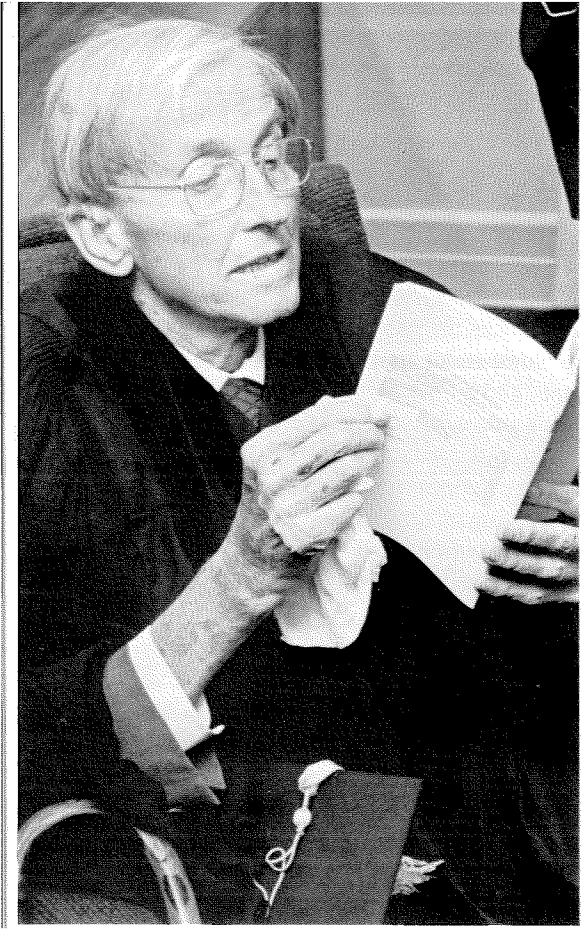

Max Delbrück

1906-1981

Max Delbrück, Nobel Laureate and Board of Trustees Professor of Biology Emeritus, died on March 9 at the age of 74. A service in celebration of his memory was held at Caltech on April 19, with a program arranged as requested by the family and presided over by Seymour Benzer, who is Boswell Professor of Neuroscience at Caltech. Speakers included Jonathan Delbrück, the eldest of the four Delbrück children; Nobel Laureate James Watson of Cold Spring Harbor, New York; David Presti, Weizmann Research Fellow in Biology at Caltech who was Delbrück's last graduate student; Gunther Stent, professor of molecular biology at UC, Berkeley; and David Smith, associate professor of literature at Caltech.

The service concluded with the Bach Cantata No. 106, requested by Max 20 years ago in anticipation of such an occasion. The cantata was performed by a group of friends under the direction of Helene Hancock, with the Delbrück's daughter Ludina as cellist.

Excerpts from the tributes given at the service follow.

JONATHAN DELBRÜCK: I think if Max were here today he'd be inclined to ask quite seriously, "Why is everybody being so serious today? Why do you people think of this as such a serious occasion?"

A year ago today we were on the annual Joshua Tree camping trip, an event we've done every year for the last eight years, so there's a hard core of Joshua Tree people who have been on every trip, but there are always many new faces too. It was officially designated as a trip to introduce undergrads at Caltech to being in the desert and to Max's unusual way of doing science in the wilderness. A distinguishing feature of this trip every year was what Max called the "Death March." He was never able to go on the whole trip himself, but he dubbed it that when he saw the exhausted people staggering in. He probably would have made a good joke about that on this occasion.

So let's remember Max for his sense of humor and his acceptance of and his interest in people from all walks of life — farmers in the fields and people we ran into on camping trips, scientists and politicians. He took an interest in everybody. Let us remember his great spiritual strength, which bore up those of us who had more problems than he with his passing through this last great adventure. That was how he saw the experience of dying. Let's celebrate our good fortune in having been able to partake of Max's benign and generous influence on all our lives.

SEYMOUR BENZER: After abandoning physics, Max moved into biology, and his career there covered two major phases: The first one was bacteriophage, and the second was Phycomyces. In each of these he fostered the development of innumerable young people. Some gave him more trouble than others. He once said to me of Jim Watson, "Jim used to love me like a father, and now he hates me like a father." Jim will speak of Max as a scientific father in the phage era.

JAMES WATSON: My initial glimpse of Max came soon after I entered Salvador Luria's lab in 1947 to work on phages, never doubting that there in that lab would be another way to truth. Instantly the hero worship I had felt from my reading of Max's writings became adoration, and I wanted to be as much like him as I could, possibly including marrying a girl as wonderful as Manny. For Max was no ordinary very bright mortal, but a graceful god sent into the world of biology to rescue it from its complexity by placing into its hands those marvelous replicating phages, which Max made us call T1 or T2 or T4, but never T100 because that would have been too much complexity.

My approach to science as well as to people became indelibly fixed the following summer when we all came together at Cold Spring Harbor — the Delbrücks, the Lurias, Gunther Stent, Seymour Benzer, and I — in an atmosphere that I can never remember as less than perfect. Now I realize that all the personality of Cold Spring Harbor, which I so loved then and still do, was given to it by Max. He abhorred the petty, and in searching for the deepest of theories he insisted that we work together in a collective, generous fashion. The selfish and the avaricious were not tolerated, and those unfortunate souls who could only survive with those traits were not for Max or for those of us who without being ever formally ordained knew we were the apostles of phage.

Max also had no use for stuffiness or protocol. He was never Professor Delbrück or Dr. Delbrück, but always Max to all who would learn with him. There was no hierarchy in which to fit, and the informality in which ideas were accepted or rejected gave us all the chance to do our best — and to dream that we might find out later the ultimate of answers. Never did Max divert toward his own glorification the talents of his disciples, but he al-

ways made sure that when we claimed a decisive result that he was also convinced so that we would not be led astray by the haste of our youth.

I still cannot accept that Max is not here and worry that my words will not please him. I want badly to say what I never had the courage before to reveal save now for my wife and children — that Max meant more to me than anyone else. I hope I did not too often needlessly disappoint him.

BENZER: One example of Max's originality is that he was one of the first molecular biology dropouts, around 1952. So he felt at liberty to turn to another problem that greatly interested him — that of sensory transduction. He chose Phycomyces as an organism and produced a whole new brood of Phycomyces biologists. One of these is David Presti, who will speak of Max as a scientific father in the Phycomyces era.

DAVID PRESTI: I knew Max over a period of several years as a teacher and as a colleague, but most importantly I knew him as a close friend. Max's scientific achievements were certainly significant, but his impact on the development of molecular biology came at least as much through his influence on individuals by way of personal interaction as through experiments done by his hand.

One of Max's great virtues was that he was always willing to give enthusiasm a chance, and thus he launched a number of successful careers in biology. Those who often saw Max as humorless and scolding might ponder Voltaire's statement that "God is a comedian playing before an audience that is afraid to laugh." For a deep sense of humor really did pervade his relationships. He also often expressed an attitude that was extraordinarily skeptical and scathingly critical, but at the same time very tolerant. Although he would all too often be heard to say, "I don't believe a word of it!" he would lend support while you proved him wrong. In fact, in a way, I think he actually delighted in being proved wrong, just so long as the proof was solid.

Max brought to his work great intellectual curiosity and incisive analytical thought, and also his own healthy childlike enthusiasm, which he made no attempt to suppress. This excitement was manifest in many circumstances. For example, several months ago Max suffered a small stroke in his visual cortex that produced a blind region in part of his visual field. When I visited him in the hospital shortly after this mishap, at a time when most people would have been exceedingly depressed, he was excited and very interested in the possibility of doing experiments on himself that might shed some light on human visual cortical functions. Such was his enthusiasm.

Max always insisted on openness in scientific research and had little regard for empire-building at the cost of openness. A spirit of integrity and cooperation pervaded his laboratory at Caltech, from the era of phage research through the days of the Phycomyces sensory transduction group in which I worked. Max's style of doing science may be approaching extinction as scientific research becomes more and more a big business — more a domain of the ambitious and less a "haven for freaks," as Max liked to say. He truly gave science a human touch, and I feel greatly privileged to be among the many people upon whose lives he had a major influence.

BENZER: Gunther Stent was a postdoc in Max's lab at Caltech in 1948-50. Gunther, who shared Max's German background and deeply ingrained interest in philosophy, was intrigued by the notion that Max got from Niels Bohr that there might be some kind of uncertainty principle at work in biology — similar to the one in physics — such that complete predictability of the future or an organism would be incompatible with the living state. Gunther will speak of Max as a philosopher.

GUNTHER STENT: As everyone who had even the slightest acquaintance with Max realizes, it was his extraordinary personality that made him the spiritual force which affected the scientific and personal lives of so many people. It may be less well known, however, that Max's personality and scientific attitudes reflected, and were probably shaped by, a particular brand of philosophy — the so-called Copenhagen Spirit.

It was thanks to the Copenhagen Spirit that Max could take the remarkable sovereign attitude that he had in controversial matters. This is not to say that Max was invariably right. On the contrary, as is well known to his friends, in scientific decisions that, for lack of critical data, had to be based on intuition rather than logical inference, Max was very often wrong. But he was never unreasonable and always appreciated the full depths of the problem addressed, often better even than the person who eventually found the correct solution. And so I want to say something about this Copenhagen Spirit, without an understanding of which I think Max cannot be understood.

It was Niels Bohr who found in the Taoist symbol of Yin and Yang an appropriate symbol for the Copenhagen Spirit. He points out explicitly in his great "Light and Life" lecture that the Copenhagen Spirit addresses the same kind of epistemological problems which thinkers like Buddha and Lao-tzu, who inspired Taoism, had confronted when they tried to harmonize our position as spectators and actors in the great drama of existence. The most distinctive feature of these problems is that they pose deep paradoxes, which arise because there is something inherently paradoxical about our intuition about the world.

Most contemporary philosophers of science know all about the Copenhagen Spirit, of course, and they are fully aware of the role it has played in the development of present-day physics. I think it is fair to say that, with Max, Bohr found his most influential philosophical disciple outside the domain of physics, in that, through Max, Bohr provided one of the intellectual fountainheads for the development of 20th-century biology.

Fortunately Max left us his own explication of the Copenhagen Spirit in the form of an unpublished book-length manuscript entitled *Mind from Matter?* a transcript of a series of 20 lectures on the origins of human cognitive abilities, particularly as they pertain to the sciences. He gave these lectures in 1972 in a course he called "Evolutionary Epistemology."

Toward the end of the book Max — having pointed out that in the far reaches of our search for understanding of the world deep paradoxes are encountered — raises a yet larger paradox. How is it possible, he asks, if it is indeed true that the categories of space, time, number, truth, and so on were put into our brain by evolution, that we are able to transcend them now and finally reach a higher level of understanding that was never selected for. That is to say, he asks, how is it possible that in natural selection so much more was delivered than was ordered?

In line with Bohr's closing statement of "Light and Life" that any meaningful sense of the term "explanation" precludes

any attempt to explain our own conscious activity, Max does not really answer that final question. Nevertheless, he feels that, thanks to the Copenhagen Spirit, mind has come to look less psychic and matter less materialistic. He closes his last lecture by asking his students to bring him their answers by next Thursday at 5 p.m. Or, he says, better yet, why don't you rephrase my questions, bring them into sharper focus, and then spend the rest of your lives trying to answer them?

As for us, we can't bring Max our answers, but some of us at least will spend the rest of our lives trying to find them.

BENZER: Max's method for learning was to teach, and every year for about 40 years he would assign himself the task of teaching a course in some new subject that *he* wanted to learn. This ranged all the way from statistical mechanics to epistemology. So Max became an expert in every one of those subjects. As recently as a year and a half ago, long after he had been officially retired, he volunteered to teach freshman physics here at Caltech as a sort of refresher course for himself.

David Smith, our next speaker, is in the Division of the Humanities and Social Sciences here at Caltech. He is founder of the Baxter Art Gallery, and he and his wife, Annette, have been close friends of the Delbrücks over many years, sharing an interest in literature, poetry, and art. David will speak of his and Annette's reminiscences of Max as a humanist.

DAVID SMITH: A few weeks ago Annette and I received a gift from Max and Manny of Walter Kaufmann's *Twenty-Five German Poets*. Max had been enjoying it and had ordered copies for some of his friends. Kaufmann uses a wonderful phrase to describe certain poets, whom he calls "human archetypes." With that phrase in hand, I realize that I always thought of Max as a human archetype. Taken whole and entire, he was one; but we all knew him serially too, in his parts and moments; and it is sometimes hard to sustain that archetypal sense. It keeps returning as the sum, but so do the parts — his love of paradox, his impatience as well as his playfulness, the intensity of his play, and his lack of self-seriousness.

One time when a bunch of us went camping, Max and his younger son, Toby, failed to arrive until late at night, long after the rest of us. They had, it seems, spent four hours looking for a Yo-Yo string. His playfulness translated quite literally into plays, the marionette shows he put on with his children, in which in a marvelous conceit, he often took the role of Uncle Max, the fusty professor with a thick German accent. Max was Max, and sometimes he played Max. He also proposed to play Samuel Beckett, threatening to give the latter's Nobel acceptance speech for him when he failed to go to Stockholm.

He particularly admired the work of Beckett because, almost as a scientist, Beckett had reduced the complexities of human intercourse to their elements, a series of games turning in an eternal round. A few years ago, when relevancy was the word, a graduate student induced a number of notables here to discuss the relevancy of their science. Max discomfited them all by using Beckett's Molloy and his obsession about putting his sucking stones in order as a metaphor for why people do science. Scientists "are hooked," he would later say, "like an addict or a nut who likes to solve puzzles."

His interest in the humanities was profound, of long duration, and of increasing intensity. And it was a matter of day to day, practical observance, as most things profound are. He often attended humanities seminars. He even sponsored one. He and Manny regularly attended youth recitals and concerts. He was the most active supporter of the art gallery on the faculty. He was interested in the whole education of students. For years Max and Manny organized wonderful camping weekends — huge tribal affairs with undergrads, grads, postdocs, faculty from here and sometimes afar, and, of course, families and dogs.

He took an ironic pleasure in pointing out that he was a relic of another day. Translated and interpreted, what that really meant was that he was that rare bird, a man of general culture, an intellectual. He did not like the schism which produced the "two cultures," and, in fact, his commencement address in 1978, "The Arrow of Time," warned against it. Time was the controlling metaphor of that talk, and it was for him a central issue, both intellectually and personally. Time, he pointed out, differs in the physical and biological sciences, the one reversible, the other directional. But this arrow of time is also the specialty of poetry, time "whose bending sickle's compass comes" to menace constancy in the endless Platonic struggle between the biological clock and human hope. He corresponded with poets about it.

If in these past months Max had begun to concentrate on poetry (which he did with intensity and luminosity), the immediate reason was that he had been invited to give a lecture at the Poetry Center in New York. It was about Rilke, the most intuitive of the German poets, that he intended to talk. He had completed some nine pages of his talk, titled "Rilke's Eighth Duino Elegy and the Unique Position of Man," when he had to suspend work on it. He was intrigued by how Rilke, without scientific knowledge, with no more than the chaotic intuitions he had during his stay in the Duino Castle, could finally arrive at a view of man entirely in keeping with one science might approve of today.

In keeping with Max's sense of humor, I should like to return to a more Delbrückian mode. A few years ago, in another commencement talk at another university, he addressed himself to the moral dilemma of the scientist who must follow mother nature with unblinking eye. "There is great happiness in doing research," he said, "but nature is full of hard truths. How do we live with what we discover, with the broom and bucket we can't stop?" He put his answer in a parable of his own, a true Maxim, set as it was against the expectations of loftiness which attend such events. "Let me come, at long last," he concluded, "to the plot of *The Pig and I*. It is simplest if I show you the play. Here is Wilbur, the pig, very much beloved by my daughter Ludina, and very much scorned by her older brother Toby. Here is the professor and he has advertised for a companion to live with him. The lion comes and brags about his courage and ferocity. The mouse comes and shows its cheerful disposition and playfulness. The dog comes and offers himself as a friend and servant. The cat comes and shows its elegance and languor, and finally the pig comes and says, 'I am down to earth, I have my nose to the ground. I don't look up to anybody, I don't look down on anybody.' So the professor decides: 'You are my choice; you are what I want. Dogs look up to us; cats look down on us; pigs is equal.' So this is my advice to you. Hold on to the pig if you want to keep your sanity in the difficult years ahead."

We shall try, Max. □