Letters

Origin of Serendipity

In my 1949 presidential address to the Chemical and Physical Society of University College London (unpublished) on "Scientific serendipities," I quoted the origin of the word *serendipity* as follows: "*The letters of Horace Walpole, 4th Earl of Oxford.* Edited by Mrs. Paget Toynbee. [Vol. III 1750–1756. pp. 203–4 *No. 382.* To Horace Mann. Arlington Street, *28.1.1754.* 'This discovery I made by a talisman, which Mr. Chute calls the *Sortes Walpolianae,* by which I find everything I want, *à point nommée,* wherever I dip for it. This discovery, indeed, is almost of that kind which I call *Serendipity*, a very expressive word, which, as I have nothing better to tell you, I shall endeavour to explain to you: you will understand it better by the derivation than by the definition. I once read a silly fairy tale, called *The Three Princes of Serendip*: as their Highnesses travelled, they were always making discoveries, by accidents and sagacity, of things which they were not in quest of: for instance, one of them discovered that a mule blind of the right eye had travelled the same road lately, because the grass was eaten only on the left side, where it was worse than on the right—now do you understand *Serendipity*? One of the most remarkable instances of this *accidental sagacity* (for you must observe that *no* discovery of a thing you *are* looking for comes under this description), was of my Lord Shaftesbury, who, happening to dine at Lord Chancellor Clarendon's, found out the marriage of the Duke of York and Mrs. Hyde, by the respect with which her mother treated her at table.' "

It will be seen, therefore, that the word *Serendipity* was probably coined and certainly defined by Horace Walpole, and that he *had* read the "silly fairy tale" in question. S. Stuart West [*Science* **141,** 862 (6 Sept. 1963)] does him less than justice.

E. N. da C. Andrade tells me that there used to be a secondhand bookshop in the Shepherds Market, London, called the *Serendipity Bookshop*, which was a good place for picking up valuable old books quite cheaply if you liked to browse and knew what you were about.

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Several years ago, while studying creativity, I became interested in the story of the *Three Princes of Serendip* and wrote to the Library of Congress about it. They advised me of three copies available in the United States. One was at the Harvard Library; two others were in Chicago—one of them at the Newberry Library.

The copy at the Newberry Library was translated from Persian into French and then into English. The date I have is 1722, although I believe the original was written some time in the 1400's.

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In his letter, S. Stewart West writes that "When the origin of serendipity is mentioned by modern research writers, they sometimes mention Walpole also, but I have never seen such a reference which was made specific by direct quotation or even the date of the letter in question."

Perhaps West and other readers of *Science* would like to know that Chapter VI of Walter B. Cannon's *The Way of an Investigator* (W. W. Norton, New York, 1945) is entitled "Gains from Serendipity." There he writes: "In 1754 Horace Walpole, in a chatty letter to his friend Horace Mann, proposed adding a new word to our vocabulary, 'serendipity.' " He goes on to state that Serendip was the ancient name of Ceylon. Cannon then devotes about nine pages to examples in scientific investigation where "this sort of happy use of good fortune has been conspicuous." This chapter is actually an elaboration of a lecture given by Cannon in 1939 and published in the *Scientific Monthly* [**50,** 204 (March 1940].

I agree wholeheartedly with West that *The Three Princes* should be published in English.

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. . . if there is any more discussion as to when the idea of serendipity took hold in America you might be interested to know that I was told about it in about June 1913 by Walter B. Cannon, when I was working at Harvard. Cannon was pointing out to me that my experience in his laboratory was typical of serendipity. I started out to study the absorption of gases from the bowel and quickly noticed the gradient of irritability in the bowel—which Cannon and I both felt was immensely more important than what I was learning about flatulence.

In the old days one example of serendipity that was often given was Saul's experience in ancient Israel. He went out to find his father's asses and found himself head of a kingdom.

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Purity of Halothane ("Fluothane")

Current concern about possible toxic manifestations following "Fluothane" anesthesia has resulted in attention being called to the presence in commercial "Fluothane" of small amounts of a hexafluorodichlorobutene [Cohen, Bellville, Budzikiewicz, Williams, *Science* **141**, 899 (1963)]. Cohen and his collaborators have reported that evaporation of "Fluothane" can result in a build-up of this substance in the residues. Moreover, they stated that the butene derivative could increase in concentration as a result of a chemical interaction of the anesthetic agent with metallic copper in the presence of oxygen.

As reported verbally by F. L. Rose, on 4 September 1963, to the Subcommittee on Anesthesia appointed by the National Research Council to carry

out the National Halothane Study, we have not been able in these laboratories to confirm the findings of Cohen with respect to the conversion of "Fluothane" to the butene derivative. We have found no significant evidence of such conversion of "Fluothane" to the butene by contact with copper and oxygen, or with copper oxide, under conditions much more severe than those which obtain in anesthetic practice.

Although the concentration of the butene derivative may increase by evaporation, it should be borne in mind that the quality-control specifications for "Fluothane" require it to be 99.9 percent pure. No other ingredient may be present in amount greater than 0.05 percent (an amount corresponding to a concentration of 5 parts per million in 1-percent "Fluothane" vapor, as used in the maintenance of anesthesia). This rigorous specification for "Fluothane" is the result of careful work on the details of the manufacturing process over a period of years; this work is continuing.

Of the 100 specimens of "Fluothane" drawn from all types of anesthesia vaporizers—copper, chrome-plated copper, stainless steel, and glass—some of which had not previously been drained for periods of up to 18 months, only one specimen was found to contain a concentration of the butene derivative in excess of the quality-control specification for freshly prepared "Fluothane"; this one sample contained 0.058 percent. The mean butene content of all the specimens examined was 0.029 percent.

Because of the importance of this matter we have thought fit to write this preliminary letter; a detailed report, including both chemical and toxicological data, is in preparation.

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The Social Stimulus to Creativity

What the social engineer, designing scientists, wants to know is the optimum of gregariousness needed for creativity. There are many things of which a servomechanism like man can get too much and also too little, and people are one of them. Do 12 students make a better seminar than 4 or 20? From what sized audience will your productive drives profit most? From 20 who can talk back? 100 who cannot? 5000 who may even not have been there, unless the TV audience rating turns out to have been right? When President Garfield said that the ideal university would be a student on one end of a log with Mark Hopkins on the other, was he thinking about Mark Hopkins or only about the student? Would another student in the middle of the log have stimulated Mark Hopkins more? We need to know more about the kinds and dimensions of small groups that best promote creativity, and which groups work best with which scientists.

It is almost impossible to imagine a scientist's contributing to knowledge without any social stimulus at all. Would such a scientist be a robot, capable of energizing himself from handy natural resources and set to run through the concomitant variations of the n parameters of the system he was designed to investigate and then to file the results in his magnetic memory? That would not be science, for it would be asocial: there would be no communication. Or would the isolated creative mind be Descartes' as he moved from one to another of his 24 Dutch hideouts with his address known only to Father Mersenne and a few others? Not a bit of it. Descrates corresponded with his peers, got into controversies, and cultivated the acquaintance of some whom he admired (one philosopher, one princess), although he kept himself free to claim soiltude for meditating and writing when he wished. He needed both privacy and social stimulus—now one, now the other.

There are many creative individuals whose minds work best with constant stimulation from small groups of others with common interests—disciples sometimes, or peers. It has often been remarked that the researcher gets along better when he can also teach, and this is true for the investigator who likes to do his teaching in his laboratory, perhaps sitting on a table—a scientific equivalent of Mark Hopkin's log. We all know laboratory men who cannot help teaching even when there are no classes.

Yale's psychologist Clark Hull got enormous support from his "in-group," which came to extend far beyond New Haven. In the days of its maximum vivacity, when Hull would come to speak in Cambridge, Massachusetts, the Harvard Yard would bristle with Hullians who had come along, not to learn the current truth, for they already knew it, but to see it succeed. They were rooters. Certainly Hull was stimulated by disapproval, too, yet it is hard to imagine his being as effective as he was without his in-group.

At a much broader level there have been the academies and societies that have been formed to stimulate scholarship and research. In 1660 the Royal Society began as a small group of men who met together to inform and animate one another and to establish a journal for the publication of discovery. The French Academy was not very different, and on this side of the water comparable groups were formed later in Philadelphia and Boston, both of which, in spite of their present enormous sizes, have managed to keep some of the advantages of the social activation of creativity. In general, the society that succeeds in stimulating creativity grows, for scientists look upon social stimulation as a good natural resource, and they join up. Eventually the society gets too large, gaining some advantages that go with size but losing many of the advantages of intimate friendly discussion.

Then it is that new little societies form, in an attempt to recapture the lost stimulation. They may come into being by fission from the parent, or they may emerge from some in-group that has been starved for social activation. Any scientist can fill in, for his own field, the details of this paradoxical social growth, where the healthy scientific society loses its original usefulness by its inevitable growth and is supplanted by younger and smaller groups of a new generation, which in their turn become too large. This paradox of growth's defeating its original purpose is not merely a symptom of the present explosion in science. It has also been the pattern of the proliferation of the sciences themselves, as each came to include too much for the individual human mind to grasp, and as smaller sciences were needed.

The familiar modern in-group that supports investigation nowadays is more the result of the scientific explosion than of the magnetism of a leader who compels loyalty. Joint endeavors in research resulting in multiple authorship, are the symptoms not only of the need to combine research efforts in order to achieve publication in the limited space avail-