

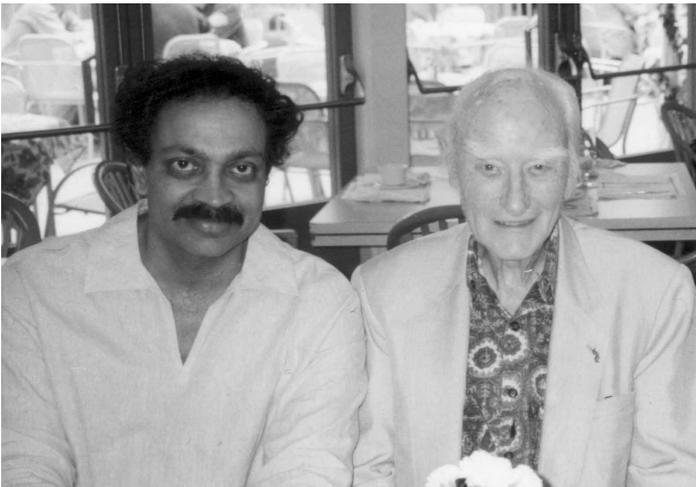
Guest editorial

The astonishing Francis Crick[†]

The word ‘genius’ is rarely used these days, yet few would deny the aptness of that term for Francis Crick. Indeed, most historians of science would agree that he was the greatest biologist of the 20th century.

Everyone knows that Crick (along with his colleague James Watson) unraveled the double helical structure of the DNA molecule, but not everyone appreciates the even greater contributions he made soon afterwards. He went on to decipher the genetic code (three nucleotides coding for an amino acid, the mechanism of DNA replication, the transcription of the code by mRNA, and its subsequent translation into amino acid sequences mediated by transfer RNA). With these achievements in place, Crick soon came to be regarded as the founder of the new science of molecular biology and occupied the same place in 20th-century science as Darwin did in the 19th century.

The history of ideas in the last few centuries has been punctuated by major upheavals in thought that have turned our worldview upside down and created what Thomas Kuhn called “scientific revolutions”. The first of these was the Copernican revolution, that, far from being the centre of the Universe, the Earth is a mere speck of dust revolving around the Sun. Second came Darwin’s insight that we humans do not represent the pinnacle of creation—we are merely hairless neotonous apes that happen to be slightly cleverer than our cousins. Third, the Freudian revolution—the view that our behaviour is governed largely by a cauldron of unconscious motives and desires. Fourth—Crick and Watson’s elucidation of DNA structure and the genetic code, banishing vitalism forever from science. And now, thanks once again partly to Crick, we are poised for the greatest revolution of all—understanding consciousness—understanding the very mechanism that made those earlier revolutions possible! As Crick often reminded us, it’s a sobering thought that all our motives, emotions, desires, cherished values, and ambitions—even what each of us regards as his very



[†] The title of the recent “Francis Crick memorial lecture” I gave at the Center for the Philosophical Foundations of Science in New Delhi, India, at the invitation of Professor Ranjit Nair. Also given at “Francis Crick; a celebration” held at the Salk.

own 'self'—are merely the activity of a hundred billion tiny wisps of jelly in the brain. He referred to this as the “astonishing hypothesis”—the title of his last book (echoed by Jim Watson’s quip “There are only molecules—everything else is sociology”).

Crick’s contributions to molecular biology are too well known to require repetition here. I will, instead, just mention a few anecdotes which, I hope, will convey the spirit of the man. He was without any doubt the most amazing person I have known. He loomed large, like a colossus, over the entire La Jolla neuroscience community and was a formidable—but always welcome—presence at seminars. His intolerance for sloppy thinking was widely feared by speakers visiting from the east coast: “Politeness is the poison of all good collaboration in science”, he once said.

Watson’s famous opening line “I have never met Francis Crick in a modest mood” is now part of the folklore of science. Yet he was, at heart, extraordinarily modest, although he would sometimes inadvertently give the impression of being arrogant. I remember the time when he was writing a book on neuroscience intended for a broad audience. He phoned me and sounded a bit agitated “I have sent a first draft to my editor, Rama. She feels it’s well written but that it’s still too full of jargon and technical language and suggested that I pass it around to a layman to get some feedback”. He then paused and added “Rama, the trouble is I don’t *know* any laymen; do you know any layman I could show it to?”. It’s easy to see how a remark such as this could have been misconstrued as arrogance, even though he was being perfectly honest! He was arrogant not so much towards his colleagues as towards nature herself as he tried to wrest away her deepest secrets.

I should add, though, that he didn’t suffer fools gladly. He abhorred shoddy thinking and was suspicious of ‘modeling’ that was not informed by biological constraints. I recall a time—in the eighties—when a scientist from MIT was telling Crick about his model for some aspect of brain function. Upon seeing Crick’s vehement, exasperated nods of disapproval, the young man said, “But Dr Crick, my model is pretty and it works”; to which Crick replied: “My dear chap, *that’s* a criterion you would use for selling a vacuum cleaner—I don’t see what it has to do with the brain.”

He had very little patience with orthodox philosophers. He felt they became too prematurely trapped in matters of terminology. I am reminded of a seminar on consciousness he gave at the Salk in the eighties. A philosopher—whose name politeness forbids me from mentioning—raised his hand and said “But Dr Crick, you are attempting to solve the so-called problem of consciousness yet you haven’t even bothered to define it; can you clearly define what you are talking about?” Crick’s reply: “My dear chap, there was never a time in the pre-DNA era when a lot of us biologists sat around the table and said ‘Let us first clearly *define* life before we explore it’. We just went our there, forged ahead and *found out* what it was. It’s no doubt good to have a rough idea of what one is talking about, but matters of terminology are best left to philosophers who spend most of their time on such things. Indeed clear definitions often *emerge* from empirical research. We now no longer quibble over questions like is a virus *really* alive.” Semantic hygiene, Crick felt, was largely a waste of time.

Through most of his career Crick wisely steered clear of administrative responsibilities—in fact he regarded administrators, bureaucrats, and paper pushers as mainly a nuisance and impediment to his research. Yet, he surprised everyone (including himself) when he accepted an appointment as president of the Salk, and discharged his duties admirably—a tradition now being continued by Richard Murphy.

Crick was also an outstanding seminar speaker, frequently sought after for his erudition, eloquence, pugnacity, and wit. But even in a public forum he was reluctant to completely avoid all technical terms, for fear of oversimplifying the complexities of brain function. I remember after a fundraiser at UCSD he was approached by a lady during the cocktail reception. “All this stuff on the brain is interesting, Dr Crick”,

she said “But can you name any one single discovery in the last two decades that has really important implications?” “Well, my dear”—replied Crick—“One thing we have now learnt is that the brain is really plastic.” The lady fainted.

I would be remiss not to add that my own career in neuroscience and those of many of my colleagues here at UCSD have benefited enormously from having had Crick as a colleague. His influence has been felt in many different ways. First, he and Koch have made the scientific study of consciousness respectable and, in so doing, played a key role in making UCSD and the Salk the nation’s preeminent centres for research in cognitive neuroscience. Second, he was instrumental in having many of us in neuroscience and psychology move to La Jolla in the early eighties—transforming it into ‘neuron valley’. (He had the foresight to bring Terry Sejnowsky and the Churchlands to UCSD at a time when the kinds of topics they worked on were not considered especially fashionable.) We all thought of him as a great sequoia tree under whose branches many of us saplings eked out a precarious existence. And third, the most important lesson I learned from him on research strategy was—as I tell my students—that it is better to tackle ten fundamental problems and succeed in only one, than to tackle ten trivial ones and solve them all! (so obvious when stated, yet so difficult to practice). Be careful not to get trapped in narrow cul-de-sac of specialization no matter how many pats on the back you get from colleagues.

It’s all too easy to become lulled into a false sense of security in a system that is largely organised to reward the conformist and punish the visionary. Be especially wary—Francis warned us—of the small rewards: papers accepted by *Nature* or *Science*, those federal grants, job offers, awards, honorary degrees, fellowships in professional societies, and the like. Such perks are welcome, of course, but you have to take them in your stride and not confuse them for the real thing. Never confuse the icing for the cake.

The converse is true too: don’t let minor setbacks or nods of disapproval from the ‘experts’ influence your choice of problems. Recall that both William Bragg and Erwin Chargaff strongly discouraged Crick from pursuing DNA. Amazingly, even after DNA structure and the genetic code were deciphered, Crick was turned down for a job (a professorship in genetics) in Cambridge on the grounds that he wasn’t a ‘proper geneticist’. How ironic, given that it was his discovery that subsequently transformed genetics into a science!

Crick played a direct role in the intellectual development of CHIP (Center for Human Information Processing—now renamed CBC—Center for Brain and Cognition) which was a brainchild of George Mandler at UCSD. Crick’s lively discussions with Dave Rumelhart, Jay McLelland, Don Norman and Geoff Hinton in the late seventies set in motion the neural networks revolution, making UCSD a leader in the field of cognitive neuroscience. To honour his contributions to CBC/CHIP, Jim Kulik and I named the main seminar room (shared with the faculty of psychology) “The Francis Crick conference room”, with the enthusiastic endorsement of the administration and psychology faculty. The Crick room has now become one of the main hubs of intellectual life on the campus.

Crick has been a tremendous inspiration to a whole generation of young students here in La Jolla and elsewhere. There are several hallmarks of his style of research that we would all do well to emulate. I’ll mention just two. First, sheer chutzpah; he pointed out that problems of fundamental importance in science are not necessarily more difficult than humdrum, trivial ones: “Nature isn’t conspiring against us to make important problems difficult”—he often said—“So given a finite life span, aim high—go after fundamental problems”. Second, those who met Crick for the first time were often struck by the sheer force of his passion and energy; even at 88 he was more passionate and ebullient about science than most of my younger students and

colleagues. (I recall the time when he drove me back to La Jolla from Irvine after a full-day Helmholtz club symposium. It was 11pm and I was dozing off, but he—at 85—was gesticulating wildly, airing his views on the Meynert cells. I remember saying to myself that it was this same tenacity and passion that led him to crack the secret of life 40 years ago!) Science, for Crick, was always a love affair with nature—a grand romantic adventure.

It is difficult to imagine La Jolla without Francis Crick. He will be missed by all of us who knew him. Over the years his name has almost become synonymous with La Jolla neuroscience. His presence here was so powerful that upon hearing the sad news, my son Mani said: “It is hard to believe that anything—even death—could have vanquished Francis Crick”. What’s more, most of my colleagues would agree that apart from his superhuman intellect, he was also a wonderful human being (two traits that don’t always coexist in the same individual, but did so in Crick). His warmth and generosity towards younger colleagues was widely appreciated. Odile and Francis were always gracious hosts at the numerous dinner parties they held in their home for friends, visiting speakers, and new faculty recruits.

Three weeks prior to his death I visited him in his home in La Jolla. He was 88, had terminal cancer, was in pain, and was on chemotherapy; yet he had obviously been working away non-stop on his latest project. His very large desk—occupying half the room—was covered by articles, correspondence, envelopes, recent issues of *Nature*, a laptop (despite his dislike of computers), and recent books on neuroanatomy. During the whole two hours that I was there, there was no mention of his illness—only a flight of ideas on the neural basis of consciousness. He was especially interested in a tiny structure called the claustrum which, he felt, had been largely ignored by mainstream pundits. As I was leaving he said: “Rama, I think the secret of consciousness lies in the claustrum—don’t you? Why else would this tiny structure be connected to so many areas in the brain?”—And gave me a sly, conspiratorial wink. It was the last time I saw him.

Crick is gone, but if I might be allowed a cliché, he is immortal in spirit (a word he would have probably loathed). The seeds he planted in the minds of hundreds of students and colleagues here in La Jolla will continue to take root, blossom, and bear fruit for centuries to come.

Here was a Francis Crick, when comes such another?

Vilayanur S Ramachandran

Center for Brain and Cognition, University of California at San Diego, La Jolla, CA 92093, USA;
e-mail: vramacha@ucsd.edu

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