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RESEARCH AND DISCOVERY AT THE UNIVERSITY OF VICTORIA

UVic chemist goes for gold

by Kirsten Rodenhizer

"Can we do chemistry this way instead?"

That's the question UVic chemistry professor Dr. Tom Fyles is asking as he conducts some unconventional research funded by a two-year, $100,000 grant from the Canadian Society for Chemistry (CSC).

The grant — sponsored by pharmaceutical companies AstraZeneca Canada, BioChem Pharma Inc., Boehringer Ingeleheim (Canada) and Merck Frosst Canada — will allow Fyles to explore the potential of doing automated chemical synthesis on gold surfaces instead of conventional polystyrene beads.

What he finds out could have important applications in the discovery and development of new drugs.

In conventional chemistry, chemists do one specific reaction, then isolate the new compound they have created. Combinatorial chemistry is a means of making many chemical compounds at once, or substituting particular ingredients in a systematic way to create a library of new compounds.

Combinatorial chemistry is most often done by machines, which are capable of conducting the many necessary reactions quickly and efficiently. Pharmaceutical companies use combinatorial chemistry as a way to discover "lead" compounds for new drugs.

"What we do is create chemistry that is compatible with automated synthesis," says Fyles.

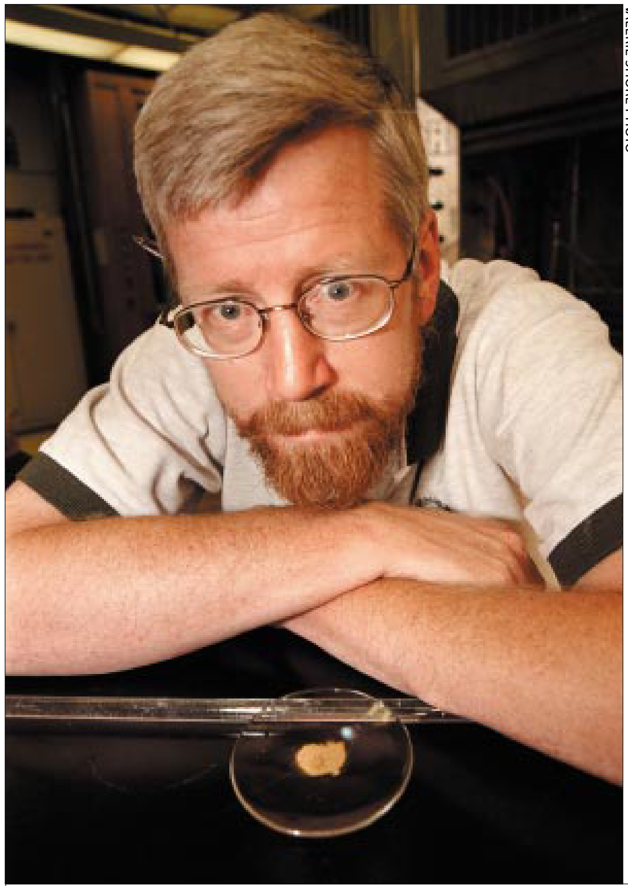
The CSC originally requested proposals to invent new chemical reactions that would expand the repertoire of such machines. Fyles decided to take a different approach, and proposed they change the very solid on which they were doing their reactions. They normally use polystyrene; he proposed gold.

"It's like inviting a bunch of interior decorators to fix up a room," says Fyles. "I come along and say, I don't even want to be in this room."

Until now, gold has commonly been used in tandem with sulphur compounds to create modified gold surfaces that are very stable. Most of the time, chemists who create such surfaces aren't interested in doing more reactions on them — they create them for other tasks. For example, gold surface technology has been used in medical procedures such as blood and tissue-typing and genetic screening.

However, Fyles plans to use these surfaces in a totally new way, doing chemical reactions on them and then isolating the new compounds by using electrons to release the new compound into a solution. "It sounds almost like magic but it's really easy to do," he says. "The whole premise is that the reaction step is better on gold than on polystyrene."

Many reactions don't work on polystyrene because the compounds react with the polystyrene itself. Fyles estimates that out of the hundreds of thousands of possible reactions, only about 10 per cent can be done on polystyrene.



VALERIE SHORE PHOTO

Fyles, with a sample of gold dust.

"If gold works on at least another 10 per cent, it will be a great deal better, and it's likely more," he says. Surprisingly, gold powder is also cheaper to purchase than polystyrene beads.

Fyles and his team are currently doing reactions one after the other to test whether surface technology is viable in combinatorial chemistry — a process that takes him back to his early days as a chemist. "I haven't done this since the mid-'70s," he says. "Most chemists don't do reactions like this today. It's become a specialty area because robots can do it faster."

Fyles is grateful that the companies who funded the grant were willing to take a risk on his unconventional proposal. "I really am delighted the companies took the view that they can afford to gamble," he says. " If we can create a new chemistry it would be great because it would give us a whole new class of reactions to do."

UVic student Leah Pence assisted with the content on this page as a participant in the SPARK program (Students Promoting Awareness of Research Knowledge), funded jointly by UVic and the Natural Sciences and Engineering Research Council of Canada.

SPARK

SHARPEN YOUR KNOWLEDGE

- The Green Chemistry Network provides interesting links on the movement toward a more environmentally friendly way of thinking: www.chemsoc.org/networks/gcn
- The American Chemical Society's Web site provides a great launching pad to reach a host of chemistry links including international chemistry news and the chemcyclopedia. Check out: www.acs.org
- Reactive Reports is an easy-to-read chemistry Web magazine: www.acdlabs.com/webzine/
- Science News is a more conventional science magazine with wide appeal: www.sciencenews.org/index.asp

ON THE EDGE OF YOUR SEAT

The Rape of Nanking at the Tokyo War Crimes Trial
Dr. Timothy Brook, University of Toronto
(Henry Y.H. Fong Lecture in Chinese Studies)
Thursday, Nov. 2, 7:30 p.m.
Fraser Building (formerly Begbie), room 152
Info: 721-8708
An examination by a leading Chinese historian of Japanese atrocities in Nanking during WWII.

Learning Matters: The Web-enabled University
Dr. Mike Fitzgerald, senior fellow, Strategic Management Consultants, London, England
(Lansdowne Lecture)
Wednesday, Nov. 8, 7 p.m.
Centre for Innovative Teaching, room 105

This informal lecture explores the demand for higher education, the increasing number of providers in both the public and private sectors, and the implications for the Web-enabled university.

Oriza Hirata's "Tokyo Notes"
Performed by Hirata's Seinendan Theatre Company
(in Japanese with English subtitles)
ONE PERFORMANCE ONLY
Friday, Nov. 10, 8 p.m.
Alix Goolden Hall, 907 Pandora Avenue
Tickets $22, students $16. Reservations: McPherson Box Office 386-6121.
Info: 721-8708
Sponsored by UVic and the Canada Council

All events free and open to the public.
For further information, visit the online events calendar at www.uvic.ca/events

EDGE/WISE A golden opportunity

Chemists are not turning to gold over polystyrene just because of its lustrous appeal. Gold is more durable, more conducive to microelectronic testing and even cheaper than its competitor, polystyrene beads.

Although it's hard to believe that the metal used in wedding bands is cheaper than the product used to make styrofoam cups, the numbers prove it. The gold that UVic's Dr. Tom Fyles is using for his project costs only a quarter as much as polystyrene for the same synthesis. Gold for the project costs approximately $20 per gram, whereas polystyrene runs $80 a gram. Polystyrene beads cost much more than gold for two reasons: the basic market principle of supply and demand; and the polystyrene must be chemically modified to be suitable for synthesis.

Gold is also much more durable than polystyrene. Because polystyrene reacts with more chemicals than gold, it gets used up in reactions and wears out faster. Although chemists won't stop using polystyrene surfaces, the prospect of also using gold surfaces opens up a new set of reactions for use.

Gold is also compatible with microelectronics applications, making it possible for researchers to one day create a "lab on a chip" to make and analyse molecules from the metal.

"What we'd envisage doing is making the compounds in one part of this chip, then analysing them in another," says Fyles. "This would be of great benefit to pharmaceutical companies as they develop new drugs, because they wouldn't have to make very much compound in the initial screening stage of drug discovery."