

Address

by Stanley L. Jaki

*Professor of Physics, Seton Hall University,
South Orange, N. J.
on November 24, 1970
at Rockefeller University, New York, NY,
following his acceptance of the
Lecomte du Noüy Award for 1970,
for his work, Brain, Mind And Computers.*

You will all agree with me, I am sure, that an author's chances to win the Lecomte du Noüy Prize are rather slim. He must be around at the right time, in the right place, and he must produce the right book. Mathematically and very conservatively speaking, the probability for this to happen is not greater than 1/10,000. Again, exceedingly small are the chances, say 1/10,000, that the first scientific paper of the prizewinning author should open with a reference to Lecomte du Noüy. Yet, this is what actually happened in my case. My reference to Lecomte du Noüy was to his great classic, the *Human Destiny*, translated into 24 languages and sold in half a million copies. In that work, I wrote, Lecomte du Noüy brought to the center of attention a fact of utmost importance for the solution of basic problems of human existence. The fact in question concerned the limited role of chance in evolution. Well, contrary to the laws of probability, that first paper of mine was on chance, and the chances of this again could not very well be greater than 1/10,000.

The real point of all this lies, of course, in the fact that the probabilities in question are not isolated from one another. They represent three phases of one chain of events. Taken singly those events have already a very small probability. Their combined probability is vanishingly small. In this respect it is enough to recall the probability of throwing six three times in succession. The probability of this, since a die has six faces, is 1/6 times 1/6 times 1/6, or 1/216. The combined probability of three chances, each of which is equal to 1/10,000, is one over a thousand billion. While it is easy to grasp the meaning of the number one, the fraction one over a thousand billion is so small as to be beyond human visualization. The fraction is so small, because a thousand billion is so immensely large. You may recall in this connection that, old as the universe is, only ten billion

years have passed since its present expansion got under way.

But we should not go that far back in cosmic history. Twenty-seven years ago I attended the lectures of a philosophy professor who took an almost perverse satisfaction in proving first the claims of one school of philosophy, then in the next breath doing the same with the claims of the opposite camp. He did not sound overly convincing, but he certainly entertained his audience. I shall do much the same now by trying to prove the very opposite of what I have said so far. In other words, I submit that far from having exceedingly small chances to win the award, I was simply foreordained to win it. The reason for this lies in the fact that, if you forgive the pun, I am an ordained man, that is a priest and a theologian. But there is more to it than that.

Theologians are a strange breed. Prolonged thinking about God, the source of all, may easily create in the theologian the illusion that he knows all. — Needless to say, I am not talking of some present-day theologians who abandoned thinking for the sake of activism. — Now, this illusion of knowing all can manifest itself in many ways. One of them is the eagerness to exploit those conclusions of science which seem to favor certain theological tenets. There is, for instance, the law of entropy. It says, figuratively speaking, that the universe as a big machine is on a rundown course. From this it was tempting to conclude that science therefore has proved that the universe had a beginning and will have an end. Or take that famed principle of indeterminacy. How many theologians sighed with relief that it secured the freedom of will in the teeth of absolute physical determinism.

About twenty years ago when I started my professional career as a theologian, I kept nursing a secret wish, the wish to work out from physics the first truly watertight proof of the existence of God. The good Lord seemed to cooperate, although as always, in His unpredictable ways. In 1953 I lost much of my voice and with it my chair as a professor of theology. In those years the academe did not keep silent teachers. Today, some campuses certainly would be better off with some of their faculty members concentrating on the benefits of silence. Anyway, silence, or inability to give a speech or lecture for eleven years, gave me a golden opportunity to resume my studies in physics and by the fall of 1957 I had the PhD, but not the scientific proof of the existence of God.

For this it was most natural to blame the workload of a graduate student in physics. But there was also my growing awareness that in order to get the proof, more was needed than wizardry with well-behaving equations, or with

complicated electronic circuits. The winter of 1957 found me at Stanford, where I began to delve into the philosophy and history of physics, still in avid search of the proof. Study of the history of physics chilled before long my hopes. It taught me that many before me tried to do what I was trying to achieve. Some of them were such giants of the intellect as Sir Isaac Newton, Leonhard Euler, Michael Faraday, and James Clerk Maxwell. Yet, all these giants and many smaller ones came a cropper while riding on high hopes. Their discomfiture was not caused by atheists or agnostics. Physics itself proved to be their undoing.

Newton, for one, called on God, because his physics could not secure stability to the solar system. Well, a hundred years later, Laplace came up with equations that showed that Newton's fear was unfounded. The mutual disturbance of planets remained always within well defined limits. Much the same happened in all other cases. Problems which the physics of one generation could not solve were solved by the physics of the next generation or century. The lesson was all too obvious. It was self-defeating to base the existence of God on a discipline which kept replacing and revising its conclusions at an ever increasing rate.

As awareness about this point began to seize me, something else also slowly emerged on my mental horizon. The history of physics clearly showed that physics was growing more robust, more universally valid with each century if not decade. But this development also showed that quantitative laws had a built-in limitation. First, all efforts have failed so far to come up with an ultimate form of physics. Also there are some telling indications that the formulation of a so-called ultimate set of quantitative laws is inherently impossible. Second, and this is easier for the layman to grasp, efforts to base all understanding on science, or on physics to be specific, are bound to fail because of the built-in limitations of quantitative laws.

I was not, of course, the first to state that efforts to apply physics outside its field may end in absurdities. About a hundred years ago, the well-known British physicist, William Rankine, wrote a poem about a mathematician, who, as the poem has it,

A mathematician fell madly in love

With a lady, young, handsome, and charming.

Since the prize was really a worthy one, our mathematician decided to use the

foolproof methods of mathematical physics to win her hand. As the poem tells us:

*No doubts of the fate of his suit made him pause,
For he proved, to his own satisfaction,
That the fair one returned his affection; – “because,
As every one knows, by mechanical laws,
Re-action is equal to action.”*

How things really worked out on such a basis is revealed in the last stanza:

*Said he – “If the wandering course of the moon
By algebra can be predicted,
The female affections must yield to it soon” –
– But the lady ran off with a dashing dragoon,
And left him amazed and afflicted.*

From your reaction it is clear that I proved my point. Poetry still can do what differential equations cannot do, namely make people laugh. This encourages me to recite another poem, a short limerick. Its anonymous author was probably none other than Sir Arthur Stanley Eddington, one of the most creative and original physicists of our century. In the limerick he poked fun at those who believed that everything in the universe was governed by the laws of chance:

*There once was a brainy baboon
Who always breathed down a bassoon,
For he said, “It appears
That in billions of years
I shall certainly hit on a tune.”*

Well, about a minute or so ago, I said that I was not the first to state that the laws of physics, or quantitative laws, have a built-in limitation and revisability. But my book, *The Relevance of Physics*, seems to be the first systematic and thoroughly documented presentation of this point. The title is a misnomer. The book should have been called *The Irrelevance of Physics*. But you see, in a scientific age such as ours, this would have amounted to *lèse majesté*, or heresy at least, and

you know where heretics usually end up. So I decided that rank heresies are better proposed in a roundabout way. I hope that you agree on this point, if not with the historian of physics, at least with the theologian.

The Relevance of Physics is a long book. But it is not as long as it was meant to be. Its third section was supposed to contain six chapters, instead of the four now there. Those four have the titles "Physics and Biology," "Physics and Metaphysics," "Physics and Ethics," "Physics and Theology." The fifth and sixth chapters were to have the titles "Physics and Psychology," "Physics and Sociology." It is the material of the former, "Physics and Psychology," that has grown into a whole book, the *Brain, Mind and Computers*. The material of "Physics and Sociology" will become God willing, a book of its own, with the title *Physics, Society and History*. There I will try to show that contrary to some very fashionable trends, sociology and historiography cannot follow the methods of physics. The reason for this is very simple: society and history are about men, and men are not machines. By the same token, the brain-mind relationship has so far refused to yield to the physicalist approach. For all we know, that much maligned dualist theory of man, namely that he is more than sheer matter, is still as good a working hypothesis as any, either in brain research, or in psychology, or in cybernetics.

History, or to be more specific, scientific history, is a great teacher. When its record is set straight, one may sight unsuspected vistas both about the true greatness and the real limitations of science in its concrete reality. For science is not merely a set of discoveries. It is also a living entity, a continuous enterprise, a baffling chain of startling insights and astonishing shortsightedness. About the discoveries, almost everybody knows; about the shortsightedness and shortcomings, hardly anybody. To see these shortcomings, one need not go to specialized courses and to scholarly volumes. It is enough to take, for instance, a look at the night sky. It is dark. In that darkness lies perhaps the greatest lesson we can have about the universe. The lesson is that the total mass, the total number of stars in the universe, can only be strictly finite. The proof is elementary. It could have been formulated two thousand years ago. It certainly should have been accepted three hundred years ago. Newton himself was told about it by Edmund Halley. But Newton, Halley himself, all members of the Royal Society, and all those all over Europe who received the 1720 issue of the *Philosophical Transactions* chose to ignore the momentous issue. Belief in an infinite universe was so strong as to block the vision not only of Newton, but of almost all scientists up to about

twenty-thirty years ago. I told the whole story in my book, *The Paradox of Olbers' Paradox*. It is a fantastic tale. It seized me with such a force that I kept writing practically day and night for ten weeks.

I doubt that I shall write another book of 300 pages of massive historical documentation in ten weeks' time. My last book, which has just been finished, has been with me for some five years. It is also about the shortcomings of quantitative method, and it is also historical. Again, I happened to center on an idea which has been sporadically hinted at, but nobody so far has cared to take a long look at it. The idea concerns the second greatest singularity of human history. The first, needless to say, is the birth and life of the Master from Nazareth, and the incomparable impact He made on human history. The second greatest singularity is also about a birth, the birth of science.

Before science got really born, it went through many stillbirths. It came to a sad standstill in ancient India, China, pre-Columbian America, Egypt, Babylon, and even in Greece. It also failed among the Arabs. Science got its wings, it became a self-sustaining enterprise only once, during the period from 1200 to 1600. Of all the causes for this, one stands out dramatically. What all other cultures lacked, the Middle Ages did possess. Then and there, a whole culture became saturated with the Judaeo-Christian belief that the universe was the handiwork of a personal, transcendental and rational Lawgiver, or Creator. Consequently, there developed also the conviction that the universe was governed by laws, and that those laws could be recognized by the human mind, the masterwork of the same Creator and Lawgiver. By contrast, all other cultures were dominated by a pantheistic notion of the universe going through endless, inexorable, cyclic repetitions.

I hope that the painstaking documentation that I brought together in that new book, which I intend to call *Eternal Cycles and an Oscillating Universe*, will speak for itself and will illustrate the limitations of the quantitative method from an unexpected angle. The message of that book is that the quantitative method could not become truly operative without a non-quantitative factor, a firm, uncompromising and devout faith in the Creator of all.

You may perhaps ask at this point whether all that work, all that effort of mine, is really spent for the right purpose. Let me answer this question in the words of that grand old man of American science, Vannevar Bush, to whom goes the credit, among other things, of constructing the first modern digital computer.

“Much is spoken,” he wrote in 1965, “about the power of science and rightly. It is awesome. But little is said about the inherent limitations of science, and both sides of the coin need equal scrutiny.”

This need for equal scrutiny is not merely a matter of intellectual honesty. It is also a matter of human or humanistic survival. We all see today that mankind, nay our whole globe, is in the throes of a runaway technology, where man is no longer master of his own tools. The last two centuries were spent in the worship of machines. Today we are witnessing the technological sacrificing of man on the altars of machinery. For this the guilt lies not with technology and science, but with man, who chose to ignore all that was non-quantitative. The threatening pollution of the air is merely one aspect of the murky atmosphere which, as a result, is enveloping all mankind.

The stifling air of sheer machinery, the false security of its comforts, can hardly be the true destiny of man. Of this few spoke in our century with greater persuasion than did the author of *Human Destiny*. During the last ten years of his life he was seized with the recognition that man lives not by tools alone, but also by faith. The steps that led Lecomte du Noüy to faith in the fullest sense of the word were revealed with great insight in that charming book, *The Road to Human Destiny*, written by Madame Lecomte du Noüy.

My starting point could not have been more different from the early phase of Pierre Lecomte du Noüy's intellectual career. As an agnostic, he professed that man can know nothing about what lies beyond the realm of matter and quantities. As a young theologian, I believed that I knew everything that is outside the realm of matter. Today, it gives me far greater satisfaction to see clearly at least one point. It is the recognition that the realm of matter is not self-explaining and self-consistent. The understanding of the quantitative world demands the recognition of non-quantitative propositions. The whole future of science rests on that recognition and so does the ultimate issue of human dignity and human destiny.

[Note by Antonio Colombo: the book *Physics, Society and History* has not been written, but the argument has been dealt with in several other books, e.g., *Impassable Divide, or the Separation between Science and Religion* (New Hope, KY: Real View Books, 2008). The actual title of the book *Eternal Cycles and an Oscillating Universe* is: *Science and Creation: From Eternal Cycles to an Oscillating Universe* (New York: Science History Publications; Edinburgh: Scottish Academic Press, 1974). The complete text of William Rankine's poem *The Mathematician in Love* can be found [here](#).]