JACQUES LOEB

BY PAUL DE KRUIF

"No—but that doesn't mean that I believe Eve was created out of Adam's rib!"

As he said this—and, so saying, silenced me—Jacques Loeb glared at me across the lunch table and his eyes opened until the ten thousand tiny crowsfeet around them were smoothed away. That is how his eyes always behaved at such times. Those eyes that, in repose, smiled, just showing between narrow lids, now suddenly became round with a dark enormous glow. Their gesture was a triumphant exclamation point for his unanswerable epigrams.

You will wonder why such a free-thinking atheistical searcher—for that was what Jacques Loeb was—should think that I suspected him of taking the twenty-second verse of the second chapter of Genesis literally. As a matter of fact, he did not think so; his reference to Adam's rib was simply his way of putting me in my place for protesting against his sardonic jabs at Darwinians. In that solemn refectory of ours at the Rockefeller Institute he often made the lunch table gay with salty remarks about them and sometimes he did not even spare Saint Darwin himself. I laughed with the others at his ribaldries about so sacred a scientific subject as Organic Evolution, but just the same such evil comments (coming from so great a man as I knew Jacques Loeb to be) disturbed me mightily. I was only thirty and I believed with a holy fervor in Darwin. Wasn't he the Moses who had led me out of the stern land of the Calvinists? Yet here was Loeb inciting me to think of him as a sort of tin horn Moses! My intellectual house began to come down around my ears.

That was essentially what Jacques Loeb was—a wrecker of cozy intellectual houses in which folks like to put their brains to sleep. Prince of priers into the machinery of living things, he was almost alone among biologists as a heretic against the Theory of Evolution. How he mixed me up at first, that Jacques Loeb! Of course I could never again believe in the legendary Old Gentleman who said "Let there be light!" three days before He created the sun, moon and stars. But I felt that for my spiritual comfort my brain needed to know where Eve and the rest of living things came from, and, without too close an examination of the evidence, I had swallowed what Darwin had told me about Eve being eighth cousin to a baboon. After listening to Loeb's digs at Darwinism that day at the laboratory lunch table, I said, with an innocent boldness that I blush for now:

"But surely, Doctor Loeb—you *know* there is such a thing as Evolution—"

It was then he blew me up with that answer about Adam's rib. . . . Right here I hasten to put in a parenthetical self-defence, both for Jacques Loeb and for myself. It is necessary because I can hear the tramp of ten thousand biologists and intelligent laymen coming toward me—they come with half-bricks in their hands, hurrying to the succor of Jacques Loeb's scientific respectability, and eager to demolish me once and for all. Drop your missiles, defenders of the faith! It is admitted that for certain excellences Loeb admired Darwin. There was, for example, Darwin's great service as Antigod. Loeb was enthusiastic for that, just as he wor-

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shiped Copernicus and Galileo for demonstrating that the sun and planets do not march around the heavens for the delectation of man. Now Copernicus and Galileo —they had proved their stuff; but Darwin, well, that was something else again! . . . But let Jacques Loeb praise Darwin in his own words:

> . . . Darwin rendered a similar service by his insistence that accidental and not purposeful variations gave rise to the variety of organisms.

It was as a great insister on the lack of purpose in creation that Loeb thought of Darwin. It was thus that he admired the Darwin who put into people's heads a dreadful disbelief in God as the manager of a protoplasm factory in which were turned out a million different models of living beings—in a delicately varied but none the less stupendous standardized production. But now, alas, Darwin's followers had turned their master's irreligion into a new form of worship, and it was Loeb who turned destroyer, with epigrams of an Eighteenth Century smack and by experiments that were entirely his own. No one has ever made finer theory-destroying experiments than Loeb made.

II

More noons I passed very merry with him at that lunch table, a dozen noons, a hundred noons maybe, and long afternoons too in his little office where he sat at a plain desk before a high confusion of sheets of paper pot-hooked with experimental data. Gradually his heretical ideas about the Theory of Evolution became clear to me. It was experiments to prove the yes or no that Loeb wanted. Always he was in his laboratory experimenting, on week-days and Sundays, forty years ago in Germany and Naples, and then year after year in Philadelphia, and Chicago, and San Francisco, and New York, and Woods Hole. Never has there been a man of note who spent so little time in frivolous pomposities. Three hundred and sixty-five days of the year he was in his laboratory taking nature apart, and improving on it, and putting his nose into some dark corner where sat the enigmas of life. Loeb long ago, in his first years as a searcher, had tried to convince himself of Evolution in his laboratory: in endless godless experiments he had groped at trying to change one species into another—and always he had failed. Now, dogmatic and epigrammatic as he was, he was a great skeptic too, about any theory that told of events in nature—happenings he could not make come off by experiment in his laboratory. So he dismissed the whole excitement about Evolution with:

> . . . We cannot consider any theory of evolution as proved unless it permits us to transform at desire one species into another, and this has not yet been accomplished.

Professors of biology might come bringing him plausible theories about better and better fishes, and larger and larger whales, and schematic diagrams showing (said they) that little five-toed *Eohippus* had evolved into the magnificent one-toed brewery horse of today. Such tales the professors might come telling Loeb, stories these were, yarns they had made up after studious sincere bendings over bits of bones dug up out of ancient rocks—but all their histories left him cold. It might, he thought, be amusing to speculate about monkeys improving gloriously into men, and he was not above the confection of sour and grisly humors in which he told of men reverting to monkeys. (Privately, and with sinister chuckles during the late war, he had appointed Roosevelt Bishop of the Church of St. Simian.) But to be serious about such stuff? No . . . these supposed events, alas, had happened ages ago, and—you can imagine Jacques Loeb looking at the professors until his eyes grew round with that dark enormous glow—how was it possible to experiment with the past?

That was what Loeb was always demanding of the serious men who arrange sets of bones to fit a theory. He would have been quick to propose huzzahs for the

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professor who first really imitated what nature is supposed to have done; he would have stretched out his hands to the searcher who first, by experiment, changed monkeys into men. . . .

Not, of course—let me hurry to tell you—that Loeb had any traffic with Jennings Bryan and the Fundamentalists. On the contrary, he railed at them with the cheerful bitterness of a Voltaire administering sarcastic spankings to that Infamy which the ridicule of a thousand Voltaires will never crush. He detested all religions much more than he abominated the historians and morphologists of science; but he had no time for the latter because his thoughts ran all the time on the machinery by which living things develop and grow and have their being *now*—there never was such a maniac for mechanism! If he had been called to the stand and asked about the history of living things on this earth for the past ten million years, I can imagine him saying, as Ford said: "Such history is bunk!"

His views of the workings of the world of living creatures, the ideas that he distilled in a kind of excited brooding before his rows of test-tubes and his baths of sea-urchins—these notions were quite as epigrammatic and as paradoxical as his most frivolous passages of wit. He had an impish (I say impish with my hat off) way of looking at things from a point of view not before thought of by anyone. It has always seemed to me that the high God Loeb did not believe in, fashioned his brain to look at the phenomena of nature in a way to confound the best beliefs of the professors and pastors who served that God. Loeb was always spouting short embarrassing objections—which rose not so much from his love of truth (whatever that may be) as from his hatred of empty words. How Jacques Loeb hated words! At all times, even when he had to jump fearful chasms of logic to do it, he thought of the intricate workings of plants and animals in terms of pretty tables of figures where the observed results of his experiments agreed more or less closely with the values calculated from his theories. For him breeding and loving and growing old and dying, the whole struggle for existence, was only to be thought of in terms of figures, and after peering at charts graceful with curves upon which the dots of his observed results fitted with a sufficient neatness. As you will see, after dreaming of such mathematical reductions of romance to absurdity, he made some of his dreams come true in the last ten years of his life. A lucky man, this Jacques Loeb, for how many poets live to see their dreams come true?

III

But long before he realized his dream of reasoning about life only in terms of precise figures he was a very devil at finding experiments and fishing up facts to flabbergast the gentlemen he called "verbalists." Take the idea, for example, of animals adapting themselves to their environment in order to survive. The organs and appendages and instincts of animals are all there for that purpose, say the evolutionists; a beast's color is supposed to have been evolved to protect him from his enemies and his sight and smell developed to lead him to his food. These things, in brief, are supposed to have been evolved because they are for his highest interest. But Loeb asked:

"Why, on the contrary, is it not just as plausible to think that an animal has survived because his species happened to be equipped with these instincts . . . ?"

For Loeb wandered in a world where there are no such words as "interest" and "purpose"; for him, trying always to formulate the mathematical laws by which animals and plants are born and live and die, "interest" and "purpose" were as much out of place as they would be in Newton's Laws of Motion.

But are there actually instances, you will ask, of species equipped with instincts for which they have no use—instincts of which they were already in possession before it

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was necessary for them to adapt themselves? Jacques Loeb was ready to come back at you with such instances, not one but many, all gathered during the feverish years of his experimenting. He told how he put a shrimp into a trough of water and shot an electric current through that water, and how the shrimp moved like an automaton toward the positive pole at one end of the trough. That shrimp and every brother shrimp of his species had to move in that direction—it was their instinct to move that way and no other way in an electric current—just as it is the instinct of flies to settle on molasses. But where did shrimps get this preference for positive poles and what good can it do them now? Said Loeb:

> Except for a few individuals of this species who happen to have fallen during the last few years into the hands of physiologists, there is not an animal who has ever had occasion to be under the influence of an electric current. . . . It would be hard to find a fact more directly in contradiction with the opinion that animal reactions are determined by their needs or by natural selection.

And then he brought forward the goat moth larvæ that live under the bark of trees, miserable larvæ that die when they chance to come into the light. But take them from under the bark of their tree and they travel in an inexorable bee-line toward the very light that is their doom! . . . It was no gentle world, this world of Jacques Loeb, and on melancholy Sunday afternoons his mechanistic universe often makes me ponder sourly on the millions of marvellous species—some of a beauty and an excellence that by comparison would make *Homo sapiens* fit only for the ash can—species that have died a-borning because they *happened* to possess self-exterminating instincts.

So Jacques Loeb made hash of the word *adaptation;* and by other incessant messings with pipettes and troughs of sea-urchins and crabs and barnacles he reduced the sonorous word *environment* to a term fit only for use by Modernist pastors with sociological tendencies. His common sense made him see clear the futility of trying to use the word *environment* in any but a loosely literary sense—this environment that is made up of a thousand subtle shifting factors.

Environment indeed! For him it seemed as nonsensical to speak of the effect of the environment as it would be for astronomical physicists to talk of the effect of the cosmos on the movements of the heavenly bodies. But the separate components that made up the environment—that was another thing! And so, for more than forty years, Loeb made hundreds of thousands of experiments; he made a beginning, in short, at the dreadful (and impossible) task of taking the environment apart. At Bryn Mawr, where he taught young ladies who were trying to be intellectual; at Chicago, where strange publicities tormented him and where jealous victims of his wit charged him with not being a regular professor at all; in California, where he knew a fine saloon in which to eat meals on Saturday nights; and in the fine austerity of a great institute of applied medical science in New York—in all these places Jacques Loeb was every day and at all hours in his laboratory, pinning down one after another of the tangled components of this hopelessly complex environment and testing the effect of now this and then that factor upon a given species of plant or animal. And never in any of these places did he stumble on any experiment that pointed to the reality of what the professors call Evolution!

What a parade of strange results these experiments made as they passed before his excited and always curious eyes. He altered the degree of acidity of sea water and produced weird hybrids between species that under ordinary conditions would never cross. Eggs of other marine animals he put for a while into solutions with a certain concentration of the salts of calcium and potassium; then he returned them to common sea water and watched them develop fantastically into twins. There was, too, that notorious business of soak-

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ing the unfertilized eggs of a mother sea-urchin in a series of solutions of different salts. These eggs (with no possible chance for sperm to get at them, remember) grew strangely into sea-urchins without fathers, or rather into beasts whose fathers were the salt solutions of Jacques Loeb.

This last research spilled over into the newspapers—to Loeb's great disgust, for there was something old-fashioned about him—and wild rumors went abroad that he had succeeded in making living things from dead stuff, and there was excitement among the Olive Schreiner-like ladies who believed human fathers to be nuisances. That was a grandstand time for him, and I believed him when he said later that the annoyance of it took several years off his life. . . .

IV

But presently he was back at his cloistered work again, forgotten by the newspapers. Temperature, as we know, is a factor in the environment of all living things; by lowering by ten degrees the temperature of the water in which certain beasts lived he increased the duration of their lives a thousand times. Light is a part of the environment and he showed—with a disgusting mathematical preciseness—how certain creatures are slaves of the light, how they are drawn to it by an inexorable chemical mechanism in which there is no room for whims or purposes or desires.

I have heard him praising the beauty of paintings, but I never heard him (though he may have done so) mention any enchantment at some beauty of nature. I believe the beauty that he was after (for he was at bottom a poet seeking for loveliness) was that of the thermodynamical laws which lay beneath the quivering mystery that is life. Loeb felt those hard, lovely laws there—he almost, you might say, smelled them, like some strangely intellectual hound—and that is one of the chief reasons he was such a lonely man. Most people—and this includes biologists—detest the idea that the shimmering surface beauty of life and its often gay capriciousness are only masks for a rigid determinism. . . .

Jacques Loeb knew the novelist Dreiser and told him these things and even Dreiser—who, God knows, is disillusioned enough—even Dreiser was made uneasy by these mechanistic laws. For Dreiser wrote, after coming out of the remorseless hissings and poundings of the engine room of a transatlantic liner:

> I shouldn't like that, I think. . . . Life is better than rigidity and fixed motion, I hope. I trust the universe is not mechanical, but mystically blind. Let's hope it's a vague, uncertain, but divine idea. We know it is beautiful. It must be so.

Ponder these mutterings of the novelist and you will understand why the philosophy that follows from Loeb's researches will never be popular, like Darwinism.

He showed a strange erratic sort of impatience at his work and he had a way of his own of circumnavigating those swamps of experimental failure that so often bog even first-rate searchers and bring them years barren of results. "I like to have two or three things going at the same time," he told me one day. "When you get stuck in some problem, de Kruif, try something else—that is the way. If, for example, my colloid experiments go wrong, I go down and fuss with my plants in the green-house for a few days—and usually all at once I find my way around the troubles with my colloids."

His was one of those strange heads that can play thirty games of chess at the same time. His brain, without his knowing it, solved difficulties while his hands were working far afield. So he was always in a state of mental eruption, the despair of those technicians who were his slaves: for he would get them to start vast experiments in the morning and then come in the afternoon with sheets covered with entirely different plans. . . .

"But, Doctor Loeb, we have already started—"

"Never mind that!" he would cry, aghast at their stupid reasonableness.

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"This is what I want you to do now!" Often what he asked them to do were experiments that looked foolish to a merely rational person. Sometimes his plans seemed impossible to accomplish; at other times they *were* impossible. But always those technician slaves managed to do them somehow. They had to, for Doctor Loeb, who was above all natural limitations, had ordered them to be done. Never was there a searcher having less of that clear reasonableness or that glacier-like patience with which legend endows men of science.

But just the same no plodding, precise mathematical investigator could have stuck more closely than Jacques Loeb stuck to one guiding idea: and that was the belief —it was a sort of fixed atheistical faith and not what ordinarily would be called a scientific theory—that all living things are machines run by the same law that lifeless mechanisms obey. The whirling electrons of the atoms of the protein molecules of the brain of a child at play—those electrons (so knew Jacques Loeb) are driven and guided by the same remorseless forces that drive the earth around the sun. What a bold man he was—not merely to affirm this, for one need only be a philosopher to affirm it—but to set out to try to prove it by experiment!

He was always insisting that the only results worth anything were those that could be expressed in figures. To a physicist this preaching would be platitudinous, but such talk, you may be sure, especially ten years or so ago, stepped on the scientific toes of most biologists. Science is so much easier and certainly more satisfying if you simply pour some of this into a little of that! But such was Loeb's mad demand for quantitative work that figures, and all men working rationally with figures, took on a peculiar excellence in his mind.

"There will be universal peace," he once told us, "only when the entire population of the world is made up of physicists—they are the only people who have nothing to fight about!"

Then his eyes almost disappeared in the slits made by his wrinkly smile and he added: "Or maybe there may be peace also when England has finished conquering the whole world."

This weighing and measuring obsessed him so that he carried it over into his comments (which I must admit were always tinged with a bit of sardonic ribaldry) upon all the affairs of human society. Although he admitted in his later years to taking two or three cocktails per annum—what his rations were in that good saloon in San Francisco I never asked him—, yet he was a violent advocate (privately) of temperance, and even of Prohibition. And he would make arguments with pseudo-quantitative data to back them. "In Bavaria the drinking of alcoholic beverages has caused dreadful conditions," he would exclaim. "The curves of beer-drinking and brutality have been shown to run parallel!" I remember guffawing at this, but Loeb never smiled; he opened his eyes wide and insisted it was so.

He used to make sardonic jokes too, at himself, about the irrational romance that his life was.

"I have lived my life topsy-turvy," he exclaimed once. "I have lived my whole scientific career backwards. I began trying to do exact work with sharks and dogs, and here I am at the end finding colloids—they are not even living stuff—too complicated. I started with dogs and always I have been forced to work with simpler and simpler animals, and now . . ."

This ironic view of his own life he used to toy with (though he was never very serious about it) in his last years,—when, at the age of sixty, but with the concentrated, alert fury of a boy at play, he was at his brilliant job of bringing order out of the sticky chaos of colloidal chemistry. For the Jacques Loeb who started life as a very lazy bank-clerk and read "Candida" when he should have been studying pathology, and poked about brilliantly if inexpertly with the brains of sharks, and messed with solutions of salts until he

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made them the fathers of sea-urchins—this man ended his life as a chemist who went a long way toward reducing the tangled empiricism of the study of colloids to the simple laws of classical chemistry.

"But you see—that is where I should have *begun*—I should have studied the stuff living things are made of before I tried to explain life itself. . . ."

V

Just the same, Jacques Loeb was not, fundamentally, what you would call a man who underestimated his own power; though when face to face with lesser men it was his fine custom to show a modest kindness toward them. But he knew, I am sure, that he did not belong in their ranks. At those moments when his eyes grew round with that dark glow and on those afternoons when he kicked aside intricate experiments already under way in order to start new ones—he was aware of his superiority then. His chief heroes among men were the encyclopedists of France, Diderot and D'Alembert and their godless crew, and he was a kind of anachronistic experimenting encyclopedist himself. Like them he was a materialist down to his spleen and pancreas, and I have no doubt he would have liked to have heard applied to himself the words of John Morley on Diderot:

> He was one of those simple, disinterested, and intellectually sterling workers to whom their own personality is as nothing in the presence of the vast subjects that engage the thoughts of their lives.

But Jacques Loeb could never be quite that, at least, so it seems to me; he could not be that to those fortunate ones who were close to him and knew him well. To me it was not his work but the man himself who was the miracle to be gaped at.

Loeb—and how this warms my memory of him—was never a systematically eminent man; he did not belong to that class of great men who smile carefully and laugh in a 4-4 rhythm; he would talk as eagerly and guffaw as boisterously with a twenty-five-year-old novice of science as with a university president—*more* eagerly, in fact, for these worthies ranked in Loeb's category of *bêtes noires* just below the vitalists and verbalists whom he detested most of all.

"They are for the most part windbags [he pronounced it *vindtbacks*] and in the next war it would be wise to draft college presidents for the dirigible balloon corps—then there would be no need to make helium. . . ."

Dreadful words to be spoken in that frivolously solemn refectory of ours, and even I—already marked as a potential nuisance—felt just alarmed enough to pull my laugh a bit. Let it be said to the credit of those in whose hands the economic fate of Loeb reposed that they never did more than wince a little at his geysers of scalding ribaldry. But then, who could have touched him? He towered too much. Strangest of all things about him, his heart belied the cold deterministic faiths that nature put into his head. Despite this tongue of his that was sometimes a rapier and at others a dreadful bludgeon, Loeb face to face with his victims was gentle and so kind and generous. Had one of those detested college presidents been caught in *flagrante delicto* and chased by a mob, Jacques Loeb would have jumped in front of him and faced his persecutors.

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ALLIE

BY WINIFRED SANFORD

One day, when I was a little girl, my mother came home in the greatest excitement. She said that Mr. Wright had run off with all the money in his bank, . . . and what was going to become of Allie? She said it was bad enough for a girl to grow up without any mother, and lose her lover in a train wreck, without having this to happen.

After that we were all a little afraid of Allie. I don't mean that we suspected her of stealing,—she was the kind that wouldn't hurt a fly,—but we didn't know what to say to her when we met her anywhere. If we sat next her at the soda fountain in the drug store, for instance, we didn't like to say, "Nice day, Miss Allie," or "Will you buy a couple of tickets to the Senior Play?" because it didn't seem appropriate to say such things to a girl whose lover had been pinned under a Pullman car and roasted alive and whose father was a fugitive from justice. It didn't seem adequate. And then, if you said "a couple of tickets," as you were sure to from long habit, why, you were just rubbing it in. For when Allie went anywhere, she went alone.

She lived in a furnished room over the drug store, and ate most of her meals at the soda fountain. She said it was the cheapest place in town, and of course she didn't have any money because the bank creditors took the house and everything Mr. Wright had left behind. Allie got a job as clerk in Mr. Stickney's dry goods store. Mr. Stickney put her at the notion counter, which was in a dark corner under the stairs. Even on bright days they had to keep the electric light burning, though Allie said it gave her a headache. And her back hurt because she had to stand up all the time. Everybody said it must be awful for Allie when you remembered all the things she used to have.

We girls used to march along through town, with our arms on each other's shoulders, singing. Every now and then we'd meet Allie Wright going home from work. She had the funniest way of walking without swinging her arms. They just hung down, and her black cotton gloves looked as if they were stuffed with sand. I don't believe she ever bought any new clothes. She kept on wearing the clothes her father had bought for her when he was in the bank. We were always afraid, when we passed her like that, that she was going to cry. And we always stopped singing when we saw her.

"How do, Miss Allie?"

"Good evening."

It was just as if a cloud had blown over the sun.

The worst of it was that she knew how we felt. So we were always trying to make it up to her. When our Sunday-school teacher moved away, we begged Allie to take our class. We said, "Please, please, Miss Allie. We'd rather have you than anybody." Of course, we wouldn't have asked her to chaperone a party or anything like that, but Sunday-school didn't matter so much. We didn't go there for fun. Besides, it made us feel as if we were doing a lot of good.

Once Allie invited us up to her room over the drug store. It was supposed to be a party. Some of the girls had dates, but we made them come anyway. It would

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