Forgotten 1928 chemistry paper leads to a modern innovation

A new method for nuclear medicine

by Alex Shetsen

The University of Toronto may be winning the Nobel prizes, but at the same time, world-class research is being done right here at the U of A.

Dr. Richard Flanagan is a radio-pharmaceutical chemist working at the university. After four years of work, he has come up with what may be, without exaggeration, described as a revolutionary new method of preparing radioactive solutions used in nuclear medicine to diagnose illnesses.

Certain solutions used to take a full day to prepare by highly trained specialists in labs costing $100,000 to equip. These now may be prepared in five minutes by a technician using the pipette-like device developed by Flanagan.

The use of radiation in medicine dates back to the discovery of X-rays at the end of the nineteenth century.

More recently, solutions containing very small, non-toxic doses of radioactive isotopes have been used as a means of diagnosing various glandular disorders, cancers, and other diseases.

Although the radiation levels are far below being dangerous, the radioactive chemicals' location in the body can be easily detected. In this way, doctors can locate which organs are absorbing the chemicals and decide what is wrong and how to treat it.

Certain types of radioactive solutions theoretically useful in identifying various diseases have always been too expensive for mass production and use in hospitals. But Flanagan's little device eliminates much of the hassle involved.

"We can mass-produce it," he says, "and aim it directly at diagnosing breast and prostate cancers."

Flanagan's device offers a simple "kit method" for preparing solutions of compounds with radioactive iodine, an element in its simple form essential to the body.

A solution containing approximately one-millionth of a gram of the radio-iodine is poured into the tube. As the solution filters through the tube, it reacts with chemicals inside, and the solution which comes out can be injected directly into the body.

The actual mechanics of the reaction are very complicated. It is the complexity of the chemical bonds involved that, up to now, has required the $100,000 laboratory, and it is this complexity which took four years to iron out.

The research has been Flanagan's alone. How he became involved in it is a story in itself.

"We were working on something completely different when I stumbled onto a 1926 paper by a German scientist named Mertz," explains Flanagan.

This paper was also about a subject unrelated to radiopharmaceutical chemistry.

Mertz was trying to determine the structure of cholesterol. That structure was not finally settled until 1940, and the theories of Mertz, who by that time had died, were discredited and forgotten. But Mertz' research of cholesterol reactions gave Flanagan a clue on how to handle the radio-iodine bonding.

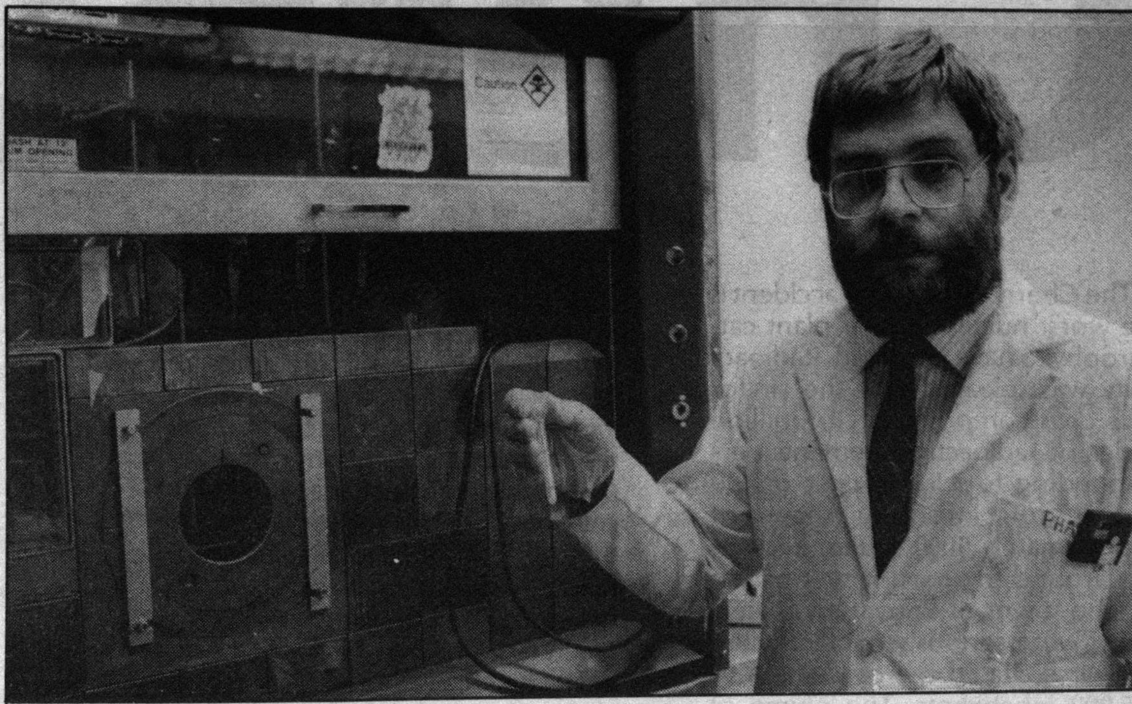
Flanagan's project has cost $250,000. The funds were raised from government research grants and from donations by Merck Frosst Inc. of Montreal, a company which developed an early interest in the work and now has exclusive rights to the device.

Flanagan's research was a topic at the Sixth International Symposium on Pharmaceutical Chemistry in Boston earlier this year. Similar research will have doubtlessly started elsewhere, but as Flanagan puts it, "we are definitely the world leaders at the moment."

According to Flanagan, if there is anything really interesting in the story of his research, it is his stumbling across Mertz' long-forgotten work.

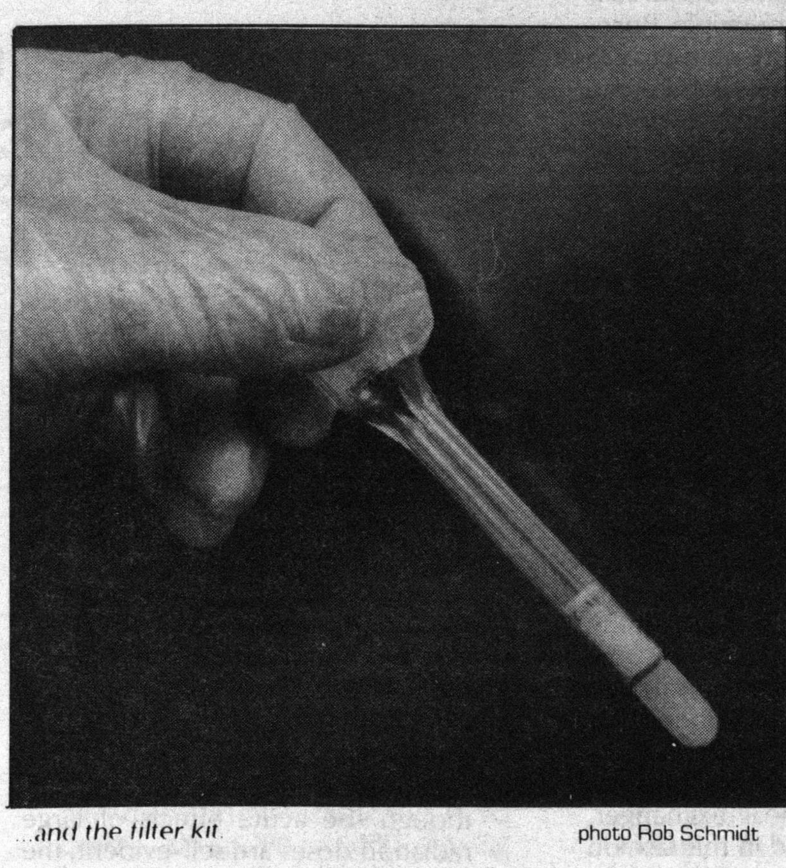
"Science inconsequential in its day is never inconsequential in the course of time," says Flanagan.

"The lesson to be learned here is that we cannot judge what is relevant or not without the benefit of hindsight."



The lab...

photo Rob Schmidt



...and the filter kit.

photo Rob Schmidt