
Recognizing the Role of Chance

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Las Vegas is perhaps not the first city that comes to mind when one thinks of a meeting place for scientists. Yet that is where the Federation of American Societies for Experimental Biology (FASEB) is holding its annual convention this week. Upon reflection, however, it seemed more appropriate than I had first thought for scientists to gather in a city that epitomizes chance and the good fortune it sometimes brings.

The vision I held of gaming tables, roulette wheels and one-armed bandits put me in mind of that rich autobiography of Nobel laureate Salvador E. Luria, *A Slot Machine, A Broken Test Tube* (Harper & Row, 1984). In it Luria tells of attending a faculty dance at Indiana University in 1943. At the country club where the dance was held, he observed a colleague playing at a slot machine.

"Not a gambler myself, I was teasing him about his inevitable losses, when he suddenly hit the jackpot, about three dollars in dimes, gave me a dirty look, and walked away. Right then I began giving some thought to the actual numerology of slot machines; in doing so it dawned on me that slot machines and bacterial mutations have something to teach each other." (p.75)

The analogy between slot-machine returns and the mutation of bacteria suggested to Luria a simple experiment in which he proved that resistant bacteria originated by spontaneous mutations, not by reaction to phage. Chance, and of course a well-prepared and sensitive mind, put Luria on the trail of a major discovery in genetics.

While Luria's story is especially apt in light of the meeting place for the FASEB conference, hundreds of discovery accounts include the important part played by chance, accident, and serendipity. Usually they are found in biographies and autobiographies, in which it is not unusual for the reader to find such statements as "It just so happened ... By lucky coincidence ... I chanced to meet ..." The Citation Classics feature that appears each week in *Current Contents* is another established forum in which statements on the role of chance in discovery are welcomed, even encouraged. And once in a while a book appears on this subject, such as Gilbert Shapiro's recent *A Skeleton in the Darkroom: Stories of Serendipity in Science* (Harper & Row, 1987).

The Price of Pristine Papers

But the inclusion of what some

scientists and editors call "anecdotal" or "background" information is typically discouraged when it comes to the formal publication of discoveries in the journal literature.

Another Nobel laureate, Sir Alan L. Hodgkin, in "Chance and Design in Electrophysiology: An Informal Account of Certain Experiments on Nerve Carried Out between 1934 and 1952," recalled the publications, people and events that influenced his course of research, as well as the portion of his work obtained by planning and the portion obtained by accident or chance.

Hodgkin explained why he felt the need to provide an addendum to his batch of formal articles: "I believe that the record of published papers conveys an impression of directness and planning which does not at all coincide with the actual sequence of events. ... In writing papers, authors are encouraged to be logical, and, even if they wished to admit that some experiment was done for a perfectly dotty reason, they would not be encouraged to clutter up the literature with irrelevant personal reminiscences. But over a long period I have developed a feeling of guilt about suppressing the part which chance and good fortune played in what now seems to be a rather logical development" (*The Pursuit of Nature: Informal Essays on the History of Physiology*. Cambridge University Press, 1977. p. 1).

The same discomfort led the late Sir Peter B. Medawar to ask if the scientific paper, which embodies a fictional inductive method, is not at root fraudulent ("Is the Scientific Paper a Fraud?", in D. Edge, editor, *Experiment*. British Broadcasting Corporation, 1964. p. 7-12).

Despite such protestations, Louis Pasteur's advice on writing up scientific discoveries—"Make it look inevitable"—has clearly been accepted by the society of science. "The mores of science publication," Robert K. Merton has written "call for a passive idiom and

format of reporting which imply that ideas develop without benefit of human brain and that investigations are conducted without benefit of human hand" ("On the History and Systematics of Sociological Theory," *Social Theory and Social Structure*. Free Press, 1968. p.6). But science is eminently a human enterprise. There is a cost, doubtless incalculable, in systematically deleting the human element from the scientific literature.

Making Room for the Anecdotal

This is not to argue that the accepted format of scientific publication is wholly misguided. Its uniform structure is clearly well designed in certain respects. Gerald Holton has called the standard format "immensely functional." ("Foreword," *Contemporary Classics in the Physical, Chemical, and Earth Sciences*. ISI Press, 1986. P. VII.)

Rather, I argue that the accepted format is merely a bit too narrow. There ought to be room for some of what lay behind a question and behind the experiment designed to answer it. For those interested in understanding the discovery process and what makes for scientific creativity and even genius (a matter of interest to working scientists, as well as historians and sociologists of science), these immaculate but doctored accounts are inadequate because they are too restrictive.

It is up to scientists to include, and up to journal editors to accept, where appropriate, stories of serendipity in scientific discovery. The literature would make for more interesting and inspirational reading. More important, learning how colleagues have grappled conceptually with their problems—even by accident—may very well help others struggling with theirs. The impetus for creativity can come any time, any place and from anything...even a slot machine. ■