



## FOREWORD

It is always a daring undertaking to write a biography of someone living, and all the more so when it is the life story of someone you know. Things get trickier yet when you consider that individual to be a friend—and when that friend is well known to the world as a supremely prickly genius, it becomes a nearly impossible act of tightrope walking. This book is a quintessential instance of such delicate tightrope walking, and it strikes me as a wonderful success, even though the friendship, such as it once was, wound up more or less on the rocks.

~I~

In 1992, George Johnson, a talented *New York Times* science writer, was in Santa Fe, New Mexico, doing research for a book he was working on. The result, *Fire in the Mind*, explored the nascent field of complexity, the focus of the newly formed Santa Fe Institute. It was at a conference at the Institute that he witnessed, for the first time, the great physicist Murray Gell-Mann (“MGM” for short) in action. Gell-Mann, after working for four decades at the forefront of particle physics, had shifted the focus of his thoughts to complex systems. George was very aware that, many years earlier, MGM had spearheaded a revolution in our understanding of what all physical matter is made of at its finest grain, and now he watched intently as the erstwhile particle pioneer turned his powerful gaze to this emerging new area of science.

One day during the conference, as fate would have it, MGM sat down across the table from George at lunch and introduced himself. When he found out that his tablemate wrote about science for the *Times*, MGM patiently (or impatiently) explained that he had nothing but disdain, if not contempt, for the *Times*’s stable of science writers (especially for “this *Gleick* person” and “that *Wilford* person”)—two of George’s esteemed colleagues. And for good

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measure, MGM proceeded to rake another *Times* science writer even more harshly over the coals (but mercifully, George doesn't reveal who that individual was).

This may not seem like a very promising start, yet out of this awkward but provocative exchange there emerged a tentative, rickety friendship, and over the next couple of years it grew into a solid and even somewhat warm relationship. Very early on, George realized that this brilliant but difficult man would be the ideal subject of a biography, and after a while, despite Gell-Mann's reluctance and skepticism, George moved out to Santa Fe from New York and began work on it. What eventually resulted from his tireless efforts was this book, first published in 1999, and now appearing in a new edition.

~2~

I GREW UP SURROUNDED BY PHYSICISTS, especially particle physicists, and the magically arcane ideas that they were exploring. My father, Robert Hofstadter, was an accomplished experimentalist at Stanford University, who, doing electron scattering during the 1950s, laid bare certain aspects of the internal structure of atomic nuclei, and especially of the proton and the neutron. I often heard my dad talk about MGM with a mixture of admiration and puzzlement. When, in the early 1960s, Gell-Mann proposed that inside every proton and every neutron there were exactly three fractionally charged components called "quarks," my dad didn't believe the idea for a split second. He, one of the world's top experts on nuclear structure, thought it was ugly as sin. And my own youthful inner aesthetic compass (formed partially from growing up with my dad) whispered exactly the same thing to my eighteen-year-old self, so my dad and I were fully aligned. Exactly *three* particles making up the proton and the neutron?! Ridiculous! And having *fractional charges* to boot?! Repulsive! That's not like nature at all!

Readers may not share this gut-level anti-quark prejudice, and it's not easy to explain how deep it ran, but let me try to give some perspective by exploring a few counterfactual variations on the theme. Suppose that someone had proposed that every proton and

neutron in the universe is made of exactly *seventeen* quarks; would such a proposal not strike you as unlikely and weird—maybe even crackpot-y? How or why could nature have possibly “chosen” the number seventeen? On the other hand, what about sixteen quarks? Somehow this *even* number, this square of four, this fourth power of two, seems much more likely, *a priori*, to play a central role in how the universe works, than seventeen. But, of course, sixteen quarks is not what Gell-Mann proposed, nor did he propose seventeen.

Well, all right now—let’s move down from seventeen to, say, *eleven*. Once again, one recoils (I’m speaking for myself now) at the thought of such basic constituents of nature as the proton and the neutron being made of *exactly eleven* tinier pieces. How could that possibly make sense? Where could eleven-ness have come from? It sounds almost as silly as seventeen. But of course, Gell-Mann didn’t propose eleven quarks either. So now let’s jump from eleven down to a mere *five*. One’s aesthetic objections are probably growing a little softer and gentler at this point. But still, the oddness of five seems somehow mysterious and strongly calling for explanation; after all, oddness is a bit *odd*.

Now let’s make the final downward leap from five to *three*. Maybe at this point in your mind, three-ness starts to sound perfectly plausible. If so, I can’t argue you out of it; *de gustibus non est disputandum*. But to me and my dad—in fact, to nearly all particle physicists in the early 1960s—the idea of three quarks making up every neutron and every proton seemed too bizarre and too outlandish; it just didn’t *smell* right. Worse yet, these hypothetical constituents were supposed to carry smaller charges (whether positive or negative) than that of the electron— $\frac{2}{3}$  or  $\frac{1}{3}$  of its charge, to be specific—but no experiment had ever detected either  $\frac{2}{3}$  or  $\frac{1}{3}$  of an electron’s charge. The idea seemed artificial, forced, and improbable—and to some old-fashioned purists, like me and my dad, even absurd. And so, for many years, skepticism ran very high.

And yet . . . a decade or so later, careful experiments performed at the Stanford Linear Accelerator Center (SLAC) proved that Murray Gell-Mann had been right—quarks really *did* exist, and

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they were just as MGM had described them—and so, at some sad point in the early 1970s, both my dad and I (then a particle-physics graduate student at the University of Oregon) reluctantly had to eat our hats. Each of us had implicitly and profoundly trusted our personal aesthetic intuitions about nature—and those intuitions, although very strong, turned out to have been dead wrong. It was a most painful and unforgettable lesson in humility.

~4~ I might mention that the very idea of SLAC was first proposed by my dad himself in a casual meeting with a few Stanford colleagues in 1954, and the two-mile-long accelerator was constructed during the 1960s. As it happens, two out of the three experimentalists who together used it to conduct the pathbreaking quark-confirming research in the late 1960s had been postdocs of my dad's for several years during the late 1950s (Jerome Friedman and Henry Kendall). It was thus rather ironic that the experts whom my Dad had so carefully trained wound up, some ten years later, blasting to bits some of his own most cherished visions.

I MYSELF INTERACTED WITH MURRAY GELL-MANN on several occasions over the course of a few decades. The first time was at Stanford in the mid-1960s, when I was an undergraduate math major and an eager student of languages. MGM was visiting the Physics Department for a few days, and my dad suggested that we might enjoy each other's company, so Professor Gell-Mann and I met for lunch at the student union, where we talked mainly about the classification of all the world's languages, a topic we were both fascinated by.

The next time we crossed paths was in Aspen, Colorado, in the summer of 1969. At that time, I was an excited young physics grad student, powerfully lured by particle physics. I did not suspect in the least that over the next few years, as I plunged myself ever more deeply into that field, its exotic concepts would turn out to be more and more profoundly out of sync with all of my intuitions, and that, rage though I might against what I insisted were grotesquely ugly

ideas, no card-carrying particle physicist would give my views the time of day, and that in the end I would have no choice but to flee in horror from that once magically alluring field.

Our third encounter took place in Ann Arbor, Michigan, in 2001, when I had become a professor of cognitive science at Indiana University in Bloomington but was also passionately involved in literary translation, especially poetry translation.

Our fourth and final head-to-head meeting occurred in Alexandria, Egypt, in 2005, at a symposium commemorating the centenary of Albert Einstein's *annus mirabilis*—that is, the miraculous year of 1905, in which AE, then only twenty-five years old, published four papers that turned physics on its head.

Each one of these interactions with MGM left an indelible impression on me. A good example is our brief encounter in Ann Arbor, to which I now turn.

ONE EVENING, MURRAY AND I were dinner guests at the home of my close friends John and Maurita Holland. At some point in the conversation it came out that I had recently completed and published an English-language verse translation of Alexander Pushkin's astonishing novel-in-verse *Eugene Onegin*. I had given a copy to John and Maurita, and Murray was curious to see it, so Maurita fetched it from the bookshelf and handed it to him. He flipped through it, pausing for a while here and there, and then, to my surprise, he read aloud the last eight lines of my translation of stanza IV.20:

*Our kith and kin we're meant to love;  
We dish out kisses, tokens of  
Our high esteem; we pay a visit  
Each Christmas—it's a Russian rut—  
Or else send notes in greeting, but...  
It isn't out of fondness, is it?  
It's all so they'll forget forthwith  
Us kin—and so let's toast our kith!*

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Murray then bluntly said, “In the last line, Pushkin is ironically suggesting that we should clink our glasses to toast our relatives, even though they’re all total hypocrites who don’t give a damn about us. That’s rather humorous—but you, Doug, at the very end of the stanza, offer a toast to ‘*our kith*,’ which means ‘*our friends*,’ not ‘*our relatives*.’ So, unfortunately, your closing line is fatally flawed!”

~6~  
For a moment I felt horrified at my stupid gaffe, but I soon recovered my wits, because I was pretty sure that I recalled that in 1998, while I was translating this stanza (and all the other 380 stanzas in the book) from the Russian, I had dutifully looked up the word *kith* in the dictionary and had discovered that it can mean either friends or relatives. In fact, it happened that John and Maurita had a copy of *The American Heritage Dictionary* on hand, and I quickly found this entry in it and read it aloud, with a feeling of great relief:

- kith and kin** 1. One’s acquaintances and relatives.  
2. One’s relatives.

I was thereby vindicated, and the seemingly invincibly self-assured spoilsport nitpicker Murray Gell-Mann grudgingly had to back down. Whew! I guess that sort of made up (at least a tiny little bit) for my dad’s and my having had to eat humble pie concerning quarks, many years earlier.

IN 1999, I BOUGHT A HARDBACK COPY of *Strange Beauty* at the Stanford Bookstore with great excitement and in high hopes of reading it very soon, but my good intentions got completely swept aside by life’s pressures, and my copy wound up merely gathering dust on my bookshelf for twenty years. But in the summer of 2019, I got caught up in an intense binge of reading about the history of particle physics (I was being a moth to the flame of my old *bête noire*), and among the dozens of books I consumed at that time was George’s biography of MGM. At long last!

On June 3 of that year, I wrote the following rather breathless email to George, who, after having interviewed me for a newspaper

profile in the early 1980s, had been a casual friend of mine for a couple of decades:

*Hi, George—*

*A couple of days ago I finished reading *Strange Beauty*, and was deeply impressed and deeply moved by it. It's so vivid a portrait of so complex a human being. You do an amazing job of walking the delicate tightrope between praise and criticism, between toasting and roasting (both of which your subject merits in spades). You give such a thorough, balanced, and nuanced treatment of such an important, complex, hugely brilliant, but often sadly immature individual. You bend over backwards to be kind to him, but you also paint him so accurately, warts and all. I will tell you, your portrait is so vivid that one night I actually dreamed about Murray! That is pretty damn unusual! I have never dreamed about Feynman, even though I read Jim Gleick's biography of him extremely carefully and even taught a whole course about Feynman a few years ago.*

~7~

*In short, your book is a marvelous contribution to our understanding both of MGM himself and of how his ideas evolved, and thus it's a major contribution to the history of physics, or even more generally, to the history of ideas. Kudos! Hats off! Felicitations! And so forth.*

*But the reason I'm writing isn't to congratulate you on a job well done some twenty years ago, but to strongly urge you to come out with a new edition of the book. It would be extremely timely, since Murray just left us, and since it's an amazingly vivid portrait of him. Hardly anyone in theoretical physics in the latter half of the twentieth century measures up to Murray's level of genius, except for Feynman. Maybe there are one or two other contenders—especially C. N. Yang and Steven Weinberg, in my opinion—but probably they are one notch below him (whatever a “notch” might be).*

*You could add a chapter to try to summarize the main events since 1999. In fact, I myself have a small MGM anecdote dating from the summer of 2005, when I was invited to participate in a*

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*grand symposium at the Library of Alexandria in Egypt, commemorating the 100th anniversary of Albert Einstein's annus mirabilis. I always think of that meeting in Alexandria, Egypt, as "AE in AE"—and in that spirit, I called my talk "Albert Einstein, Analogizer Extraordinaire" ("AE, AE"), but these days, I look back on it as "AE, AE, in AE." Anyway, MGM was also invited to speak on AE in AE, and (as you point out a couple of times in the book) Gell-Mann, ever since he was in grade school, considered Einstein to be his foremost intellectual rival. (This in itself is most telling about MGM's character.)*

~8~

*During a coffee break, Murray and I joined a couple of others to chat, and I innocently made a remark sympathizing with Einstein's lifelong doubts about quantum mechanics. At that, Murray, no less than if I had unpardonably insulted his mother, flew into near-apoplexy, virulently shouting about how stupid and stubborn AE had been on the subject of QM. He lividly sputtered, "Einstein never understood quantum mechanics in the least! Any random undergraduate today grasps quantum mechanics far better than Einstein ever did!" (etc., etc.) I couldn't believe my ears. It was an astounding display of MGM's arrogance, intolerance, contempt, and insecurity, all mixed together in some intimate fashion. It was absurd, and everyone in the small group there knew it, except for Murray himself. (If you feel like including this anecdote in a revised edition, feel free to do so!)*

*In conclusion, Strange Beauty is one of the best biographies I've ever read. You did a superlative job, George, and I feel that your book deserves, at this time, to be revived, reissued, and read far and wide. And you, as its author, deserve a great deal of honor and credit for all the hard work you sank into it, and for all the beauty and genuine insight with which you expressed yourself.*

*Over and out for now!*

*Yours,  
Doug*

George replied posthaste, as follows:

*Doug,*

*Thank you so much for this encouraging email. To say you made my day would be a great understatement! And I love the story about AE. I have been sounding out my publisher about bringing out a revised edition. I even began roughing out a new epilogue.*

*George*

At some point I asked George if he would like me to write a foreword to the second edition of his book about MGM, and he replied, in effect, “Foreword ho!” And the rest is history! And the rest of this book is his story. 🍷

~9~

*Douglas Hofstadter  
Bloomington, Indiana  
July 2023*