



W. H. Freeman and Company
\$23.95
375 pages

(The *Quark and the Jaguar* will be available in bookstores in April.)

by **John Sutherland**

This is a difficult book to categorize. The mythical librarian who put *Cancer Ward* in the medical section will probably tear *The Quark and the Jaguar* in two and put one half in "Zoology" and (after toying with "Irish Literature: Joyce") deposit the other in "Physics." The resistance to categorization is, in large part, a willed thing. Murray Gell-Mann despises the "departmentalization of knowledge" that goes on in institutions of higher education and research—even, lamentably, at Caltech. He devotes a longish digression to the incorrigible "reductionism" (and by implication philistinism) of the Caltech intellectual regime:

Why does so little research in psychology go on at Caltech today? Granted, the school is small and can't do everything. But why so little evolutionary biology? (I sometimes say in jest that a creationist institution could scarcely do less.) Why so little ecology, linguistics, or archaeology? One is led to suspect that these subjects have something in common that puts off most of our faculty.

It is that "something in common" of the subjects disdained by Caltech that nowadays fascinates Gell-Mann. On one level *The Quark and the Jaguar* is a long advertisement for the Institute at Santa Fe, which he founded in 1984 and where

he and a band of carefully selected MacArthurite geniuses cogitate on "complex adaptive systems, functioning in such diverse processes as the origin of life on Earth, biological evolution, the behavior of organisms in ecological systems, the operation of the mammalian immune system, learning and thinking in animals (including human beings), the evolution of human societies, the behavior of investors in financial markets, and the use of computer software and/or hardware designed to evolve strategies or to make predictions based on past observations."

It is clear that Gell-Mann regards the interdisciplinary seminars at Santa Fe as a kind of ideal superstructure to Caltech's foundation. A lot of prophets have gone into the desert and come up with a plan for the salvation of mankind (this is not hyperbolic or intended as sarcasm: *The Quark and the Jaguar* concludes with a program for the human race in the face of its imminent self-destruction). But this description does not fit Gell-Mann. Nor is he what he superficially resembles—a 19th-century totalizing sage crudifying science into popular ideology (Ernst Haeckel, for instance, with his genealogical "tree of life forms" with its monera at the roots and man in the top branches; or Herbert Spencer with his pan-Darwinism). Even when discussing subjects as remote from theoretical physics as the territorial behavior of big cats in the rain forest, Gell-Mann is, first and foremost, a fastidiously strenuous scientist. In his 40 years at Caltech as one of the world's most distinguished exponents of quantum mechanics, he has, as he demonstrates, articulated a definition of "com-

It is aimed at the intelligent layperson, and the overall effect is that of an extraordinarily bracing series of Watson Lectures.

plexity” (and its correlative “plectic,” simplicity), which he now feels he can apply to other fields—particularly that of complex adaptive systems. Wall Street is a CAS, Madonna is a CAS, the TB bacterium is a CAS. It is magnificent, although many of his colleagues may think it is not science.

The Quark and the Jaguar is at least three kinds of book. It opens with a short introspective prelude made up of a number of autobiographical snapshots. In terms of reader enjoyment this is the most attractive section. Gell-Mann reminisces about not having seen a jaguar in the wild, but having had a dramatic encounter with a jaguarundi (the precise distinction of species is very characteristic) in a northeastern corner of Guatemala. He reminisces about himself as “a curious child” and recalls early intellectual adventures with his brother in prewar New York. He confides some touching recollections of his first-generation American father and hints at youthful rebellions that still trouble him. There is a vivid vignette of himself, newly married in 1956, driving with his wife through the Tejon Pass in their Hillman Minx and coming upon 11 California condors feasting on a dead calf.

These early pages make one wish that the author had been prevailed on to write an autobiography proper. But the central section of *The Quark and the Jaguar*, rather surprisingly, comprises a series of briskly technical expositions on plectics, coarse-graining, Algorithmic Information Content (a central element in Gell-Mann’s definition of complexity), randomness, chaos theory, Zipf’s law, Grand Unified Theory, superstring

theory, and “Quantum Mechanics and the Classical Approximation.” It is aimed at the intelligent layperson, and the overall effect is that of an extraordinarily bracing series of Watson Lectures (one recalls, incidentally, that Gell-Mann is one of that select band of Watson lecturers for whom Beckman Auditorium is too small). Speaking as a layperson who was baffled to the point of fury by *A Brief History of Time*, I found this pedagogic section of the book lucid yet never condescending. Richard Feynman, one is told, habitually brushed off requests to explain the mysteries of his subject to nonspecialists with the good-natured jest: “If you could understand it, you’d win the Nobel Prize as well.” Gell-Mann, by contrast, gives the nonspecialist at least a glimpse of the inner workings of theoretical physics. One comes away feeling a cleverer person.

The final section of *The Quark and the Jaguar* picks up themes publicized in Caltech’s centenary “Sustainable World” conference. Gell-Mann makes a passionate and rational plea for conservation, particularly in the tropics, where the bulk of the planet’s surviving biological complex adaptive systems are stored. A professional theorist, he believes that the kind of interdisciplinary theoretic interventions secreted at places like Santa Fe may offer “some kind of headlight, even a flickering one, to help avoid some of

the worst disasters.” Since the disasters he foresees will involve, among other things, the extinction of the human species, one hopes he is right.

One reads *The Quark and the Jaguar* with the sense that only Caltech could have produced Murray Gell-Mann, and not even Caltech can hold him. No institution organized into “divisions” can satisfy his Baconian ambition to make “all knowledge my province.” This is an outstandingly brilliant man’s book and will doubtless have a huge impact. It must be said, however, that for all its author’s brilliance, the editorial hand could have been applied to better purpose. The overall shape of the discourse seems in places to have been improvised. Stretches of the text read as if they had been dictated and never polished. The author’s love of name dropping (“Tom” Kuhn, “Steve” Hawking) and his habit of attaching a kind of *Who’s Who* list of honors to even cursory mentions of his distinguished friends should have been curtailed. The final sections of the book—which, as Gell-Mann’s Cassandra-call to humanity, require a ringing eloquence—seem to have been phoned in from Rio. It is a pity that with a book of this importance the publisher could not have contrived to produce something worthy of the author’s mind.

John Sutherland is the Lord Northcliffe Professor of English at University College London. From 1984 to 1992 he was professor of literature at Caltech and returned last fall term as a Fairchild Distinguished Scholar.