SCIENCE & TECHNOLOGY

The World According to Nobel Laureate Murray Gell-Mann

By Simson L. Garfinkel

IN recent years, there has been a steady stream of books by the world's great physicists who, having made their contributions to science, now seek to explain their discoveries and those of their elite scientific brethren to the rest of us.

Books like "The God Particle" (Houghton Mifflin, 1993) by Leon Lederman and Dick Teresi, Stephen Hawking's "A Brief History of Time" (Bantam, 1988), and Peter Coveney's "The Arrow of Time" (Fawcett, 1991) try to make sense of the last quarter-century's developments in cosmology, astronomy, and high-energy particle physics. They try to show how everything, from the very small to the very big, is ultimately the same thing, built from the same "star stuff," and tied together by the laws of physics.

While some of these books are successful at the bookstore, many of them make such demands on the average reader that they are soon left to gather dust on the coffee table - an expensive reminder that for most of us the details of modern physics are all but incomprehensible.

Discouraged with the quality of these previous books, Nobel laureate Murray Gell-Mann has decided to write his own. But instead of following the well-worri path of explaining the world from the beginning of creation to the present, or from the smallest subatomic particle to the largest cluster of galaxies, Gell-Mann has taken a different approach, paint-Ing a picture of the world from the simple to the complex.

Few people are in a better position to chart this course than the author. Besides his achievements in physics, he is the founder of the Santa Fe Institute in New Mexico, an interdisciplinary think tank that is known as a haven for those interested in such subjects as artificial life, chaos theory, language, and global economics: a few of the many disparate studies that all seem to be part of the newly emerging field called "complexity."

A simple example from complexity theory is Zipfs Law, named for George Kingsley Zipf, a professor of German at Harvard University in the 1930s. Zipf noticed that the second largest city in a country tends to have roughly half the population of the largest, the third largest city tends to have roughly one-third the population of the largest, and so on. It turns out that similar scaling laws, with minor mathematical corrections, have popped up in a wide range of different fields, from hard sciences such as physics and biology to the social sciences as well.

Gell-Mann starts off "The Quark and the Jaguar: Adventures in the Simple and the Complex" with a set of chapters that bounce back and forth from the personal to the abstract. The abstract parts are among the least interesting: thermodynamics, entropy, and Gell-Mann's notions of how to mathematically measure the com-

THE QUARK AND THE JAGUAR: ADVENTURES IN THE SIMPLE AND THE COMPLEX
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plexity of a system.

Far more interesting are the author's personal digressions. Although he states emphatically that his book is not a scientific autobiography, his descriptions of the life of a theoretical physicist in the 1950s and 1960s are spellbinding.

One of Gell-Mann's most enjoyable anecdotes recounts an incident that happened shortly after he started teaching physics at the California Institute of Technology in Pasadena. In need of s.ome extra cash, Gell-Mann took a part-time consulting job at the RAND Corporation. While reading through a stack of reports, he came across the RAND Table of Random Numbers, a seminal work containing page after page of random numbers. The purpose of the RAND book was to help physicists and mathematicians in simulating random processes such as coin tosses, die rolls, and nuclear reactions.

"What I found interesting about the report was a small piece of paper (a 'blow-In') that fluttered out of it and fell to the floor. I picked it up and found it was an errata sheet The RAND mathematicians were supplying corrections to some of the random numbers! Were they catching random errors In the random numbers? For a long while, I regarded this Incident as Just one more scene in the human comedy, but as I speculated about it later it focused my attention on an important fact: Even to mathematicians and scientists the word 'random' means several different things."

But rather . than combining these atoitwr with an explanation of how the experiences of physicists, biologists, social scientists and mathematicians have led to the birth of complexity theory, the middle third of Gell-Mann's book examines quarks - the elementary particles that Gell-Mann helped predict and also named - . and quantum mechanic*. H4A;*% find pages littered with obliqui*"ip$ references and hidden attacks on the other popular books of this genre.

Gell-Mann tries valjantiy to set the record straight; but in the-end leaves the reader confused. He-even acknowledges- that this section tion is one of the weakest parts of his book, writing in the preface: "It is ironic that a portion of the book intended to explain why fundamental physical theory is simple should nevertheless be difficult for many readers. Mea culpa!" Nobel prize or not, Geli-Mann should have played to his strengths and resisted the temptation to be all-inclusive.

"The Quark and the Jaguar" is interesting reading, but it's easy to get lost along the way - especially for anyone without a background in math and physics. Fortunately, there is little cohesion between the chapters, so readers can skip around without losing much of the book's flow. But it would have been better if Gell-Mann had realized that the world does not need another book describing the quantum mechanics of the late 20th century.

The author has watered down an otherwise excellent book by spending too much ink on quarks, and not nearly enough on jaguars. Perhaps next time, Gell-Mann will write a real scientific autobiography. He certainly has a lot worth sharing.

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