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Self-Transcendence

The gifts of modern science

What are the positive things which we gain by looking at the universe scientifically? It would take an entire book even to begin to list all of the marvelous and useful discoveries that have been made over the past three hundred years, which have made human life easier and more pleasant in countless ways. The development of the modern germ theory of disease (by scientists like Agostino Bassi, John Snow, and Louis Pasteur during the period 1835-75) has saved innumerable human lives, while the medical use of nitrous oxide ("laughing gas"), ether, and chloroform beginning in 1846-7 relieved the unbelievable horror of surgery without anesthesia which human beings had faced on most occasions throughout all of preceding history. The development of modern farming machinery and techniques has provided tables overflowing with food for much of the world. The invention of steam-powered railroad locomotives and steam boats was followed by the development of automobiles, trucks, and farm tractors powered by internal combustion engines, and the airplane. The invention of the telegraph was followed by that of the development of the telephone, radio, and finally television.

Who could deny that modern science works? We are surrounded on every side by its fruits. Only a romantic fool would attempt to challenge the basic presuppositions of modern scientific methodology. And one of the central articles of faith in modern

science is that everything that happens has a cause, and that if scientists investigate for long enough, they can determine what that cause was.

The need to act as though all events have causes

When I was a student at the University of Louisville, in 1959-60, I worked on a research team which was irradiating various simple amide compounds with high energy radiation from a cobalt 60 source, to see what chemical reactions were induced. The object was to learn more about what causes radiation sickness when human beings are exposed to an overdose of radiation. The proteins that make up such a large part of the human body are very complex molecules, but they are composed of chains of alpha-amino acids joined by amide linkages, so that the amide structure (O = C – N) is an essential part of their makeup. By taking much simpler amide compounds, it was hoped that useful information could be learned about what causes radiation sickness, which in turn might be able to suggest better ways of treating it and healing the radiation damage. The team study, which was eventually published in the *Journal of Radiation Chemistry*, was in fact my first scholarly publication.

At any rate, when I took the simple amide compound which I had been assigned, and dissolved it in carbon tetrachloride and froze it and then sealed it under high vacuum in a glass ampoule and irradiated it, the liquid in the sealed glass container ended up filled with beautiful white crystals. None of the other experimenters were obtaining any kind of results like this, and the nature of the crystals was at first a total and quite puzzling mystery.

Now at that point, it would have been possible, I imagine, for me to have gone to the chairman of the chemistry department, and said, "I believe that we have an instance here where the laws of nature do not operate, so that we have an uncaused effect. Well, since there could be no answer to a situation of that sort, further investigation would clearly be futile here." At best, I would have been laughed out of his office, and told to get back to work and figure out what the crystals were, and why they were being created.

In fact, I already knew that it was incumbent on me to solve that problem, which I eventually did. It took a lot of work to prove what the crystals were, and then even more work to make sure that they were not being produced by minute amounts of water vapor which might have entered as a contaminant at some point. I had to re-perform the

experiment using a dry box with rubber gloves for handling the materials, and go to other extreme lengths to make sure that this was not happening.

The point of all this is, that the development of modern science would have been undercut at its very roots if scientists had allowed themselves to say that perhaps yellow fever had no cause, or that cancer had no cause, or that the strange behavior of static electricity had no rational causes and could not be explored by rigorous scientific experimentation.

So real scientists tend (understandably) to draw back in horror if a theologian begins talking about certain kinds of events which take place (he claims) without prior determining causes. To the scientist, this sounds like a retreat back into the Dark Ages, where fuzzy minded mythological thinking was allowed to rule human societies, and scientists who dared to ask about the real causes of things could be threatened with being burnt at the stake — or at the very least, could be told that the public schools in a certain district would no longer purchase and use the biology textbooks these good scientists had written, because these books said things about evolution based on copious fossil records[1] and the comparison of the DNA chains between different species,[2] which contradicted two primitive creation myths (one coming from a band of wandering nomads and the other from the cities of ancient Babylon)[3] which came from the pre-scientific world of the Ancient Near East in the second and third millennia B.C.

And there is also the severely practical question: would you rather believe in Laplace's Demon and the principle that all events have scientific causes, or live in a world without science where men would have to have legs amputated after industrial accidents and women would have to deliver babies by Caesarean section, all without anesthetics?

The deterministic paradox and self-referential questions

Phrased that way — either all events have scientific causes or we have to give up all the benefits of modern medicine and go back to a world where leprosy and epilepsy are believed to be caused by demons — it all appears to be so simple.

But the reality is more complicated than that, and contains a puzzling paradox. On the surface, it may appear that our ability to use scientific reasoning to work out sequences of cause and effect commits us to a world ruled by Laplace's Demon. And

that in turn would seem to necessitate that human beings are no more than the kind of clockwork figures which come out to strike the hour on one of those marvelous Central European clock towers — or perhaps no more than cuckoos in the cosmic cuckoo clock! We stick our necks out, and do whatever we do, not because we truly decided to do so, but because the mechanism made us do so.

The reason why this is not so is that, at any given time, my human brain can ask the simple self-referential question, *"But how is the situation being affected by the way that I myself am thinking about it?"* The principle of scientific determinism, paradoxically, does not take away my human freedom, but is the real basis of that freedom.

Let me give a simple example. Somewhere in the 900's B.C. roughly, the city of Rome began when some several early iron age villages were built on the tops of some of the hills on the banks of the Tiber river, at the place where the major north-south trade route had to cross that river as it ran along the west coast of Italy. The small island in the Tiber at that point produced two narrow channels instead of one wide channel, which allowed for the building of two short wooden bridges instead of one extremely long one — a crucial factor, given the primitive state of technology at that time.

What radically decreased the value of this real estate, was that the area between the hills, although higher in elevation than the nearby river, was nevertheless lower than the surrounding hills and completely surrounded by them, so that rainwater pooled up and turned it into a soggy marsh, which was an ideal breeding ground for mosquitoes. The villagers continually suffered from malaria. When the more civilized Etruscans to the north began to extend their sphere of influence to the Tiber river, they prompted the villagers to ask a self-referential question: "What would happen if, instead of just swatting at the mosquitoes and suffering from malaria, we drained the swamp?" The Etruscans helped show them how to do it, and around 600 B.C. a giant drainage ditch (later a covered tunnel) called the Cloaca Maxima was dug, which is still in operation to this day. The area between the hills which was drained was then turned into the Roman forum, the site of many of ancient Rome's governmental offices and some of its principal temples. If visitors to Rome visit the church of San Clemente today, they can go down into the excavations under the present building, and down at the lowest excavated level, hear the rush of the waters coursing through the Cloaca Maxima.

The early Romans made a primitive scientific observation, namely that "all over the Mediterranean world it is observed that people who live beside swamps suffer from

malaria," and then asked themselves a simple self-referential question, "How would it change the situation if we ourselves did something different?"

The reason why some modern scientists (and a large number of modern philosophers) try so vigorously to defend the notion that everything that happens in the universe is governed by deterministic scientific laws, is because they are deathly afraid that, if it were not so, we would no longer be in control of our lives. What they do not seem to realize is, that if the kind of scientific determinism they are defending is the kind of rigid total determinism described in the theory of Laplace's Demon, we would in fact have no control at all.

We need to learn how to firmly embrace the Deterministic Paradox and turn it to our advantage. A certain kind of event may be rigidly determined by prior causes until we discover exactly how it is being determined. But that very discovery allows us to do something different ourselves, and this in turn allows us to change the course of events and assert control once more.

It is therefore necessary to assert both that *we can predict what the future would be* (if we allowed things to run their course) on the basis of a scientific investigation of how present causes would have certain future effects, and that *we can change what the future will bring* on the basis of what we learn. Scientific determinism and the exercise of human free will are not contradictory to one another, but simply two different phases of the same investigative intellectual process.

This, we remember, was one of the broader implications of Gödel's proof. Once we begin asking self-referential questions, the simple and mechanical way in which logical consequences could be derived within any given system of thought, can quickly start to break down.

The study of human beings vs. the study of Nature

I think it might comfort the physicists (and chemists and biologists) to a certain degree, to agree with them that deterministic chains of cause and effect do in fact fairly rigidly determine the course of subhuman Nature most of the time. Not completely so — we have already discussed the effects of chance and probability, chaos theory, and the Heisenberg uncertainty principle, among other things — but even the exceptions to the

rule of rigid determinism can themselves be described with precision in good mathematical formulas.

The place where rigid scientific determinism begins to work less well, is where human minds are concerned. This is because it takes something at the level of sophistication of human mental processes to ask the kind of self-referential questions (at a level of full conscious awareness) which are capable of breaking an existing cause-effect sequence by the entry of something completely new and different.

Many computer scientists believe that they will someday be able to create artificial intelligence which will be able to do the same thing. I can think of no philosophical reason why this should not be theoretically possible. But there are no computers at present which can truly understand meaning and perform acts of higher order self-transcendence, so for now we can draw a clear distinction, here on the planet Earth, between human beings (whose brains can ask self-referential questions and practice a little bit of real free will) and everything else in the universe which scientists are able to study.

And even then, the psychologists, sociologists, and political scientists have shown that if one engages in real scientific investigations of the way human beings think and behave, that one can come up with extremely valuable discoveries, because human beings still act in fairly deterministic fashion a good deal of the time. It is less often, comparatively speaking, that men and women produce real creativity and novelty.

The attempt to explain away self-transcendence

There are modern philosophers who will try to argue that what I have just asserted is a fallacy. "Yes," they will say, "it is true that a scientist can discover the cause of something and then realize on that basis what can be done to change the course of events. But the scientist's discovery of that was also the result of education and influences from the environment, and that too — at least in principle — could be analyzed in such a way as to show that his discovery was completely determined by preexisting causes."

Let us first be wary of "in principle" arguments! Can Einstein's discoveries really be "explained" that way? Granted that the historical context supplied the impetus to solve those particular problems, were the solutions which he devised mechanically produced? Or the works of an extraordinary genius? Every person I have seen who has claimed that

he could explain great acts of human creativity and sudden insight has given such facile and trivial "explanations" that no intelligent person could ever take them seriously.

But rather than trying to argue out things of this sort on a case by case basis, let us instead acknowledge that there are "degrees of freedom," if we might put it that way. There are lower level decisions and insights where perhaps we can explain how and why the person made the discovery or decided to do things differently. But there is a higher kind of act of free will, where the human being engages in an act of true self-transcendence. If I ask, "how is the situation being affected by the way that I myself am thinking about it?" I can include in that act of self-analysis the question, "how are my own prior prejudices and assumptions, and the influences from the environment, trying to make me act?" and then I can see if there are ways that I can break free of all of those forces too.

Kant understood this apparent paradox at a certain level. As he put it, the acts of real freedom which we could carry out on certain occasions, came when we investigated the categorical imperatives which we were allowing to rule our lives. We could take rules of living (such as "always tell the truth") and examine in detail how these rules would require us to live and act. But we could not only analyze them, we could also decide to change them, and then freely commit ourselves to a new and different kind of life based on a different set of principles. The twentieth-century existentialists took Kant's idea and expanded it into even more powerful philosophies of freedom.

Good psychoanalysis and psychotherapy is designed to produce situations where that kind of self-transcendence can occur, and where, in a moment of insight, the patient can see how he or she could break free from all the psychological forces of the past, and all the attempts by family and friends and co-workers to keep the patient trapped in his or her old ways of thinking and behaving. There were attempts in the twentieth century to do therapy on the basis of deterministic theories of operant conditioning and producing conditioned reflexes, and none of them produced very good results, particularly if patients were evaluated three and five years later. The therapies that worked best were the ones which attempted to encourage patients to assert their true freedom and become self-initiating and self-actualizing. Seeing for myself exactly why a certain traumatic period in my childhood produced a pattern of behavior on my part which has now become destructive, is the key to releasing me from its power, and restoring my freedom — the freedom to chose whatever alternate way of living looks best to me.

The reason why there appears to be a paradox here is because there are in fact two infinite processes going on. (1) I can continue forever asking myself what the causes were which made me act in certain kinds of ways over and over, and what the causes were which made me think in certain kinds of ways. And then I can ask about the causes of those causes — psychological issues going back into my childhood, sociological issues arising from the pressures of the society around me, the improper functioning of my own brain chemistry (which might be potentially correctable with medication), the political events which created the war or the collapse of the stock market or whatever else affected my life so severely at one point, the negative effects of racism or sexism or religious prejudice, and so on — and I can then go on and investigate the causes in turn of those causes. (2) But I must simultaneously carry out the infinite process of figuring out, step by step, how to free myself as much as possible from the negative impact of some of these forces, because it is in this that I will find my freedom.

Self-transcendence in the twelve step program

One of the best places to see how we can learn to practice self-transcendence and regain our freedom, is to look at the twelve step program, where the fourth of the twelve steps requires the participants to make a self-inventory. In that step they are asked to look introspectively at themselves, and work out — totally by themselves and for themselves — the factors in their own character which produce obsessive resentments and fears. It is vitally important to do this, and to carry it out thoroughly, because gaining an insight into a particular character defect brings with it the possibility of being freed from its effect. No one tells people in the twelve step program what their character defects are — each person has to work that out for himself or herself. No one tells them what kind of life they ought to live instead — there too each person is given total freedom. But it works. The results are incredible, where we see men and women undergoing total transformation over a period of only two or three years.

A woman in Al-Anon named Karen C. was told by her grown daughter (an alcoholic and addict) that she was that way because of her childhood upbringing, and the way her mother had behaved when she was a child. Karen, who had quite a few years in the twelve-step program, simply said, “Well, then, get over it!” A man in A.A. named Steve C. remembers how he was whining and complaining about his life in an A.A. meeting,

and talking about his abusive father, and his traumatic experiences in the jungles of Viet-Nam. After the meeting his sponsor, a man named Fritz, pulled him aside and leaned into his face. Fritz chewed tobacco, was unshaven, and had taken out his false teeth. He leaned into Steve's face — and Steve could smell him breathing in his face — and snapped, "When are you going to grow up?" Steve walked away angrier than he had ever been in his life, but as he thought about it, he finally realized the gift that old Fritz was trying to give him. He could be freed from his past at any time he wanted, if he were only willing to seize his freedom.

That is the only way alcoholics and addicts and Al-Anon members ever get freed from the past: analyze it, work out what it has been making you do, and then quit doing it. The most important objective of the twelve step program is to push people into practicing self-transcendence, and exercising it in such a way that they are no longer at the mercy of other people, and influences from the environment, or even their own pasts.

Again, the central message of this chapter is that seeing how my past has been determined is not an imprisoning exercise which dooms me to act like a clockwork figure on a bell tower, repeating that same tired old chain of cause and effect over and over again. It is the key to the door which will allow me to walk away from my past, and assert my true freedom for the first time in my life. It is the cry to those who have been in slavery to the past, to cast off their chains and emerge from their prisons, and breathe once more the clean air of freedom.

The ghost in the machine

I am well aware that a ghost has been hovering in the background, so to speak, when looked at from the viewpoint of many of my readers. It is a famous ghost, which goes back to the time of the French philosopher and mathematician René Descartes (1596-1650).[4] In his dualistic philosophical system, Descartes acknowledged that the human body worked like a machine and followed the laws of chemistry and physics. But he argued that the human mind was immaterial and was therefore exempt from the deterministic laws of chemistry and physics. The problem was how to account for pure thoughts (which were immaterial) being able to influence the actions of material bodies (our arms and legs and so on as they were connected by the nervous system to the cells in the human brain). Descartes came up with the rather quaint idea that the soul was able to move the body through the intermediary of the pineal gland. But it is easy to see that

even if this were so, the pineal gland is a collection of cells (and hence a material object), so the problem of how pure thought can move material objects is still not fundamentally resolved.

Phrased in this fashion, the idea that our thoughts could control the motions of our bodies does appear to be an absurd idea. Sitting here at my desk, I could think as hard as I wished, but I would be unable to make the cup sitting beside my computer keyboard rise through the air and move into the kitchen and refill itself with another serving of coffee, and then come back again (moved by my thoughts alone) and obediently place itself at my right hand. And so we are left with the image of the human brain as a piece of mechanical clockwork with gears and cogs meshing with one another, while a pale white ghost flits nervously through the spinning gear wheels attempting futilely to make the machinery do something different from what we all know it will invariably be forced to do. But since it is completely immaterial, when the poor ghost attempts to shove on one of the cogwheels, its hand simply passes right through the wheel.

Ideas (which are completely immaterial) cannot affect the course of physical bodies (which are material). We all know that — or think we do — here at the beginning of the twenty-first century, with all our modern knowledge. But is that in fact true?

The first step in exorcizing the image of the ghost in the machine is to realize that pure ideas can indeed shape the movements of physical bodies, and do so all the time. This is the fundamental basis of modern science. The laws of science are all cast in mathematical form as pure ideas. When an apple detaches from a tree, it falls to the ground because the law of gravity (an idea) compels it to do so. The law of gravity determines the course of a cannonball shot from a cannon, and the elliptical orbit of the earth about the sun. *Of course pure ideas can make physical objects move in specific paths!* It is sheer nonsense to try to argue otherwise.

Why can't I make the coffee cup move just by sitting absolutely still and thinking at it really hard? Thoughts going on in a human mind can control what is going on in the brain cells, because our thoughts take place *in correspondence with* the electrical processes and tiny biochemical changes taking place in our brain cells. There is no such direct one-to-one relationship taking place between the thoughts in my mind and the coffee cup sitting on my desk. So I have to do it a different way. My thoughts have to command my hand to pick up the cup, and my legs to carry my body out to kitchen, where I have to further command my hand to pick up the coffee pot and pour some of the coffee into my cup. That's the way life is, the coffee cup is not part of my brain.

Jean Piaget

In order to fully explain, however, why the figure of the ghost in the machine is an empty phantom, we need to talk more about the distinction between *correspondence* and *interdependence*. We already discussed this issue in part in Chapter 15, but we need to say more about it now, because it is so extremely important. And in this context, we need to explain who Piaget was, for he gave one of the best explanations ever given of that distinction.

Jean Piaget (1896-1980), a Swiss developmental psychologist, was one of the greatest philosophers of the twentieth century. He took the fundamental ideas of the great formative western philosophers, ranging from Plato to Immanuel Kant — their speculative theories about how the human mind learned about the world — and spent his life doing experimental work with infants and small children, to see what actually happened in reality. In the process, he wrote some sixty books, plus several hundred articles, describing his observations. A brilliant American named John H. Flavell, who is currently Professor Emeritus of Developmental Psychology at Stanford University, used Piaget's work to totally shift the direction of developmental psychology in the United States. The best systematic account of Piaget's discoveries which I have read, is Flavell's *The Developmental Psychology of Jean Piaget*, which came out in 1963.[5] If I were in charge of a doctoral program in philosophy, I would require that all of the graduate students study that book and be able to pass a detailed exam on its ideas.

What Piaget learned through his observations of infants and small children forms yet another of the marvelous sets of discoveries which turned the twentieth century — that remarkable century — into one of the two most formative periods in the development of western thought, paralleled only by the revolution in human thought which took place in classical Greece during the fifth and fourth centuries B.C. For literally thousands of years, philosophers had sat in their armchairs and speculated about how the human mind learns about the world, but until Piaget came along, no one ever carried out any detailed observations of infants and small children to see what actually happened. It was rather like the ancient Greek philosophers arguing interminably about whether atoms did or did not exist, but never attempting to carry out any scientific experiments to see what was true.

As I have mentioned before, this present book is in part my attempt to write a sort of *Contra Kantum*, a refutation of some of the key principles in Kant's philosophy. This is because in my perception, for over two centuries (Kant's *Critique of Pure Reason* was published in 1781) western theology has been going around in meaningless circles for a good deal of the time, and has become nearly paralyzed in terms of coming out with any kind of philosophical theology which would make sense in terms of modern science, but would also be genuinely helpful to ordinary people who wish to pursue the spiritual life.

In my reading, Piaget was fundamentally a Kantian, but a Kantian who explained how to get past the central problem raised for philosophy by the *Critique of Pure Reason*. In Kant's system, the fabric of time and three-dimensional space was simply directly intuited, and formed a kind of invariant and unchangeable straitjacket in which our minds were forced to create the phenomenal world. The fact that our souls were imprisoned in material bodies,[6] inside a box of space and time which we could not change or choose to intuit in any way other than a strict Euclidean geometry, blocked us off from ever being able to directly grasp the noumenon, the real world of ideas which actually structured the universe. And Kant came up with a list of the fundamental categories of the understanding, which he likewise assumed were invariant and unchangeable, which our minds had to schematize in order to turn the phenomena of sense perception into an intelligible universe.

Piaget showed that the schemas which connected the categories to the phenomena did in fact change, and change remarkably during our childhood — something that most Kantian philosophers either deny or largely ignore. So for example, Piaget demonstrated that infants and children did in fact change their understanding of space as they developed, through their interactions with the real world around them.

Now the reader should be warned that the Swiss children whom Piaget studied were quite bright, and were learning in a highly intellectual milieu, so the age ranges given below seem to have been correct for them. But at any rate, the four basic developmental stages which he discovered were as follows, where I am giving the age ranges at which his Swiss children made the transition from one level to the next:

> Sensorimotor stage: birth to age 2 (children experience the world through movement, manipulation of objects, and sense perception, and learn object permanence)

> Preoperational stage: ages 2 to 7 (acquisition of a sophisticated understanding of space and an elementary understanding of causality, but initially in a totally preverbal way, and throughout without any strong self-analytical capability)
>
> Concrete operational stage: ages 7 to 11 (children learn to think more logically about concrete events, but still in an oversimplified way, where they have difficulty in analyzing situations in which two different causes or two different dimensions of the situation are affecting the outcome)
>
> Formal operational stage: after age 11 (full development of abstract reasoning)

In terms of the age ranges given above, I and some of my fellow professors at Indiana University discovered to our dismay that some of our college students (who were 18 years or older) had not truly progressed to the full formal operational stage in terms of their ability to handle abstract reasoning, which Piaget's children had mastered by age 11. Their elementary school education (and their high school education as well) had been very poor compared to the Swiss institutions where Piaget's subjects had been educated. But this is not necessarily fatal. My colleague Eileen Bender in the English Department carried out some interesting experiments with small seminars, in which she was able to bring some of these college students with lesser reasoning ability to a fuller understanding of the schemas that adults use in carrying out abstract reasoning. And one of our mathematics professors likewise discovered that valuable remedial teaching techniques could be developed by applying Piaget's kind of analysis to the issue of understanding why some mathematics students got the same kind of wrong answers over and over to certain kinds of thought problems.

The main point however, is that Piaget demonstrated through thousands of experimental observations, that the human mind is not at all locked into a specific intuition of time and three-dimensional space, and that it is also not locked into any specific set of schemas for using the fundamental categories of the understanding to organize the world around us in rational and productive fashion. Will we ever perfectly know the fundamental ideas which structure the universe, or know exactly what the fabric of space-time is? Probably not, but the noumenon (the ideas which structure the universe) are hardly impenetrable mysteries, about which we can say nothing at all. Let us remember what we noted in an earlier chapter. Back in the period when Locke and Kant were writing their philosophies, in the late seventeenth and eighteenth centuries, it

was in fact the case that no one knew why all swans looked so much alike, or why all samples of gold acted the same way chemically. Locke (with his theory of the unknowable real essences of things) and Kant (with his theory of the totally unknowable noumenon) were able to frighten their readers into believing that answers to scientific questions of that sort could never be worked out, because of the essential nature of human thought itself. And philosophers who were terrified by the bugbear which Locke and Kant created by those theories, drew the unfortunate conclusion that we could likewise know nothing at all about God, even if a God of some sort did exist. This was what has disrupted western theology for over two hundred years.

But it isn't so. Scientists can now talk intelligently about the genetics of swans, and the nature of the outer electron shell in the gold atom. And likewise, theologians can learn to say at least a few things about what God is, that are equally rational and logical, and grounded in what the universe external to our minds actually is.

Piaget on correspondence vs. interdependence

As part of his analysis of how infants and children learn about the world — first at the purely operational level, without any ability to adequately verbalize or analyze their discoveries, but later with the ability to give carefully reasoned analyses of their observations about the world around them — Piaget found it useful to distinguish between layers of analysis which were *interdependent with* other layers of analysis, and those which were *in correspondence with* other layers. So he discovered, for example, that although the properties of space which children gradually discover are in correspondence with the principles of pure mathematics, one cannot derive the properties of space from elementary mathematical principles by a process of simple deduction. Mathematics gives us tools for talking about space at a higher analytical level, but physical space as it actually exists (along with many of its basic characteristics) cannot be mechanically deduced from the foundational mathematical theorems and axioms themselves.[7]

To draw a contrast, chemistry and physics are related by interdependence. In principle at least, all of the findings of modern chemistry could be explained in terms of the physical laws governing the atoms and molecules which the chemist investigates, and could be deduced from the basic laws of physics.

We can use Piaget's distinction to help make better sense of the mind-body problem. Every time a thought in my mind changes, there will be a *corresponding* change in the minute electrical impulses and tiny biochemical balances in my brain cells and their interconnections. But one cannot mechanically deduce higher human thought structures simply by detailing all the causal connections between the electrical and biochemical changes which occur as part of that process.

Let me give a simple example to illustrate this point. Douglas Hofstadter, the computer scientist at Indiana University's Bloomington campus, has recently published a book called *I Am a Strange Loop*, in which he describes a simple computer setup for determining whether a given integer is a prime number. I am going to modify his story a little bit, but I want to give credit to him for posing the issue in this interesting fashion.[8]

When I was in high school, I won a minor prize at a science fair with a small computer which I built, using mechanical electromagnetic relays salvaged from old pinball machines. Each relay consisted of a steel lever which would be pulled down to close a circuit if an electrical impulse traveled through an electromagnet made of coiled wire. A mechanical catch then held the lever down, so that the current continued to flow through the wire attached to it, even after the original electrical impulse was no longer being applied. But there was a second electromagnet which would, if an electrical impulse passed through it, pull the catch back so that the lever would flip up, at which point the relay would no longer be sending current down a wire to the next relay. So the relay basically consisted of an on-off switch, which would transmit a continuous electrical current if one magnet was activated even momentarily, but would turn that current off again if the other magnet was activated even for just a second or so.

Although the computer I built was designed to solve a different kind of problem (it was designed to carry out the basic computations involved in solving syllogisms in elementary Aristotelian logic), it could easily have been rebuilt to solve Hofstadter's prime number problem. It could have been set up so that when a number like 19 was entered, it would first divide the number by 2 to see if there was remainder. And in this case, 19 divided by 2 would give us 9 plus a remainder. The computer would then work its way down stepwise from 9, dividing 19 next by 8, then 7, then 6, and so on, all the way down to 3, checking each time to see whether there was a remainder, or whether 19 was evenly divisible by one of those numbers. By salvaging a few more parts from old pinball machines, the computer could have been constructed so that a red light would start blinking the first time the number which was input was evenly divisible by some

smaller number (indicating that the number was *not* a prime number) and that a bell would start ringing if the process carried through to completion with no even divisor being found (which meant that we had successfully found a prime number).

No matter what number we entered — a prime number like 17, 19, or 23, or a non-prime number like 18, 20, 21, or 22 — we could "explain" what happened by simply describing the way in which each electromagnetic relay was activated by its predecessor in the series, and then transmitted an impulse to its successor in the series. But would that in fact be a real explanation? No matter how the relays were connected to one another, one could "explain" which relays were triggered (or de-triggered) and how by this kind of explanation, but one would come nowhere near explaining what the idea of a prime number meant. The most important thing going on would be left totally unexplained by this kind of analysis.

The fundamental idea of what a prime number is, and the way we would have to structure our ideas and thought in order to determine whether a given number was a prime number, were *in correspondence with* but NOT *interdependent with* the clicking and clacking of the mechanical electromagnetic relays as they opened and closed.

The human brain as a computer which can creatively reprogram itself

To see more clearly what is at stake in this distinction, let us look at an important difference between that primitive little computer and the workings of the human brain. That computer made with parts from old pinball machines was programmed during its construction so that it could only function in that specific way. That is what can mislead us into believing that reciting the details of its construction gives a complete and totally adequate explanation of what was going on.

There are computers today which can, to a limited extent, rewrite parts of their own programming on the basis of patterns found in the mass of accumulated data in their memory banks, but the rewriting does not go very far. Could we one day build computers that could engage in more extensive rewriting of their own programs? I do not see any theoretical reason why it would be impossible, but it is sufficient to say here, that such computers do not exist at present. On the other hand, the human brain functions like a computer which can carry out massive rewriting of its own programs. That was in effect what Jean Piaget was studying, put in the language of computer science. As the

children he was studying grew and learned, they totally rewrote their basic internal mental "programs" for interacting with objects in three-dimensional space and objects which were involved in causal connections.

That is what the capacity for self-transcendence means. By "reprogramming" the thought structures of our minds (that is, by "reframing" the cognitive framework of our minds as the cognitive behavioral therapists would say) we can put the thoughts themselves in the driver's seat, instead of functioning simply by mechanical reflex to whatever is presently programmed into the electrical and biochemical structure of our brains.

The pattern of our thoughts must always of necessity be *isomorphic with* the underlying electrical and biochemical changes going on in our brain cells and their interconnections. But that does not mean that our thoughts can be *reduced to* an account of what is going on at the electrical and biochemical level. This is simply another way of describing what is meant by *correspondence* rather than *interdependence*.

Human free will

So can human beings practice free will? Kant grasped the basic idea of how this can be done, at least at one level. He argued that we do have free will when we practice self-transcendence and begin examining the moral imperatives by which we have been governing our lives. We have the freedom to change them, and begin living our lives on a different set of moral principles. Some of the twentieth-century existentialist philosophers, like Martin Heidegger,[9] expanded on this idea and showed how we could reclaim our independence and autonomy as human beings. Heidegger showed that the way our minds actually perceived phenomena was determined in part by thought structures like the moral imperatives we live by and the goals we set for our lives. The being itself of these phenomena was ontologically constituted by the structuring of these thought patterns. When I change my basic thought structures, all of the beings in the external universe change at the deepest ontological level — insofar as I can perceive them as phenomena — and literally become a whole set of different objects. Objects from the past cannot determine the direction of major personal self-transformations (in the way in which they were supposed to control things according to the theory of Laplace's Demon), because those objects from the past literally no longer exist in the new and transformed thought world which is created. Oh, at one level, it may still be the

same father and mother, and the same eighth grade teacher in high school, and so on, but when we undergo deep personal transformation, those images take on totally different characters and valuations in our new view of the world.

Perhaps it would be fairer to say that we have a certain degree of free will in certain kinds of situations. No one totally escapes the heritage of his or her own past. I am who I am today at least in part because of the world in which I was brought up, and the places where I received my education. But the story of my life also involves instances in which the plot suddenly changed in a surprising direction. We remember the first chapter in this book, about the mysterious "x-factor" that can show up in many people's life stories. Sometimes this is God's grace at work, sometimes it is us practicing free will and transcending our own pasts, but most of these instances I believe are a combination of those two things.

Can "the ghost in the machine" sometimes put itself in control of what the body is doing? Well, ideas aren't ghosts — the law of gravity is not a ghost although it controls the movements of physical objects — but in a sense, yes, when the x-factor shows up in someone's life story, one can pretty well be guaranteed that the thoughts and ideas in that person's brain were taking control of what was going on. Real free will can indeed exist on occasion, at least to a certain degree, and this is vitally important, because real spirituality at its best is directed at making the most productive use of this human ability.

God cannot know that 2 + 2 = 5

We need to think now about the implications of this — along with the things we discussed in the previous chapter, "Why the Future Cannot Be Totally Predicted," and see how this applies to God and the way an intelligent, personal God would know the world.

We already mentioned in an earlier chapter that the professors in the Catholic universities of medieval Europe would point out to their students that "Not even God can make a square circle." What they really meant was that the statement "God made a square circle" would be a meaningless statement, because the phrase "square circle" did not mean anything intelligible. Standing around delivering grandiose statements that were totally meaningless did not count as writing serious theology, no matter how piously one proclaimed these words.

I am now going to push this principle a couple of steps further. "God knows that 2 + 2 = 5" is likewise not a serious theological statement. "2 + 2 = 5" is a logical contradiction, which means that a statement involving that phrase means nothing intelligible. We are not trying to talk here about what God could or could not do — that is not the issue — but saying instead that any claims we make about things that God can do have to be put in the form of meaningful statements. And this in turn means that the claim that God can know the universe in ways that violate Gödel's proof is an unintelligible and hence meaningless proposition which would require logical impossibilities as great as the assertion that "God knows that 2 + 2 = 5."

And in addition, making statements such as "God knows that tigers have six legs and are blue with pink polka dots" would also lead us to a very peculiar kind of theology, because the person making that statement presumes that God is very ignorant and thinks he knows things about the world which are in fact false. Claiming that God "knows" something about the universe which is obviously and blatantly contrary to fact is either a nonsense statement, or even worse. For how could we be saved by a God who was more ignorant even than us? So the assertion that God "knows perfectly" things which are impossible to know with certainty according to the Heisenberg uncertainty principle, would in like manner involve either self-contradictory nonsense, or the claim that God thinks he knows facts about the universe which even our human minds can tell are factually untrue.

Trying to build a system on "2 + 2 = 5" statements, and propositions about blue tigers with six legs and pink polka dots, and similar kinds of assertions, is not a good way to try to write theology.

God knows the future as it actually is, as still partially undetermined

High Calvinism taught a doctrine of geminal supralapsarian predestination, along with a doctrine of total foreordination. By that they meant the claim that God knew, even before Adam and Eve ate the apple in the Garden of Eden (and in fact even before the world was created), everything that was going to happen in the universe, and that God had already decided and decreed which human beings were going to be saved and which human beings were going to be damned. But if you remember the things we discussed in the previous chapter, this is no more meaningful ultimately than saying "God makes

square circles" or "God knows that 2 + 2 = 5." It also presupposes that God is so ignorant that he believes things that are empirically false.

Even shortly after the Big Bang, no one — not the Calvinist God nor Laplace's Demon nor the brightest scientist in the world — could have predicted the exact state of the universe today. It is not just a matter of chaos theory and the Heisenberg uncertainty principle and things of that sort, but far more basic issues raised by Gödel's proof and information theory, which strike to the heart of mathematics and logic itself, and the very nature of knowledge itself.

And in this chapter we see the most powerful reason of all why Alfred North Whitehead and Charles Hartshorne were correct, and why God cannot know the exact shape of the future. We must posit human free will as a necessary prerequisite for us being able to know the universe well enough for us even to be able to talk about God at all. If you removed human free will — that is, the ability to ask self-referential questions and engage in self-transcendence — then there would be no human beings of a sort who could make new discoveries and be involved in real creativity. Scientific progress and spiritual growth both require the same basic human ability: the ability to come to new and novel insights, make real discoveries, and act creatively to change the future.

Encountering a personal God

When I enter upon the path of the spiritual life, I begin what will become a dialogue between two persons, God and me. I am not going to be allowed to set myself up as my own God and take over the rulership of the universe. But God on his side respects my freedom, and will never force me to accept any of his gifts of grace. I can take everything God gives me and throw it away, if that is what I foolishly want to do, and he will not stop me.

As an encounter between two persons, there are no mechanical rules which can describe and predict what will happen. We can try to draw up a legalistic religious system involving hundreds of complicated rules, but all it will do is block us from receiving any real grace. God delights in doing the unexpected (and sometimes, I believe, laughs heartily at the expressions on our faces). But God also delights in us human beings when we are innovative and creative and come up with a completely new and novel way of doing something. If he enjoys completely surprising us, I believe that he also gains enormous pleasure from the situations in which we surprise him, and do

something so noble, so good, so beautiful, so humorous, so courageous, that it makes all his work in creating the universe worth it.

We human beings are not clockwork mechanisms. It is at the level of pure thoughts and ideas — at the level, in other words, of meaning and the pure life of the spirit — and not in the underlying electrical and biochemical substratum of the brain, that the creativity and the freedom occur. And along with that, it is also in our thoughts and ideas that we find both the joy and the tears, both the delight in beauty and goodness and the horror at evil.

It is an extraordinary universe in which we live. But we human beings are likewise truly extraordinary creatures. Let us not cheapen either the universe or ourselves, by trying to turn the universe into a machine grinding along mechanically, without the splendor or glory of a God whose divine light and love illuminates and fills all things, or the sheer delight of a great artist or scientist (or a true master of the spiritual life) who has just made a brilliant new discovery, or created something of extraordinary beauty and goodness.

NOTES

1. That human beings share a common ancestor with the great apes had already been established on the grounds of comparative anatomy, and was an intrinsic part of many of the new atheistic systems which began developing in western thought in the mid-nineteenth century. Charles Darwin, in his book *On the Origin of Species* (1859), made only one brief allusion to the topic of human evolution — "light will be thrown on the origin of man and his history" — but Victorian controversialists understood the implications of what he was saying about the evolution of species by natural selection, and almost immediately began attacking him on the grounds that he was teaching that human beings were descended from apes. Darwin's *The Descent of Man, and Selection in Relation to Sex* (1871) made it much clearer and more explicit that human beings were also part of the evolutionary process, and have helped keep his name at the focus of conservative Christian attacks on the doctrine of evolution ever since.

2. The scientific evidence demonstrating that human beings are descended from apelike ancestors moved in the mid-twentieth century from the study of comparative anatomy to new discoveries in biochemistry, when it was found that a kind of molecule called DNA (deoxyribonucleic acid) contained the genetic instructions used in the development of all known living organisms. The link between DNA and heredity was established in work carried out between 1953 and 1958, when I was in high school and just beginning college. This was another of the great twentieth-century discoveries that has so revolutionized our picture of the world. DNA studies carried out in the latter half of the twentieth century gave chemical measurements for working out the basic ancestral tree of human beings and the great apes. Human beings are not descended from chimpanzees or gorillas. It is rather than we and the great apes share a common remote ancestor. Modern human beings are descended from early primates like Proconsul (the fossil evidence for this species was first discovered in 1909) which lived from 27 to 17 million years ago. A comparison of the DNA from modern primates shows that the gibbons split off and formed their own family between 18 and 12 million years ago, and the line of evolutionary development that produced modern orangutans split off about 12 million years ago. The ancestors of modern gorillas split off about 8 million years ago, and that of the chimpanzee only about 4 million years ago. The part of the genetic code which distinguishes us from the latter is extremely small. Human DNA is 98.4 percent identical to the DNA of chimpanzees.

3. The story in Genesis 1:1-2:3 (which originally came from the picture of the universe taught by the priests in the Babylonian city-states) has human beings created after all of the other living creatures on earth. The story in Genesis 2:4-24 (which originally was recited by the Israelite tribes while they were still wandering as nomads, shepherding their little flocks of sheep and goats around the margins of the areas in the Near East which could be turned into settled farms), gives a different order of creation: it has the first man created, then all the animals and

birds, and then the first woman. Among the great Greek philosophers later on, the Epicureans stayed closer to the Babylonian theory, and taught (like modern scientists) that life first appeared in the oceans, then the first land animals appeared, and finally human beings evolved out of animal ancestors. The Epicurean philosophers said (again fundamentally like modern scientists) that this evolution occurred due to random selection produced by the chance movement and recombination of atoms.

4. The actual phrase "the ghost in the machine" was coined by the British philosopher Gilbert Ryle in his book *The Concept of Mind* (New York: Barnes & Noble, 1949) as a derogatory description of Descartes' philosophy of mind-body dualism.

5. Flavell, *Developmental Psychology of Jean Piaget*.

6. The idea that the soul cannot see the world of ideas clearly as long as it is imprisoned in a material body was a prejudice, inherited from the world of ancient Platonic and Neo-Pythagorean philosophy, which influenced Kant at an extremely basic level in spite of his attempts in his critical philosophy to shake himself out of his earlier "dogmatic slumbers." One of the earliest of the Kantian interpreters, Jakob Friedrich Fries (1773-1843), pointed that out very clearly and, I believe, quite correctly. For a good introduction to Fries' interpretation of Kant, see Rudolf Otto, *The Philosophy of Religion Based on Kant and Fries*. See also Jakob Friedrich Fries, *Knowledge, Belief, and Aesthetic Sense*, ed. Frederick Gregory, trans. Kent Richter (Köln: Jürgen Dinter Verlag für Philosophie, 1989).

7. We can in fact illustrate the distinction between interdependence and correspondence by looking at Kant's philosophy. Kant's categories were *in correspondence with* the basic principles of logic. Every category could be connected with a specific type of logical statement, in a strict isomorphic relationship. So for example, every time my mind takes the category of causality and schematizes it onto the phenomenal world to make a causal observation, what I am observing can be put in the form of an "if ... then" logical statement. I might say, in one situation, "Be careful, IF you drop that bag of groceries, THEN you will break the eggs that are sitting in the bottom of the bag." But I think that almost all modern philosophers are agreed that Kant's categories cannot be *deduced* from that set of different kinds of logical statements. That is, an "if ... then" statement does not necessarily logically imply the fundamental understanding that is involved when we say that the occurrence of one event is the efficient cause of the occurrence of another event ("when the batter hit the ball, it went flying through the air"). The concept of efficient causality means something *more than* a simple "if ... then" relationship. If as a philosopher, you understand why Kant's categories are in correspondence with certain basic types of logical statements, but cannot be mechanically derived from them, then you understand what is meant by the distinction between correspondence and interdependence. If Kant's categories could be

derived from the principles of pure logic, then and only then could we say that the Kantian categories and those logical principles were in a relationship of interdependence.

8. Douglas R. Hofstadter, *I Am a Strange Loop* (New York: Basic Books, 2007), see pages 37-39 and further discussions later on in the book. See also his earlier extremely thought-provoking book *Gödel, Escher, Bach* (1979).

9. Martin Heidegger, *Being and Time*, trans. John Macquarrie and Edward Robinson (San Francisco: Harper, 1962).