

*Paul Salzman*

## **the science jungle**

[1] A couple of years ago I became involved on a panel for the Western Psychological Association which was about something called "The Psyche of a Scientist." It turned into a kind of psychodrama because here were all these psychologists, sociologists, and anthropologists, but I was the only real live scientist. The tribe I belong to is called biochemistry, which is sort of a subgroup in the pecking order of science somewhere below physical chemistry and above geology. And what I was listening to was a fantasy, or, you might say, the results of a con job by the natives on some poor hapless explorers who did not understand the terrain at all.

[2] There was one speaker who had surveyed the psychological patterns of nine hundred undergraduates and then run correlations on the Minnesota Multiphasic Test of their attitudes and concerns, and individuality, and intercourse with girls, and why they dropped out of Cal Tech and went to UCLA. Another fellow from a place called the Institute for Creativity had done his correlations on some scientists in industry and why they were good guys or bad guys, or did they conform and shoot good golf, and were they rising in their companies. The third panelist, who also writes books about the scientific psyche, had interviewed

Copyright © 1967, by Harper's Magazine, Inc. Reprinted from the February, 1967 issue of Harper's Magazine by permission of the author.

some seventy famous scientists along the coast of California, and talked about their deep feelings for humanity and how they all want to understand nature and make some small contribution to the greatness all about us.

[3] Now I know these guys she interviewed. And I knew what they told her was not true. It was their fantasy of what they would like to think they are. So when my turn came, I said, "Look, pals, here's the real world. Here's the jungle in which I live." I was annoyed that none of these panelists truly understood the frenetic and frustrating existence of the scientist in America today. And I'd like to explain why.

[4] Let's start with the world in which young scientists grow up. It's a fundamentally anti-intellectual culture. Of course we boast a lot about being scientifically oriented and worry about Sputnik, psychedelic drugs, and the two cultures. But if you want to see what really concerns human beings in our society, all you have to do is dial your favorite TV station.

[5] Our scientist-to-be grows up in this society, and the people who are supposed to teach him science are as anti-intellectual types as you can find anywhere. I've spent a lot of time teaching high-school science teachers and hoping maybe that some of them would be turned on about the greatness of science. But it doesn't happen often enough. Because you see, most of these people are coaches whose teams started losing, so they took up teaching modern biology. And they are absolutely noninvolved. I remember one time I was sitting on a surfboard with an old colleague who used to play basketball with me in high school, and was a coach for a while, and I said, "Bill, how do you like teaching science?" (His teams had lost.) He said, "Well, what the hell, I manage to keep three or four pages ahead of the class." It never entered his head to do anything so highbrow as read *Scientific American*, much less drop in at my lab to see what was going on.

[6] The students don't learn anything about science from teachers like this. And their anti-intellectual parents pound them with the idea that the big thing in life is financial security and the good All-American ethic, whatever that is. The kids know that sooner or later they're going to have to take the College Board exams and seek admission to a prestigious university. So they start when they are very young to worship the Great God Grades.

And the smart thing is to stay away from tough, challenging subjects like science.

[7] By the time they wander into a university where I first see them as freshmen, their attitude toward science is abominable. Their image of a scientist is a scrawny runt whose sole purpose in life is to synthesize a compound which when injected into beautiful blondes turns them into gorillas. They are absolutely illiterate in the language of science, which is based on the vocabulary of mathematics. The last thing they want to be is a science major with four labs that take up all afternoon when the coach says be out on the field at two if you want to be a football hero.

[8] So, despite all the speeches about how vital and great science is, we're getting a very strange, narrow breed of student. A precious few will say, "I'm committed to science." But the typical freshman is really committed to Security on a scale which is not likely to happen to a professor or a researcher. So he figures, "Well, I'll do four years of science and then go to Harvard or Stanford Business School. Then I'll become a great leader on Wall Street and control the destiny of men and make a million dollars and live happily ever afterward." He is totally alienated from science by this time.

[9] This is about where I was when I finished college. In high school, thanks to a wild and wonderful chemistry teacher, I had learned to love science. But in four undergraduate years, my college professors managed to squeeze all joy, all pleasure out of it. They handed me a diploma and said, "Baby, you've made it. Go forth." And forth to Harvard Business School I was going. In the last ten weeks of my senior year, I was intellectually seduced by Professor James Bonner, a vital and three-dimensional teacher and researcher in biochemistry. He rekindled old fires and aroused dormant passions concerning science as a way of life. My uncle, who had nurtured and nurtured me thus far along the test-tube trail, encouraged me to give science one more go. And, I married a most wonderful girl and went to Paris, where I had a research fellowship that didn't pay very much. To balance the budget I played basketball for the Racing Club and my wife modeled for Jacques Fath. It was a swinging year. And I fell in love with science all over again. I rediscovered that science is not the memorization of the parts of a frog, the names of organic re-

actions, or a series of formulas which you must plug in and solve. Science is a way of life. It's a beautiful—if you will, essentially an orgiastic—experience, and you'd damn well better experience it or you will never be a real scientist.

[10] Does anything like this happen at an American university? It seldom happens to an undergraduate and hardly ever in graduate school. It is in the three to six years in graduate school that the student is supposed to come of age in science. The student knows that to be a real scientist he has to be called "doctor," because if he stops at the bachelor's degree, he's a dropout or a lab technician.

[11] So he goes to grad school. And he finds out that the professors use their students as a form of semi-slave labor. This is a terrible evil, but it is not hard to see why it exists. To support a student in a graduate program as a research assistant costs about \$3,000 a year plus tuition (much less than a good tackle). And where did you the "professor" get the money? You got it by asking one of Lyndon's agencies, or some nice philanthropic organization like the John A. Hartford Foundation, which believes in encouraging science. You hold out your hand and they lay the gold on it and the minute the gold touches your palm they say, "What did you do for me lately? Where are the publications? How many meetings are you presenting your paper at? When was the last time your picture was on the cover of *Life*?"

[12] What do you do? You go into the lab with a stick and go whop! across the graduate student's back and say, "Where's the data? Where are the numbers? Where are the publications? I don't give a damn if you love science, but grind out the numbers! Kill the rats! Chop up the spinach leaves! Where's my enzyme?"

[13] Now when a student is under this kind of pressure his feeling for science as a love affair, science as a quest for knowledge, joy, beauty, and pleasure, is stamped out on about the fourth day. Don't forget that at the same time you're demanding data, you're demanding that he pass courses and examinations and write propositions and stand for oral exams. This last is a curious phenomenon which makes the auto-da-fé of the Spanish Inquisition look tame.

[14] The majority who survive this combination of ordeals become what I call trivial scientists. Instead of making positive contributions by asking meaningful questions and answering a

few of them, they will be stamp collectors, obfuscators, and polishers. For some professors have conditioned these Pavlovian creatures to understand that they too, the day they exit from the lab, have to get grants and start their students collecting data for them so they can go to meetings and show slides and be hailed as heroes, and maintain the cyclic ritual.

[15] Our hypothetical student has, at any rate, now become a member of the scientific tribe, complete with union card. He soon finds that his tribe is egomaniacal in structure, that everybody knows exactly where everybody else stands in the hierarchical order of things. Even if you're a nonmember, an outlander, and happen to drop in on a meeting of the American Chemical Society, the American Physical Society, or the Biochemical Society, you can't help seeing who's making it. The heroes are playing the big stage, while the peasants are doing the Friday afternoon ten-minute talk in the men's room in the basement of the convention center. The chiefs are up in the big ballroom with the spotlights on. So, to perform in the center ring of the circus becomes the drive of our young scientist, and my drive too. For my ego is as great as the next man's, and I want to play the big hall in Atlantic City, to be carried on shoulders, and to go to Stockholm on the King's money.

[16] Such symbols are so real in this tribe, and so mixed up with the way each tribe member lives and breathes, that when someone thinks he's not getting his share of adulation there is an awful tendency to whore out. One fast way of doing this is to fake data. I've been involved peripherally in such horror stories, and although these had happy endings (they were discovered and corrected) there is no reason to believe fraud is always punished.

[17] There was a student who faked the data of his Ph.D. thesis, published with his professor as coauthor, and they both became famous. In the tribal tradition, the young man went off to his postdoctoral research in a most distinguished laboratory where he and his mentor published a second series of papers—all fraud. Other research workers in a nearby laboratory in the course of related experiments could not repeat the work. In a confrontation of a most weird and vicious sort, the very week before the postdoctoral fellow was to appear on the main stage at the big annual tribal rites, he was cast out from the tribe. Prizes have been

awarded for outstanding research, much of which was actually refuted or retracted in the very speech of acceptance, although the check and medal were never returned. Or, as happened recently, a noted biochemist had to stand before his colleagues at a national meeting and retract a postdoctoral fellow's publications on which his name had appeared as coauthor.

[18] These stories only typify a polar extreme of a situation all of us live in. Of course, you *should* work at science with holy objectivity. But by God, you get a theory, it's beautiful, you love it, and if the colorimeter doesn't just record the results you want, you sort of give the machine a little shove, you know, like the pinball player. Or you don't do that particular control experiment which is essential for proving your theory because what if it came out all wrong? For years you go along this way, dishonest to yourself, but not willing to admit to errors and thus lose what status you have in the science tribe.

[19] Maybe you're too scrupulous to fake data, then why not steal it? Once while I was still a grad student, a very notable chemist from another university wandered into the lab where I was working with two lovely characters, postdoctoral fellows who were responsible for my indoctrination in the world of biochemistry. This famous man walked in the door and said, "Hey, whatcha doing?" and we said, "Well, you know we've got this and this and this, and we got this enzyme and the enzyme does the following things," and he said, "Hmmm, that's very interesting. I've been working in the same area and I didn't see any of those things." So we showed him the data books and discussed them fully with him. And we read all about our results in an article under his by-line three months later in a scientific journal. We later learned he had begged, borrowed, or stolen from others on numerous occasions.

[20] The worst evil inherent in wanting to be a hero isn't that it makes cheats and fakers out of some scientists, it is the corrupting influence of the negative values attached to teaching and communicating science. The worst thing is its effect on the next generation of scientists who ought to be learning to love science. Because of course you don't get to be a hero by teaching. So we leave the teaching—mostly—to the clods who haven't the ego drive to make it as scientists. I know scientists—Nobel Prize winners—who refuse to take mere graduate students into their

laboratories. "It takes too much time to educate a graduate student," one of them told me. "He's no good to me for two years. Send me your good postdoctoral fellows after you've trained them." And I told him to go to hell.

[21] Well—all this is the seamy side of science. There are other horror stories too—university politics, how to kill a dean before the dean kills you, how to muscle into your best friend's laboratory space, etc. But they are for another time.

[22] Why bother to say all these ugly things out loud? I say them because I believe science is a fantastic and wonderful way of life. That the joy that can come from learning new ideas, the exploration of new relationships in a living system or in an atom or in a molecule more than compensates for the fact that your car is not a Cadillac and you don't live in the fanciest house in town. There are men in science—the ones I love—who feel the same about it. But there are not enough of them. And that's why I am still, as I started out, outspokenly concerned. I think that is probably the healthiest way to feel right at this moment.

[23] Until we become aware of these evils of big science we cannot hope to eradicate them. Until we eliminate the covert dishonesty, until we stop crushing the precious creativity of students and trainees, until we reward and honor those men who generate, nurture, and foster the love of science in themselves and their associates, until we hold up a true mirror to reflect the psyche of the scientist, science will stay a jungle.

### questions and suggestions

1. Saltman begins his essay with a personal anecdote used for the purpose of leading up to his own statement, which is about something different from the kinds of things the other panelists are concerned with. What are other examples of his use of himself in this essay?
2. Does the tone of "The Science Jungle" lend personal authority to

its author's statements? Note, for example, the kind of diction used in the first paragraph. Find examples of colloquial hyperbole. How are we to understand these?

3. The organization of this essay is straightforward. The purpose of the panel, its findings, and the refutation of its findings lead to the last sentence of ¶3. This sentence introduces the matter completed by ¶21, which then leads to the conclusion. But what do you find to be the organization of ¶4-21?
4. How does Saltman use echoes at the end of the last sentence to provide a rounded finish to the essay? Which words does he echo from the first three paragraphs?
5. How does Saltman's diction serve to destroy the stereotype of "the scientist" that he pictures in ¶7? Examine ¶15 in particular. Does the tactic work or does it serve only to make Saltman seem frivolous and less authoritative? To what authority does Saltman appeal as a basis for his assertions? In what way does it parallel or differ from the authority of Malcolm X? of Kozol?
6. In ¶15-18, Saltman talks of the ways of the *science tribe*. As a biochemist himself, Saltman is a member of that *tribe*. Do his attacks, therefore, mean more or less than they would had they come from, say, an exposé journalist? from Harvey Cox? from Eldridge Cleaver?