesthetic sense." He mightresonate to the "holy" atmosphere in the Canyon de Chelly, or in themonastery, and yet not have any "religious" sense of his own.

Back in our hotel, in Phoenix, I heard sounds of wind instruments coming fromStephen's room, next door. I knocked at his door and entered-Stephen wasalone, his hands cupped around his mouth. "What was that?" I asked.

"A clarinet," he said, and then did a tuba, a saxophone, a trumpet, and anose-flute, all with uncanny accuracy.

I returned to my room, thinking about Stephen's disposition and power toreproduce, its many levels, and how it dominated his life. As a child he hadshown echolalia when spoken to, echoing the last word or two of whatever otherpeople said, and this still occurred, typically when he was tired orregressed. Echolalia carries no emotion, no intentionality, no "tone" whatever-it is purely automatic and may even occur during sleep. Stephen's"coypu" the day before was more complex than this, for he had savored thesound, the peculiar emphasis I gave it, but did it in his own way, animitation, with variations. Then, at a still higher level, there was hisreproduction of Rain Man, in which he reproduced or represented entirecharacters, their interactions, conversations, and voices. He often seemednourished and stimulated by these, but at other times taken over, possessedand dispossessed, by them.

Such a "possession" may occur at many levels and may also be seen in peoplewith postencephalitic syndromes or Tou-rette's syndrome. An automatic mimicrycan occur in these, a reflection of a low-level physiological force overridinga normal mind and personality. Such a force may determine the more automaticaspects of autistic mimicry, too. But there may also be, at higher levels, asort of identity hunger-a need to take off, take on, take in, other personas.

Mira Rothenberg has sometimes compared autistic people, in this sense, tosieves, constantly sucking in other identities but unable to retain andassimilate them. Yet, she points out, after thirty-five years of experience, she still feels there is always a real self that she can connect to in theautistic.

Our last morning in Phoenix, I was up at seven-thirty, watching the sunrisefrom my hotel-room balcony. I heard a cheery "Hullo, Oliver!" and there wasStephen on an adjacent balcony.

"Wonderful day," he said, and then, holding his yellow camera, snapped me as Ismiled back from my balcony. This seemed such a friendly, personal act-itwould stay in my mind as our farewell to Arizona. As we walked outside, hewent over to the cacti: "Bye, Saguaro! Bye, Barrel! Bye, Prickly Pear, see younext time!"

The paradox of Stephen's art was sharpened for me, but without resolution, bythis trip. Margaret was constantly delighted by his work and would hug him andsay, "Stephen! You give such delight! You have no idea how much pleasure yougive!" Stephen would give his goofy smile and chortle- but Margaret was right.

He did, through his drawings, bring others great pleasure, and yet it was notclear that they were associated in him with any emotion whatever, other than the pleasure of afaculty being exercised and used.

At one point on our Arizona trip, stopping at a Dairy Queen, Stephen ogled twogirls sitting at a table and was so fascinated by them, indeed, that he forgotto go to the rest room. In some ways, he is a normal adolescent boy; neitherhis autism nor his savantism precludes this. Later, he went up to the girls-heis not unpersonable on first impression. But he spoke to them in a manner soinappropriate and childlike that they looked at each other, giggled, and thenignored him. Adolescence, both physical and psychological, perhaps slightlybelated, now seems to be rushing ahead with great speed. Suddenly, Stephen hasdeveloped a strong interest in his appearance, his clothes, rock music, andgirls. He never seemed to notice mirrors when he was younger, Margaret said, but now he is always checking himself, preening before them. He has developedvery decided tastes in clothing: "I like western-style jeans, light blue, garment washed, and shirts& and black western boots."

"What do you think of Oliver's shoes?" Margaret asked archly on one occasion.

"Boring," he said, throwing a glance at them. Very little social life, as yet, is possible for Stephen. He meets people, superficially, but does not know howto talk with them and has few friends or real relationships outside his ownfamily or the Hewsons. He is very close to his sister, Annette, and can beaffectionate to her. He feels himself the man of the house, a protector of hismother; and he feels that Margaret is very much a protector of himself. Butfor the most part he is thrown back on his drawings, and on increasinglycharged and detailed daydreams.

The world that really excites Stephen at this point is that of "Beverly Hills, 90210," a television show he adores. Last year, I asked him about it: "I loveJennie Garth," he said. "She's the coolest girl in L.A. She's got redlipstick& She's twenty-one years old. She's from Illinois. She's in 'BeverlyHills, 90210.' I fell in love with Jennie Garth. It started in 1991, I think. She plays Kelley Taylor. She always wears jeans and western-style shirts andbodysuits." It is not just Jennie Garth but the entire cast of the show thatStephen is in love with, and whom he now incorporates in more and moreelaborate fantasies. "I collect their pictures," he said. "I sent them severaldrawings." Now he wants to design a penthouse for them on Park Avenue. Theywill all live together, and he will live with them, as "artist-in-residence."

He will decide who may visit them and who may not. In the evening, after theyhave worked all day, they will all eat out together or have a picnic in thepenthouse. He has drawings of all this.

He has also been making fantasy sexy drawings of girls; Margaret discoveredthis by accident one day, while they were traveling, when she wandered intohis hotel room and found a drawing by his bed. His other drawings-even thegrandest ones, which he has spent days making-he is almost indifferent to; they can get lost or damaged, and he scarcely cares. But the sexy drawings aremanifestly different; he seems to feel these as his own and keeps them in theprivacy of his room-he would not think of showing them to anyone. They arewholly different from his other drawings, his commissioned work, for they arean expression of his inner life and dreams and needs, of his emotional andpersonal identity; whereas the architectural drawings, however dazzlinglyaccomplished, are not intended as anything more than likenesses, reproductions.

Stephen's interest in girls, his fantasies of them, all seem very normal, veryadolescent in a way, and yet they are marked by a childishness, a naïveté thatreflects his deep lack of human and social knowledge. It is difficult toimagine him dating, much less enjoying a deep personal or sexual relationship.

These things, one suspects, may never be possible for him. I wonder whether hefeels this, or feels sad about it sometimes.

In July of 1993, Margaret phoned me, beside herself with excitement.

"Stephen's erupted musical powers," she announced. "Huge powers! You must comeand see him straightaway." I was startled by her call; I had never known herso excited.

Stephen's musical talents clearly went back to early childhood, like hisartistic talents. Lorraine Cole writes that, even when he was scarcely verbal, he was a natural performer and mime: "His portrayal of an angry man in arestaurant was so spirited and so funny that it was only when we played backthe video we had made that we realized he had used no actual words, only awide range of angry noises. It was then that we understood his capacity forimitating sounds." This was especially striking after a brief visit toJapan-the sound of the language fascinated him, and when Andrew picked him andMargaret up from Heathrow, Stephen babbled pseudo-Japanese, complete with"Japanese" gestures, to such effect that Andrew almost crashed the carlaughing.

It had been clear to all of us, for years, that Stephen had an immense abilityto reproduce instrumental sounds, voices, accents, intonations, melodies, rhythms, arias, songs-complete with words or lyrics when need be-aneffortlessly large and accurate auditory memory. And, significantly, he likedmusic, too; it moved him with an almost physical pleasure, almost more, Ithink, than drawing did.

But Margaret, who knew all this better than I, was obviously referring tosomething more, to some quite new and unexpected breakthrough. The crucialfactor, she had said, had been finding the right music teacher for Stephen("She's marvelous, darling!"), and they had struck up an instant rapport. Itimed a visit to London to coincide with one of their weekly music lessons andtook along my niece Liz Chase, a music teacher and pianist with a very acuteear, skilled in improvisation, analysis, and theory.

Liz and I had been chatting with Evie Preston, his music teacher, for a fewminutes when Stephen came in, gustily, at the stroke of twelve. "Hullo, Evie, how are you I am fine," he said, then, "Hullo Oliver Sacks, how are you?" and, when I introduced my niece, "Hullo Liz Chase, how are you?" He then rushed over to the piano and, under Evie's bidding, started to play scales, then to sing chords, starting with major triads. He did all this very easily, and gleefully. The idea of thirds, fifths-this Pythagorean, numerical sense of musical intervals-seemed quite innate in Stephen. "I never had to teach him," Evie remarked.

He seemed hungry for more. "Let's do sevenths now," Evie said, and Stephen nodded and chortled as if he had been promised a chocolate.

Next, Evie said, "Now we'll do the blues-you take the top, I'll do the bass."

Using only three fingers (it looked ungainly, but worked brilliantly), Stephen now improvised an upper voice, full of intriguing, delightful complications.

At first he confined his improvisations to the lower half of one octave, but then became bolder, his improvisations steadily becoming wider ranging, more complex. He did six improvisations in all, rising to a climax in the last one.

But, Liz said, "Improvisation is easy, you do it off the top of your head." If one had the musical intelligence to catch the variational structure, she added, an ability to generate variations was almost automatic, a defining quality of intelligence itself. What she did find remarkable was how Stephen had infused his improvisations with feeling, with something of himself; how he had made them "creative, daring, and dramatically interesting."

Evie asked Stephen if he would sing "What a Wonderful World." His singing seemed to be full of genuine feeling, and his gestures while he sang were not his usual stilted, ticlike ones. As soon as the song was over, Evie asked Stephen to analyze it harmonically; to sing and number all the chords. He did so without a moment's hesitation. "It is clear that he is possessed of quite extraordinary powers of harmonic identification, analysis, and reproduction," Liz noted. Then Evie gave him an exercise in "interpretation," as she does every week, playing a theme he had never heard before, Schumann's "Träumerei."

Stephen listened intently and told us his "associations" as he listened: "It's about& air in the field, daffodils in springtime& a stream& sunshine& (I love it)& rose gardens& light breezes, fresh& children come out to play with their friends."

Was Stephen-so lacking in feeling or cut off from it, for the most part-actually feeling these affects and moods? Or had he learned, been taught somehow, to "decode" music, to learn that such-and-such forms were "pastoral" or "vernal," and as such would have appropriate images? Was this a sort of trick, performed without any real feeling? I mentioned this thought to Evie later, and she told me that at first his associations to music were random or egocentric, strikingly irrelevant to the actual tone of the piece. She then explained what feelings or images "went with" different forms of music, and now he has learned these. But she thinks he also feels them.

Finally, it was time for Stephen to choose a song he wanted to perform. He wanted to do "It's Not Unusual," a song much to his liking-a piece on which he could really let himself go. He sang with great enthusiasm, swinging his hips, dancing, gesticulating, miming, clutching an imaginary microphone to his mouth, addressing himself in imagination to a vast arena. "It's Not Unusual" has become the theme song of Tom Jones, and in his version, Stephen took on Jones's flamboyant physicality, adding to it a flavor of Stevie Wonder. He seemed completely at one with the music, completely possessed-and at this point there was none of the skewed neck posture that is habitual with him, none of the stiltedness, the ticcing, the aversion of gaze. His entire autistic persona, it seemed, had totally vanished, replaced by movements that were free, graceful, with emotional appropriateness and range. Very startled at this transformation, I wrote in large capitals in my notebook, "AUTISM DISAPPEARS." But as soon as the music stopped, Stephen looked autistic once again.

Until now, it had seemed to be part of Stephen's nature, part of being autistic, to be defective precisely in that range of emotions and states of mind that defines a "self" for the rest of us. And yet in the music he seemed to have been "given" these, to have "borrowed" an identity-though these were lost the moment themusic ended.

It was as if, for a brief time, he had become truly alive.

Stephen's music lesson, then, was a revelation to me-not just of furthertalents (not wholly unexpected in an autistic savant), but of a mode of beingthat I would not have thought available to him. Nothing of what I had seenwith him before, and nothing in his art, had quite prepared me for this. Heseemed to be using his whole self, his whole body, with all its repertoire ofmovements and expressions, to sing, to enact the song-though it remainedunclear to me whether this was basically a brilliant piece of pantomime or atrue entering into the words, the feelings, the inner states of the song. Itraised for me (even more acutely than some of his Matisse drawings) thequestion of whether he treated the originals (paintings or songs) asrepresentations of inwardness, of others' states of mind, or as objects. Didhe, so to speak, enter the painter's or the songwriter's head, share theirsubjectivity, or merely treat their productions (like houses) as purelyphysical, as objects? (Was his repetition of Rain Man, for that matter, just aliteral playback, a mimicry or echolalia, or was it charged with a sense ofthe significance of the film?) Were his gifts no more than mindless, "amenttalents," in Goldstein's term, or were they genuine achievements of mind andidentity?

Goldstein is quick to equate "mind" with the abstract-categorical, theconceptual, and to regard anything else as pathological, as sterile. But thereare forms of health, of mind, other than the conceptual, although neurologistsand psychologists rarely give these their due. There is mimesis-itself a powerof mind, a way of representing reality with one's body and senses, a uniquelyhuman capacity no less important than symbol or language.

Merlin Donald, inOrigins of the Modern Mind, has speculated that mimetic powers of modeling, ofinner representation, of a wholly nonverbal and nonconceptual type, may havebeen the dominant mode of cognition for a million years or more in ourimmediate predecessor, Homo erectus, before the advent of abstract thought andlanguage in Homo sapiens. [102] As I watched Stephen sing and mime, I wondered if one mightnot understand at least some aspects of autism and savantism in terms of thenormal development, even hypertrophy, of mimesis-based brain systems, thisancient mode of cognition, coupled with a relative failure in the developmentof more modern, symbol-based ones. And yet, even if some analogies can bedrawn here, they are very partial and must not mislead us. Stephen is neitheran ament, nor a computer, nor a Homo erectus-all our models, all our terms, break down before him.

Stephen's development has been singular, qualitatively different, from thestart. He constructs the universe in a different way-and his mode ofcognition, his identity, his artistic gifts, go together. We do not know, finally, how Stephen thinks, how he constructs the world, how he is able todraw and sing. But we do know that though he may be lacking in the symbolic, the abstract, he has a sort of genius for concrete or mimetic representations, whether drawing a cathedral, a canyon, a flower, or enacting a scene, a drama, a song-a sort of genius for catching the formal features, the structurallogic, the style, the "thisness" (though not necessarily the "meaning"), ofwhatever he portrays.

Creativity, as usually understood, entails not only a "what," a talent, but a"who"-strong personal characteristics, a strong identity, personalsensibility, a personal style, which flow into the talent, interfuse it, giveit personal body and form. Creativity in this sense involves the power tooriginate, to break away from the existing ways of looking at things, to move freely inthe realm of the imagination, to create and recreate worlds fully in one'smind-while supervising all this with a critical inner eye. Creativity has todo with inner life- with the flow of new ideas and strong feelings.

Creativity, in this sense, will probably never be possible for Stephen. Butthe catching of thisness, perceptual genius, is no small gift; it is quite asrare and precious as more intellectual gifts. I once referred to José asliving not in a universe, but in what William James called a "multiverse," ofinnumerable, unconnected though intensely vivid particulars, and asexperiencing the world |in Proust's term) as "a collection of moments"-vivid, isolated, with no before or after. I imagined José, who liked to draw animalsand plants, as an illustrator for botanical works or herbals (indeed, I havesince heard that an autistic artist is employed by the Royal Botanical Gardensat Kew).

Is autism necessary to, or an ingredient of, his art? Most autists are notartists, as most artists are not autists; but in the chance of their comingtogether (as in Stephen, or José), there must, I think, be an interactionbetween the two, so that the art takes on some of the strengths and weaknessesof autism, its remarkable capacity for minutely detailed reproduction andrepresentation, but also its repetitiveness and stereotypy. But whether onecan speak of a distinctive "autistic art," I am not sure.

Is Stephen, or his autism, changed by his art? Here, I think, the answer isno. I do not have the feeling that his art spreads or diffuses, in any sense, into his character, or alters the general tone of his mind. But this, perhaps, is not entirely surprising: there are many examples of artists who are great, even sublime, in their art, but whose personal lives are unremarkable, incoherent, or vile. (There are others, of course, whose lives match theirart.)

Of those with classical autism, 50 percent are mute, never use speech; 95percent lead very limited lives-Stephen, in a sense, has escaped from thesestatistics, in part through his art, in part by virtue of those who have stood so committedly behind him.

Gifts and art, unrecognized, unsupported, are not enough: José is almost as gifted as Stephen but has never been recognized, never supported, and continues to languish on a back ward; whereas Stephen lives a varied and stimulating life-he travels, goes out drawing, and now attends art school.

Margaret Hewson, Chris Marris, and others have played an essential part in supporting him and nurturing his gifts, making possible for him his present creative life. But his passivity remains extreme, and he will continue, I think, to need such personal support, as Blind Tom needed the support of Colonel Bethune.

Stephen's drawings may never develop, may never add up to a major opus, an expression of a deep feeling or theory or view of the world. And he may never develop, or enter the full estate, the grandeur and misery, of being human, of man.

But this is not to diminish him, or to call his gifts small. His limitations, paradoxically, can serve as strengths, too. His vision is valuable, it seems to me, precisely because it conveys a wonderfully direct, unconceptualized view of the world. Stephen may be limited, odd, idiosyncratic, autistic; but it is given him to achieve what few of us do, a significant representation and investigation of the world.

Notes

92. Later, Bidder described some of the techniques and algorithms which hefound himself using; though their discovery in the first place, as well astheir use, seemed to be unconscious. In our own time, A. C. Aitken, a greatmathematician and calculator, observes:

I have noticed at times that the mind has anticipated the will; I have had ananswer before I even wished to do the calculation; I have checked it, and amalways surprised that it is correct. This, I suppose (but the terminology maynot be right), is the subconscious in action; I think it can be in action atseveral levels; and I believe that each of these levels has its own velocity, different from that of our ordinary waking time, in which our processes ofthought are rather tardy. (This is cited by Steven B. Smith in "CalculatingProdigies. ")

93. Tredgold writes of savants with various sensory powers and skills, ofolfactory savants-and of a tactile savant, too:

Dr. J. Langdon Down told me of a boy at Normansfleld whose sense of touch wasso delicate and his Angers so deft that he could take a sheet of the Graphicand gradually split it into two perfect sheets, as one would peel a postagestamp off an envelope.

94. Though prodigious musical abilities tend to show themselves extremelyearly-almost all the great composers exemplify this-"there are no prodigies inart," as Picasso said. (Picasso himself was a remarkable draftsman at ten, butcould not draw horses at three, like Nadia, or cathedrals at seven.) Theremust be fundamental neurodevelopmental and cognitive reasons for this. ThoughYani, a nonautistic Chinese girl, showed her artistic powers very early-shehad done thousands of paintings by the age of six-her paintings are those of avery gifted, sensitive (and highly trained) child, arising from a normal, albeit accelerated, perceptual development, which was undoubtedly encouragedby her artist father. Her paintings are quite unlike the suddenly appearing, full-blown, "unchildlike" drawings characteristic of prodigious graphicsavants like Stephen Wiltshire. There may, of course, exist in somenonautistic people a mixture of savant and normal talents (see footnote 100).

95. Meeting a young physicist-astronomer, Ben Oppenheimer, recently, Imentioned Jessy's paintings, and showed him copies of some. He was astoundedat their astronomical accuracy, and was reminded of an amateur astronomer andminister, Robert Evans, in Australia. Evans single-handedly, with a smalltelescope, observed the incidence of supernovae in a sample of 1017 bright(Shapley-Ames) galaxies which he observed for a period of five years(examining, Oppenheimer calculates, sixty or moie galaxies each night); hewent on from this to deduce a new figure for the supernova rate in suchgalaxies. (This work was published by van den Bergh, McClure, and Evans in TheAstrophysical Journal.) Evans used no photographic or electronic assistance, and thus seemed able to construct and hold in his mind an absolutely preciseand stable image or map of more than a thousand galaxies, as seen in thesouthern sky. It seems likely that his memory is either eidetic or savantlike, though there is no suggestion that he is autistic.

96. When Stephen was invited to sit in the jump seat for the New York landing, Chris recalled a prescient dream that he had reported before they left London. "I am being the pilot of the jumbo jet," Stephen had said. "I can see the skyscrapers and the Manhattan skyline."

97. Visiting the autistic artist Jessy Park, I was struck by the great affection her parents showed for her. "I see how you love her," I said to her father. "Does she love you, too?" "She loves us as much as she can," he replied.

98. This was pointed out to me, with many examples, by a very acute correspondent, John Williamson, of Brownsville, Texas, who plans to write about them at length.

99. In a rare congenital condition, Williams syndrome, there is astonishingverbal (and social) precocity, combined with intellectual (and visual) defects-an extreme scatter between different intelligences. The combination oflinguistic gift-edness with intellectual deficiency is especially startling: children with Williams syndrome often appear exceptionally self-possessed, articulate, and witty, and only gradually is their mental deficit borne in onone. The precise neuroanatomi-cal correlates of this are being investigated byUrsula Bellugi and others.

100. It is possible for savant and normal talents to coexist, sometimes inseparate spheres (as with Nabokov); sometimes, confusingly, in the samesphere. I have had this impression strongly with an extremely gifted young manI have known since infancy. At two, Eric W. could read fluently-but this wasnot just hyperlexia,- he read with comprehension. At the same age he couldrepeat any melody he heard, harmonize in singing with it, and had a grasp offugue and counterpoint. By three he was doing remarkable drawings withperspective. At ten he wrote his first string quartet. He showed greatscientific powers in early adolescence, and now, in his early twenties, isdoing fundamental work in chemistry. (I never had any sense of Eric W. beingautistic-he was full of spontaneity and playfulness as a child, and is full ofdeep feeling as an adult.) Had he had only savant talents, they would not havebeen capable of significant development or integration. Had he had only normaltalents (at least in the graphic sphere) they would not have been presented insuch a savantlike fashion. He has been singularly fortunate in having both.

101. Freeman Dyson, who has known Jessy Park since she was a child, remarks:

I've always felt she was the closest I would ever come to an alien intelligence. Autistic children are so strange and so different from us-and yet you can communicate; there are many things you can talk with her about& [But] she has no concept of her own identity, she doesn't understand the difference between "you" and "I"-she uses pronouns almost indiscriminately. And so her universe is radically different from mine. Concrete social relations are for her *very, very difficult to comprehend. On the other hand, with anything abstract, she has no trouble. So mathematics, of course, is no problem for her, and we can talk very easily about mathematics& I think autism comes about as close as possible to the central problem of exploring the neurological basis of personality. Because these are people whose intelligence is intact, but something at the center is missing.*

102. Jerome Bruner, who has studied cognitive growth in children so minutely, speaks of "enactive" representation as its first expression. The enactive, heemphasizes, though it is supplemented by subsequently developed forms ofcognition or representation (which he terms the "ikonic" and "symbolic"), isnot superseded by them, but remains throughout life a potent mode ofexpression, instantly available for use. So it is with Donald's mimeticstage-this did not go out with Homo erectus, but remains a perpetual andpowerful part of our own "sapient" repertoire. All of us make frequent use ofsuch nonverbal behaviors and communications, and they are supremely developedin mimes, in actors, in all performing artists, and in the deaf.

I had just returned from a few days with Stephen Wiltshire in July. I had driven up to Massachusetts to visit another autistic artist, Jessy Park (whose mother describes her in a most beautiful and intelligent personal narrative, "The Siege"), and had seen her intensely colored, star-studded drawings (very different from Stephen's) and something of her labyrinthine, magic world of correlations (between numbers, colors, morality, the weather). I had paid flying visits to several schools for autistic children.

I had spent an extraordinary week at a camp for autistic children, Camp Winston, in Ontario-the more so as one of the counselors there this summer was a friend of mine, Shane, with Tourette's syndrome, who, with his lungings and touchings, Teachings and buttings, his enormous vitality and impulsiveness, seemed able to get through to the most deeply autistic children, in a way the rest of us were unable to do.

Turning west, I had visited an entire autistic family in California-both parents, highly gifted, and their two children, all of them given (between the serious business of life) to jumping on trampolines, flapping their hands, and screaming.

And now, finally, I was on my way to Fort Collins, in Colorado, to see Temple Grandin, one of the most remarkable autistic people of all: in spite of her autism, she holds a Ph.D. in animal science, teaches at Colorado State University, and runs her own business.

While autism was described almost simultaneously by Leo Kanner and Hans Asperger in the 1940s, Kanner seemed to see it as an unmitigated disaster, where Asperger felt that it might have certain positive or compensating features-a "particular originality of thought and experience, which may well lead to exceptional achievements in later life."

It is clear even in these first accounts that there is a wide range of phenomena and symptoms in autism-and many more can be added to those that Kanner and Asperger listed. A majority of Kanner-type children are retarded, often severely; a significant proportion have seizures and may have "soft" neurological signs and symptoms-a whole range of repetitive or automatic movements, such as spasms, tics, rocking, spinning, finger play, or flapping of the hands; problems of coordination and balance; peculiar difficulties, sometimes, in initiating movements, akin to what is seen in parkinsonism.

There may also be, very prominently, a large range of abnormal (and often "paradoxical") sensory responses, with some sensations being heightened and even intolerable, others (which may include pain perception) being diminished or apparently absent. There may be, if language develops, odd and complex language disorders-a tendency to verbosity, empty chatter, cliché-ridden and formulaic speech; the psychologist Doris Allen describes this aspect of their autism as a "semantic-pragmatic deficit." In contrast, Asperger-type childrenare often of normal (and sometimes very superior) intelligence and generallyhave fewer neurological problems.

Kanner and Asperger looked at autism clinically, providing descriptions ofsuch fullness and accuracy that even now, fifty years later, they can hardlybe bettered. But it was not until the 1970s that Beate Hermelin and Neil O'Connor and their colleagues in London, trained in the new discipline ofcognitive psychology, focused on the mental structure of autism in a moresystematic way. Their work (and that of Lorna Wing, in particular) suggeststhat in all autistic individuals there is a core problem, a consistent triad of impairments: impairment of socialinteraction with others, impairment of verbal and nonverbal communication, andimpairment of play and imaginative activities. The appearance of these threetogether, they feel, is not fortuitous; all are expressive of a single, fundamental developmental disturbance. Autistic people, they suggest, have notrue concept of, or feeling for, other minds, or even their own; they have, inthe jargon of cognitive psychology, no "theory of mind."

However, this is onlyone hypothesis among many; no theory, as yet, encompasses the whole range ofphenomena to be seen in autism. Kanner and Asperger were still, in the 1970s, pondering the syndromes they had delineated more than thirty years earlier, and the foremost workers of today have all spent twenty years or moreconsidering them. Autism as a subject touches on the deepest questions ofontology, for it involves a radical deviation in the development of brain andmind. Our insight is advancing, but tanta-lizingly slowly. The ultimateunderstanding of autism may demand both technical advances and conceptual onesbeyond anything we can now even dream of.

The picture of "classical infantile autism" is a formidable one. Most people(and, indeed, most physicians), if asked about autism, summon up a picture ofa profoundly disabled child, with stereotyped movements, perhaps head-banging; rudimentary language; almost inaccessible: a creature for whom very littlefuture lies in store.

Indeed, in a strange way, most people speak only of autistic children andnever of autistic adults, as if the children somehow just vanished from theearth. But though there may indeed be a devastating picture at the age ofthree, some autistic youngsters, contrary to expectations, may go on todevelop fair language, a modicum of social skills, and even high intellectualachievements; they may develop into autonomous human beings, capable of a lifethat may at least appear full and normal-even though, beneath it, there mayremain a persistent, and even profound, autistic singularity. Asperger had aclearer idea of this possibility than Kanner; hence we now speak of such "high-functioning" autistic individuals as having Asperger'ssyndrome. The ultimate difference, perhaps, is this: people with Asperger'ssyndrome can tell us of their experiences, their inner feelings and states, whereas those with classical autism cannot. With classical autism, there is nowindow, and we can only infer. With Asperger's syndrome there isself-consciousness and at least some power to introspect and report.

Whether Asperger's syndrome is radically different from classical infantileautism (in a child of three, all forms of autism may look the same) or whetherthere is a continuum from the severest cases of infantile autism (accompanied, perhaps, by retardation and various neurological problems) to the most gifted, high-functioning individuals, is a matter of dispute. (Isabelle Rapin, aneurologist who specializes in autism, stresses that the two conditions may beseparate at the biological level even if they are sometimes similar at thebehavioral level.) It is also unclear whether this continuum should beextended to include the possession of isolated "autistic traits"- peculiar, intense preoccupations and fixations, often combined with relative socialwithdrawal or remoteness-such as one encounters in any number of peopleconventionally called "normal" or seen, at most, as a little odd, eccentric, pedantic, or reclusive.

The cause of autism has also been a matter of dispute. Its incidence is aboutone in a thousand, and it occurs throughout the world, its features remarkablyconsistent even in extremely different cultures. It is often not recognized inthe first year of life, but tends to become obvious in the second or thirdyear. Though Asperger regarded it as a biological defect of affectivecontact-innate, inborn, analogous to a physical or intellectual defect-Kannertended to view it as a psychogenic disorder, a reflection of bad parenting, and most especially of a chillingly remote, often professional, "refrigeratormother." At this time, autism was often regarded as "defensive" in nature, orconfused with childhood schizophrenia. A whole generation of parents-mothers, particularly-were made to feel guilty for the autism of their children. It was only in the 1960s that thistrend began to reverse, and the organic nature of autism to be fully accepted.

(Bernard Rimland's 1964 text, Infantile Autism, played an important parthere.)

That the disposition to autism is biological is no longer in doubt, nor theincreasing evidence that it is, in some cases, genetic. Genetically, autism isheterogeneous-it is sometimes dominant, sometimes recessive. It is much morecommon in males. The genetic form may be associated, in the affectedindividual or the family, with other genetic disorders, such as dyslexia, attention deficit disorder, obsessive-compulsive disorder, or Tourette'ssyndrome. But autism may also be acquired. This was first realized in the1960s with the epidemic of rubella, when a large number of babies exposed tothis pre-natally went on to develop autism. It remains unclear whether theso-called regressive forms of autism-with sometimes abrupt losses of languageand social behavior in two- to four-year-olds who had previously beendeveloping relatively normally-are genetically or environmentally caused.

Autism may be a consequence of metabolic problems (such as phenylketonuria) ormechanical ones (such as hydrocephalus).[103] Autism, or autismlike syndromes, may develop even in adult life, though infrequently, especially after certainforms of encephalitis. (Some of my Awakenings patients, I think, had elementsof autism, too.)

And yet the parents of an autistic child, who find their infant receding fromthem, becoming remote, inaccessible, unresponsive, may still be tempted toblame themselves. They may find themselves struggling to relate to and love achild who, seemingly, does not love them back. They may make superhumanefforts to get through, to hold on to a child who inhabits some unimaginable, alien world; and yet all their efforts may seem to be in vain.

The history of autism, indeed, has been in part a desperate search for, andpromotion of, "breakthroughs" of various sorts. One father of an autistic boyexpressed this to me with some bitterness: "They come up with a new 'miracle'every four years-first it was elimination diets, then magnesium and vitaminB6, then forced holding, then operant conditioning and behaviormodification-now all the excitement is about auditory desensitization andfacilitated communication." This boy, at twelve, was still tantalizingly muteand unreachable, and his condition had defied every form of attemptedtherapy-hence his father's pessimism and blanket condemnation. Responses seemto be extremely varied: some individuals may respond spectacularly to some ofthese methods, while others show virtually no response at all. [104]

No two people with autism are the same; its precise form or expression isdifferent in every case. Moreover, there may be a most intricate (andpotentially creative) interaction between the autistic traits and the otherqualities of the individual. So, while a single glance may suffice forclinical diagnosis, if we hope to understand the autistic individual, nothingless than a total biography will do.

My own first experience with the autistic was in a grim ward in a statehospital in the midsixties. Many of these patients, perhaps a majority, werealso retarded; many had seizures; many had violent self-abusive behaviors, such as head-banging; many had other neurological problems. These worst-offpatients tended to be multiply handicapped in addition to their autism (andseveral had been traumatized by abuse). And yet, even in this population, there were sometimes "islands of ability," occasionally spectacular talents, shining through the devastation, precisely as Kanner and Asperger haddescribed-remarkable numerical or graphic powers, for instance. It was thesespecial talents, apparently isolated from the rest of the mind andpersonality, and maintained by a passionate, intensely focused fixation ormotivation-these savant syndromes-that engaged my special interest and that Iexplored most deeply at the time. And even in this population of the seeminglyhopeless, there were some who responded to individual attention.

One youngpatient, nonverbal, responded to music and danced; another, after some weeks, started to play pool with me and later, in the botanical garden, said hisfirst word-"dandelion." Many of these patients, born in the 1940s or early1950s, had not even been diagnosed as autistic when young, but had been lumpedtogether indiscriminately with the retarded and psychotic and warehoused inhuge institutions since early childhood. This is probably how the severelyautistic have been treated for centuries. It has only been in the last twodecades or so that the picture for such youngsters has decisively changed, with increasing medical and educational awareness of their special strengths and problems, and the widespread introduction of special schools andcamps for autistic children. [105]

Visiting a few of these during August, I had seen a variety of children, someintelligent, some mildly retarded, some outgoing, some timid, all with theirown individual personalities. At one such school, as I approached, I had seensome children in the playground, swinging and playing ball. How normal, Ithought-but when I got closer I saw one child swinging obsessively interrifying semicircles, as high as the swing would go; another throwing asmall ball monotonously from hand to hand; another spinning on a roundabout, around and around; another not building with bricks but lining them upendlessly, in neat, monotonous rows. All were engaged in solitary, repetitiveactivities; none was really playing, or playing with any of the others. Someof the children inside, when not in classes, would rock back and forth; somewould flap their hands or jabber unintelligibly. Occasionally, one of theteachers told me, a few of the children would have sudden panics or rages andscream or hit out uncontrollably. Some of the children would echo any wordsthat were spoken to them. One boy apparently had an entire television show byheart and would "replay" it all day, complete with all the voices andgestures, and even sounds of applause. At Camp Winston, an attractivesix-year-old boy had been given a pair of scissors and was cutting minute"H"s, a fraction of an inch high, each perfect, from a piece of paper. Most ofthe children looked physically normal-it was their remoteness, theirinaccessibility, that were so uncanny.

Some, in adolescence, were starting to emerge-to speak fluently, to learnsocial skills (much more difficult for such children than any academiclearning), to create social surfaces they could present to the world.

Without special schooling-schooling that for many had started in the nursery or at home-these autistic youngsters, despite theiroften good intelligence and background, might have remained profoundlyisolated and disabled. They had certainly learned, many of them, to "operate" after a fashion, to show at least a formal or external recognition of socialconventions-and yet the very formality or externality of their behavior wasitself disconcerting. I felt this especially at one school I visited, wherechildren would stick out rigid hands and say in loud, unmodulated voices,

"Good morning my name is Peter& I am very well thank you how are you" withoutany punctuation or intonation, affect or tone, in a sort of litany. Would anyof them, I wondered, ever achieve true autonomy? Use their social automatismspragmatically, as a way ot functioning in the world, but, beyond this, achievea true inwardness of their own, perhaps a profoundly different inner life, ofan autistic sort-perhaps an inner life known or shown only to a few others?

Uta Frith has written, in her book Autism: Explaining the Enigma, "Autism& does not go away& Nevertheless, autistic people can, and often do, compensatefor their handicap to a remarkable degree. [But] there remains a persistentdeficit& something that cannot be corrected or substituted." She alsoimplies, in a speculative mood, that there may be a reverse side to this"something," a sort of moral or intellectual intensity or purity, so farremoved from the normal as to seem noble, ridiculous, or fearful to the restof us. She wonders, in this regard, about the blessed fools of old Russia, about the ingenuous Brother Juniper, an early follower of Saint Francis, and, interestingly, about Sherlock Holmes, with his oddness, his peculiarfixations-his "little monograph on the ashes of 140 different varieties ofpipe, cigar and cigarette tobacco," his "clear powers of observation anddeduction, unclouded by the everyday emotions of ordinary people," and theextreme un-conventionality that often allows him to solve a case that thepolice, with their more conventional minds, are unable to solve. Aspergerhimself wrote of "autistic intelligence" and saw it as a sort of intelligence scarcely touched by tradition andculture-unconventional, unorthodox, strangely "pure" and original, akin to theintelligence of true creativity.

Dr. Frith, when we met in London, expanded on these themes and said I must besure to visit one of the most remarkable autistic people she knew-to see herat work and at home, to spend time with her. "Go see Temple," Dr. Frith saidas I left her office.

I had, of course, heard of Temple Grandin-everyone interested in autism hasheard of her-and had read her autobiography, Emergence: Labeled Autistic, whenit came out, in 1986. When I first read the book, I could not help beingsuspicious of it: the autistic mind, it was supposed at that time, wasincapable of self-understanding and understanding others and therefore ofauthentic introspection and retrospection. How could an autistic person writean autobiography? It seemed a contradiction in terms. When I observed that thebook had been written in collaboration with a journalist, I wondered whethersome of its fine and unexpected qualities- its coherence, its poignancy, itsoften "normal" tone-might in fact be due to her. Such suspicions havecontinued to be voiced, in regard to Grandin's book and to autisticautobiographies in general, but as I read Temple's papers (and her manyautobiographical articles) I found a detail and consistency, a directness, that changed my mind. *106*

Reading her autobiography and her articles, one gets a feeling of how strange, how different, she was as a child, how far removed from normal. *107* At six months, she started to stiffen in her mother'sarms, at ten months to claw her "like a trapped animal." Normal contact wasalmost impossible in these circumstances. Temple describes her world as one ofsensations heightened, sometimes to an excruciating degree (and inhibited, sometimes to annihilation): she speaks of her ears, at the age of two orthree, as helpless microphones, transmitting everything, irrespective ofrelevance, at full, overwhelming volume-and there was an equal lack ofmodulation in all her senses. She showed an intense interest in odors and a remarkable sense of smell. She was subject to sudden impulses and, when thesewere frustrated, violent rage. She perceived none of the usual rules and codesof human relationship. She lived, sometimes raged, inconceivably disorganized, in a world of unbridled chaos. In her third year, she became destructive andviolent:

Normal children use clay for modelling; I used my feces and then spread mycreations all over the room. I chewed up puzzles and spit the cardboard mushout on the floor. I had a violent temper, and when thwarted, I'd throwanything handy-a museum quality vase or leftover feces. I screamedcontinually&

And yet, like many autistic children, she soon developed an immense power ofconcentration, a selectivity of attention so intense that it could create aworld of its own, a place of calm and order in the chaos and tumult: "I couldsit on the beach for hours dribbling sand through my fingers and fashioningminiature mountains," she writes. "Each particle of sand intrigued me asthough I were a scientist looking through a microscope. Other times Iscrutinized each line in my finger, following one as if it were a road on a map." Or she would spin, or spin acoin, so raptly that she saw and heard nothing else. "People around me weretransparent& Even a sudden loud noise didn't startle me from my world." (Itis not clear whether this hyperfocus of attention-an attention as narrow as itis intense-is a primary phenomenon in autism or a reaction or adaptation to anoverwhelming, uninhibited barrage of sensation. A similar hyperfocus issometimes seen in Tourette's syndrome.)

At three, Temple was taken to a neurologist, and the diagnosis of autism wasmade; it was hinted that lifelong institutionalization would probably benecessary. The total absence of speech at this age seemed especially ominous.

How, I had to wonder, had she ever moved from this almost unintelligiblechildhood, with its chaos, its fixations, its inaccessibility, itsviolence-this fierce and desperate state, which had almost led to herinstitutionalization at the age of three-to the successful biologist andengineer I was going to see?

I phoned Temple from the Denver airport to reconfirm our meeting-it wasconceivable, I thought, that she might be somewhat inflexible aboutarrangements, so time and place should be set as definitely as possible. Itwas an hour-and-a-quarter drive to Fort Collins, Temple said, and she providedminute directions for finding her office at Colorado State University, whereshe is an assistant professor in the Animal Sciences Department. At one point, I missed a detail, and asked Temple to repeat it, and was startled when sherepeated the entire directional litany-several minutes' worth-in virtually thesame words. It seemed as if the directions had to be given as they were heldin Temple's mind, entire-that they had I used into a fixed association orprogram and could no longer be separated into their components. Oneinstruction, however, had to be modified. She had told me at first that Ishould turn right onto College Street at a particular intersection marked by aTaco Bell restaurant. In her second set of directions, Ternple added an asidehere, said the Taco Bell had recently had a face-lift and been housed in afake cottage, and no longer looked in the least "bellish." I was struck by thecharming, whimsical adjective "bellish"-autistic people are often calledhumorless, unimaginative, and "bellish" was surely an original concoction, aspontaneous and delightful image.

I made my way to the university campus and located the Animal SciencesBuilding, where Temple was waiting to greet me. She is a tall, strongly builtwoman in her midforties; she was wearing jeans, a knit shirt, western boots, her habitual dress. Her clothing, her appearance, her manner, were plain, frank, and forthright; I had the impression of a sturdy, no-nonsensecattlewoman, with an indifference to social conventions, appearance, orornament, an absence of frills, an absolute directness of manner and mind.

When she raised her arm in greeting, the arm went too high, seemed to getcaught for a moment in a sort of spasm or fixed posture-a hint, an echo, ofthe stereotypies she once had. Then she gave me a strong handshake and led theway down to her office. (Her gait seemed to me slightly clumsy or uncouth, asis often the case with autistic adults. Temple attributes this to a simpleataxia associated with impaired development of the vestibular system and partof the cerebellum. Later I did a brief neurological exam, focusing on hercerebellar function and balance; I did indeed find a little ataxia, butinsufficient, I thought, to explain her odd gait.)

She sat me down with little ceremony, no preliminaries, no social niceties, nosmall talk about my trip or how I liked Colorado. Her office, crowded withpapers, with work done and to do, could have been that of any academic, withphotographs of her projects on the wall and animal knickknacks she had pickedup on her travels. She plunged straight into talking of her work, speaking ofher early interests in psychology and animal behavior, how they were connectedwith self-observation and a sense of her own needs as an autistic person, andhow this had joined with the visualizing and engineering part of her mind topoint her toward the special field she had made her own: the design of farms, feedlots, corrals, slaughterhouses-systems of many sorts for animal management.

She handed me a book containing some of the layouts she had developed over the years-the book was titled Beef Cattle Behaviors, Handling, and Facilities Design-and I admired the complex and beautiful designs inside, and the logical presentation of the book, starting with diagrams of cattle and sheep and hog behavior and moving through designs of corrals to ever more complex ranch and feedlot facilities.

She spoke well and clearly, but with a certain unstoppable impetus and fixity. A sentence, a paragraph, once started, had to be completed; nothing was left implicit, hanging in the air.

I was feeling somewhat exhausted, hungry, and thirsty-I had been traveling all day and had missed lunch-and I kept hoping Temple would notice and offer me some coffee. She did not; so, after an hour, almost fainting under the barrage of her overexplicit and relentless sentences, and the need to attend to several things at once (not only what she was saying, which was often complex and unfamiliar, but also her mental processes, the sort of person she was), I finally asked for some coffee. There was no "I'm sorry, I should have offered you some before," no intermediacy, no social junction. Instead, she immediately took me to a coffeepot that was kept brewing in the secretaries' office upstairs. She introduced me to the secretaries in a somewhat brusque manner, giving me the feeling, once again, of someone who had learned, roughly, "how to behave" in such situations without having much personal perception of how other people felt-the nuances, the social subtleties, involved.

Time to get some dinner, " Temple suddenly announced after we had spent another hour in her office. "We eat early in the West." We went to a nearby western restaurant, one with swinging doors and with guns and cattle horns on the walls-it was already crowded, as Temple had said it would be, at five in the afternoon-and we ordered a classic western meal of ribs and beer. We ate heartily and talked throughout the meal about the technical aspects of Temple's work and the ways in which she sets out every design, every problem, visually, in her mind. As we left the restaurant, I suggested we go for a walk, and Temple took me out to a meadow along an old railway line. The day was cooling rapidly-we were at five thousand feet-and in the long evening light gnats darned the air and crickets were stridulating all around us. I found some horsetails (one of my favorite plants) in a muddy patch below the tracks and became excited about them. Temple glanced at them, said "Equisetum," but did not seem stirred by them, as I was.

An Anthropologist on Mars

On the plane to Denver, I had been reading a remarkable piece of writing by a highly gifted, normal nine-year-old-a fairy story she had created, with a wonderful sense of myth, a whole world of magic, animism, and cosmogonies.

What, I wondered as we walked through the horsetails, of Temple's cosmogony?

How did she respond to myths, or to dramas? How much did they carry meaning for her? I asked her about the Greek myths. She said that she had read many of them as a child, and that she thought of Icarus in particular-how he had flown too near the sun and his wings had melted and he had plummeted to his death.

"I understand Nemesis and Hubris," she said. But the loves of the gods, I ascertained, left her unmoved-and puzzled.

It was similar with Shakespeare's plays. She was bewildered, she said, by Romeo and Juliet ("I never knew what they were up to"), and with Hamlet she got lost with the back-and-forth of the play. Though she ascribed these problems to "sequencing difficulties," they seemed to arise from her failure to empathize with the characters, to follow the intricate play of motive and intention. She said that she could understand "simple, strong, universal" emotions but was stumped by more complex emotions and the games people play. "Much of the time," she said, "I feel like an anthropologist on Mars."

She was at pains to keep her own life simple, she said, and to make everything very clear and explicit. She had built up a vast library of experiences over the years, she went on. They were like a library of videotapes, which she could play in her mind andinspect at any time-"videos" of how people behaved in different circumstances.

She would play these over and over again and learn, by degrees, to correlatewhat she saw, so that she could then predict how people in similarcircumstances might act. She had complemented her experience by constantreading, including reading of trade journals and the Wall Street Journal-allof which enlarged her knowledge of the species. "It is strictly a logicalprocess," she explained.

In one plant she had designed, she said, there had been repeated breakdowns ofthe machinery, but these occurred only when a particular man, John, was in theroom. She "correlated" these incidents and inferred at last that John must be sabotaging the equipment. "I had to learn to be suspicious, I had to learn itcognitively. I could put two and two together, but I couldn't see the jealouslook on his face." Such incidents have not been uncommon in her life: "It bends some people out of shape that this autistic weirdo can come in anddesign all the equipment. They want the equipment, but it galls them that theycan't do it themselves, but that Tom"-an engineering colleague-"and I can, that we've got hundred-thousand-dollar Sun workstations in our heads."

In heringenuousness and gullibility, Temple was at first a target for all sorts oftricks and exploitations; this sort of innocence or guilelessness, arising notfrom moral virtue but from failure to understand dissembling and pretense("the dirty devices of the world," in Traherne's phrase), is almost universalamong the autistic. But over the years Temple has learned, in her indirectway, by inspecting her "library," some of the ways of the world. She has, infact, been able to found her own company and to work as a freelance consultantto and designer of animal facilities all over the world. By professionalstandards, she is extraordinarily successful, but other human interactions-social, sexual-she cannot "get." "My work is my life," she told me severaltimes. "There is not that much else."

There seemed to me pain, renunciation, resolution, and acceptance all mixedtogether in her voice, and these are the feelings that sound through her writings. In one article she writes:

I do not fit in with the social life of my town or university. Almost all ofmy social contacts are with livestock people or people interested in autism.

Most of my Friday and Saturday nights are spent writing papers and drawing. Myinterests are factual and my recreational reading consists mostly of scienceand livestock publications. I have little interest in novels with complicatedinterpersonal relationships, because I am unable to remember the sequence ofevents. Detailed descriptions of new technologies in science fiction ordescriptions of exotic places are much more interesting. My life would behorrible if I did not have my challenging career.

Early the next morning, a Saturday, Temple picked me up in herfour-wheel-drive, a rugged vehicle she drives all over the West to visitfarms, ranches, corrals, and meat plants. As we headed for her house, Iquizzed her about the work she had done for her Ph.D.; her thesis was on theeffects of enriched and impoverished environments on the development of pigs'brains. She told me about the great differences that developed between the twogroups-how sociable and delightful the "enriched" pigs became, howhyperexcitable and aggressive (and almost "autistic") the "impoverished" oneswere by contrast. (She wondered whether impoverishment of experience was not acontributing factor in human autism.) "I got to love my enriched pigs," shesaid. "I was very attached. I was so attached I couldn't kill them." Theanimals had to be sacrificed at the end of the experiment so their brainscould be examined. She described how the pigs, at the end, trusting her, lether lead them on their last walk, and how she had calmed them, by strokingthem and talking to them, while they were killed. She was very distressed attheir deaths-"I wept and wept."

She had just finished the story when we arrived at her borne-a small two-storytown house, some distance from the campus. Downstairs was comfortable, with the usual amenities-a sofa, armchairs, a television, pictures on the wall-but I had the sense that it wasrarely used. There was an immense sepia print of her grandfather's farm inGrandin, North Dakota, in 1880; her other grandfather, she told me, hadinvented the automatic pilot for planes. These two were the progenitors, shefeels, of her agricultural and engineering talents. Upstairs was her study, with her typewriter (but no word processor), absolutely bursting withmanuscripts and books- books everywhere, spilling out of the study into everyroom in the house. (My own little house was once described as "a machine forworking," and I had a somewhat similar impression of Temple's.)

On one wallwas a large cowhide with a huge collection of identity badges and caps, fromthe hundreds of conferences she has lectured at. I was amused to see, side byside, an I.D. from the American Meat Institute and one from the AmericanPsychiatric Association. Temple has published more than a hundred papers, divided between those on animal behavior and facilities management and thoseon autism. The intimate blending of the two was epitomized by the medley ofbadges side by side.

Finally, without diffidence or embarrassment (emotions unknown to her), Templeshowed me her bedroom, an austere room with whitewashed walls and a single bedand, next to the bed, a very large, strange-looking object. "What is that?" Iasked.

"That's my squeeze machine," Temple replied. "Some people call it my hugmachine."

The device had two heavy, slanting wooden sides, perhaps four by three feeteach, pleasantly upholstered with a thick, soft padding. They were joined byhinges to a long, narrow bottom board to create a V-shaped, body-sized trough.

There was a complex control box at one end, with heavy-duty tubes leading offto another device, in a closet. Temple showed me this as well. "It's anindustrial compressor," she said, "the kind they use for filling tires."

"And what does this do?"

"It exerts a firm but comfortable pressure on the body, from the shoulders tothe knees," Temple said. "Either a steady pressure or a variable one or apulsating one, as you wish, " she added. "You crawl into it-I'll show you-andturn the compressor on, and you have all the controls in your hand, here, right in front of you."

When I asked her why one should seek to submit oneself to such pressure, shetold me. When she was a little girl, she said, she had longed to be hugged buthad at the same time been terrified of all contact. When she was hugged, especially by a favorite (but vast) aunt, she felt overwhelmed, overcome bysensation; she had a sense of peacefulness and pleasure, but also of terrorand engulfment. She started to have daydreams-she was just five at the time-ofa magic machine that could squeeze her powerfully but gently, in a huglikeway, and in a way entirely commanded and controlled by her. Years later, as anadolescent, she had seen a picture of a squeeze chute designed to hold orrestrain calves and realized that that was it: a little modification to make it suitable for human use, and it could be her magic machine. She hadconsidered other devices-inflatable suits, which could exert an even pressureall over the body-but the squeeze chute, in its simplicity, was quiteirresistible.

Being of a practical turn of mind, she soon made her fantasy come true. Theearly models were crude, with some snags and glitches, but she eventuallyevolved a totally comfortable, predictable system, capable of administering a"hug" with whatever parameters she desired. Her squeeze machine had workedexactly as she hoped, yielding the very sense of calmness and pleasure she haddreamed of since childhood. She could not have gone through the stormy days ofcollege without her squeeze machine, she said. She could not turn to humanbeings for solace and comfort, but she could always turn to it. The machine, which she neither exhibited nor concealed but kept openly in her room atcollege, excited derision and suspicion and was seen by psychiatrists as a"regression" or "fixation"-something that needed to be psychoanalyzed and resolved. With her characteristic stubbornness, tenacity, single-mindedness, and bravery-along with a complete absence of inhibition or hesitation-Templeignored all these comments and reactions and determined to find a scientific"validation" of her feelings.

Both before and after writing her doctoral thesis, she made a systematicinvestigation of the effects of deep pressure in autistic people, collegestudents, and animals, and recently a paper of hers on this was published inthe Journal of Child and Adolescent Psychopharmacology. Today, her squeezemachine, variously modified, is receiving extensive clinical trials. She hasalso become the world's foremost designer of squeeze chutes for cattle and haspublished, in the meat-industry and veterinary literature, many articles onthe theory and practice of humane restraint and gentle holding.

While telling me this, Temple knelt down, then eased herself, facedown and atfull length, into the "V," turned on the compressor (it took a minute for themaster cylinder to fill), and twisted the controls. The sides converged, clasping her firmly, and then, as she made a small adjustment, relaxed theirgrip slightly. It was the most bizarre thing I had ever seen, and yet, for allits oddness, it was moving and simple. Certainly there was no doubt of itseffect. Temple's voice, often loud and hard, became softer and gentler as shelay in her machine. "I concentrate on how gently I can do it," she said, andthen spoke of the necessity of "totally giving in to it& I'm getting realrelaxed now," she added quietly. "I guess others get this through relationwith other people."

It is not just pleasure or relaxation that Temple gets from the machine but, she maintains, a feeling for others. As she lies in her machine, she says, herthoughts often turn to her mother, her favorite aunt, her teachers. She feelstheir love for her, and hers for them. She feels that the machine opens a doorinto an otherwise closed emotional world and allows her, almost teaches her, to feel empathy for others.

After twenty minutes or so, she emerged, visibly calmer, emotionally lessrigid (she says that a cat can easily sense the difference in her at these times), and asked me if I would care to try themachine.

Indeed, I was curious and scrambled into it, feeling a little foolish andself-conscious-but less so than I might have been, because Temple herself wasso wholly lacking in self-consciousness. She turned the compressor on againand filled the master cylinder, and I experimented gingerly with the controls.

It was indeed a sweet, calming feeling-one that reminded me of my deep-divingdays long ago, when I felt the pressure of the water on my diving suit as awhole-body embrace.

After my own trial in the squeeze machine, and with both of us suitablyrelaxed, we drove out to the university's experimental farm, where Temple doesmuch of her basic fieldwork. I had earlier thought there might be aseparation, even a gulf, between the personal-and, so to speak, private- realmof her autism and the public realm of her professional expertise. But it wasbecoming increasingly clear to me that they were hardly separated at all; forher, the personal and the professional, the inward and the outward, werecompletely fused.

"Cattle are disturbed by the same sorts of sounds as autisticpeople-high-pitched sounds, air hissing, or sudden loud noises; they cannotadapt to these," Temple told me. "But they are not bothered by low-pitched, rumbling noises. They are disturbed by high visual contrasts, shadows orsudden movements. A light touch will make them pull away, a firm touch calmsthem. The way I would pull away from being touched is the way a wild cow willpull away-getting me used to being touched is very similar to taming a wildcow." It was precisely her sense of the common ground (in terms of basicsensations and feelings) between animals and people that allowed her to showsuch sensitivity to animals, and to insist so forcefully on their humanemanagement.

She had been primed to this knowledge, she felt, partly through the experienceof her own autism and partly because she came from a long line of farmers and, as a child, had spent much of hertime on farms. And her own mode of thinking allowed her no escape from theserealities. "If you're a visual thinker, it's easier to identify with animals," she said as we drove to the farm. "If all your thought processes are inlanguage, how could you imagine that cattle think? But if you think inpictures& "

Temple has always been a powerful visualizer. She was astonished when shediscovered that her own near-hallucinatory power of visual imagery was notuniversal-that there were others who, apparently, had other ways to think. Sheis still very puzzled by this. "How do you think?" she kept asking me. But shehad no sense that she could draw, make blueprints, until she was twenty-eight, when she met a draftsman and watched him drawing plans. "I saw how he did it," she told me. "I went and got exactly the same instruments and pencils as heused-a point-five-millimeter HB Pentel-and then I started pretending I washim. The drawing did itself, and when it was all done I couldn't believe I'ddone it. I didn't have to learn how to draw or design, I pretended I wasDavid-I appropriated him, drawing and all."*108*

Temple constantly runs "simulations," as she calls them, in her head: "Ivisualize the animal entering the chute, from different angles, differentdistances, zooming in or wide angle, even from a helicopter view-or I turnmyself into an animal, and feel what it would feel entering the chute."

But if one thinks only in pictures, I could not help reflecting, one might notunderstand what nonvisual thinking was like, and one would miss the richnessand ambiguity, the cultural presuppositions, the depth, of language. Allautistics, Temple had said earlier, were intensely visual thinkers, like her. If this was true, was it, I wondered, more than a coincidence? Was Temple'sintense visuality a vital clue to her autism?

A cattle farm, even a large one, is often a quiet place, but when we arrivedwe could hear a great tumult of bellowing. "They must have separated thecalves from the cows this morning," Temple said, and, indeed, this was whathad happened. We saw one cow outside the stockade, roaming, looking for hercalf, and bellowing. "That's not a happy cow," Temple said. "That's one sad, unhappy, upset cow. She wants her baby. Bellowing for it, hunting for it. She'll forget for a while, then start again. It's like grieving, mourning-notmuch written about it. People don't like to allow them thoughts or feelings. Skinner wouldn't allow them."

As an undergraduate in New Hampshire, she had written to B. F. Skinner, thegreat behaviorist, and finally she had visited him. "It was like having anaudience with God," she said. "It was a letdown. He was just a regular humanbeing. He said, 'We don't have to know how the brain works-it's just a matterof conditioned reflexes.' No way I could believe it was juststimulus-response." The Skinner era, Temple concluded, was one that deniedfeelings to animals and rationalized regarding them as automata; it was an eraof exceptional cruelty, both in animal experimentation and in the management of farms and slaughterhouses. Shehad read somewhere that behaviorism was an uncaring science, and this wasexactly how she herself felt about it. Her own aspiration was to bring a vividsense of animals' feelings back into husbandry.

Seeing the grieving cow and hearing the bereft bellows angered Temple andturned her mind toward inhumanities in slaughter. She had nothing to do withchickens, she said, but the killing of chickens was particularly loathsome.

"When it's time for chickens to go to McNuggetland, they pick 'em up, hang 'emupside down, cut their throats." A similar shackling of cattle, and hangingthem upside down so that the blood rushes to their heads before their throatsare cut, is a common sight in old kosher slaughterhouses, she said. "Sometimestheir legs get broken, they scream in pain and terror." Mercifully, suchpractices are now starting to change. Properly performed, "slaughter is morehumane than nature," she went on. "Eight seconds after the throat's cut, endorphins are released; the animal dies without pain. It is similar innature, after sheep have been ripped up by coyotes. Nature has done this toease the pain of a dying animal." What is terrible, the more so because it isavoidable, she feels, is pain and cruelty, the introduction of fear and stressbefore the lethal cutting; and it is this that she is most concerned toprevent. "I want to reform the meat industry. The activists want to shut itdown," she said, and added, "I don't like radical anything, left or right. Ihave a radical dislike of radicals."

Away from the bellowing of the separated calves and mothers, whose distressTemple seemed to feel in her bones, we found a calm, quiet area of the farm, where cattle were browsing placidly. Temple knelt and held out some hay, and acow came over to her and took the hay, nudging her hand with its soft muzzle.

A soft, happy look came over Temple's face. "Now I'm at home," she said. "WhenI'm with cattle, it's not at all cognitive. I know what the cow's feeling."

The cattle seemed to sense this, sensed her calm, her confidence, and came upto her hand. They did not come up to me, sensing, perhaps, the unease of thecity dweller, who, living mostly in a world of cultural conventions andsignals, is unsure how to behave with huge, nonverbal animals.

"It's different with people," she went on, repeating her earlier remark aboutfeeling like an anthropologist on Mars. "Studying the people there, trying tofigure out the natives. But I don't feel like that with animals."

I was struck by the enormous difference, the gulf, between Temple's immediate, intuitive recognition of animal moods and signs and her extraordinarydifficulties understanding human beings, their codes and signals, the way theyconduct themselves. One cannot say that she is devoid of feeling or has afundamental lack of sympathy. On the contrary, her sense of animals' moods andfeelings is so strong that these almost take possession of her, overwhelm herat times. She feels she can have sympathy for what is physical orphysiological-for an animal's pain or terror-but lacks empathy for people'sstates of mind and perspectives. *109* When she was younger, she was hardly ableto interpret even the simplest expressions of emotion; she learned to "decode" them later, without necessarily feeling them. (Similarly, Dr. Hermelin, inLondon, had told me a story about an intelligent autistic girl of twelve whocame to her and said, of another student, "Joanie is making a funny noise."

Upon going to investigate, Hermelin found foanie crying bitterly. The meaningof weeping had been completely missed by the autistic girl: she had merelyregistered it as something physical, "a funny noise." I was reminded, too, of Jessy Park, and how she was fascinated by the fact that onions could makeone weep but was totally unable to comprehend that one could also weep forjoy.) *110*

"I can tell if a human being is angry," she told me, "or if he's smiling." Atthe level of the sensorimotor, the concrete, the unmediated, the animal, Temple has no difficulty. But what about children, I asked her. Were they notintermediate between animals and adults? On the contrary, Temple said, she hadgreat difficulties with children-trying to talk with them, to join in theirgames (she could not even play peekaboo with a baby, she said, because shewould get the timing all wrong)-as she had had such difficulties herself as achild. Children, she feels, are already far advanced, by the age of three orfour, along a path that she, as an autistic person, has never advanced far on.

Little children, she feels, already "understand" other human beings in a wayshe can never hope to.

What is it, then, I pressed her further, that goes on between normal people, from which she feels herself excluded? It has to do, she has inferred, with animplicit knowledge of social conventions and codes, of culturalpresuppositions of every sort. This implicit knowledge, which every normalperson accumulates and generates throughout life on the basis of experienceand encounters with others, Temple seems to be largely devoid of. Lacking it, she has instead to "compute" others' intentions and states of mind, to try tomake algorithmic, explicit, what for the rest of us is second nature. Sheherself, she infers, may never have had the normal social experiences fromwhich a normal social knowledge is constructed. And it may be from this, too, that her difficulties with gesture and language stem-difficulties that weredevastating when she was a near-speechless child, and also in the early daysof speech, when she mixed all her pronouns up, not able to grasp the differentmeanings of "you" and "I," depending on context.

It is extraordinary to hear Temple speak of this time, or to read of it in herbook. When she was three, as an outside chance, although her family did nothave much belief in its promise, she was sent to a special nursery school fordisturbed and handicapped children, and a trial of speech therapy wassuggested. Somehow, the school and the speech therapist got through to Temple, rescued her (she later came to feel) from the abyss, and started her on herslow emergence. She remained clearly autistic, but her new powers of languageand communication now gave her an anchor, some ability to master what had beentotal chaos before. Her sensory system, with its violent oscillations ofoversensitivity and undersensi-tivity, started to stabilize a little. Therewere many periods of backsliding and regression, but it is clear that by theage of six she had achieved fair language and, with this, had crossed theRubicon that divides high-functioning people like her from low-functioningones, who never achieve proper language or autonomy.

With the access oflanguage, the terrible triad of impairments-social, communicative, andimaginative-began to yield somewhat. Temple started having some contact withothers, especially one or two teachers who could appreciate her intelligence, her specialness, and could withstand her pathology-her now-incessant talkingand questioning, her strange fixations, her rages. No less crucial was theemergence of some genuine playfulness and creativity-painting, drawing, makingcardboard models and sculptures, as well as "unique and creative ways of beingnaughty." At eight, Temple was starting to achieve the pretend-play thatnormal children achieve as toddlers, but the lower-functioning autistic childnever achieves at all.

Her mother, an aunt, and several teachers were crucial, but also crucial, onthe long journey up, was the slow development that many autistics show; autism, being a developmental disorder, tends to become less extreme as onegrows older, and one may learn to cope with it better.

Temple had longed for friends at school and would have been totally, fiercelyloyal to a friend (for two or three years, she had an imaginary friend), butthere was something about the way she talked, the way she acted, that seemedto alienate others, so that, while they admired her intelligence, they never accepted her as part of their community. "I couldn't figure out what I wasdoing wrong. I had an odd lack of awareness that I was different. I thoughtthe other kids were different. I could never figure out why I didn't fit in."

Something was going on between the other kids, something swift, subtle, constantly changing-an exchange of meanings, a negotiation, a swiftness ofunderstanding so remarkable that sometimes she wondered if they were alltelepathic. She is now aware of the existence of these social signals. She caninfer them, she says, but she herself cannot perceive them, cannot participatein this magical communication directly, or conceive the many-leveledkaleidoscopic states of mind behind it. Knowing this intellectually, she doesher best to compensate, bringing immense intellectual effort and computationalpower to bear on matters that others understand with unthinking ease. This iswhy she often feels excluded, an alien.

A crucial event occurred when she was fifteen. She had become fascinated with the squeeze chutes used to hold cattle. A science teacher took her fixationseriously, instead of scoffing, and suggested she actually build her ownsqueeze chute. From this beginning, he guided her from particularconsiderations of farm animals and machinery to a general interest in biologyand all science. And here Temple, still quite abnormal in her understanding ofordinary or social language- she still missed allusions, presuppositions, irony, metaphors, jokes-found the language of science and technology a hugerelief. It was much clearer, much more explicit, with far less depending onunstated assumptions. Technical language was as easy for her as social language was difficult, and it now provided her withan entry into science.

But if there was a resolution at this level, with the focusing of much of herintellectual and emotional energy on science, other tensions, anxieties-evenagonies-remained. With the onset of adolescence, Temple started to confrontthe realization that she might never lead a "normal" life, or enjoy the"normal" satisfactions-love and friendship, recreation and society-that wentwith it. This realization may be devastating for gifted young autistic peopleat this stage and has been a cause of depression in some and even of suicideon occasion. Temple dealt with this realization partly by renunciation anddedication: she would be celibate, she decided, and would make science herwhole life.

Adolescence also taught her that not only her emotional state but her wholemental and physical being were very finely tuned and could easily be thrownout of balance by certain sensory stimuli, stress, exhaustion, or conflict. *111* The hormonal turbulences of adolescence, in particular, threw her up and down.

But there was also a passion, an intensity, at this turbulent time; and it wasonly when she had finished college and was launched on her career, she said, that she could afford to calm down. Indeed, she felt she had to; otherwise herbody would destroy itself. At this point, she started on a small dose ofimipramine, a drug marketed as an antidepressant. In her book, Temple speaksof the pros and cons of this:

Gone are the frenzied searches for the basic meaning of life. I no longerfixate on one thing since I am no longer driven. During the last four years Ihave written very few entries in my diary because the antidepressant hastaken away much of the fervor. With the passion subdued, my career and& business is going well. Since I am more relaxed, I get along better withpeople, and stress-related health problems, such as colitis, are gone. Yet ifmedication had been prescribed for me in my early twenties, I might not haveaccomplished as much as I have. The "nerves" and the fixations were greatmotivators until they tore my body apart with stress-related health problems.

I was reminded, reading this, of what Robert Lowell once told me about beingon lithium for his manic-depressive disorder: "I feel much 'better/ in a way, calmer, stabler-but my poetry has lost much of its force." While Temple, too, is well aware of the cost of being calmed down, she feels, at this point inher life, that it is well worth paying. Yet she sometimes misses the emotions, the frenzies, she once felt.

The other side of a much-retarded development may be a continuing ability todevelop social skills and perceptions throughout life, and the last twentyyears have indeed been years of continuing development for Temple. Ten yearsago, when she first started lecturing, I had been told, she often seemed notto be addressing the audience-she would have no eye contact and might actuallybe facing in another direction-and she could not take questions after thelecture. Now she spends almost 90 percent of her time on the road, lecturingaround the world, sometimes about autism, sometimes about animal behavior. Shehas become much more fluent in her lecturing style, has more eye contact withthe audience, and may even add humorous asides and improvisations; sheanswers-and, if need be, parries-questions easily. In her social life, sheseems also to have developed, so that most recently, Temple told me, she hasbeen able to enjoy spending time with two or three friends.

But achievinggenuine friendship, appreciating other people for their otherness, for theirown minds, may be the most difficult of all achievements for an autisticperson. Uta Frith, in Autism and Asperger Syndrome, writes, "Asperger syndromeindividuals& do not seem to possess the knack of entering and maintaining intimate two-waypersonal relationships, whereas routine social interactions are well withintheir grasp." Her colleague Peter Hobson writes of an intelligent but autisticman who could not comprehend the meaning of "a friend." Yet it seemed to me, as I listened to her, that Temple, now in her forties, had grasped at leastsomething of the nature of friendship.

On this note-we had been walking and talking for almost two hours-we finishedour visit to the university farm and took a break for lunch. Temple, it seemedto me, was happy to stop talking, stop thinking for a while; there had been analmost ferocious intensity in the self-examination I had forced on her(although it was not unlike the self-examination she forces on herself daily, struggling, as always, to understand and live with autism in a nonautisticworld). "Normality" had been revealed more and more, as we spoke, as a sort offront, or facade, for her, albeit a brave and often brilliant front, behindwhich she remained, in some ways, as far "outside," as unconnected, as ever.

"I can really relate to Data," she said as we drove away from the farm. She isa "Star Trek" fan, as I am, and her favorite character is Data, an androidwho, for all his emotionlessness, has a great curiosity, a wistfulness, aboutbeing human. He observes human behavior minutely, and sometimes impersonatesit, but longs, above all, to b human. A surprising number of people withautism identify with Data, or with his predecessor, Mr. Spock.

This was the case with the B.'s, the autistic family I had visited inCalifornia-the older son, like the parents, with Asperger's syndrome, theyounger with classical autism. When I first arrived at their house, the wholeatmosphere was so "normal" that I wondered if I had been misinformed, or if Ihad not, perhaps, ended up at the wrong house, for there was nothing obviously"autistic" about them or it. It was only after I had settled down that Inoticed the well-used trampoline, where the whole family, at times, likes to jump and flap their arms; the hugelibrary of science fiction; *112* the strange cartoons pinned to the bathroomwall; and the ludicrously explicit directions, pinned up in the kitchen-forcooking, laying the table, and washing up-suggesting that these had to beperformed in a fixed, formulaic way (this, I learned later, was an autisticin-joke). Mrs. B. spoke of herself, at one point, as "bordering on normality," but then made clear what such "bordering" meant: "We know the rules andconventions of the 'normal,' but there is no actual transit. You act normal, you learn the rules, and obey them, but& "

"You learn to ape human behavior," her husband interpolated. "I still don'tunderstand what's behind the social conventions. You observe the front-but& "

The B.'s, then, had learned a front of normality, which was necessary, giventheir professional lives, their living in the suburbs and driving a car, theirhaving a son in regular school, and so on. But they had no illusions aboutthemselves. They recognized their own autism, and they had recognized eachother's, at college, with a sense of such affinity and delight that it wasinevitable they would marry. "It was as if we had known each other for amillion years," Mrs. B. said.

While they were well aware of many of theproblems of their autism, they had a respect for their differentness, even apride. Indeed, in some autistic people this sense of radical and ineradicable differentness is so profound as to lead them to regard themselves, halfjokingly, almost as members of another species ("They beamed us down on thetransporter together," as the B.'s liked to say), and to feel that autism, while it may be seen as a medical condition, and pathologized as a syndrome, must also be seen as a whole mode of being, a deeply different mode oridentity, one that needs to be conscious (and proud) of itself.

Temple's attitudes seem similar to this: she is very aware (if onlyintellectually, inferentially) of what she is missing in life, but equally(and directly) aware of her strengths, too-her concentration, her intensity ofthought, her single-mindedness, her tenacity; her incapacity for dissembling, her directness, her honesty. She suspects-and I, too, was coming more and moreto suspect-that these strengths, the positive aspects of her autism, go withthe negative ones. And yet there are times when she needs to forget that sheis autistic, to feel at one with others, not outside, not different.

Having spent the morning among beef cattle, and planning to visit aslaughterhouse (or "meat-packing plant," in the industry's euphemism) in theafternoon, we found ourselves a little averse to meat and had a Mexican mealof rice and beans. After lunch, we drove to the airport and took a tinycommuter plane, then drove out to the plant. Temple was proud of its layoutand wanted to show me how it looked. Such plants are closed to the public andmaintain a high degree of security. Temple had designed the facilities acouple of years earlier and still had her overalls and I.D. with the plant'sinsignia. But I was a problem: What was to be done with me? Temple had thoughtof this in the morning and had selected from her hat collection a sanitaryengineer's bright-yellow hard hat. She handed it to me, saying, "That'll do. You look good in it. It goes with your khaki pants and shirt. You look exactlylike a sanitary engineer." (I blushed; no one had ever told me this before.)

"Now all you have to do is behave like one, think like one." I was astoundedat this, for autistic people, it is said, have no pretend-play, and hereTemple had, very coolly, and without the slightest hesitation, determined on asubterfuge and was all set to smuggle me into the plant.

Our entry, in the event, went off without trouble. Temple drove through thegate with a sublime air of confidence, waved cheerily to the security guard, and was as cheerily waved in. "Keep the hard hat on," she said to me when weparked. "Keep it on the whole time. You're a sanitary engineer here."

We stopped to lean over the fence where the cattle are corralled outside thelarge plant building and then followed the path that the cattle follow whenthey go on their last journey, up and up a curving ramp leading into the mainplant building-"the stairway to Heaven," Temple called it. Here, again, I waspuzzled. The autistic have difficulty with metaphor, it is said, and never useirony. But, looking at Temple's straight, serious expression, I was not surethat, for her, this was metaphor or irony. She had heard the phrase-perhaps itseemed to her literally true. She describes in her autobiography a similarliteralization of a symbol when, as an adolescent, she heard a minister quoteJohn 10:9-"I am the door: by me if any man enter in, he shall be saved"-andthe minister added, "Before each of you there is a door -opening into Heaven. Open it and be saved." Temple writes:

Like many autistic children, everything was literal to me. My mind centered onone thing. Door. A door opening to Heaven& I had to find that door& The closet door, the bathroom door, the front door, the stable door-all werescrutinized and rejected as the door. Then one day& I noticed that an addition to our dorm was being constructed& A small platform extended outfrom the building and I climbed on it. And there was the door! It was a littlewooden door that opened out onto the roof& A feeling of relief flooded me& A feeling of love and joy& I'd found it! The door to my Heaven.

Later, Temple told me that she believed in some sort of existence after death(even if it was only as "an energy impression" in the universe). Intenselyconscious of animals' emotions, their "humanity," she had to grant them somesort of immortality, too.

We walked slowly up by the side of the gently curving, high-walled ramp, where cattle walk in single file, blithely unconscious of what is to come, up to thestunner, with its lethal bolt. Temple has been a pioneer in the design of suchramps, and her name is associated, in the trade, with the introduction ofcurved chutes. As we ascended the catwalk, looking over the chute's walls, Temple told me of their special virtues, how curved chutes prevented theanimals from seeing what was at the other end of the ramp until they werealmost there (thus preventing any apprehension) and, at the same time, tookadvantage of the cow's natural tendency to circle. The high walls preventedupsetting distractions and served to concentrate the animals on their walk.

At the top of the ramp, inside the building, the animals found themselvesmoved, almost insensibly, onto a conveyor belt running under their bellies.

(This "double-rail restrainer" was another innovation of Temple's.) A fewseconds later, the animal is instantly killed by a bolt shot by compressed airthrough the brain. A very similar system, Temple told me, might be used forhogs as well, though typically these would be killed by electrical stunning, not a bolt. She added an interesting gloss: "An electroshock machine"-such asis used in some psychiatric facilities-"and a hog stunner have almost exactlythe same parameters: around one ampere, at three hundred volts." A slightmisplacement of the leads, she added, and the patient would be killed, stunned, like a hog. She was a bit shocked, she allowed, when she realizedthis.

I got a sense of horror as Temple showed me the stunner, but the cattle, sheassured me, had no intimation, no apprehension, of what was to happen to them; her whole effort, indeed, was to remove anything that could frighten or stressthe animals, so that they could go peacefully, gently, unknowingly, to their death. But I still felt queasy about the whole thing. How did she feel, how did others feel, working in such places?

Temple has explored this and has written a classic paper on the subject. *113* Some employees in slaughterhouses, she notes, rapidly develop a protectivehardness and start killing animals in a purely mechanical way: "The persondoing the killing approaches his job as if he was stapling boxes moving alonga conveyor belt. He has no emotions about his act." Others, she reveals, "start to enjoy killing and& torment the animals on purpose." Speaking ofthese attitudes turned Temple's mind to a parallel: "I find a very highcorrelation," she said, "between the way animals are treated and thehandicapped& Georgia is a snake pit-they treat [handicapped people] worsethan animals& Capital-punishment states are the worst animal states and theworst for the handicapped."

All this makes Temple passionately angry, and passionately concerned forhumane reform: she wants to reform the treatment of the handicapped, especially the autistic, as she wants to reform the treatment of cattle in themeat industry. (The only fitting approach to killing animals, the only onethat shows respect for the animal, Temple feels, is the ritual or "sacred" one.)

It was an enormous relief getting out of the slaughter plant, away from thehideous smell, which seemed to permeate every inch of the place and had mademe hold my stomach and my breath sometimes in an effort not to puke; anenormous relief, once we were outside, to breathe the sharp, clear air, untainted with the smell of blood and offal; an enormous relief, morally, toget away from the idea of killing. I asked Temple about this as we drove away.

"Nobody should kill animals all the time," she said, and she told me she hadwritten much on the importance of rotating personnel, so that they would notbe constantly employed in killing, bleeding, or driving. She herself is inneed of other atmospheres and occupations, and these form a vital andaltogether pleasanter part of her life. Her understanding of the psychologyand behavior of herd animals is sought not only by feedlots andslaughterhouses all over the world but by sheep shearers as far away as NewZealand, and by game parks and zoos. I had the feeling that she might like tospend time on the African veldt, as a consultant on elephant herds and preyanimals like antelopes and wildebeest. But would she, I wondered, be able tounderstand apes (who have some "theory of mind") as well as she understoodcattle? Or would she find them bewildering, impenetrable, the way she foundchildren and other human beings? ("With farm animals, I feel their behavior," she said later. "With primates I intellectually understand theirinteractions.")

Temple's deepest feelings are for cattle; she feels a tenderness, acompassion, for them that is akin to love. She spoke of this at length as wemade our way to our next destination, a feedlot-how she sought gentleness, holding cattle in the chute, how she sought to transmit calmness to theanimals, to bring them peace in the last moments of their lives. This, forher, is half-physical, half-sacred, this cradling of an animal in the lastmoments of its life, and it is something she endlessly tries to teach thepeople who operate the chutes in the slaughter plants. She told me a story ofhow one plant manager, while very defensive about being advised on this byher, was fascinated by her power to calm excited animals, and how, unknown toher, he had spied on her through a hole in the ceiling as she worked. This hadoccurred when she was consulting at a slaughterhouse in the South, and theentire scene, and its context, kept returning to her mind: she told me thestory half a dozen times in the afternoon, each time at length, and invirtually the same words. I was struck both by the vividness of thereexperience, the memory, for her-it seemed to play itself in her mind with extraordinarydetail-and by its unwavering quality. *114* It was as if the original scene, itsperception (with all its attendant feelings), was reproduced, replayed, withvirtually no modification.

This quality of memory (so akin to StephenWiltshire's, in a way) seemed to me both prodigious and pathological-prodigious in its detail and pathological in its fixity, more akin to acomputer record than to anything else. Such computational analogies, indeed, are frequently brought up by Temple herself: "My mind is like a CD-ROM in acomputer-like a quick-access videotape. But once I get there, I have to playthat whole part." She could not just focus, for instance, on the cradling ofan animal in its last moments; she had to play, in memory, the entire scene, from the animal entering the chute and progressing steadily ("no fast-forward, it takes about two minutes") until the death of the animal and its collapse, after its throat has been cut. "I can do anything the computers in Jurassic Parkdo," she continued. "I can do all that stuff in my head& I actually have thatmachine in my head. I run it in my mind. I play the tape-it's a slow method ofthinking."

But an ideal sort of thinking for much of her work. She designs themost elaborate facilities in her mind, visualizing every component of thesystem, juxtaposing them in different ways, viewing them from differentangles, from near and far. Once the design is complete, she will "run asimulation" in her mind-that is, imagine the entire plant in operation. Thissimulation may show an unexpected problem, and when this happens she willpinpoint the problem, modify the design, do another simulation-severalsimulations, if need be-until the design is perfect. Only now, when all isclear in her mind, does she make an actual blueprint of it. No more attentionis needed at this point; the rest is mechanical. "Once I get the basic thinglaid out, I just put it on paper. I can listen to the TV. There's no emotionin it. I just turn on my Sun workstation and do it."

But this sort of simulation or concrete imagery is much less appropriate whenshe has to do other kinds of thinking- symbolic or conceptual or abstractthinking. To understand the proverb "A rolling stone gathers no moss," shesaid, "I have to run a video of the rock rolling and getting the moss offbefore I can think of what it 'means.' " She has to concretize before she can generalize. At school, she could not understand the Lord's Prayer until she"saw" it in concrete images: " 'The power and the glory' were high-tensionelectric wires and a blazing sun; the word 'trespass'& a 'No Trespassing'sign on a tree." *115*

In her autobiography, and, more concisely, in a thirty-page article published a little before the book-"My Experiences as an AutisticChild," which appeared in the Journal of Ortho-molecular Psychiatry in1984-Temple indicates how, even as a child, she scored at the top of therecorded norms in spatial tests and visual tests but did rather badly inabstract and sequential tasks. (Such "profiles" are characteristic of autisticpeople: they tend to show "scatter," or extreme unevenness, on so-calledintelligence tests.) In some cases, Temple writes, the scores were misleading, because tasks that might have been very difficult for her if she had done themin the "normal" way were easy because she did them in an idiosyncratic, visualway: thus sentences and poems, and strings of numbers, instantly generatedvisual images, and these were what she remembered, not the words or numbers assuch. Complex calculations, impossible for her in the normal way, might becomepossible if she transformed them into visual images. *116*

Visual thinking in itself is not abnormal, and Temple was quick to point outthat she knows several nonautistic people-engineers, designers-who seem ableto "see" what they need to do, to make designs in their mind and test them insimulations, just as she does. *117* Indeed, she often gets on very well withsuch people, especially her friend Tom. He is a powerful, creative visualizer, like her, and is also, like her, unorthodox, roguish, fond of pranks. "I get on the same wavelength as Tom," Temple said, "though it's a childish wavelength." But, above all, she enjoys working withTom- this, too, is "childish," but a form of childishness that is essentiallycreative. "Tom and I are little children," she said. "Concrete is grown-upmud, steel is grown-up cardboard, building is grown-up play."

I was moved by Temple's words, with their lovely analogizing of creativity andchild's play, and thought what a healthy development this had been in her. Andmoved, too, when she spoke of her relation to Tom. I wondered whether indeedshe loved him and had ever thought of a sexual relationship or marriage withhim. I asked her about this-asked whether she had ever had sexual relationships, or dated, or fallen in love.

No, she said. She was celibate. Nor had she ever dated. She found suchinteractions completely baffling and too complex to deal with; she was neversure what was being said, or implied, or asked, or expected. She did not know, at such times, where people were coming from, or their assumptions orpresuppositions, or intentions. This was common with autistic people, shesaid, and one reason why, though they had sexual feelings, they rarelysucceeded in dating or having sexual relationships.

But the problem was not just in actual dating or relating. "I have neverfallen in love," she told me. "I don't know what it's like to rapturously fallin love."

"What do you imagine 'falling in love' is like?" I asked.

"Maybe it's like swooning-if not that, I don't know."

I thought the phrase "falling in love, " with its suggestion of overwhelmingfeeling or transports, might be the wrong term to use. I amended my questionto "What is 'loving'?"

"Caring for somebody else& I think gentleness would have something to do withit."

"Have you cared for somebody else?" I asked her.

She hesitated for a moment before answering. "I think lots of times there arethings that are missing from my life."

"Is this painful?"

"Yeah& I guess." Then she added, "When I started holding the cattle, Ithought, What's happening to me? Wondered if that was what love is& it wasn't intellectual anymore."

She is wistful about love, in a sense, but cannot actually imagine how itmight be to feel passion for another person. "I couldn't understand how myroommate would swoon over our science teacher," she recalled. "She wasoverwhelmed with emotion. I thought, He's nice, I can see why she likes him. But there was no more than that."

The capacity to "swoon," to experience a passionate emotional response, seemsdiminished in other areas, too-not merely in relation to other people. For, after speaking of her roommate, Temple immediately said, "It's similar withmusic-I don't swoon." She has absolute pitch, she added (this is normally veryrare, but is relatively common in people with autism), and a precise andtenacious musical memory, but, on the whole, music fails to move her. Shefinds it "pretty," but it evokes nothing deep in her, only literalassociations: "Whenever I hear that Fantasia music, I see those stupid dancinghippos." It doesn't seem to "call" her. She doesn't "get" music, shesaid-doesn't see what it is "about." One might suppose that Temple is simplynot "musical," despite her absolute pitch and her ear. But her inability torespond deeply, emotionally, subjectively, is not confined to music. There isa similar poverty of emotional or aesthetic response to most visual scenes: she can describe them with great accuracy but they do not seem to correspondto or evoke any strongly felt states of mind.

Temple's own explanation of this is a simple mechanical one: "The emotioncircuit's not hooked up-that's what's wrong." For the same reason, she doesnot have an unconscious, she says; she does not repress memories and thoughts, like normal people. "There are no files in my memory that are repressed," she asserted. "You have files that are blocked. I have none so painful thatthey're blocked. There are no secrets, no locked doors-nothing is hidden. Ican infer that there are hidden areas in other people, so that they can't bearto talk of certain things. The amygdala locks the files of the hippocampus. Inme, the amygdala doesn't generate enough emotion to lock the files of thehippocampus."

I was taken aback and said, "Either you are incorrect or there is an almostunimaginable difference of psychic structure. Repression is universal in humanbeings." But, having said it, I was not so sure. I could imagine organicconditions in which repression might fail to develop, or be destroyed, or beoverwhelmed. This seems to have been the case with Luria's Mnemonist, who, though not autistic, had memories of such vividness as to beinextinguishable-even though some of these were so painful that they wouldsurely have been repressed had this been (physiologically) possible. I myselfhad had a patient in whom damage to the frontal lobes of the brain "released" some of the most deeply repressed memories- memories of a murder he hadcommitted-and forced them upon his terror-stricken consciousness.

I had another patient, an engineer, with massive frontal lobe damage from ahemorrhage, whom I would often see reading Scientific American. He was stillwell able to understand most of the articles, but he said that they no longerevoked any sense of wonder in him-the very sense that, formerly, had beencentral to his passion for science.

Another man, a former judge who is described in the neurological literature, had frontal lobe damage from shell fragments in the brain, and, inconsequence, found himself totally deprived of emotion. It might be thoughtthat the absence of emotion, and of the biases that go with it, would haverendered him more impartial-indeed, uniquely qualified-as a judge. But hehimself, with great insight, resigned from the bench, saying that he could no longer enter sympathetically into the motivesof anyone concerned, and that since justice involved feeling, and not merelythinking, he felt that his injury totally disqualified him. *118*

Such cases show us how the whole affective basis of life can be undercut byneurological damage. But there is something much more selective about theaffective problems in autism; there is by no means an overall flatness orblandness, despite Temple's comments about the "emotion circuit" or amygdala. An autistic person can have violent passions, intensely charged fixations andfascinations, or, like Temple, an almost overwhelming tenderness and concernin certain areas. In autism, it is not affect in general that is faulty butaffect in relation to complex human experiences, social ones predominantly, but perhaps allied ones-aesthetic, poetic, symbolic, etc. No one, indeed, brings this out more clearly than Temple herself.

Both as a person struggling to understand herself and as a scientist exploringanimal behavior, Temple is constantly exercised by her own autism, constantlyseeks models or similes to understand it. She feels that there is somethingmechanical about her mind, and she often compares it to a computer, with manyelements in parallel (a parallel-distributed processor, to use the technicalterm), seeing her own thinking as "computation" and her memory as computerfiles. She surmises that her mind is lacking some of the "subjectivity," theinwardness, that others seem to have. She sees the elements of her thoughts asconcrete and visual images, to be permuted or associated in different ways. *119* She believes that the visual parts of her brain and those concerned with processing a great mass of datasimultaneously are very highly developed, and that this is generally so inautistic people, and she believes that the verbal parts of her brain, andthose designed for sequential processing, are comparatively underdeveloped, and that this, too, is very common in autistic people. *120* She is conscious ofthe "stickiness" of attention in herself, so that there is great tenacity onthe one hand but a lack of agility and pliability on the other; she ascribesthis to a defect in her cerebellum, the fact that (as an MRI has shown) it isbelow normal size in her. She believes such cerebellar defects are significantin autism, though scientific opinion is divided on this.

She feels that there are usually genetic determinants in autism; she suspectsthat her own father, who was remote, pedantic, and socially inept, hadAsperger's-or, at least, autistic traits-and that such traits occur withsignificant frequency in the parents and grandparents of autistic children. *121* Though she feels early environment (in pigs or people) plays a crucial role inpsychic development, she does not hold (as Bruno Bettelheim did) that parentalbehavior is responsible for autism; it is more likely, she thinks, that autismitself presents barriers to contact and communication that parents may beunable to penetrate, so that the entire range of sensory and socialexperiences (especially holding and deep pressure) becomes severelyimpoverished.

Temple's own formulations and explanations generally correspond with the rangeof existing scientific ones, except that her emphasis on the necessity ofearly hugging and deep pressure is very much her own-and, of course, has beena mainspring in directing her thoughts and actions from the age of five. Butshe thinks that there has been too much emphasis on the negative aspects ofautism and insufficient attention, or respect, paid to the positive ones. Shebelieves that, if some parts of the brain are faulty or defective, others arevery highly developed-spectacularly so in those who have savant syndromes, butto some degree, in different ways, in all individuals with autism. She thinksthat she and other autistic people, though they unquestionably have greatproblems in some areas, may have extraordinary, and socially valuable, powersin others-provided that they are allowed to be themselves, autistic.

Moved by her own perception of what she possesses so abundantly and lacks soconspicuously, Temple inclines to a modular view of the brain, the sense thatit has a multiplicity of separate, autonomous computational powers or"intelligences"-much as the psychologist Howard Gardner proposes in his bookFrames of Mind. He feels that while the visual and musical and logicalintelligences, for instance, may be highly developed in autism, the "personalintelligences," as he calls them-the ability to perceive one's own and others'states of mind-lag grossly behind.

Temple is impelled by two drives: a theorizing part of herself, which makesher want to find some general explanation of autism, some key that will beapplicable to all of its phenomena and to every case,- and a practical, empirical part of herself, which constantly faces the range and irreduciblecomplexity and unpredictability of her own disorder, and the great range ofphenomena in other autistic people, too. She is fascinated by the cognitiveand existential aspects of autism and their possible biological basis, eventhough she is intensely aware that they are only part of the syndrome. Sheherself faces, almost every day, extreme variations, from overresponse to nonresponse, in her own sensory system, which cannot be explained, she feels, in terms of"theory of mind." She herself was already asocial at the age of six months andstiffened in her mother's arms at this time, and such reactions, common inautism, she also finds inexplicable in terms of theory of mind. (No onesupposes that even normal children develop a theory of mind much before theage of three or four.) And yet, given these reservations, she is stronglyattracted by Frith and other cognitive theorists; by Hobson and others who seeautism as foremost a disorder of affect, of empathy; and by Gardner and histheory of multiple intelligences. Perhaps, indeed, all these theories, despitetheir different emphases, hover about the same point.

Temple has dipped into the chemical and physiological and brain-imagingresearches on autism and emerged with the sense that they are still, at thispoint, fragmentary and inconclusive. But she holds to her notion of impaired"emotion circuits" in the brain, and she imagines these serve to link thephylogenetically ancient, emotional parts of the brain-the amygdala and thelimbic system-with the most recently evolved, specifically human parts of theprefrontal cortex. Such circuits, she accepts, may be necessary to allow anew, "higher" form of consciousness, an explicit concept of one's self, one'sown mind, and of other people's-precisely what is deficient in autism. [122]

At a recent lecture, Temple ended by saying, "If I could snap my fingers andbe nonautistic, I would not-because then I wouldn't be me. Autism is part ofwho I am." And because she believes that autism may also be associated withsomething of value, she is alarmed at thoughts of "eradicating" it. In a 1990article she wrote:

Aware adults with autism and their parents are often angry about autism. Theymay ask why nature or God created such horrible conditions as autism, manicdepression, and schizophrenia. However, if the genes that caused theseconditions were eliminated there might be a terrible price to pay. It ispossible that persons with bits of these traits are more creative, or possiblyeven geniuses& If science eliminated these genes, maybe the whole world wouldbe taken over by accountants.

Temple arrived to pick me up at the hotel at exactly eight o'clock on Sundaymorning, bringing along some additional articles of hers. I had the feelingthat she was incessantly at work, that she used every available moment, "wasted" very little time, that virtually her entire waking life consisted ofwork. She seemed to have no recreations, no leisure. Even the weekend she had"scheduled" for me was by no means regarded as a social one but as forty-eighthours allocated for a special purpose, forty-eight hours set aside to allow abrief, intensive investigation of an autistic life, her own. If she sometimessaw herself as an anthropologist on Mars, she could see me as a sort ofanthropologist, too, an anthropologist of autism, of her. She saw that Ineeded to observe her in all possible contexts and situations, amass asufficient database to make correlations, to arrive at some generalconclusions. That I might see with a sympathetic or friendly eye as well as ananthropological one did not at first occur to her. So our visit was seen aswork, and work to be carried through with the same conscientiousness andscrupulousness as all her work. Though in the normal course of events sheinvites people to her house, she would ordinarily never have shown her bedroomto a visitor; much less displayed, and illustrated the use of, the squeezemachine by her bedside-but this, she realized, was part of the work.

And though normally in the course of her own life she never went to thebeautiful mountains of Rocky Mountain National Park, a two-hour drivesouthwest of Fort Collins, having no time or impulse for leisure orrecreation, she thought that I might like to go, and that this would alsoallow me to observe her in a quite different context-one in which we could perhapsfeel unprogrammed, free.

We piled our stuff into Temple's car-with its four-wheel drive, it was thething for mountain terrain, especially if we wandered off-road-and took offaround nine for the national park. It was a spectacular route: we climbed tohigher and higher altitudes on a hairpin road, with terrifying bends, and sawtowering cliffs with banded rock strata, foaming gorges far below, and amarvelous range of evergreens, mosses, and ferns. I had the binoculars outconstantly and exclaimed at the wonders at every turn.

As we drove on into the park, the landscape opened out into an immensemountain plateau, with limitless views in every direction. We pulled off theroad and gazed toward the Rockies-snowcapped, outlined against the horizon, luminously clear even though they were nearly a hundred miles away. I askedTemple if she did not feel a sense of their sublimity. "They're pretty, yes. Sublime, I don't know." When I pressed her, she said that she was puzzled bysuch words and had spent much time with a dictionary, trying to understandthem. She had looked up "sublime," "mysterious," "numinous," and "awe," butthey all seemed to be defined in terms of one another.

"The mountains are pretty," she repeated, "but they don't give me a specialfeeling, the feeling you seem to enjoy." After living for three and a halfyears in Fort Collins, she said, this was only the second time she had been tothem.

What Temple said here seemed to me to have an element of sadness orwistfulness, even of poignancy. She had said similar things on the way up tothe park ("You look at the brook, at the flowers, I see what great pleasureyou get out of it. I'm denied that"), and, indeed, throughout the weekend.

There had been a spectacular sunset the evening before (the sunsets have beenparticularly fine since Mount Pinatubo erupted), and this, too, she found"pretty" but nothing more. "You get such joy out of the sunset," she said. "Iwish I did, too. I know it's beautiful, but I don't 'get' it." Her father, she added, often expressedsimilar sentiments.

I thought about what Temple had said on Friday night as we walked under thestars. "When I look up at the stars at night, I know I should get a 'numinous'feeling, but I don't. I would like to get it. I can understand itintellectually. I think about the Big Bang, and the origin of the universe, and why we are here: Is it finite, or does it go on forever?"

"But do you get a feeling of its grandeur?" I asked. "I intellectuallyunderstand its grandeur," she replied, and continued, "Who are we? Is deaththe end? There must be reordering forces in the universe. Is it just a BlackHole?"

These were grand words, grand thoughts, and I found myself looking at Templewith a heightened sense of her mental spaciousness, her courage. Or were they, for her, just words, just concepts? Were they purely mental, purely cognitiveor intellectual, or did they correspond to any real experience, any passion orfeeling?

Now we drove on, higher and higher, the air becoming thinner, the treessmaller, as we moved toward the summit. There was a lake near the park, GrandLake, which I especially wanted to swim in (I am always excited by theprospect of swimming in exotic, remote lakes: I dream of Lake Baikal and LakeTiticaca), but, sadly, since I had a plane to catch, we did not have time.

On the way back down the mountain, we stopped the car for a brief plant- andbird-spotting geological walk-Temple knew all the plants, all the birds, thegeological formations, even though, she said, she had "no special feeling" forthem- and then we started the long descent. At one point, just outside thepark, seeing a huge, inviting flat sheet of water, I asked Temple to pullover, and impetuously scrambled down toward it: I would have my swim, eventhough we had not made it to the lake.

It was only when Temple yelled "Stop!" and pointed that I paused in myheadlong descent and looked up, and saw that my flat sheet of water, my "lake," so still just in front of me, wasaccelerating at a terrifying rate a few yards to the left, prior to rushingover a hydroelectric dam a quarter of a mile away. There would have been afair chance of my being swept along, out of control, right over the dam. Therewas a look of relief on Temple's face when I stopped and climbed back. Later, she phoned a friend, Rosalie, and said she had saved my life.

We talked of many things on the way back to Fort Collins. Temple mentioned anautistic composer she knew ("He would take bits and pieces of music he hadheard, and rearrange them"), and I spoke of Stephen Wiltshire, the autisticartist. We wondered about autistic novelists, poets, scientists, philosophers.

Hermelin, who has studied (low-functioning) autistic savants for many years, feels that though they may have enormous talents, they are so lacking insubjectivity and inwardness that major artistic creativity is beyond them.

Christopher Gillberg, one of the finest clinical observers of autism, feelsthat autistic people of the Asperger type, in contrast, may be capable ofmajor creativity and wonders whether indeed Bartok and Wittgenstein may havebeen autistic. (Many autistic people now like to think of Einstein as one ofthemselves.)

Temple had spoken earlier of being mischievous, or naughty, saying she enjoyedthis at times, and she had been pleased at having smuggled me successfullyinto the slaughterhouse. She likes to commit small infractions on occasion-"Isometimes walk two feet outside the line at the airport, a little act ofdefiance"-but all this is in a totally different category from "real badness."

That could have terrifying, instantly lethal consequences. "I have a feelingthat if I do anything really bad, God will punish me, the steering linkagewill go out on the way to the airport," she said as we were driving back. Iwas startled by the association of divine retribution with a broken steeringlinkage; I had never thought about how an autistic person, with a whollycausal or scientific view of the universe and a deficient sense of agency orintention, might formulate such matters as divine judgment or will.

Temple is an intensely moral creature. She has a passionate sense of right andwrong, for example, in regard to the treatment of animals; and law, for her, is clearly not just the law of the land but, in some far deeper sense, adivine or cosmic law, whose violation can have disastrous effects-seemingbreakdowns in the course of nature itself. "You've read about action at a distance, or quantum theory," she said. "I've always had the feeling that whenI go to a meat plant I must be very careful, because God's watching. Quantumtheory will get me."

Temple started to become excited. "I want to get this out before you get tothe airport," she said, with a sort of urgency.

She had been brought up an Episcopalian, she told me, but had rather early"given up orthodox belief"-belief in any personal deity or intention-in favorof a more "scientific" notion of God. "I believe there is some ultimate ordering force for good in the universe-not a personal thing, not Buddha orJesus, maybe something like order out of disorder. I like to hope that even ifthere's no personal afterlife, some energy impression is left in the universe& Most people can pass on genes-I can pass on thoughts or what I write.

"This is what I get very upset at& " Temple, who was driving, suddenlyfaltered and wept. "I've read that libraries are where immortality lies& I don't want my thoughts to die with me& I want to have done something& I'm not interested in power, or piles of money. I want to leave something behind. I want to make a positive contribution-know that my life has meaning. Rightnow, I'm talking about things at the very core of my existence."

I was stunned. As I stepped out of the car to say goodbye, I said, "I'm goingto hug you. I hope you don't mind." I hugged her-and (I think) she hugged meback.

Notes

103. The television show "20/20" has reported on a town in Massachusetts witha very high incidence of autism, especially in the neighborhood of a formerplastics factory-but the question of whether autism can be caused by exposureto toxic agents has yet to be fully studied.

104. The most recent and controversial of these methods is facilitated communica-tion. FC (originally used with children with cerebral palsy) isbased on the notion that if the hand or arm of a nonverbal autistic child is supported by a facilitator, the child may then be able to communicate bytyping or by using an electronic communicator or letter board. The underlyingthought is that such children may have a difficulty in initiating movements(akin to that of parkinsonism), and that a light contact with another personmay allow them to overcome this and achieve a normal motor facility (as mayoccur with touching, or even visual contact, in some parkinsonian patients-Idiscuss this in Awakenings, footnote 45). The hope is that there may be, in atleast some otherwise inaccessible patients, a rich but "imprisoned" world ofthought and feeling that may now be released by this simple tactic.

The reported range of effects is very great, from minor releases of simplecommunications in some patients to entire autobiographies seemingly emanatingfrom previously mute children. These reports have been the subject of almostevangelistic enthusiasm, among many parents and teachers of autistic childrenon the one hand; and of wholesale dismissal by the medical profession, on theother. It has been difficult to arrive at a calm judgment in the overchargedatmosphere of claims and dismissals; while some instances of FC have beenshown to be entirely factitious-the result of unconscious suggestion by thefacilitator- and others must be suspect, there remains a nucleus of apparentlybona fide phenomena that deserve a careful and openminded scrutiny.

105. A pioneer here was Mira Rothenberg, who formed the Blueberry TreatmentCenters in 1958, an early experience she describes in her book, Children withEmerald Eyes.

106. What one does see in Temple's writings (and in the writings of other veryable autistic adults, not excluding some with marked literary gifts) arepeculiar narra-tional gaps and discontinuities, sudden, perplexing changes oftopic, brought about (so Francesca Happé suggests in a recent essay on thesubject) by Temple's failure "to appreciate that her reader does not share theimportant background information that she possesses. " In more general terms, autistic writers seem to get "out of tune" with their readers, fail to realizetheir own or their readers' states of mind.

107. Authentic memories from the second (perhaps even the first) year of life, though not available to "normals," may be recalled, with veridical detail, byautistic people. Thus, Lucci et al. write of one such boy, "He seems torecall, in exquisite detail, events from when he was two or three years old." Coenesthetic memories of infancy are also reported by Luria of S., themnemonist he studied.

108. At first it seemed, from what Temple told me, that the "appropriated" David, and his skill, had been swallowed whole, existed only as a sort ofimplant or foreign body within her and was only slowly integrated to becomepart of her. Another gifted (and poetic) autistic woman has compared herself, in this regard, to a boa constrictor, swallowing entire animals whole, butonly very slowly being able to assimilate them. Sometimes the swallowed roleor skill seems not to be properly assimilated or integrated and may be lost orexpelled as suddenly as it was acquired-thus the tendency (especially markedin younger autistic savants) to engulf complex skills or personas or masses ofinformation wholesale, to juggle with these for a while, and then suddenly torelinquish or forget them with such completeness that they seem to passthrough without leaving any residue whatever (such unincorporated behaviorsand convulsive mimeses are sometimes seen in people with severe Tourette'ssyndrome).

Much more complex are the situations where behaviors, and indeed entirepersonas, are retained as a sort of pseudopersonality. The taking on ofexaggerated, stereotypic, almost cartoonlike sexual demeanors (mimicked orcaricatured from comic strips or soap operas on TV) is sometimes seen inadolescents with autism. Donna Williams, in her fascinating personalnarratives (Nobody Nowhere and Somebody Somewhere) describes how she *"adopted" two personas, Carol and Willie, and thought and spoke through them, in the many years when she had only a rudimentary identity herself.*

109. She was deeply affected, physically shocked, when, during our talk, I imitated a young man with extremely severe Tourette's syndrome-how, with violent tics, he had put out his own eyes. Expressions of raw impulse, violence, pain, she perceived, reacted to, straightaway. I was reminded of how, in a completely benign way, Shane, with his Tourette's, had got through to the autistic children at Camp Winston, at a level of emotion and animal sympathy, a level more elemental, more directly conveyable, than that of complex states of mind and perspectives.

110. Some autistic people keep dogs, as blind or deaf people may do, to assisttheir perceptions-in this case, social perceptions. They may use dogs to"read" the minds and intentions of visitors, which they may feel unable to dothemselves. I know two autistic people who regard their dogs as having"telepathic" abilities, but of course the abilities of their dogs are merelynormal canine ones-and indeed normal human ones-which they themselves lack.

111. The provocative stimuli may be very different from one person to another: one autistic person will be intolerant of high-pitched noises, another oflow-pitched noises, one of a fan, another of a washing machine. There may alsobe various visual, tactile, and olfactory idiosyncracies.

112. Many high-functioning autistic people describe a great fondness for, almost an addiction to, alternative worlds, imaginary worlds such as those of C. S. Lewis and Tolkien, or worlds they imagine themselves. Thus both the B.'sand their older son have spent years constructing an imaginary world with itsown landscapes and geography (endlessly mapped and drawn), its own languages, currencies, laws, and customs-a world in which fantasy and rigidity play equalparts. Thus days might be spent computing the total grain production or silverreserves in Leutheria, or designing a new flag, or calculating the complexfactors determining the value of a thog-this occupies hours of the B.'sleisure time at home together, Mrs. B. providing the science and technology; Mr. B. the politics, languages, and social customs; and their son the naturalfeatures of the often-warring countries.

113. Her article, "Behavior of Slaughter Plant and Auction Employees Toward the Animals," appeared in Anthrozoos: A Multidisciplinary Journal on the Interactions of People, Animals, and Environment in the spring of 1988.

114. The psychologist Frederic Bartlett writes of remembering as"reconstruction, " but for Temple (as for Stephen), seemingly, this does notoccur, or occurs to a much smaller extent than usual. Nor is memory, for her, entirely internalized as part of the self-thus her frequent allusions to"videotapes" and "computer records, " and other external forms of memorystorage.

Temple's self-description here is intriguingly at odds with some of thecurrent formulations of imagery and memory, as conceived by Damasio, Edelman, and others.

Thus Damasio writes, in Descartes' Error. Images are not stored as facsimile pictures of things, or events, or words, orsentences. The brain does not file Polaroid pictures of people, objects, landscapes; nor does it store audiotapes of music and speech; it does not store films of scenes in our lives& In brief, there seems to be nopermanently held pictures of anything, even miniaturized, no microfiches ormicrofilms, no hard copies.

Yet this, Damasio emphasizes, "must be reconciled with the sensation& that we can conjure up" such reproductions or facsimile images. One must wonder, ifthis is the case, whether Temple-and also Franco and Stephen (and Luria'sMnemonistl-are merely, like the rest of us, susceptible to an illusion ofreproduction, or whether in fact (as Jerome Bruner suggests) there may be inthem some failure of integration of perceptual systems with higher integrativeones, and with concepts of self, so that relatively unprocessed, uninterpreted, unrevised images persist.

115. When Temple lectures, she often uses very odd slides, mixed in with theusual diagrams and charts-slides that might bear no discernible relation toher theme and might convey nothing to her audience, since in fact they aredesigned not for them but for her, private jottings or mnemonics for her owntrains of thought. For instance, a joke slide of a roll of toilet paper madefrom sandpaper reminds her to speak about tactile sensitivity in autism.

116. As Temple described this and gave examples, I was reminded of theMnemon-ist described by A. R. Luria (in The Mind of a Mnemonist) and hisbizarre, purely visual way of transforming words and numbers into images. TheMnemonist, indeed, thought exclusively in images-and sometimes overwhelmingly; hundreds of these might be generated in the course of listening to a singleparagraph or a short poem. Thinking in images gave him greatstrength-provided, in Luria's words, "a powerful base on which to operate, allowing him to carry out in his mind manipulations which others could onlyperform with objects." But such thinking also created strange difficulties, sometimes preposterous ones, when it could not be replaced by verbal-logicalthought. Luria's Mnemonist was not in the least autistic, but his visualthought processes-his concrete imagery, at least- were remarkably close toTemple's and perhaps shared a similar physiological basis. She was fascinatedwhen I told her of the Mnemonist and felt that her thinking was indeed verysimilar to his.

117. Precisely such a mode of mind was possessed by the great inventor NikolaTesla: "When I get an idea I start at once building it up in my imagination. I change the construction, make improvements and operate the device in my mind. It is absolutely immaterial to me whether I run my turbine in my thought ortest it in my shop. I even note if it is out of balance."

118. The founding of reason on feeling is the central theme of Antonio Damasio's book, Descartes' Ezioi.

119. Temple's self-description here made me think of Coleridge's delineationof Fancy: "[It] has no other counters to play with, but fixities anddefinites& [It] must receive all its materials ready made from the law ofassociation." I think that the overwhelming tendency to fixed, concrete, perceptual images, and their quasi-mechanical association, permutation andplay-which one sees in autism and sometimes Tourette's syndrome-while it maydispose to vivid and active Fancy (in Coleridge's sense), may also dispose against Imagination (as he calls it, in contrast), which "dissolves, diffuses, dissipates, in order to recreate." The creation, or re-creation, of the Imagination entails a letting-go of fixities and defi-nites in order to revise and reconstruct-and it is just this that seems so difficult in the overprecise and rigid mind of an autistic person.

120. Russell Hurlburt, at the University of Nevada, has studied the ways in which individuals report or represent their inner experiences, their streams of thought. He has found that whereas normal (and neurotic or schizophrenic) subjects seem to utilize a combination of different modes-inner speech and hearing, feelings, bodily sensations, as well as visual images-subjects with Asperger's syndrome seem to use visual images exclusively or predominantly.

121. That this is indeed the case has recently been shown by Ed and Riva Ritvoof UCLA.

122. That the amygdala do play a crucial role in empathy and social perception has only been confirmed very recently, by Damasio and others, through the examination of a young woman who, by an extraordinary chance, had suffered an isolated destruction of the amygdalaon both sides in consequence of Urbach-Wiethe disease. Although otherwise intact, she showed specific deficiencies of social perception and social behavior (Adolphs et al., 1994) and an inability to form conditioned autonomic responses to visual or auditory stimuli, though she could appreciate them intellectually (Bechara et al., 1995). Her responses, indeed, are like Temple's in this regard – though she is in no sense autistic.

Selected Bibliography

Choice is always personal and idiosyncratic, and what follows is a selectionof sources which I have found enjoyable and intriguing, as well asinformative, and which I would encourage the reader to sample. A fullreference list follows this section. I have, in addition, listed some favoriteor important books to the general reference list, even when no reference hasbeen made to them in the text.

PREFACE

L. S. Vygotsky's early papers, lost for many years, have been recovered andtranslated into English recently as The Fundamentals of Defectology.

In his autobiography, The Making of Mind, A. R. Luria traces his ownintellectual development in relation to the changing moods of neurologythroughout his long lifetime,- his chapter on "Romantic Science" particularlybrings out his sense of the indispensability of case histories, and how thenarrative is crucial to medicine. His own two "romantic" case histories-The Mind of a Mnemonist and The Man with a Shattered World-are the finest contemporary examples of such histories. A fine critical essay on "inside" narratives of illness is Anne Hunsaker Hawkins's Reconstructing Illness: Studies in Pathography.

Kurt Goldstein's general discussion of neurological health, disorder, andrehabilitation is to be found in his remarkable 1939 book, The Organism(especially Chapter 10).

The postwar rationalist thinkers on health and disease have been especiallyGeorges Canguilhem and Michel Foucault. Central books are Canguilhem's TheNormal and the Pathological and Foucault's Mental Illness and Psychology.

Gerald Edelman has published five books on his theory of neuronal groupselection; the most recent and most readable is Bright Air, Brilliant Fire.

Israel Rosenfield's The Invention of Memory gives a clear history ofclassical, localizationist neurology, and a sense of how radically neurologymay have to be revised in the light of Edelman's theory. I find Edelman's ideas extremely exciting, providing a neural basis, as they aim to do, for the entire range of mental processes from perception to consciousness, and for what it means to be human and a self. An entire new theoretical neuroscience seems to spring from them. I have published two essays on Edelman's work myself in The New York Review of Books: "Neurology and the Soul" and "Making Up the Mind."

In a more general way, I have very much enjoyed Freeman Dyson's Infinite in All Directions (originally entitled, when given as the Gifford Lectures, "In Praise of Diversity"). The sense of nature's richness and complexity and creativity is also conveyed in all of Ilya Prigogine's books-my favorite is From Being to Becoming-and in a book of extraordinary range, Murray Gell-Mann's The Quark and the Jaguar: Adventures in the Simple and the Complex.

THE CASE OF THE COLORBLIND PAINTER

A charming early book (it contains the report on the achromatopic surgeon whofell off his horse, and other gems) is Mary Collins's 1925 Colour-Blindness.

Arthur Zajonc's Catching the Light: The Entwined History of Light and Mind isa beautifully researched and written book, especially interesting in itsconsideration of Goethe's ideas on color and their relation to Land's. (Zajoncalso speaks of the case of Jonathan I.)

Though Schopenhauer wrote a youthful essay "On Vision and Colour," this is notreadily accessible in English. But thoughts on color vision punctuate hismagnum opus, The World as Will and Representation, and increased with everyedition in his lifetime.

The nineteenth-century debate between different theories of color vision andtheir advocates comes to life in Steven Turner's In the Eye's Mind: Vision andthe Helmholtz-Hering Controversy, and in an excellent essay-review of this by C. R. Cavonius.

Semir Zeki has been the pioneer investigator of mechanisms of color perceptionin the monkey; a synthesis of his work and its relation to currentneuroscience is provided in his book A Vision of the Brain. A grand synthesisat a higher level, the level of visual awareness, is given by Francis Crick inThe Astonishing Hypothesis: The Scientific Search for the Soul. Both of thesebooks are quite accessible to the general reader. (And both discuss at lengththe case of Jonathan I.)

Antonio and Hanna Damasio and their colleagues have published many minuteclinical studies of cerebral achromatopsia. Antonio Damasio has given a veryfull, if somewhat technical, account of this and other visual disorders in hischapter in Principles of Behavioral Neurology, and a more general account, coupled with reflections on the theoretical and philosophical importance ofsuch observations, in his recent book, Descartes' Error.

Edwin Land's papers have recently been published in their entirety, but one of the most vivid of his accounts is "The Retinex Theory of Color Vision," in Scientific American. An excellent essay on Land is "I Am a Camera," byJeremy Bernstein (this, too, refers to the case of Jonathan I.). And afascinating film showing the chaos that would result if we did not have colorconstancy is Colorful Notions, originally broadcast by the BBC's HorizonSeries in 1984.

The Oxford Companion to the Mind, edited by Richard Gregory, is anindispensable reference on all sorts of neurological and psychological topics.

It includes very good articles by Tom Troscianko, "Colour Vision: BrainMechanisms"; by W. A. H. Rushton, "Colour Vision: Eye Mechanisms"; and by J.J. McCann, "Retinex Theory and Colour Constancy."

An interesting account of the beginnings of color photography, "The FirstColor Photographs," by Grant B. Romer and Jeannette Delamoir, was published inthe Scientific American of December 1989. I published a letter on the subject, with reminiscences of color photography in the 1940s, in the March 1990 issue.

A centenary article, "Maxwell's Color Photograph," by Ralph M. Evans, appearedin the November 1961 Scientific American.

The personal experiences of a congenitally achromatopic man (who is also avision scientist) are beautifully described in Knut Nordby's "Vision in aComplete Achromat: A Personal Account."

Finally, Frances Futterman, the achromatopic woman whose letters I haveexcerpted here, has started publishing the Achromatopsia Network Newsletterand hopes to network with achromatopic people all over the world. She may becontacted at Box 214, Berkeley, CA 94701-0214.

THE LAST HIPPIE

The grand describer of both frontal lobe and amnesic syndromes was A. R. Luria, in (respectively) Human Brain and Psychological Processes and TheNeuropsychology of Memory. Both of these books are somewhat academic; it wasLuria's last wish to supplement them with "romantic" case histories. FrançoisLhermitte's two long papers entitled "Human Autonomy and the Frontal Lobes" give a vivid picture of his sympathetic and naturalistic approach to suchpatients.

By contrast, the ruthlessness that characterized the lohotomy era is describedin a frightening book, Great and Desperate Cures, by Elliot Valenstein. Asuperb essay review of this was written for The New York Review of Books byMacdonald Critchley.

The case of Phineas Gage has excited unceasing neurological interest fornearly 150 years and even now is being reexplored using the most sophisticatedtechniques of reconstructive neuroimaging (see Damasio et al.'s Sciencearticle). The deepest exploration of the case, and its relevance to allnineteenth-century theorizing about the nervous system from Gall to Freud, hasbeen provided by Malcolm Macmillan in "Phineas Gage: A Case for All Reasons" and by Antonio Damasio in Descartes' Error.

Two of my earlier studies on memory, referred to in this chapter-"The LostMariner" and "A Matter of Identity"-are reprinted in The Man Who Mistook HisWife for a Hat.

The field of memory research is extremely active now, and it is almostinvidious to single out names. But Larry Squire and Nelson Butters arecertainly leaders in this field and, individually and jointly, have writteninnumerable papers over the years, as well as edited the volume TheNeuropsychology of Memory. Other suggested readings on the subject of memoryare included in the suggested readings for "The Landscape of His Dreams. "

There is also an explosion of interest in the neurology of music and all itstherapeutic powers in patients with neurological disorders. Anthony Storr, thepsychiatrist, has written a beautiful book, Music and the Mind, which toucheson every aspect of human response to music. In a chapter entitled "Music andthe Brain," in the forthcoming book Music and Neurologic Rehabilitation, I have focused more narrowly on the possible ways in which music can affect thebrain.

Mickey Hart has written about percussion and rhythm in many cultures, inDrumming at the Edge of Magic.

A SURGEON'S LIFE

Gilles de la Tourette's two-part paper, "Étude sur une affection nerveuse," was published in 1885, and a partial translation is included, with acommentary, in "Gilles de la Tourette on Tourette Syndrome," by C. G. Goetzand H. L. Klawans. Meige and Feindel's great book, Les Tics et leurtraitement, was published in 190a and translated by Kinnier Wilson in 1907.

This book is remarkable not only for its comprehensiveness, but for itstone-the authors' respect for their subjects and the real conversationsbetween them and their physicians. It includes a unique, earlyautobiographical narrative, "Les Confidences d'un ticqueur."

It is only in the last few years that there have been more accounts from theinside about what it can mean to live with Tourette's. A series of such inside narratives, edited by Adam Seligman and John Hilkevich, was published as Don'tThink About Monkeys.

I have written a number of papers on Tourette's: "Witty Ticcy Ray," originallypublished in 1981, was republished in The Man Who Mistook His Wife for a Hat, along with "The Possessed." A general overview of the subject is given in"Neuropsychiatry and Tourette's," published in 1989, and more briefly andrecently in "Tourette's Syndrome: A Human Condition." A particular aspect ofTourette's that has always fascinated me was presented in "Tourette's andCreativity"; and research on the speed and accuracy of Tourettic movement, "Movement Perturbations Due to Tics," appeared in the 1993 Society forNeuroscience Abstracts.

The Tourette Syndrome Association, 42-40 Bell Boulevard, Bayside, NY 11361, first founded in 1971, disseminates information, gives physician referrals, and sponsors research. It can be contacted at (718) 224-2999 or (800) 237-0717 for information on local chapters.

TO SEE AND NOT SEE

The restoration of vision to those blinded early in life, though rare, hasbeen documented with great care since Cheselden's report in 1728. All knowncases up to 1930 are summarized in von Senden's encyclopedic book, Space andSight. Many of these are analyzed by Hebb in his Organization of Behaviour andform, along with much other observational and experimental data he provides, crucial evidence that "seeing"-visual perception-must be learned.

The single richest and most detailed case study is that of Richard Gregory andJean Wallace. This was subsequently reprinted, with further additions, including an exchange of letters with von Senden, in Gregory's Concepts andMechanisms of Perception. The philosophical background to the Molyneuxquestion and the impact of the Cheselden case are also well described byGregory in his article "Recovery from Blindness," in The Oxford Companion tothe Mind.

Alberto Valvo's deeply pondered cases of patients submitted to a new surgicalprocedure for corneal reconstruction are described in his Sight Restorationafter Long-Term Blindness.

The effects of late blindness-most especially its effects on visual imageryand memory, orientations, and attitudes-have been masterfully described byJohn Hull in his autobiographical book, Touching the Rock. And the restorationof vision after late blindness is finely described in Second Sight, by RobertHine.

One of the deepest, widest-ranging explorations of what it may mean in termsof identity to be blind, both to the individual and to those around him, wasgiven by Diderot in his great Letter on the Blind: For the Use of Those WhoCan See (he wrote a similar Letter on the Deaf and Dumb: For the Use of ThoseWho Can Hear and Speak). Von Feuerbach's account of Kaspar Hauser contains aremarkable description of his profound visual agnosia when first released intothe daylight, after being kept in a lightless dungeon since infancy (pp. 64-5).

These themes have not only been the subject of philosophical discussions andcase reports, but of fiction and dramatic reconstruction, ever since Diderot'simagination of Nicholas Saunderson's deathbed. In 1909 the novelist WilkieCollins based a novel, Poor Miss Finch, on such a subject, and the theme isalso central in Gide's early novel La Symphonie pastorale. A more recenttreatment is a brilliant reconstruction by Brian O'Doherty, The Strange Caseof Mademoiselle P., very closely based on Mesmer's original 1779 account. InBrian Friel's 1994 play, Molly Sweeney, the central character is, like Virgil, blind from early life with retinal damage and cataracts, and, following the removal of the cataracts in middle life, is plunged into a state of agnosic confusion and ambivalence, which is resolved only by a final reversion to blindness.

THE LANDSCAPE OF HIS DREAMS

The original report on Franco Magnani, written by Michael Pearce and illustrated with reproductions of Franco's paintings and Susan Schwartzen-berg's photographs in linked pairs, is found in the Exploratorium Quarterly for Summer 1988.

Esther Salaman's A Collection of Moments provides a beautiful literary and psychological study of "involuntary memories" as they occurred in Proust, Dostoevsky, and other writers. An excerpt from this, and the greater part of Schachtel's paper on memory and childhood amnesia, Stromeyer's classic account of an Eidetiker, a segment of Luria's Mind of a Mnemonist, and much else, are to be found in an invaluable sourcebook, Ulrich Neisser's Memory Observed.

Frederic Bartlett's classic book, Remembering, brings together his experiments showing the constructive, imaginative quality of memory.

The eruption of "experiential" memories during seizures (and their elicitation by direct stimulation of the brain at surgery) is described in almost novelistic detail by Wilder Penfield |and his colleague Perot) in a book-length article, "The Brain's Record of Visual and Auditory Experience," in Brain. This same volume of the journal also contains a striking account of Dostoevsky's epilepsy, by Alajouanine. A readable and accessible description of TLE and Dostoevsky syndrome, both in relation to ordinary people and to celebrated artists and thinkers, is given in Eve LaPlante's Seized: Temporal Lobe Epilepsy as a Medical, Historical, and Artistic Phenomenon.

A good historical discussion and acute psychoanalytic consideration of nostalgia is given by David Werman in "Normal and Pathological Nostalgia."

PRODIGIES

Darold Treffert's Extraordinary People is an excellent introduction to the subject of idiot savants, drawing as it does equally on historical accounts (from Séguin, Down, Tredgold, and others) and Treffert's own clinical experience.

In a more academic vein, The Exceptional Brain, edited by Loraine Obler and Deborah Fein, brings together a great range of research regarding human talents in general, and savant talents in particular.

Steven Smith's book, The Great Mental Calculators, is the fullest source of observations on calculating talent as it occurs in normal as well as retarded and autistic people.

A particular favorite of mine, never noted by current writers, is F. W. H. Myers's Human Personality. Myers himself was a genius, and this shows in every sentence of his great (though often absurd) two-volume book. The chapter on "Genius" is a penetrating and prescient account of computing talents in relation to the cognitive unconscious.

Though Loma Selfe's Nadia: A Case of Extraordinary Drawing Ability in an Autistic Child is, sadly, out of print, Howard Gardner's Art, Mind, and Brain contains an important essay on Nadia, which was to some extent the starting point of his subsequent, widely ramifying studies on intelligence and creativity. A particularly thoughtful review of Nadia is provided by Clara Claiborne Park, in which she compares Nadia's work with that of her daughter, Jessy, and other autistic artists.

The most detailed cognitive investigation of a musical savant, Eddie, is given by Leon K. Miller in his book Musical Savants.

The extensive investigations of Beate Hermelin and her colleagues (including Neil O'Connor and Linda Pring) are mostly available as individual papers, which include detailed studies of Stephen Wiltshire and other savants. Anearly paper by O'Connor and Hermelin, "Visual and Graphic Abilities of theIdiot Savant Artist," reproduces and discusses some of Stephen's early work.

The 1945 monograph on a savant subject, L., "A Case of 'Idiot Savant': AnExperimental Study of Personality Organization," by Martin Scheerer, EvaRothmann, and Kurt Goldstein, raises fundamental questions unanswered (andoften unasked) today. It is, to my mind, the deepest and most searchinganalysis ever made of the savant (and autistic) mind. L. is clearly autistic, though this term is not used, because the original version of the paperappeared in 1941, before Kanner's description of autism. In their later, fuller 1945 paper, Goldstein et al. compare their formulations with Kanner's.

Merlin Donald's book, Origins of the Modern Mind, in which he speculates onthe mimetic powers of primitive man, opens vast historical vistas and is oneof the most powerfully argued and imaginative reconstructions I have seen ofour past (and perhaps future) mental evolution. Jerome Bruner has explored thedevelopment of thinking in the child for many years; a very clear account ofthe "enactive" stage is given in Studies in Cognitive Growth.

A fascinating and richly illustrated study of a gifted, retarded octogenarianartist is John MacGregor's Dwight Macintosh: The Boy Whom Time Forgot.

I have written three other case histories of savant syndrome, all published inThe Man Who Mistook His Wife for a Hat: "The Autist Artist," "The Twins," and"A Walking Grove."

Finally, and most importantly, there are Stephen's own books: Drawings, Cities, Floating Cities, and Stephen Wiltshire's American Dream. (Unfortunately, only Floating Cities is currently in print in the UnitedStates.)

See the suggested readings for "An Anthropologist on Mars" for more books onautism, and for autism associations.

AN ANTHROPOLOGIST ON MARS

The delineation of autism as a medical condition goes back to the pioneerpapers of Kanner, Asperger, and Goldstein in the 1940s; while it waspsychiatrically defined (with misleading suggestions of parental etiology) byBruno Bettelheim in the 1950s (and later in The Empty Fortress), and finallyestablished as a biological condition in the 1960s (when Bernard Rimland'sInfantile Autism was published), autism was not fully portrayed as a humancondition until biographical and finally autobiographical narratives began to appear.

One of the first (and still the best) of these is The Siege: The First EightYears of an Autistic Child, by Clara Claiborne Park. Mira Rothenberg'sChildren with Emerald Eyes is a collection of portraits-at once clinical, analytic, empathetic, and poetic-of a dozen children among the hundreds in herpioneering Blueberry Treatment Centers. Charles Hart, in Without Reason, provides a remarkable account of his experience of having first an olderbrother, then a son, with autism. Jane Taylor McDonnell's beautifully writtenNews from the Border contains an afterword by her autistic son, Paul.

There has indeed been an explosion of books written about and by autisticpeople since 1990 (many centering on the complex questions of facilitatedcommunication), and it is difficult to mention any of these without appearingto ignore others. But in terms of its forthrightness, its vigor, its fullnessand insight (to say nothing of its priority-for it was the book that gavedirect, personal access to an autistic world for the first time), there isnothing to match Temple Grandin's own book, Emergence: Labeled Autistic.

Uta Frith's Autism: Explaining the Enigma is a very clear and balancedaccount, though oriented perhaps too exclusively in a "theory of mind" direction. Autism and Asperger Syndrome, edited by Frith, contains a number ofimportant articles, including clinical accounts by Christopher Gillberg, DigbyTantam, and Margaret Dewey. It also contains an essay on the autobiographical writings of Asperger adults, including Temple, by Francesca Happé; and thefirst English translation of Asperger's original 1994 paper, appended to asearching essay by Frith on his contributions. Asperger was, in a sense, "discovered" by Lorna Wing, and her essay comparing his approach and insightswith Kanner's also appears in this volume.

The Autism Society of America has chapters throughout the United States and inPuerto Rico. The national headquarters can be contacted at 7910 WoodmontAvenue, Suite 650, Bethesda, MD 20814, telephone (301) 565-0433 or (800) 328-8476. In England, the National Autistic Society is located in 276Willesden Lane, London NWi 5RB, telephone (081) 451-1114. More Able AutisticPeople (MAAP), Box 524, Crown Point, IN 46307, publishes a newsletter onhigher-functioning people with autism. The Autism Society of Canada is at 129Yorkville Avenue, Suite 202, Toronto, Ontario M5R 1C4, telephone (416) 922-0302.