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PERSONALIA

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In memory of Murray Gell-Mann

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Murray Gell-Mann, one of the great physicists of the 20th century, was born on September 15, 1929, in Manhattan, New York City; he died on May 24, 2019, in Santa Fe, New Mexico, USA. Murray Gell-Mann's unique personality as a human being, physicist, and scientific leader is very well known worldwide, and has been richly depicted in many walks of life by many an author.

Murray Gell-Mann, a Jewish born American theoretical physicist, was the winner of the 1969 Nobel Prize in physics for his contributions and discoveries concerning the classification of elementary particles and their interactions. He was a founding member of the Santa Fe Institute, Santa Fe, New Mexico. Murray Gell-Mann was the author of, among other books, the celebrated *The Quark and the Jaguar*.[1] Victor (Viki) Frederick Weisskopf (1908–2002) of the Massachusetts Institute of Technology was Murray Gell-Mann's Doctoral Thesis advisor. I knew both men personally. I am thankful to them for their support in the establishment of Stefan University. Both men had a high appreciation of each other. Here is what Murray says about his research in elementary particle theory, and Viki's scientific influence on him.[2]

"Graduate students in theoretical physics," said Gell-Mann, "who plan to study the fundamental laws of nature, are very often impressed with 'formalism' — the formal apparatus of their subject. Learning of the beautiful equations of quantum field theory and of Einstein's general-relativistic theory of gravitation, some of them dream of inventing something equally important and mathematically elegant."

"... I suffered, at least as much as other students, from an infatuation with beautiful formalism. Working with Viki Weisskopf was a most effective remedy against the excesses of such an infatuation. He never ceases to harp on the importance of 'pedestrian' work in theoretical physics and on understanding, by means of simple arguments, the physical meaning of a theory and its implications."

"I point out that much of my research in elementary particle theory can be regarded as flowing from a struggle between a natural predilection for formal theory and an awareness of Viki's advice... . That situation might be compared to that in the garden of live flowers in *Through the Looking Glass*, where an attempt to walk straight toward a beautiful flower bed was quite futile, but striking out in a different direction made it possible to reach the objective."

Murray Gell-Mann
(15.09.1929 – 24.05.2019)

Murray Gell-Mann was my guest in La Jolla, California, during the conference Achievements in Physics, January 28–29, 1991, which I had organized in collaboration with the UCSD Physics Department [Department Chairman: Roger F Dashen (1938–1995)] in honor of Keith A Brueckner (1924–2014), founding member of the Department of Physics at the University of California, San Diego (UCSD).

Gell-Mann arrived in La Jolla on Sunday evening (January 27, 1991), and left on Tuesday morning. I met him at the San Diego Airport and drove him in my red Porsche from the San Diego airport to La Valencia Hotel in La Jolla. "I did not know," said Gell-Mann, jokingly, "that a young physicist could afford to drive a Porsche, let alone a red one." We shared a laugh. That was an example of Murray's very well-known razor-sharp sense of humor.

[1] Murray Gell-Mann: *The Quark and the Jaguar*: *Adventures in the Simple and the Complex* (W.H. Freeman and Company, New York, 1994). I see the book as *The World According to Murray Gell-Mann*.

[2] Murray Gell-Mann, "The Garden of Live Flowers," in V Alexander Stefan (Editor/Author), *PHYSICS and SOCIETY–Essays in Honor of Victor Frederick Weisskopf by the International Community of Physicists* (AIP PRESS and Springer, New York, 1998); pp.109–121.

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La Jolla, California, 1991. (L-R), Murray Gell-Mann (founding member of the Santa Fe Institute, New Mexico); V Alexander Stefan, (founding member of Stefan University, California); and Roger Revelle (founding member of the University of California, San Diego).

As I was driving from the airport to La Jolla, we discussed thermonuclear fusion physics, the nature of time, and linguistics: all of these in a matter of less than half an hour. I mentioned to him my far-fetched hypothesis on ephemerons — the particles of time.[3] He said that time is a mystery. On our way to La Jolla, I mentioned to him that I had had a pleasant encounter last year with Arkady B Migdal, (1911–1991), a famous Soviet (Russian) physicist. Gell-Mann swiftly started to explain to me the roots of the word 'migdal.' I was fascinated.

During Gell-Mann's stay in La Jolla, he invigorated the conference participants with his intellect. In the presence of Murray Gell-Mann, you felt a high intellectual voltage that empowers your own mind, not just at the moment, but also for days thereupon. He was referred to by his colleagues as the "Man with Five Brains." Murray Gell-Mann was also known as a man who had a very low tolerance for stupidity. If you said something stupid, you would not be forgiven easily; probably never.

After the La Jolla Conference, I kept in touch with Murray. I would call him whenever I thought that, if there was a person on Earth who could answer my questions, that would be Gell-Mann. Once I asked him a question regarding Kabbalah. He answered it with ease; but then he said to me, jokingly, "I will tell everybody that you are interested in mysticism." "... I was a student in Caltech," said Roger F Dashen in 1991, "in the early and middle 1960s, and stayed on the Faculty there for couple of years, afterward... . I never could understand how Murray came up with all those ideas... . We all had ideas, but they were small ideas; the 'woodpecker ideas' [the 'woodpecker idea' is Einstein's phrase[4]]... . Murray would come up with remarkable ideas every two or three days... ."

"Murray Gell-Mann,"[5] said Nikolay Nikolayevich Bogolyubov (1909–1992) in 1978, "is the closest to Einstein in intellectual capacity."

I heard about Gell-Mann a lot in Russia (1977–1981) as I was working at the Lebedev Institute of Physics, Moscow, in the Plasma Phenomena Theory Department led by Viktor Pavlovich Silin (1926–2019),* my doctoral thesis advisor. The physicists in Russia characterized Gell-Mann as the one who could be compared with Einstein.**

In 1951, Murray Gell-Mann was working as a post-doc at the Institute for Advanced Study in Princeton, New Jersey. There, he often encountered Albert Einstein, usually in the mornings, as they were passing by each other.

Apparently, Einstein would greet Gell-Mann in his German-English: "Goot morning." Gell-Mann would reply in his American English: "Good Morning." In an interview,[6] Gell-Mann explained why he failed to approach Einstein and talk with him. He says that in those days he didn't like the kind of people who would approach great figures, introduce themselves, get into a conversation with them, and report the experience to others by saying, for example: "I know Einstein." That may have been quite a proper attitude for Gell-Mann, but I personally would not have missed the chance to talk with Einstein for "all the gold in California." Gell-Mann added that day in 2003 he would almost certainly have behaved differently, and would have asked the great physicist about his thoughts years ago, when he was carrying out the greatest physics research since Newton's day.

GELL-MANN'S THREE PHASES IN CONCEIVING CREATIVE IDEAS

Murray Gell-Mann said that there are three phases in conceiving creative ideas. The first is characterized by hard work, days and nights; the second by awareness that further conscious thought is useless; and the third by a sudden — while cycling, or shaving, or cooking — 'aha' insight popping up. As to the third phase, Gell-Mann said this:[7]

"... a deeper part of the human mind is, presumably, involved in the search... , how to educate the heart. This search for forgiveness, compassion... , it's something that truly involves, at least occasionally, the parts of the human mind that are outside of conscious awareness. So, there is possibly the relation between creative thinking and art, and science, and other fields, on the one hand; and the search for compassion, forgiveness, and so on, on the other hand... ."

"Compassion," says Weisskopf, "without knowledge is ineffective; knowledge without compassion is inhumane."

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[3] V A Stefan *Ephemeron*: *The Particle of Time* (Stefan University Press, La Jolla, CA, 2002). Note: This is Stefan's fiction-fantasy work — the Book I, of *The Faustef Trilogy*, 2011.

[4] V A Stefan *Thus Spoke Einstein on Life and Living* (Stefan University Press, La Jolla, California, 2011). (Stefan University Press Series on *Thus Spoke Einstein* ISSN: 1550-4115.)

[5] Murray Gell-Mann Is Closest to Einstein in Intellectual Capacity, Says N N Bogolyubov (1978); in V A Stefan, From Belgrade [Yugoslavia] to Sofia [Bulgaria] with N N Bogolyubov in September 1978, *Ukrainian Journal of Physics* **55** (5) 651 – 652 (2010).

[6] Gell-Mann's 2003 interview to Edge Foundation, Inc.

[7] Murray Gell-Mann in "Education & Enlightenment" by Dalai Lama et al., a YouTube Movie: https://www.youtube.com/watch?v=ARud3qn7UIA (00:06:44–00:07:24); Published on Dec 20, 2016.

* Obituary "In memory of Viktor Pavlovich Silin" [*Usp. Fiz. Nauk* **189** 559 (2019); *Phys. Usp.* **62** 524 (2019)]. (*Editor's note*.)

** The deep respect of Russian physicists for Murray Gell-Mann was expressed in his election as a foreign member of the Russian Academy of Sciences (RAS) in 1994. Russian translations of papers by Gell-Mann were repeatedly published in the journal *Uspekhi Fizicheskikh Nauk* [see *Usp. Fiz. Nauk*: **59** 399 (1956); **64** 391 (1958); **83** 695 (1964); **130** 459 (1980); **151** 683 (1987)]. (*Editor's note*.)