Cell Biology Moves Forward in 2050

Everything old is new again

Stephen Cooper

Transcendent technical breakthroughs sweep us along in excited pursuit of new knowledge, but also foster indifference to previous science. So have we been told by our elders, and so have we experienced it ourselves. Occasionally it seems appropriate to provide perspective and to verbalize concerns and disquietude. To be effective in doing so, one should be insightful without being officious, compelling without being pontifical, tolerant without being condescending. Genuine humor, neither forced nor shrill, is as good a means as any. We believe that Dr. Cooper has struck the right chord.

Moselio Schaechter
Frederick Neidhardt

The scientific sessions of the Cell Biology Meeting for 2050 were crowded. As each speaker rose in the varied sessions, the growth of microarray technology dominated each talk. More and more spots. More and more genes. Greater sensitivities, greater speed.

In the room on zoological topics, one microarray was described that had the genomes for all African large animals placed in 700 million spots, each one smaller than one-tenth the size of a bacterium. The array had the complete set of genes from elephants, zebras, cheetahs, okapis, and even hartebeests. In the room devoted to human physiology there were arrays described that could assay the expression from each gene in an individual in 4.5 minutes.

In the new device display area, where large corporations presented their latest equipment, there were no centrifuges, no pipettes, no large apparatus of any kind, only microarray readers, microarray producers, and microarray-related software.

Then a buzz began to move through the crowd of scientists. It was only a rumor, but it felt like more than just a rumor. It was slow at first, but the excitement built as each delegate heard something about session 413, where a breakthrough was about to be announced. It was not clear what the breakthrough was. Some expected the next leap into nano-sized arrays, which could be embedded in a person to give continuous read-outs to a remote sensor so that a person's health could be continuously monitored without even going to the doctor's office. Others expected advances in three-dimensional arrays that would lead to an order of magnitude increase in gene detection.

When session 413 began, the room was filled to capacity. People sat in the aisles while others crowded around the back of the room. Those who could not get in stood around the door hoping to hear something about this great advance.

The first speaker rose and slowly began to proceed. He described his involvement in microarray technology and how he had worked up more and more spots on a slide. Everyone began to feel a little disappointed, thinking that this was the same-old stuff that all the other sessions had presented. Then he described how he had come across an old instrument in a closet while working in his department. It was a simple "spec-tro-pho-to-me-ter" as he slowly pronounced the word so everyone could hear it clearly. He explained how the instrument worked. He then described how he assayed a single enzyme using a simple colorimetric assay.

Many were confused. A single enzyme? They wanted to ask how it could be done but most were afraid to ask what might appear to be a silly question. Then one gray-haired member of the audience raised his hand and asked, "So you assayed only one enzyme, but how did you avoid assaying the other 999,999,999 enzymes that were around?" The audience hushed, all waiting for the answer.

"It was not easy to figure out. I had to go back

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to some old literature. In fact, I had to read some articles that were written on paper."

There was a murmur of disbelief. Paper? How did he find a paper article? Ever since the introduction of subcutaneous medline chips, everyone had immediate access to all articles that were published as they were broadcast over the world and were instantly picked up by the chips embedded in their foreheads.

"It appears, and I was quite surprised to read this, that in the old days people were able to assay single enzymes by using a single substrate and a simple colorimetric assay. They worked hard to avoid complications caused by the other enzymes they were not interested in."

The audience was excited now. Two gentlemen in the front row got up and left. Everyone recognized them as the leading developers at Acme Amalgamated Bio-Geno-Xeno-Spectro-DNA Systems Limited. Immediately it became clear to everyone that this was a great area for economic development. Instead of selling one array, one could market kits to assay a single enzyme. Instead of a single sale, one could have 100 million sales. It was an unbelievable business opportunity. Others quickly stood up and left. They were going back to the lab to develop this new "single enzyme technology," or SET as it became to be known. They had to get home fast or they would be last in line at the patent office.

And so that is why we have made so many advances of late. If it wasn't for this breakthrough we would still be working with microarrays, measuring more and more genes being expressed, looking at genes from every plant, every bug, every animal.

So science moved on. Technology again showed that it was the engine of progress.