slate, but with memory and insight from all that I experienced."

Elliott's words brought to my mind the verses from Psalm 90, a psalm of life and death. It is recited in my synagogue to begin the mournful service of *yizkor*, the service of rememberance of those loved ones who are gone. I saw myself then, standing deep in prayer, my eyes closed, seeking insight from memory. This time the words spoke to me not of loss but of gain:

The stream of human life is like a dream;
In the morning, it is as grass, sprouting, fresh;
In the morning, it blossoms and flourishes;
but by evening, it is cut down and withers. . . .
Our years come to an end like a fleeting whisper.
The days of our years may total seventy;
if we are exceptionally strong, perhaps eighty;
but all their pride and glory is toil and falsehood,
and, severed quickly, we fly away. . . .
So teach us to number our days that
we may attain a heart of wisdom.

from

AN ANTHROPOLOGIST ON MARS

OLIVER SACKS

In the course of her extraordinary life, Dr. Temple Grandin, a biologist and engineer in the animal sciences department at Colorado State University, has largely broken free of the circumscribed world imposed on those labeled as autistic. Neurologist Oliver Sacks shows some of the ingenious strategies Dr. Grandin has improvised to help her get through each day.

I had, of course, heard of Temple Grandin—everyone interested in autism has heard of her—and had read her autobiography, *Emergence: Labeled Autistic,* when it came out, in 1986. When I first read the book, I could not help being suspicious of it: the autistic mind, it was supposed at that time, was incapable of self-understanding and understanding others and therefore of authentic introspection and retrospection. How *could* an autistic person write an autobiography? It seemed a contradiction in terms. When I observed that the book had been written in collaboration with a journalist, I wondered whether some of its fine and unexpected qualities—its coherence, its poignancy, its often "normal" tone—might in fact be due to her. Such suspicions have continued to be voiced, in regard to Grandin's book and to autistic autobiographies in general, but as I read Temple's papers (and her many autobiographical articles) I found a detail and consistency, a directness, that changed my mind.[1]

Reading her autobiography and her articles, one gets a

[1]What one does see in Temple's writings (and in the writings of other very able autistic adults, not excluding some with marked literary gifts) are peculiar narrational gaps and discontinuities, sudden, perplexing changes of topic, brought about (so Francesca Happé suggests in a recent essay on the subject) by Temple's failure "to appreciate that her reader does not share the important background information that she possesses." In more general terms, autistic writers seem to get "out of tune" with their readers, fail to realize their own or their readers' states of mind.

feeling of how strange, how different, she was as a child, how far removed from normal.[2] At six months, she started to stiffen in her mother's arms, at ten months to claw her "like a trapped animal." Normal contact was almost impossible in these circumstances. Temple describes her world as one of sensations heightened, sometimes to an excruciating degree (and inhibited, sometimes to annihilation): she speaks of her ears, at the age of two or three, as helpless microphones, transmitting everything, irrespective of relevance, at full, overwhelming volume—and there was an equal lack of modulation 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 these were frustrated, violent rage. She perceived none of the usual rules and codes of human relationship. She lived, sometimes raged, inconceivably disorganized, in a world of unbridled chaos. In her third year, she became destructive and violent:

> Normal children use clay for modelling; I used my feces and then spread my creations all over the room. I chewed up puzzles and spit the cardboard mush out on the floor. I had a violent temper, and when thwarted, I'd throw anything handy—a museum quality vase or leftover feces. I screamed continually . . .

[2] Authentic memories from the second (perhaps even the first) year of life, though not available to "normals," may be recalled, with veridical detail, by autistic people. Thus, Lucci et al. write of one such boy, "He seems to recall, in exquisite detail, events from when he was two or three years old." Coenesthetic memories of infancy are also reported by Luria of S., the mnemonist he studied.

And yet, like many autistic children, she soon developed an immense power of concentration, a selectivity of attention so intense that it could create a world of its own, a place of calm and order in the chaos and tumult: "I could sit on the beach for hours dribbling sand through my fingers and fashioning miniature mountains," she writes. "Each particle of sand intrigued me as though I were a scientist looking through a microscope. Other times I scrutinized each line in my finger, following one as if it were a road on a map." Or she would spin, or spin a coin, so raptly that she saw and heard nothing else. "People around me were transparent. . . . Even a sudden loud noise didn't startle me from my world." (It is not clear whether this hyperfocus of attention—an attention as narrow as it is intense—is a primary phenomenon in autism or a reaction or adaptation to an overwhelming, uninhibited barrage of sensation. A similar hyperfocus is sometimes seen in Tourette's syndrome.)

At three, Temple was taken to a neurologist, and the diagnosis of autism was made; it was hinted that lifelong institutionalization would probably be necessary. The total absence of speech at this age seemed especially ominous.

How, I had to wonder, had she ever moved from this almost unintelligible childhood, with its chaos, its fixations, its inaccessibility, its violence—this fierce and desperate state, which had almost led to her institutionalization at the age of three—to the successful biologist and engineer I was going to see?

I phoned Temple from the Denver airport to reconfirm our meeting—it was conceivable, I thought, that she might be somewhat inflexible about arrangements, so time and place should be set as definitely as possible. It was an hour-and-a-quarter drive to Fort Collins, Temple said, and she provided minute directions for finding her office at Colorado State University, where she 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 she repeated the entire directional litany—several minutes' worth—in virtually the same words. It seemed as if the directions had to be given as they were held in Temple's mind, entire—that they had fused into a fixed association or program and could no longer be separated into their components. One instruction, however, had to be modified. She had told me at first that I should turn right onto College Street at a particular intersection marked by a Taco Bell restaurant. In her second set of directions, Temple added an aside here, said the Taco Bell had recently had a

face-lift and been housed in a fake cottage, and no longer looked in the least "bellish." I was struck by the charming, whimsical adjective "bellish"—autistic people are often called humorless, unimaginative, and "bellish" was surely an original concoction, a spontaneous and delightful image.

I made my way to the university campus and located the Animal Sciences Building, where Temple was waiting to greet me. She is a tall, strongly built woman 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-nonsense cattlewoman, with an indifference to social conventions, appearance, or ornament, 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 get caught for a moment in a sort of spasm or fixed posture—a hint, an echo, of the stereotypies she once had. Then she gave me a strong handshake and led the way down to her office. (Her gait seemed to me slightly clumsy or uncouth, as is often the case with autistic adults. Temple attributes this to a simple ataxia associated with impaired development of the vestibular system and part of the cerebellum. Later I did a brief neurological exam, focusing on her cerebellar function and balance; I did indeed find a little ataxia, but insufficient, I thought, to explain her odd gait.)

She sat me down with little ceremony, no preliminaries, no social niceties, no small talk about my trip or how I liked Colorado. Her office, crowded with papers, with work done and to do, could have been that of any academic, with photographs of her projects on the wall and animal knickknacks she had picked up on her travels. She plunged straight into talking of her work, speaking of her early interests in psychology and animal behavior, how they were connected with self-observation and a sense of her own needs as an autistic person, and how this had joined with the visualizing and engineering part of her mind to point 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.

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 and inspect at any time—"videos" of how people behaved in different circumstances. She would play these over and over again and learn, by degrees, to correlate what she saw, so that she could then predict how people in similar circumstances might act. She had complemented her experience by constant reading, including reading of trade journals and the *Wall Street Journal*—all of which enlarged her knowledge of the species. "It is strictly a logical process," she explained.

In one plant she had designed, she said, there had been repeated breakdowns of the machinery, but these occurred only when a particular man, John, was in the room. 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 it cognitively. I could put two and two together,

but I couldn't see the jealous look 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 and design all the equipment. They want the equipment, but it galls them that they can'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 her ingenuousness and gullibility, Temple was at first a target for all sorts of tricks and exploitations; this sort of innocence or guilelessness, arising not from moral virtue but from failure to understand dissembling and pretense ("the dirty devices of the world," in Traherne's phrase), is almost universal among the autistic. But over the years Temple has learned, in her indirect way, by inspecting her "library," some of the ways of the world. She has, in fact, been able to found her own company and to work as a freelance consultant to and designer of animal facilities all over the world. By professional standards, she is extraordinarily successful, but other human interactions—social, sexual—she cannot "get." "My work is my life," she told me several times. "There is not that much else."

There seemed to me pain, renunciation, resolution, and acceptance all mixed together 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 of my social contacts are with livestock people or people interested in autism. Most of my Friday and Saturday nights are spent writing papers and drawing. My interests are factual and my recreational reading consists mostly of science and livestock publications. I have little interest in novels with complicated interpersonal relationships, because I am unable to remember the sequence of events. Detailed descriptions of new technologies in science fiction or descriptions of exotic places are much more interesting. My life would be horrible if I did not have my challenging career.

Early the next morning, a Saturday, Temple picked me up in her four-wheel-drive, a rugged vehicle she drives all over the West to visit farms, ranches, corrals, and meat plants. As we headed for her house, I quizzed her about the work she had done for her Ph.D.; her thesis was on the effects of enriched and impoverished environments on the development of pigs' brains. She told me about the great differences that developed between the two groups—how sociable and delightful the "enriched" pigs became, how hyperexcitable and aggressive (and almost "autistic") the "impoverished" ones were by contrast. (She wondered whether impoverishment of experi-

ence was not a contributing factor in human autism.) "I got to love my enriched pigs," she said. "I was very attached. I was so attached I couldn't kill them." The animals had to be sacrificed at the end of the experiment so their brains could be examined. She described how the pigs, at the end, trusting her, let her lead them on their last walk, and how she had calmed them, by stroking them and talking to them, while they were killed. She was very distressed at their deaths—"I wept and wept."

She had just finished the story when we arrived at her home—a small two-story town 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 was rarely used. There was an immense sepia print of her grandfather's farm in Grandin, North Dakota, in 1880; her other grandfather, she told me, had invented the automatic pilot for planes. These two were the progenitors, she feels, of her agricultural and engineering talents. Upstairs was her study, with her typewriter (but no word processor), absolutely bursting with manuscripts and books—books everywhere, spilling out of the study into every room in the house. (My own little house was once described as "a machine for working," and I had a somewhat similar impression of Temple's.) On one wall was a large cowhide with a huge collection of identity badges and caps, from the hundreds of conferences she has lectured at. I was

amused to see, side by side, an I.D. from the American Meat Institute and one from the American Psychiatric Association. Temple has published more than a hundred papers, divided between those on animal behavior and facilities management and those on autism. The intimate blending of the two was epitomized by the medley of badges side by side.

Finally, without diffidence or embarrassment (emotions unknown to her), Temple showed me her bedroom, an austere room with whitewashed walls and a single bed and, next to the bed, a very large, strange-looking object. "What is that?" I asked.

"That's my squeeze machine," Temple replied. "Some people call it my hug machine."

The device had two heavy, slanting wooden sides, perhaps four by three feet each, pleasantly upholstered with a thick, soft padding. They were joined by hinges 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 off to another device, in a closet. Temple showed me this as well. "It's an industrial 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 to the knees," Temple said. "Either a steady pressure or a variable one or a pulsating one, as you wish," she added. "You crawl into it—I'll show you—and

turn 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, she told me. When she was a little girl, she said, she had longed to be hugged but had at the same time been terrified of all contact. When she was hugged, especially by a favorite (but vast) aunt, she felt overwhelmed, overcome by sensation; she had a sense of peacefulness and pleasure, but also of terror and engulfment. She started to have daydreams—she was just five at the time—of a magic machine that could squeeze her powerfully but gently, in a huglike way, and in a way entirely commanded and controlled by her. Years later, as an adolescent, she had seen a picture of a squeeze chute designed to hold or restrain 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 had considered other devices—inflatable suits, which could exert an even pressure all over the body—but the squeeze chute, in its simplicity, was quite irresistible.

Being of a practical turn of mind, she soon made her fantasy come true. The early models were crude, with some snags and glitches, but she eventually evolved a totally comfortable, predictable system, capable of administering a "hug" with whatever parameters she desired. Her squeeze machine had worked exactly as she hoped, yielding the very sense of calmness and pleasure she had dreamed of since

childhood. She could not have gone through the stormy days of college without her squeeze machine, she said. She could not turn to human beings 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 at college, 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—Temple ignored 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 systematic investigation of the effects of deep pressure in autistic people, college students, and animals, and recently a paper of hers on this was published in the *Journal of Child and Adolescent Psychopharmacology*. Today, her squeeze machine, variously modified, is receiving extensive clinical trials. She has also become the world's foremost designer of squeeze chutes for cattle and has published, in the meat-industry and veterinary literature, many articles on the theory and practice of humane restraint and gentle holding.

While telling me this, Temple knelt down, then eased herself, facedown and at full length, into the "V," turned on the compressor (it took a minute for the master cylinder to

fill), and twisted the controls. The sides converged, clasping her firmly, and then, as she made a small adjustment, relaxed their grip slightly. It was the most bizarre thing I had ever seen, and yet, for all its oddness, it was moving and simple. Certainly there was no doubt of its effect. Temple's voice, often loud and hard, became softer and gentler as she lay in her machine. "I concentrate on how gently I can do it," she said, and then spoke of the necessity of "totally giving in to it. . . . I'm getting real relaxed now," she added quietly. "I guess others get this through relation with 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, her thoughts often turn to her mother, her favorite aunt, her teachers. She feels their love for her, and hers for them. She feels that the machine opens a door into 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 less rigid (she says that a cat can easily sense the difference in her at these times), and asked me if I would care to try the machine.

Indeed, I was curious and scrambled into it, feeling a little foolish and self-conscious—but less so than I might have been, because Temple herself was so wholly lacking in self-consciousness. She turned the compressor on again and 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-diving days long ago, when I felt the pressure of the water on my diving suit as a whole-body embrace.