
Murray Gell-Mann befriended me in Paris towards the end of my National Science Foundation postdoctoral junket and lured me to Pasadena. It was the year of the Eightfold Way, smack in the middle of Gell-Mann’s two-decade reign as emperor of elementary particles. His brilliance was so intense that lesser folk, such as myself and my sidekick Sidney Coleman, had to ration our time with him. Not only did Gell-Mann devise the lion’s share of today’s particle lore, but on first acquaintance you would soon learn, through his painfully in-your-face erudition, that he knew far more than you about almost everything, from archaeology, birds and cacti to Yoruban myth and etymology. He once drew a false etymology of avocado, but his errors were so rare as to be cherished.

This book is a brave attempt to interweave two stories. One is the history of particle physics according to Gell-Mann, from the development of quantum field theory to the fall of the Superconducting Super-Collider (which he lamented) and the coincidental rise of string theory (which he championed). The other is a must-read account of the life of a truly fascinating character.

Explaining particle physics to the lay reader is a labour of Hercules. Johnson strives magnificently but doesn’t always succeed. After a long explication of strangeness, he drops the ball by asserting that the Xi hyperon has strangeness +2. His exposition of the quark hypothesis is better: how they were invented and named by Gell-Mann; thought of independently by George Zweig, who called them “aces”, had his paper rejected and soon left physics; how Gell-Mann vacillated for years between the interpretation of quarks as helpful mathematical fictions or as real and observable particles (they are neither); how quarks acquired their “colours”, the change of which from patriotic to primary is given undue significance; and how they have become a crucial part of today’s Standard Model of particle physics.

However, blooper like “the briefer a particle’s life span, the higher its energy”, “in quantum theory every particle can be represented by a differently shaped wave”, “neutrons and antineutrons have] different spins” and the allegation that mesons are fermions will annoy physicist readers and mislead others. To explain the meaning of parity violation, Johnson asks how a radio message sent to Martians could tell them which side is the left. Two simple answers are given, but they are said to cheat or to “violate the spirit of the game”. Just what game is this?

Johnson portrays Gell-Mann’s family origins in Galicia and Austria, and his father’s difficult accommodation of life in the US, partly via his Scottish rivers. I recall another incident when, as we were wandering about Hollywood, Stanley Mandelstam read the Hebrew sign on a butcher’s shop and Gell-Mann immediately corrected his pronunciation of kosher. “I didn’t know you were Jewish,” said poor Stanley, to Murray’s pained “What? Me Jewish?” (Here I adopt Johnson’s conceit.) Why does Gell-Mann do this? Why does he refer to Israel as Palestine, and Jerusalem as the citadel of the Jebusites?

Another recurrent motif is Gell-Mann’s sometimes extreme difficulty in putting thoughts to paper. He was almost unable to complete his one book The Quark and the Jaguar, and he never did write up his Nobel lecture. However, Johnson errs when he relates Gell-Mann’s reluctance to disseminate his discovery of the Eightfold Way. The original version, a well circulated and often cited CalTech report, was created in just a few days.

In summary, I rather like this book. It explains why Gell-Mann is universally regarded as a great scientist, but only occasionally as a pompous pig. It describes his warmth and generosity toward his colleagues (Francis Low, Harald Fritzsch, John Schwarz and Yuval Ne’eman, among many others) and his problems with others (he alienated Zweig, belittled Julian Schwinger, detested Bram Pais, and his friendship with Dick Feynman turned sour). Most of all this book gives a new twist to the classic tale of a poor immigrant’s son from the Bronx making it big in the US. Sheldon Lee Glashow.

This review first appeared in the June issue of the American Journal of Physics. Reprinted with permission. Sheldon Lee Glashow, who shared the Nobel Prize for Physics in 1979, has been Higgins Professor of Physics at Harvard since 1979. He is joining the faculty of Boston University as the first Arthur G B Metcalf Professor of Science.
BOOKSHELF


It is fortunate that Howard Georgi has decided to publish a revised and updated version of his famous book Lie Algebras in Particle Physics, the previous edition having appeared in 1982. In this case it may have been a non-trivial problem to decide whether significant changes to the text are pertinent, because, as the author himself points out in the preface to the second edition, “this has been an extremely successful book”. Indeed, many generations of graduate students have learned from it the basic algebraic tools in SU and other such Lie algebras, which are at the core of the Standard Model and all of its conjectured extensions.

Besides a healthy evolution from old-fashioned typewriter fonts to modern LaTeX layout, the present edition includes numerous improvements in the presentation, as well as new material. Perhaps the most important piece of new material is an enlarged introductory chapter on finite group theory. This makes the book a little longer, but much more self-contained, because a lot of the group-theory jargon – such as conjugacy classes, characters and the role of the permutation group and Young tableaux – is introduced in a simple form, where the student can see the nuts and bolts explicitly.

Finite groups appear in many physics problems, so their absence from the first edition was somewhat unfortunate. On the other hand, in its present form the book can be used as a rather complete group-theory textbook for particle physics students.

One of the distinctive reasons for the book’s success had been the introduction of “physics-flavoured” chapters in which the algebraic techniques were put to work in simple yet important topics in high-energy physics. It is those physics chapters that have undergone comparatively major rewriting.

Keeping the essential outline of the first edition, one notes many changes in wording and emphasis, which reflects the author’s desire to suppress anecdotal information – such as the hadron tables of chapter XVII in the first edition, while at the same time making room for more useful theoretical applications. One good example is the description of algebraic constraints on the Higgs mechanism in various common unification models.

To summarize, the book’s contents have been improved while the basic philosophy – introducing the mathematical tools in a way as concrete and “calculational” as possible – is kept almost intact. Prof. Georgi has managed to maintain a fresh and direct “lecture notes” style – something that students and teachers will surely value.

JLF Barbon, CERN.


This book covers statistical models applied to the decay of atomic nuclei with emphasis on highly excited nuclei, which are usually produced using heavy ion collisions.

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