<http://www.terrybisson.com/page6/page6.html>

**TERRY BISSON of the UNIVERSE**

**Science Fiction Writer**

I’m honored that this often shows up on the internet. Here’s the correct version, as published in Omni, 1990.

**THEY'RE MADE OUT OF MEAT**

"They're made out of meat."

"Meat?"

"Meat. They're made out of meat."

"Meat?"

"There's no doubt about it. We picked up several from different parts of the planet, took them aboard our recon vessels, and probed them all the way through. They're completely meat."

"That's impossible. What about the radio signals? The messages to the stars?"

"They use the radio waves to talk, but the signals don't come from them. The signals come from machines."

"So who made the machines? That's who we want to contact."

"They made the machines. That's what I'm trying to tell you. Meat made the machines."

"That's ridiculous. How can meat make a machine? You're asking me to believe in sentient meat."

"I'm not asking you, I'm telling you. These creatures are the only sentient race in that sector and they're made out of meat."

"Maybe they're like the orfolei. You know, a carbon-based intelligence that goes through a meat stage."

"Nope. They're born meat and they die meat. We studied them for several of their life spans, which didn't take long. Do you have any idea what's the life span of meat?"

"Spare me. Okay, maybe they're only part meat. You know, like the weddilei. A meat head with an electron plasma brain inside."

"Nope. We thought of that, since they do have meat heads, like the weddilei. But I told you, we probed them. They're meat all the way through."

"No brain?"

"Oh, there's a brain all right. It's just that the brain is made out of meat! That's what I've been trying to tell you."

"So ... what does the thinking?"

"You're not understanding, are you? You're refusing to deal with what I'm telling you. The brain does the thinking. The meat."

"Thinking meat! You're asking me to believe in thinking meat!"

"Yes, thinking meat! Conscious meat! Loving meat. Dreaming meat. The meat is the whole deal!  Are you beginning to get the picture or do I have to start all over?"

"Omigod. You're serious then. They're made out of meat."

"Thank you. Finally. Yes. They are indeed made out of meat. And they've been trying to get in touch with us for almost a hundred of their years."

"Omigod. So what does this meat have in mind?"

"First it wants to talk to us. Then I imagine it wants to explore the Universe, contact other sentience, swap ideas and information. The usual."

"We're supposed to talk to meat."

"That's the idea. That's the message they're sending out by radio. 'Hello. Anyone out there. Anybody home.' That sort of thing."

"They actually do talk, then. They use words, ideas, concepts?"
"Oh, yes. Except they do it with meat."

"I thought you just told me they used radio."

"They do, but what do you think is on the radio? Meat sounds. You know how when you slap or flap meat, it makes a noise? They talk by flapping their meat at each other. They can even sing by squirting air through their meat."

"Omigod. Singing meat. This is altogether too much. So what do you advise?"

"Officially or unofficially?"

"Both."

"Officially, we are required to contact, welcome and log in any and all sentient races or multibeings in this quadrant of the Universe, without prejudice, fear or favor. Unofficially, I advise that we erase the records and forget the whole thing."

"I was hoping you would say that."

"It seems harsh, but there is a limit. Do we really want to make contact with meat?"

"I agree one hundred percent. What's there to say? 'Hello, meat. How's it going?' But will this work? How many planets are we dealing with here?"

"Just one. They can travel to other planets in special meat containers, but they can't live on them. And being meat, they can only travel through C space. Which limits them to the speed of light and makes the possibility of their ever making contact pretty slim. Infinitesimal, in fact."

"So we just pretend there's no one home in the Universe."

"That's it."

"Cruel. But you said it yourself, who wants to meet meat? And the ones who have been aboard our vessels, the ones you probed? You're sure they won't remember?"

"They'll be considered crackpots if they do. We went into their heads and smoothed out their meat so that we're just a dream to them."

"A dream to meat! How strangely appropriate, that we should be meat's dream."

"And we marked the entire sector unoccupied."

"Good. Agreed, officially and unofficially. Case closed. Any others? Anyone interesting on that side of the galaxy?"

"Yes, a rather shy but sweet hydrogen core cluster intelligence in a class nine star in G445 zone. Was in contact two galactic rotations ago, wants to be friendly again."

"They always come around."

"And why not? Imagine how unbearably, how unutterably cold the Universe would be if one were all alone ..."

(Thanks for your interest in my work. If you enjoyed this little piece, please give a dollar to a homeless person.)

<http://www.chronicle.com/article/mind-maze/149945>

**THE CHRONICLE OF HIGHER EDUCATION**

[The Chronicle Review](http://www.chronicle.com/section/The-Chronicle-Review/41)

# How to Study the Brain

By Gary Marcus, Adam Marblestone, and Jeremy Freeman

November 12, 2014

"As humans, we can identify galaxies light years away, we can study particles smaller than an atom. But we still haven’t unlocked the mystery of the three pounds of matter that sits between our ears."
—President Obama, April 2, 2013

The human brain contains roughly 86 billion neurons and trillions, perhaps hundreds of trillions, of intricate interconnections among those neurons. There are hundreds, maybe thousands of different kinds of cells within the brain. And—after nearly two centuries of research—exactly zero convincing theories of how it all works.

Why is it so hard to figure out how the brain functions, and what can we do to face the challenges?

The time to address these questions is now; the quotation above from the president came as he [announced](http://www.whitehouse.gov/the-press-office/2013/04/02/remarks-president-brain-initiative-and-american-innovation) a projected 12-year project known as the BRAIN Initiative, and a few months earlier Europe announced big steps of its own, a 1.2-billion-euro effort to simulate the human brain. China, Japan, and a number of nations are also planning major investments. There is real reason to believe that the field is on the verge of a number of methodological breakthroughs: Soon we will be able to study the operation of the brain in unprecedented detail, yielding orders of magnitude more data than the field has ever seen before.

And that is a good thing. On virtually any account, neuroscience needs more data—a lot more data—than it has.

To begin with, we desperately need a parts list for the brain. The varied multitude of cells in the human brain have names like "pyramidal cells," "basket cells," and "chandelier cells," based on their physical structures. But we don’t know exactly how many cell types there are—some, like Cajal-Retzius cells (which play a role in brain development) are quite rare. And we know neither what all these different cell types do nor why there are so many. Until we have a fuller understanding of the parts list, we can hardly expect to understand how the brain as a whole functions.

Detailed wiring diagrams are also crucial; the parts alone certainly won’t suffice. We need to know which neurons hook up to which others, and how. As Sebastian Seung and his co-authors have recently showed, even fine-grained details, like the exact locations of neural synapses on the recipient cell bodies, and between particular subtypes of cells, can be critical.

Also indispensable will be detailed information about the distributions of many individual molecules within individual neurons (and in the synaptic connections between them), governing how neurons connect to one another, store information, and convey a wide diversity of chemical messages to their neighbors.

Finally, we need to understand how the dynamic activity of neural circuits unfolds over time, in response to real-world inputs. In each new circuit that we try to unravel, we may need comprehensive maps of the detailed interactions among genes, molecules, wiring, neural activity, and behavior.

All of which is made more challenging by the intricate and difficult-to-apprehend nature of the brain itself.

The good news is that the Obama BRAIN Initiative, alongside private efforts like the [Allen Institute for Brain Science](http://alleninstitute.org/) and the Howard Hughes Medical Institute’s [Janelia Research Campus](http://janelia.org/), is poised to collect data of exactly those sorts. Allen aims to deliver a complete wiring diagram of a cubic millimeter of mouse cortex, a multistep process that currently relies on sophisticated electron microscopy and machine-learning methods. Advances in optical microscopy at Janelia are yielding large-scale dynamic maps of neural activity. Other projects are developing tools for perturbing brain circuits and watching how they respond. Eventually, one hopes, we will be able to gather similar data from humans, in noninvasive ways. (For now, most high-resolution techniques in humans are restricted to post-mortem tissue, while techniques on living brains are restricted to animals like flies, zebra­fish, mice, and nonhuman primates, a strong but not infallible guide to some aspects of human brain function.)

The work will begin—but not end—with the construction of a robust infrastructure for data analysis. Soon there will be exabytes (billions of gigabytes) of data, detailing what vast numbers of neurons do, in real time, as brains process information and guide action. To deal with the data flow, neuroscience will need to take a cue from Google and Amazon, spreading data analyses across large clusters of computers, with software that allows a single investigator, or a team, to marshal armies of computers in pursuit of a particular goal. Logistically, neuroscience needs standards that allow labs to share and integrate data collected at a vast range of scales, tying together data about individual molecules with data about complex circuits containing billions of cells.

But once we have all the data we can envision, there is still a major problem: How do we interpret it? A mere catalog of data is not the same as an understanding of how and why a system works.

The problem is much more difficult than it might initially appear. In the best case, individual neurons are assigned clearly defined "roles." In the late 1950s and early 1960s, David Hubel and Torsten Wiesel famously discovered neurons in the visual cortex that selectively encode whether a line is vertical, horizontal, or diagonal. Edvard and May-Britt Moser and John O’Keefe won a Nobel Prize in 2014 for identifying and characterizing neurons that encode an animal’s spatial position, which may provide a neural basis for navigation. But these clear examples may be the exception rather than the rule, especially when it comes to complex processes like forming a memory or deciding how to behave.

For one thing, the connection between neural circuits and behavior can be far less straightforward than it sometimes seems. To take a simple example, noticing in the lab that some neurons seem to be active every time a zebrafish sees a moving pattern, we might conclude initially that those neurons are encoding something related to visual processing. But when we take into account that the same stimulus also causes the animal to swim, it may turn out that some of the "motion-detection" neurons are actually "swimming-induction" neurons. The picture is complicated further when we realize that the swimming is modulated by other aspects of the behavioral state of the animal, controlled by still other sets of neurons.

Even when we can confidently identify which circuits are involved in a particular brain function, the brain, like a hydra, is constantly changing and adapting. Broca’s area, for example, is traditionally thought of as the seat of language, but there are well-documented cases of children’s recovering linguistic function even after the entire left hemisphere has been removed.

When we do know that some set of neurons is typically involved in some task, we can’t safely conclude that those neurons are either necessary or sufficient; the brain often has many routes to solving any one problem. The fairy tales about brain localization (in which individual chunks of brain tissue correspond directly to abstract functions like language and vision) that are taught in freshman psychology fail to capture how dynamic the actual brain is in action.

One lesson is that neural data can’t be analyzed in a vacuum. Experimentalists need to work closely with data analysts and theorists to understand what can and should be asked, and how to ask it. A second lesson is that delineating the biological basis of behavior will require a rich understanding of behavior itself. A third is that understanding the nervous system cannot be achieved by a mere catalog of correlations. Big data alone aren’t enough.

Across all of these challenges, the important missing ingredient is theory. Science is about formulating and testing hypotheses, but nobody yet has a plausible, fully articulated hypothesis about how most brain functions occur, or how the interplay of those functions yields our minds and personalities.

Theory can, of course, take many forms. To a theoretical physicist, theory might look like elegant mathematical equations that quantitatively predict the behavior of a system. To a computer scientist, theory might mean the construction of classes of algorithms that behave in ways similar to how the brain processes information. Cognitive scientists have theories of the brain that are formulated in other ways, such as the ACT-R framework invented by the cognitive scientist John Anderson, in which cognition is modeled as a series of "production rules" that use our memories to generate our physical and mental actions.

The challenge for neuroscience is to try to square high-level theories of behavior and cognition with the detailed biology and biophysics of the brain. As the philosopher Ned Block said to us in an email, "There is no way to understand the brain without theory at the psychological level that tells you what brain circuits are doing."

By way of example, Block pointed to the role that theory played in understanding aspects of color vision. The perception of color reflects the function of at least two opponent systems, red/green and yellow/blue, as proposed by the physiologist Ewald Hering in the 19th century on the basis of behavioral experiments, and further developed by L.M. Hurvich and Dorothea Jameson in the 1950s. These ideas helped guide a search in the brain, at which point at least a partial neural basis for opponent processes was eventually discovered in the lateral geniculate nucleus. As Block put it, this example shows the importance of a "‘co-evolution’ of neuroscience and psychology, in which hypotheses are developed on the basis of both behavioral experiments and neuroscientific data."

In the words of a terrific June 2014 [report](http://www.nih.gov/news/health/jun2014/od-05.htm) to the National Institutes of Health director, Francis Collins, a key goal of the BRAIN Initiative should be to "produce conceptual foundations for understanding the biological basis of mental processes through development of new theoretical and data analysis tools (emphasis added)." We can’t simply ask, What does this bundle of neurons do? We have to ask, how might the brain work in principle, what clues can we gather from psychology and behavior, and what kinds of experiments could we develop in order to test theories of brain function?

In our view, theory has been relatively understudied in neuroscience, and psychology has been mentioned too infrequently. Lip service has been given, but aggressive steps are necessary. For example, in the first round of 56 [NIH grants](http://www.braininitiative.nih.gov/nih-brain-awards.htm) (awarded at the end of September), the emphasis was primarily on the important goal of developing new techniques (such as combinations of optics and ultrasound that could yield improved ways to measure dynamic patterns of neural activity at high speed) and on the parts list (a crucial "census" of cell types). But no section specifically focused on theory, or on bridging among brain, behavior, and cognition; in the abstracts of the grants, the word "theory" was mentioned only once.

As William Newsome, a prominent Stanford neuroscientist who has championed stronger theory development, said in an email to one of us (Marcus), part of the problem is structural. NIH, the largest source of scientific funds for research in the United States, is basically set up to give big grants to experimentalists. The review process that decides which grants to award is heavily biased toward research that is only moderately risky. Building new theories is a trapeze act, and most theorists fall off. Because building new theories is risky, theorists almost never get funded, except as an appendage to experimentalists. But theorists are comparatively cheap—they don’t need millions of dollars of equipment—and even if most theories don’t pan out, the rewards for having the right one are enormous.

Figuring out how to foster theory development isn’t easy. To be successful, theorists need to have broad interdisciplinary training, bridging between the empirical nitty-gritty of neuroscience and more abstract characterizations of computation, behavior, and mental life, such as those found in psychology. Neuroscience needs to welcome mathematicians, engineers, computer scientists, cognitive psychologists, and anthropologists into the fold.

As a start, the NIH should give funds to young scientists who want to broaden their training, and should more actively promote collaborations between theorists and experimentalists. A small joint program of the NIH and the National Science Foundation, Collaborative Research in Computational Neuroscience, is budgeted at $5-million to $20-million and should be significantly expanded, potentially multiplying the payoffs for empirical brain mapping manyfold over the long term. The NSF’s new Integrative Strategies for Understanding Neural and Cognitive Systems [program](http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=505132) is another useful step. Two new institutes, in [London](http://www.ucl.ac.uk/swc) and [Paris](http://www.eitn.eu/), are also steps in the right direction, one focused largely on theory, the other on interactions between theory and experiment. But for now the balance, fieldwide, remains heavily skewed toward experiment over theory.

Of course, theoretical neuroscience already exists as an academic discipline, but arguably one that has been inwardly directed, strongly influenced by physics but less so by psychology, computation, linguistics, and evolutionary biology. We need institutional mechanisms that support young scholars, encourage them to transcend disciplinary boundaries, and enable them to integrate neuroscience with neighboring disciplines. We need a culture within neuroscience that embraces intellectual interactions rather than dwelling almost exclusively on empirical data gathered from the bottom up.

One option, among many, is that the NSF and NIH could fund small centers geared to bring researchers from several disciplines under the same roof, rather than spread across large universities, perhaps tied to support for graduate students that would allow young scientists to develop rich training in multiple disciplines.

Neuroscience has been around for roughly two centuries, but progress remains painfully slow. We still don’t know how the brain works, and our categories for analyzing things like brain injuries and mental illness range from vague to antediluvian. As the neurosurgeon Geoffrey Manley, at the University of California at San Francisco, recently pointed out at a White House-sponsored meeting, traumatic brain injuries are still sorted into just three categories: "mild," "moderate," and "severe"; the field still has no reliable way of being more precise in predicting whether someone is likely to fully recover cognitively from a severe concussion.

With over half a billion people around the world suffering from debilitating brain disorders, whether depression, schizophrenia, autism, Alzheimer’s disease, or traumatic brain disorder, it is no exaggeration to say that significant progress in neuroscience could fundamentally alter the world. But getting there will require more than just big data alone. It will require some big ideas, too.

Gary Marcus is a professor of psychology and neuroscience at New York University. Adam Marblestone is a research scientist at the Massachusetts Institute of Technology. Jeremy Freeman is a group leader at the Janelia Research Campus. Marcus and Freeman are co-editors of the forthcoming The Future of the Brain: Essays by the World’s Leading Neuroscientists (Princeton University Press).

<http://www.odysseyeditions.com/EBooks/Oliver-Sacks/The-Man-Who-Mistook-His-Wife-for-a-Hat/Excerpt>

# [The Man Who Mistook His Wife for a Hat](http://www.odysseyeditions.com/EBooks/Oliver-Sacks/The-Man-Who-Mistook-His-Wife-for-a-Hat) by [Oliver Sacks](http://www.odysseyeditions.com/EBooks/Oliver-Sacks)

## Excerpt

Dr P. was a musician of distinction, well-known for many years as a singer, and then, at the local School of Music, as a teacher. It was here, in relation to his students, that certain strange problems were first observed. Sometimes a student would present himself, and Dr P. would not recognise him; or, specifically, would not recognise his face. The moment the student spoke, he would be recognised by his voice. Such incidents multiplied, causing embarrassment, perplexity, fear—and, sometimes, comedy. For not only did Dr P. increasingly fail to see faces, but he saw faces when there were no faces to see: genially, Magoo-like, when in the street he might pat the heads of water hydrants and parking meters, taking these to be the heads of children; he would amiably address carved knobs on the furniture and be astounded when they did not reply. At first these odd mistakes were laughed off as jokes, not least by Dr P. himself. Had he not always had a quirky sense of humour and been given to Zen-like paradoxes and jests? His musical powers were as dazzling as ever; he did not feel ill—he had never felt better; and the mistakes were so ludicrous—and so ingenious—that they could hardly be serious or betoken anything serious. The notion of there being ‘something the matter’ did not emerge until some three years later, when diabetes developed. Well aware that diabetes could affect his eyes, Dr P. consulted an ophthalmologist, who took a careful history and examined his eyes closely. ‘There’s nothing the matter with your eyes,’ the doctor concluded. ‘But there is trouble with the visual parts of your brain. You don’t need my help, you must see a neurologist.’ And so, as a result of this referral, Dr P. came to me.

It was obvious within a few seconds of meeting him that there was no trace of dementia in the ordinary sense. He was a man of great cultivation and charm who talked well and fluently, with imagination and humour. I couldn’t think why he had been referred to our clinic.

And yet there was something a bit odd. He faced me as he spoke, was oriented towards me, and yet there was something the matter—it was difficult to formulate. He faced me with his ears, I came to think, but not with his eyes. These, instead of looking, gazing, at me, ‘taking me in’, in the normal way, made sudden strange fixations—on my nose, on my right ear, down to my chin, up to my right eye—as if noting (even studying) these individual features, but not seeing my whole face, its changing expressions, ‘me’, as a whole. I am not sure that I fully realised this at the time—there was just a teasing strangeness, some failure in the normal interplay of gaze and expression. He saw me, he scanned me, and yet . . .

‘What seems to be the matter?’ I asked him at length.

‘Nothing that I know of,’ he replied with a smile, ‘but people seem to think there’s something wrong with my eyes.’

‘But you don’t recognise any visual problems?’

‘No, not directly, but I occasionally make mistakes.’

I left the room briefly to talk to his wife. When I came back, Dr P. was sitting placidly by the window, attentive, listening rather than looking out. ‘Traffic,’ he said, ‘street sounds, distant trains—they make a sort of symphony, do they not? You know Honegger’s Pacific 234?’

What a lovely man, I thought to myself. How can there be anything seriously the matter? Would he permit me to examine him?

‘Yes, of course, Dr Sacks.’

I stilled my disquiet, his perhaps, too, in the soothing routine of a neurological exam—muscle strength, coordination, reflexes, tone. . . . It was while examining his reflexes—a trifle abnormal on the left side—that the first bizarre experience occurred. I had taken off his left shoe and scratched the sole of his foot with a key—a frivolous-seeming but essential test of a reflex—and then, excusing myself to screw my ophthalmoscope together, left him to put on the shoe himself. To my surprise, a minute later, he had not done this.

‘Can I help?’ I asked.

‘Help what? Help whom?’

‘Help you put on your shoe.’

‘Ach,’ he said, ‘I had forgotten the shoe,’ adding, sotto voce, ‘The shoe? The shoe?’ He seemed baffled.

‘Your shoe,’ I repeated. ‘Perhaps you’d put it on.’

He continued to look downwards, though not at the shoe, with an intense but misplaced concentration. Finally his gaze settled on his foot: ‘That is my shoe, yes?’

Did I mis-hear? Did he mis-see?

‘My eyes,’ he explained, and put a hand to his foot. ‘This is my shoe, no?’

‘No, it is not. That is your foot. There is your shoe.’

‘Ah! I thought that was my foot.’

Was he joking? Was he mad? Was he blind? If this was one of his ‘strange mistakes’, it was the strangest mistake I had ever come across.

I helped him on with his shoe (his foot), to avoid further complication. Dr P. himself seemed untroubled, indifferent, maybe amused. I resumed my examination. His visual acuity was good: he had no difficulty seeing a pin on the floor, though sometimes he missed it if it was placed to his left.

He saw all right, but what did he see? I opened out a copy of the National Geographic Magazine and asked him to describe some pictures in it.

His responses here were very curious. His eyes would dart from one thing to another, picking up tiny features, individual features, as they had done with my face. A striking brightness, a colour, a shape would arrest his attention and elicit comment—but in no case did he get the scene-as-a-whole. He failed to see the whole, seeing only details, which he spotted like blips on a radar screen. He never entered into relation with the picture as a whole—never faced, so to speak, its physiognomy. He had no sense whatever of a landscape or scene.

I showed him the cover, an unbroken expanse of Sahara dunes.

‘What do you see here?’ I asked.

‘I see a river,’ he said. ‘And a little guest-house with its terrace on the water. People are dining out on the terrace. I see coloured parasols here and there.’ He was looking, if it was ‘looking’, right off the cover into mid-air and confabulating nonexistent features, as if the absence of features in the actual picture had driven him to imagine the river and the terrace and the coloured parasols.

I must have looked aghast, but he seemed to think he had done rather well. There was a hint of a smile on his face. He also appeared to have decided that the examination was over and started to look around for his hat. He reached out his hand and took hold of his wife’s head, tried to lift it off, to put it on. He had apparently mistaken his wife for a hat! His wife looked as if she was used to such things.

I could make no sense of what had occurred in terms of conventional neurology (or neuropsychology). In some ways he seemed perfectly preserved, and in others absolutely, incomprehensibly devastated. How could he, on the one hand, mistake his wife for a hat and, on the other, function, as apparently he still did, as a teacher at the Music School?

I had to think, to see him again—and to see him in his own familiar habitat, at home.

A few days later I called on Dr P. and his wife at home, with the score of the Dichterliebe in my briefcase (I knew he liked Schumann), and a variety of odd objects for the testing of perception. Mrs P. showed me into a lofty apartment, which recalled fin-de-siècle Berlin. A magnificent old Bösendorfer stood in state in the centre of the room, and all around it were music stands, instruments, scores. . . . There were books, there were paintings, but the music was central. Dr P. came in, a little bowed, and, distracted, advanced with outstretched hand to the grandfather clock, but, hearing my voice, corrected himself, and shook hands with me. We exchanged greetings and chatted a little of current concerts and performances. Diffidently, I asked him if he would sing.

‘The Dichterliebe!’ he exclaimed. ‘But I can no longer read music. You will play them, yes?’

I said I would try. On that wonderful old piano even my playing sounded right, and Dr P. was an aged but infinitely mellow Fischer-Dieskau, combining a perfect ear and voice with the most incisive musical intelligence. It was clear that the Music School was not keeping him on out of charity.

Dr P.’s temporal lobes were obviously intact: he had a wonderful musical cortex. What, I wondered, was going on in his parietal and occipital lobes, especially in those areas where visual processing occurred? I carry the Platonic solids in my neurological kit and decided to start with these.

‘What is this?’ I asked, drawing out the first one.

‘A cube, of course.’

‘Now this?’ I asked, brandishing another.

He asked if he might examine it, which he did swiftly and systematically: ‘A dodecahedron, of course. And don’t bother with the others—I’ll get the icosahedron, too.’

Abstract shapes clearly presented no problems. What about faces? I took out a pack of cards. All of these he identified instantly, including the jacks, queens, kings, and the joker. But these, after all, are stylised designs, and it was impossible to tell whether he saw faces or merely patterns. I decided I would show him a volume of cartoons which I had in my briefcase. Here, again, for the most part, he did well. Churchill’s cigar, Schnozzle’s nose: as soon as he had picked out a key feature he could identify the face. But cartoons, again, are formal and schematic. It remained to be seen how he would do with real faces, realistically represented.

I turned on the television, keeping the sound off, and found an early Bette Davis film. A love scene was in progress. Dr P. failed to identify the actress—but this could have been because she had never entered his world. What was more striking was that he failed to identify the expressions on her face or her partner’s, though in the course of a single torrid scene these passed from sultry yearning through passion, surprise, disgust, and fury to a melting reconciliation. Dr P. could make nothing of any of this. He was very unclear as to what was going on, or who was who or even what sex they were. His comments on the scene were positively Martian.

It was just possible that some of his difficulties were associated with the unreality of a celluloid, Hollywood world; and it occurred to me that he might be more successful in identifying faces from his own life. On the walls of the apartment there were photographs of his family, his colleagues, his pupils, himself. I gathered a pile of these together and, with some misgivings, presented them to him. What had been funny, or farcical, in relation to the movie, was tragic in relation to real life. By and large, he recognised nobody: neither his family, nor his colleagues, nor his pupils, nor himself. He recognised a portrait of Einstein because he picked up the characteristic hair and moustache; and the same thing happened with one or two other people. ‘Ach, Paul!’ he said, when shown a portrait of his brother. ‘That square jaw, those big teeth—I would know Paul anywhere!’ But was it Paul he recognised, or one or two of his features, on the basis of which he could make a reasonable guess as to the subject’s identity? In the absence of obvious ‘markers’, he was utterly lost. But it was not merely the cognition, the gnosis, at fault; there was something radically wrong with the whole way he proceeded. For he approached these faces—even of those near and dear—as if they were abstract puzzles or tests. He did not relate to them, he did not behold. No face was familiar to him, seen as a ‘thou’, being just identified as a set of features, an ‘it’. Thus, there was formal, but no trace of personal, gnosis. And with this went his indifference, or blindness, to expression. A face, to us, is a person looking out—we see, as it were, the person through his persona, his face. But for Dr P. there was no persona in this sense—no outward persona, and no person within.

I had stopped at a florist on my way to his apartment and bought myself an extravagant red rose for my buttonhole. Now I removed this and handed it to him. He took it like a botanist or morphologist given a specimen, not like a person given a flower.

‘About six inches in length,’ he commented. ‘A convoluted red form with a linear green attachment.’

‘Yes,’ I said encouragingly, ‘and what do you think it is, Dr P.?’

‘Not easy to say.’ He seemed perplexed. ‘It lacks the simple symmetry of the Platonic solids, although it may have a higher symmetry of its own. . . . I think this could be an inflorescence or flower.’

‘Could be?’ I queried.

‘Could be,’ he confirmed.

‘Smell it,’ I suggested, and he again looked somewhat puzzled, as if I had asked him to smell a higher symmetry. But he complied courteously, and took it to his nose. Now, suddenly, he came to life.

‘Beautiful!’ he exclaimed. ‘An early rose. What a heavenly smell!’ He started to hum ‘Die Rose, die Lillie . . .’ Reality, it seemed, might be conveyed by smell, not by sight.

I tried one final test. It was still a cold day, in early spring, and I had thrown my coat and gloves on the sofa.

‘What is this?’ I asked, holding up a glove.

‘May I examine it?’ he asked, and, taking it from me, he proceeded to examine it as he had examined the geometrical shapes.

‘A continuous surface,’ he announced at last, ‘infolded on itself. It appears to have’—he hesitated—‘five outpouchings, if this is the word.’

‘Yes,’ I said cautiously. ‘You have given me a description. Now tell me what it is.’

‘A container of some sort?’

‘Yes,’ I said, ‘and what would it contain?’

‘It would contain its contents!’ said Dr P., with a laugh. ‘There are many possibilities. It could be a change purse, for example, for coins of five sizes. It could . . .’

I interrupted the barmy flow. ‘Does it not look familiar? Do you think it might contain, might fit, a part of your body?’

No light of recognition dawned on his face. (Later, by accident, he got it on, and exclaimed, ‘My God, it’s a glove!’ This was reminiscent of Kurt Goldstein’s patient ‘Lanuti’, who could only recognise objects by trying to use them in action.)

No child would have the power to see and speak of ‘a continuous surface . . . infolded on itself,’ but any child, any infant, would immediately know a glove as a glove, see it as familiar, as going with a hand. Dr P. didn’t. He saw nothing as familiar. Visually, he was lost in a world of lifeless abstractions. Indeed, he did not have a real visual world, as he did not have a real visual self. He could speak about things, but did not see them face-to-face. Hughlings Jackson, discussing patients with aphasia and left-hemisphere lesions, says they have lost ‘abstract’ and ‘propositional’ thought—and compares them with dogs (or, rather, he compares dogs to patients with aphasia). Dr P., on the other hand, functioned precisely as a machine functions. It wasn’t merely that he displayed the same indifference to the visual world as a computer but—even more strikingly—he construed the world as a computer construes it, by means of key features and schematic relationships. The scheme might be identified—in an ‘identi-kit’ way—without the reality being grasped at all.

The testing I had done so far told me nothing about Dr P.’s inner world. Was it possible that his visual memory and imagination were still intact? I asked him to imagine entering one of our local squares from the north side, to walk through it, in imagination or in memory, and tell me the buildings he might pass as he walked. He listed the buildings on his right side, but none of those on his left. I then asked him to imagine entering the square from the south. Again he mentioned only those buildings that were on the right side, although these were the very buildings he had omitted before. Those he had ‘seen’ internally before were not mentioned now; presumably, they were no longer ‘seen’. It was evident that his difficulties with leftness, his visual field deficits, were as much internal as external, bisecting his visual memory and imagination.

What, at a higher level, of his internal visualisation? Thinking of the almost hallucinatory intensity with which Tolstoy visualises and animates his characters, I questioned Dr P. about Anna Karenina. He could remember incidents without difficulty, had an undiminished grasp of the plot, but completely omitted visual characteristics, visual narrative, and scenes. He remembered the words of the characters but not their faces; and though, when asked, he could quote, with his remarkable and almost verbatim memory, the original visual descriptions, these were, it became apparent, quite empty for him and lacked sensorial, imaginal, or emotional reality. Thus, there was an internal agnosia as well. (I have often wondered about Helen Keller’s visual descriptions, whether these, for all their eloquence, are somehow empty as well? Or whether, by the transference of images from the tactile to the visual, or, yet more extraordinarily, from the verbal and the metaphorical to the sensorial and the visual, she did achieve a power of visual imagery, even though her visual cortex had never been stimulated, directly, by the eyes? But in Dr P.’s case it is precisely the cortex that was damaged, the organic prerequisite of all pictorial imagery. Interestingly and typically he no longer dreamed pictorially—the ‘message’ of the dream being conveyed in nonvisual terms.)

But this was only the case, it became clear, with certain sorts of visualisation. The visualisation of faces and scenes, of visual narrative and drama—this was profoundly impaired, almost absent. But the visualisation of schemata was preserved, perhaps enhanced. Thus, when I engaged him in a game of mental chess, he had no difficulty visualising the chessboard or the moves—indeed, no difficulty in beating me soundly.

Luria said of Zazetsky that he had entirely lost his capacity to play games but that his ‘vivid imagination’ was unimpaired. Zazetsky and Dr P. lived in worlds which were mirror images of each other. But the saddest difference between them was that Zazetsky, as Luria said, ‘fought to regain his lost faculties with the indomitable tenacity of the damned,’ whereas Dr P. was not fighting, did not know what was lost, did not indeed know that anything was lost. But who was more tragic, or who was more damned—the man who knew it, or the man who did not?

When the examination was over, Mrs P. called us to the table, where there was coffee and a delicious spread of little cakes. Hungrily, hummingly, Dr P. started on the cakes. Swiftly, fluently, unthinkingly, melodiously, he pulled the plates towards him and took this and that in a great gurgling stream, an edible song of food, until, suddenly, there came an interruption: a loud, peremptory rat-tat-tat at the door. Startled, taken aback, arrested by the interruption, Dr P. stopped eating and sat frozen, motionless, at the table, with an indifferent, blind bewilderment on his face. He saw, but no longer saw, the table; no longer perceived it as a table laden with cakes. His wife poured him some coffee: the smell titillated his nose and brought him back to reality. The melody of eating resumed.

How does he do anything? I wondered to myself. What happens when he’s dressing, goes to the lavatory, has a bath? I followed his wife into the kitchen and asked her how, for instance, he managed to dress himself. ‘It’s just like the eating,’ she explained. ‘I put his usual clothes out, in all the usual places, and he dresses without difficulty, singing to himself. He does everything singing to himself. But if he is interrupted and loses the thread, he comes to a complete stop, doesn’t know his clothes—or his own body. He sings all the time—eating songs, dressing songs, bathing songs, everything. He can’t do anything unless he makes it a song.’

While we were talking my attention was caught by the pictures on the walls.

‘Yes,’ Mrs P. said, ‘he was a gifted painter as well as a singer. The School exhibited his pictures every year.’

I strolled past them curiously—they were in chronological order. All his earlier work was naturalistic and realistic, with vivid mood and atmosphere, but finely detailed and concrete. Then, years later, they became less vivid, less concrete, less realistic and naturalistic, but far more abstract, even geometrical and cubist. Finally, in the last paintings, the canvasses became nonsense, or nonsense to me—mere chaotic lines and blotches of paint. I commented on this to Mrs P.

‘Ach, you doctors, you’re such Philistines!’ she exclaimed. ‘Can you not see artistic development—how he renounced the realism of his earlier years, and advanced into abstract, nonrepresentational art?’

‘No, that’s not it,’ I said to myself (but forbore to say it to poor Mrs P.). He had indeed moved from realism to nonrepresentation to the abstract, yet this was not the artist, but the pathology, advancing—advancing towards a profound visual agnosia, in which all powers of representation and imagery, all sense of the concrete, all sense of reality, were being destroyed. This wall of paintings was a tragic pathological exhibit, which belonged to neurology, not art.

And yet, I wondered, was she not partly right? For there is often a struggle, and sometimes, even more interestingly, a collusion between the powers of pathology and creation. Perhaps, in his cubist period, there might have been both artistic and pathological development, colluding to engender an original form; for as he lost the concrete, so he might have gained in the abstract, developing a greater sensitivity to all the structural elements of line, boundary, contour—an almost Picasso-like power to see, and equally depict, those abstract organisations embedded in, and normally lost in, the concrete. . . . Though in the final pictures, I feared, there was only chaos and agnosia.

We returned to the great music room, with the Bösendorfer in the centre, and Dr P. humming the last torte.

‘Well, Dr Sacks,’ he said to me. ‘You find me an interesting case, I perceive. Can you tell me what you find wrong, make recommendations?’

‘I can’t tell you what I find wrong,’ I replied, ‘but I’ll say what I find right. You are a wonderful musician, and music is your life. What I would prescribe, in a case such as yours, is a life which consists entirely of music. Music has been the centre, now make it the whole, of your life.’

This was four years ago—I never saw him again, but I often wondered about how he apprehended the world, given his strange loss of image, visuality, and the perfect preservation of a great musicality. I think that music, for him, had taken the place of image. He had no body-image, he had body-music: this is why he could move and act as fluently as he did, but came to a total confused stop if the ‘inner music’ stopped. And equally with the outside, the world . . . (Thus, as I learned later from his wife, though he could not recognise his students if they sat still, if they were merely ‘images’, he might suddenly recognise them if they moved. ‘That’s Karl,’ he would cry. ‘I know his movements, his body-music’)

In The World as Representation and Will, Schopenhauer speaks of music as ‘pure will’. How fascinated he would have been by Dr P., a man who had wholly lost the world as representation, but wholly preserved it as music or will.

And this, mercifully, held to the end—for despite the gradual advance of his disease (a massive tumour or degenerative process in the visual parts of his brain) Dr P. lived and taught music to the last days of his life.

## Postscript

How should one interpret Dr P.’s peculiar inability to interpret, to judge, a glove as a glove? Manifestly, here, he could not make a cognitive judgment, though he was prolific in the production of cognitive hypotheses. A judgment is intuitive, personal, comprehensive, and concrete—we ‘see’ how things stand, in relation to one another and oneself. It was precisely this setting, this relating, that Dr P. lacked (though his judging, in all other spheres, was prompt and normal). Was this due to lack of visual information, or faulty processing of visual information? (This would be the explanation given by a classical, schematic neurology.) Or was there something amiss in Dr P.’s attitude, so that he could not relate what he saw to himself?

These explanations, or modes of explanation, are not mutually exclusive—being in different modes they could coexist and both be true. And this is acknowledged, implicitly or explicitly, in classical neurology: implicitly, by Macrae, when he finds the explanation of defective schemata, or defective visual processing and integration, inadequate; explicitly, by Goldstein, when he speaks of ‘abstract attitude’. But abstract attitude, which allows ‘categorization’, also misses the mark with Dr P.—and, perhaps, with the concept of ‘judgment’ in general. For Dr P. had abstract attitude—indeed, nothing else. And it was precisely this, his absurd abstractness of attitude—absurd because unleavened with anything else—which rendered him incapable of perceiving identity, or particulars, rendered him incapable of judgment.

Neurology and psychology, curiously, though they talk of everything else, almost never talk of ‘judgment’—and yet it is precisely the downfall of judgment (whether in specific realms, as with Dr P., or more generally, as in patients with Korsakov’s or frontal-lobe syndromes—see below, Chapters Twelve and Thirteen) which constitutes the essence of so many neuropsychological disorders. Judgment and identity may be casualties—but neuropsychology never speaks of them.

And yet, whether in a philosophic sense (Kant’s sense), or an empirical and evolutionary sense, judgment is the most important faculty we have. An animal, or a man, may get on very well without ‘abstract attitude’ but will speedily perish if deprived of judgment. Judgment must be the first faculty of higher life or mind—yet it is ignored, or misinterpreted, by classical (computational) neurology. And if we wonder how such an absurdity can arise, we find it in the assumptions, or the evolution, of neurology itself. For classical neurology (like classical physics) has always been mechanical—from Hughlings Jackson’s mechanical analogies to the computer analogies of today.

Of course, the brain is a machine and a computer—everything in classical neurology is correct. But our mental processes, which constitute our being and life, are not just abstract and mechanical, but personal, as well—and, as such; involve not just classifying and categorizing, but continual judging and feeling also. If this is missing, we become computer-like, as Dr P. was. And, by the same token, if we delete feeling and judging, the personal, from the cognitive sciences, we reduce them to something as defective as Dr P.—and we reduce our apprehension of the concrete and real.

By a sort of comic and awful analogy, our current cognitive neurology and psychology resemble nothing so much as poor Dr P.! We need the concrete and real, as he did; and we fail to see this, as he failed to see it. Our cognitive sciences are themselves suffering from an agnosia essentially similar to Dr P.’s. Dr P. may therefore serve as a warning and parable—of what happens to a science which eschews the judgmental, the particular, the personal, and becomes entirely abstract and computational.

It was always a matter of great regret to me that, owing to circumstances beyond my control, I was not able to follow his case further, either in the sort of observations and investigations described, or in ascertaining the actual disease pathology.

One always fears that a case is ‘unique’, especially if it has such extraordinary features as those of Dr P. It was, therefore, with a sense of great interest and delight, not unmixed with relief, that I found, quite by chance—looking through the periodical Brain for 1956—a detailed description of an almost comically similar case, similar (indeed identical) neuropsychologically and phenomenologically, though the underlying pathology (an acute head injury) and all personal circumstances were wholly different. The authors speak of their case as ‘unique in the documented history of this disorder’—and evidently experienced, as I did, amazement at their own findings. (Only since the completion of this book have I found that there is, in fact, a rather extensive literature on visual agnosia in general, and prosopagnosia in particular. In particular I had the great pleasure recently of meeting Dr Andrew Kertesz, who has himself published some extremely detailed studies of patients with such agnosia (see, for example, his paper on visual agnosia, Kertesz 1979). Dr Kertesz mentioned to me a case known to him of a farmer who had developed prosopagnosia and in consequence could no longer distinguish (the faces of) his cows, and of another such patient, an attendant in a Natural History Museum, who mistook his own reflection for the diorama of an **ape**. As with Dr P., and as with Macrae and Trolle’s patient, it is especially the animate which is so absurdly misperceived. The most important studies of such agnosia, and of visual processing in general, are now being undertaken by A. R. and H. Damasio (see article in Mesulam [1985], pp. 259-288; or see p. 79 below).) The interested reader is referred to the original paper, Macrae and Trolle (1956), of which I here subjoin a brief paraphrase, with quotations from the original.

Their patient was a young man of 32, who, following a severe automobile accident, with unconsciousness for three weeks, . . . complained, exclusively, of an inability to recognize faces, even those of his wife and children’. Not a single face was ‘familiar’ to him, but there were three he could identify; these were workmates: one with an eye-blinking tic, one with a large mole on his cheek, and a third ‘because he was so tall and thin that no one else was like him’. Each of these, Macrae and Trolle bring out, was ‘recognized solely by the single prominent feature mentioned’. In general (like Dr P.) he recognized familiars only by their voices.

He had difficulty even recognizing himself in a mirror, as Macrae and Trolle describe in detail: ‘In the early convalescent phase he frequently, especially when shaving, questioned whether the face gazing at him was really his own, and even though he knew it could physically be none other, on several occasions grimaced or stuck out his tongue “just to make sure.” By carefully studying his face in the mirror he slowly began to recognize it, but “not in a flash” as in the past—he relied on the hair and facial outline, and on two small moles on his left cheek.’

In general he could not recognize objects ‘at a glance’, but would have to seek out, and guess from, one or two features—occasionally his guesses were absurdly wrong. In particular, the authors note, there was difficulty with the animate.

On the other hand, simple schematic objects—scissors, watch, key, etc.—presented no difficulties. Macrae and Trolle also note that: ‘His topographical memory was strange: the seeming paradox existed that he could find his way from home to hospital and around the hospital, but yet could not name streets en route [unlike Dr P., he also had some aphasia] or appear to visualize the topography.’

It was also evident that visual memories of people, even from long before the accident, were severely impaired—there was memory of conduct, or perhaps a mannerism, but not of visual appearance or face. Similarly, it appeared, when he was questioned closely, that he no longer had visual images in his dreams. Thus, as with Dr P., it was not just visual perception, but visual imagination and memory, the fundamental powers of visual representation, which were essentially, damaged in this patient—at least those powers insofar as they pertained to the personal, the familiar, the concrete.

A final, humorous point. Where Dr P. might mistake his wife for a hat, Macrae’s patient, also unable to recognise his wife, needed her to identify herself by a visual marker, by ‘. . . a conspicuous article of clothing, such as a large hat’.