Books

Of Men and Galaxies
by Fred Hoyle
University of Washington Press $2.95

Galaxies, Nuclei, and Quasars
by Fred Hoyle
Harper & Row $3.95

Reviewed by Joel N. Franklin, professor of applied science

Fred Hoyle, visiting associate in physics at Caltech, is Plumian Professor of Astronomy and Experimental Philosophy at Cambridge. His *Of Men and Galaxies* is based on three lectures given at the University of Washington in 1964.

Part I, "Motives and Aims of the Scientist," is a galaxy of Hoylean opinions. Some samples:

Scientists are not responsible for weapons; society is to blame.

Everything radically new is produced in a democracy.

The physical sciences have been on the wane since 1925 because of the creation of the bad attitudes of big science.

BIG is BAD: Big buildings are bad; big budgets are bad; big administrative responsibility is bad.

Inefficiency in unimportant matters is necessary for efficiency in important matters.

No first-rate scientist is in government because, after six months away from science, no one can be a first-rate scientist.

Brilliant minds are always around, but great scientists will emerge only in the proper cultural milieu.

"An Astronomer's View of Life" talks about science: There is no sharp difference between living and non-living things. There are intelligent beings scattered throughout the universe. To reach them by space-travel is "not merely difficult but impossible." But to communicate with them is possible and is important. "What is needed (from these beings) are the big thoughts, not the daily baseball scores . . . an interchange of messages could influence the future development of human culture, and for this it is by no means necessary to gabble continuously across the interstellar spaces." There is a galactic telephone directory for intercommunicating intelligent beings. "My guess is that there might be a million or more subscribers to the galactic directory. Our problem is to get our name into that directory."

Of the three parts of the book, "Extrapolations into the Future" is the deepest and the most personal. "It is curious," writes Hoyle, "how much attention we all pay to the immediate future and how little to the more distant future." Since the decline of the small town and the rise of the megapolis, there has been a decreasing intimacy, an increasing aimlessness. As the isolation of the individual grows in ever larger and more affluent cities, the principal personal motive will be status seeking. As meaning ebbs, diversion will become essential; and the brightest possible future is foreseen for the entertainment industry. Unimportant problems, like domestic communism, are always more fun to argue about than important, tough problems, like overpopulation. Man is not in charge of his future. The most important factor in our environment is our state of mind. Scientists produce technology, but they can exercise no political control over it. The author makes ". . . a religious hypothesis – that the emergence of intelligent life is not a meaningless accident." The big ideas in the universe can and must be obtained by communication with extraterrestrial intelligent beings. We might learn from these beings "what policies lead to nuclear war and what policies avoid it."

Either you like opinion, or you don't. Professor Hoyle has had the courage to be subjective, speculative, sometimes superficial, sometimes profound, and always honest. This reviewer felt privileged to spend a few hours reading the inner thoughts of one of the world's distinguished minds.

The book *Galaxies, Nuclei, and Quasars* would have to be labeled "for astrophysical cosmologists only" if it were not laced with gossip, sentiment, and tales of scientific adventure. Gorgeously illustrated with photographic plates from the Mount Wilson and Palomar Observatories, packed with formulas, graphs and charts, the book would be hard to master in detail; but it can be skimmed pleasurably and informatively. Caltech readers will note frequent references to the names Bolton, Fowler, Greenstein, Matthews, Minkowski, Oke, Sandage, Schmidt, Fowler, Fowler, and again Fowler.

Chapter I, "Galaxies," states that the biggest problem in present-day astronomy is to understand why there are different kinds of galaxies and how galaxies originate. There is a discussion of the red shift and an exposition of some cosmology.

"Radio Sources" talks about radio astronomy. Immense, concentrated, fluctuating sources of energy have been discovered by radio reception. These energy sources, which are too large to be stars, too concentrated and fluctuating to be galaxies, have been named quasars. One observation in Australia was considered so important that "Hazard and Bolton carried duplicate records back to Sydney, on separate planes."

"X-Rays, Γ-Rays, and Cosmic Rays" contains this comment on our space program: "I find it ironic that doubts are being cast as to whether sums of the order of 100 million dollars can be afforded for the construction of new accelerators; ironic because sums of many *tens of billions* are being afforded to set a man afoot on the ruined slag heap we call the moon. This comparison, between what can be afforded and what cannot, shows the remarkable degree to which man's cortical activity is still dominated by his lower-brain centers. It is exactly because social decision-making is controlled almost entirely by the lower centers, while science and mathematics are controlled by the cortex, that the never-ending moan is raised that science is fast outstripping man's social sense."

In "The Steady State Cosmology" Hoyle discusses the role of wrong facts in scientific theory-making. He carefully measures "the relative emotional strengths" of two contentions, and states: "I personally spend no time investigating theories that require special initial conditions."

"A Radical Departure" discusses the C-field, the oscillatory universe, and related mysteries.

"An Outline of the History of Matter" contains a lot of intricate nuclear physics and this comment on NASA: ". . . it is well to understand that NASA exists in order to put a man on the moon. . . . I do not believe that anything really worthwhile will come out of the exploration of the slag heap that constitutes the surface of the moon . . . Nobody should imagine that the enormous financial budget of NASA implies that astronomy is now well supported."

In this reviewer's opinion, *Galaxies, Nuclei, and Quasars* is an equally good book for the idly curious and for the deadly earnest. From it a journalist could learn roughly what is going on in astronomy today, or a graduate student could learn detail and theory. One may regret Professor Hoyle's acid throwing at NASA. The eminent, articulate, and persistent Hoyle detracts more from the space program than a platoon of the rest of us can add to it. Conversely, if there were any way to induce Hoyle to help formulate the objectives of the space program, our "tens of billions of dollars" would perhaps be better spent.

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Alumni News

Richard W. Shoemaker (1881-1965)

Richard W. Shoemaker '03, died on October 19, in Grass Valley, California, where he had been retired since 1953. One of the oldest living Caltech alumni, he made significant contributions to the field of engineering during his lifetime. His family has established an R. W. Shoemaker Memorial Fund to be given to the California Institute of Technology.

When Richard Shoemaker was still a student at Caltech – then called Throop College – he sent the first wireless message to Catalina Island. Carrier pigeons flew messages the 28 miles from the mainland for the island's newspapers at that time. After graduation Shoemaker went with the Federal Lead Mines in Missouri, where he installed an electrical method of hauling out ore, this time replacing donkeys being used for the job.

Back in California, in 1914, with the Bowie Switch Company, he put in the country's first trackless trolley in Laurel Canyon near Hollywood. In 1917 he enlisted in the U.S. Navy and became the officer in charge of the building of the first battleship, *Guinn*, in Seattle. After the war he went to Shanghai and Hong Kong to study electrical opportunities there, and to Manchuria to negotiate for the electrical railways in Harbin.

On his return to California, Shoemaker entered the hydroelectric field and was consulted regarding the power potential of Hoover Dam. He designed the drop for the All-American Canal in Imperial Valley and the power house at the Don Pedro Dam on the Tuolumne River near Turlock. He had more than 20 patents in his name. The most widely used is his bus bar, found in the Hoover and Grand Coulee dams.

In 1928 Shoemaker went to Brazil to centralize the electric companies in the state of Sao Paulo. Upon his return in 1934, he was engaged as a consulting engineer for the Chase Brass & Copper Company and the Kennecott Wire and Cable Company in Connecticut, and became an authority on radiant heating. His book on the subject was printed in French and Spanish.

Returning to California in 1946, Shoemaker was appointed consulting engineer for the Oakdale Irrigation District's Tri-Dam Project on the San Joaquin River and, in 1950, for the Nevada Irrigation District.

He was a fellow of the Institute of Electronics and Electrical Engineers and a member of the American Society of Mechanical Engineers and the American Society of Heating and Ventilating Engineers. In 1962 he was chosen by the Engineering Council of Sacramento Valley as the engineer who had contributed most to the growth and development of the electrical power industry and the engineering profession.

Shoemaker was a member of the Caltech Alumni Association and, in 1953, was honored by the Institute on the golden anniversary of his graduation from Throop College.

He is survived by his wife and a son, Richard, of Washington, D.C.

Freshman Event

A "Gentlemen's Tea" for freshmen entering Caltech this fall from the New York City area was held by the Caltech Alumni Association's New York chapter in September. Nineteen guests, including Caltech sophomores, juniors, and seniors from the Metropolitan area, were entertained at New York's Columbia University Club. Victor Wouk, MS '40, PhD '42, was unofficial host, and Bruno Pilorz '44, president of the alumni chapter, presided at a question-and-answer session. Harry J. Moore, Jr., '48, was in charge of arrangements.

The New York Chapter hopes the tea will become an annual event.

–Victor Wouk

Books . . . *continued*

Foundations of Solid Mechanics

by Y. C. Fung, MS '43, PhD '48

Prentice-Hall Inc. *$13.50*

Y. C. Fung, professor of aeronautics at Caltech, intends this book to bridge the gap between elementary textbooks and more advanced literature; it is the only one available covering the entire field of solid mechanics. The book belongs in the Prentice-Hall International Series in Dynamics, of which Dr. Fung is also editor.

Ideas in Modern Biology

edited by John A. Moore

The Natural History Press *$8.00*

Based on papers delivered at the XVI International Congress of Zoology, this book examines most of the major ideas in modern animal biology. Contributions include "The Duplication and Recombination of Genes," by Matthew S. Meselson, PhD '57, associate professor of biology at Harvard University.

The Architecture of Molecules

by Linus Pauling and Roger Hayward

W. H. Freeman and Co. *$10.00*

This elegant book has a text by Dr. Pauling and 57 plates in full color by Roger Hayward, the scientific illustrator who also illustrated Pauling's widely used *General Chemistry* and *College Chemistry*. It is planned especially for young people who are just beginning to develop an interest in science. The discussions treat the subject of how atoms are arranged and interconnected in molecules and crystals, and the way in which the geometry of this organization accounts for some of the properties of substances.

Space Propulsion

by Donald L. Turcotte, '54, PhD '58

Blaisdell Publishing Co. *$2.50*

Donald Turcotte, associate professor of aerospace engineering at Cornell University, wrote this for an introductory course in astronautics. It is not intended to show how to design a particular space vehicle or propulsion system, but to show how the fundamental physical and chemical laws place limitations on vehicle performance and influence the selection of propulsion systems for specific mission requirements. Topics include: requirements for a space propulsion system, chemical propulsion systems, nuclear propulsion systems, electrical propulsion devices combined with a nuclear reactor, and photon propulsion and solar sailing.