COMMENTARY

by Bernard Dixon

SERENDIPITY AND BACTERIAL FINGERPRINTS

"There's no place for serendipity nowadays," announced a biochemist on the edge of a noisy group huddled in the corner. The occasion was a meeting held in London recently by Online Conferences to explore "Bioscience Futures." Around sundown on the first day, devoted entirely to good news about biotechnology, half a dozen participants had formed a critical mass in the bar of the Bloodmsbury Crest Hotel to assess the bad news. One by one, charges were laid regarding the frenetically commercial atmosphere within which applied biologists now pursue their craft. High on the list was the need for secrecy about matters which 20 years ago would have been ventilated quite openly through journals and congresses. But the bar cabal soon agreed that this was a gray area, the patenting process actually *compelling* public disclosure of new knowledge. Other complaints examined and then set aside included the alleged distortion of priorities in pure research and the alleged deterioration of professional manners among scientists.

The sole issue on which all agreed was that of serendipity. In the years BCB (Before Cohen and Boyer), microbiologists felt they had enjoyed an important freedom to poke around in the hinterland of their principal interests, with time to pursue curious or tangential phenomena when they turned up out of the blue. This was a good thing because such totally unanticipated discoveries often proved to have cash value in the most suprising quarters. But those idyllic days were gone. In times of mission-oriented science and ferocious competition, it was naive to expect them ever to return.

I fear that this verdict may have been over-hasty. And I call in evidence a remarkable paper from the very conference during which these gloomy exchanges took place. It was given by Robert Silman, a senior lecturer in the Department of Reproductive Physiology at St. Bartholomew's Hospital Medical College (London). Silman's primary work deals with the mechanism through which the pineal gland controls human reproduction. Yet a splendid episode of serendipity had led him from those endocrinological preoccupations to a novel computerized method for identifying and classifying bacteria. Although he stumbled upon the technique entirely by accident, it will doubtless be taken up by a range of mission-oriented microbiologists, whether in biotechnology centers dealing with soil organisms or hospital laboratories concerned with pathogens.

The story began when Silman and his colleagues were incubating genetic material with radiolabeled amino acids and identifying the translation products by polyacrylamide gel electrophoresis and autoradiography. In other words, they were employing standard techniques which are used day-by-day in biotechnology and genetics laboratories throughout the world. On one occasion, however, they unknowingly laced their samples with bacteria. As a result, the physiologists found themselves visualizing translation products from the genetic material of extraneous microorganisms. But the patterns, though puzzling at first, did not seem to be haphazard. Resembling the bar codes which identify merchandise in supermarkets, they looked as though they might be individual to specific strains of bacteria.

Sensing their need for microbial expertise, Silman and his team sought help from the Department of Medical Microbiology at nearby St. Bartholomew's Hospital, with whom they soon established a collaborative project. Within a few weeks, it became clear that the accidental contamination had spawned a technique capable of discriminating between organisms with a rare degree of sophistication. By applying their comparatively simple procedure to a wide variety of bacteria, the researchers found that it provided consistent patterns that could be used to identify different species and subgroups within species. Some subgroups were resolvable even in cases where there was no suitable alternative method of doing so.

The only snag in this serendipitous finding was the cumbersome, time-consuming nature of the technique. Using X-ray films with 24–48 hour exposure times, and comparing bar patterns with the naked eye, was scarcely a formula for a method to be exploited at a routine bench. Two supplementary innovations were required: a faster imaging procedure and a means of converting pattern signals into digital information, creating a data base for identifying bacteria through pattern recognition software.

At this point, and despite those remarks in the Bloomsbury Crest Hotel, commerce became the handmaiden of serendipity. Venture capital finance helped Silman's team develop a two-dimensional scanner which, linked directly to a computer, abolished the original need for autoradiography. With this equipment, patterns can be detected within an hour or so, and the information is accesible for data processing. The St. Bartholomew's researchers are now building up a data base and developing appropriate pattern recognition programs. They are confident that their comparatively simple, automated instrument will generate a much better quality of information than that produced by traditional techniques.

But is there a genuine need, in 1985, for new methodology of this sort? I strongly suspect that there is. A curious feature of microbiology, whether medical or industrial, is that procedures for identifying organisms have changed very little over the decades. Whereas the analytical chemists and even observational astronomers of last century would scarcely comprehend some of the equipment found in modern laboratories, the pioneer microbe hunters would experience far less difficulty. Many novel instruments have proved far less popular than their makers hoped because they have simply automated classical methods rather than made them more discriminating. Serendipity, it seems, is about to change all that.

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