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Research and discovery at the University of Victoria

Improving the detection of breast cancer

by Margaret Milne

A hollow PVC tube with a thin plastic rod running down its centre may not look much like a woman's breast. But a team of UVic researchers is using just that to test their new method of detecting breast cancer.

At the head of the team is Dr. Elise Fear. Fear says that she's always been interested in women's health issues: "I think that more women should be involved in researching women's health." She made breast cancer detection the subject of her doctoral thesis, which she recently completed under the supervision of Dr. Maria Stuchly of the department of electrical and computer engineering.

The method they developed, known as confocal microwave imaging, uses ultrahigh bandwidth microwaves to scan the breast for tumors. The microwaves are extremely low power. According to Fear, "they have much less power than even a cell phone."

The microwaves are emitted by a small antenna, which then picks up the returning wave after it has been reflected by the breast. Tumors give a larger reflection than regular breast tissue, so by scanning the microwaves over the whole breast, the reflections can be added up to make an image of the tumor.

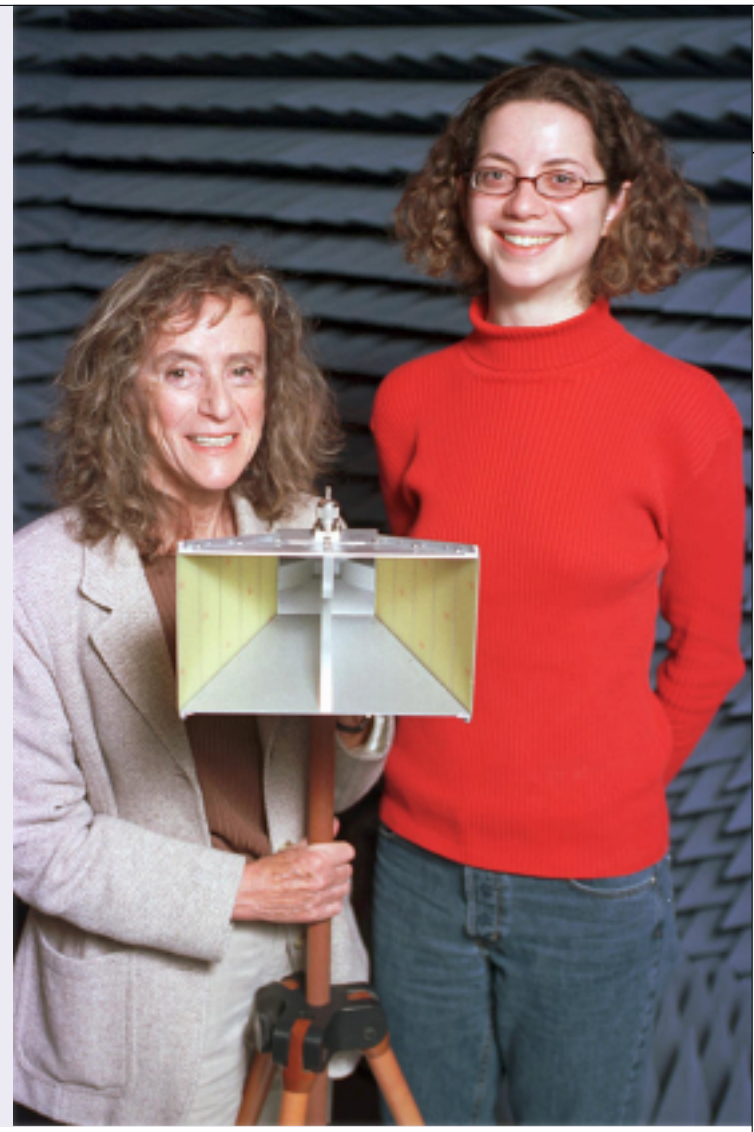
One of the biggest challenges faced by the team was to design the right antenna. "We needed an antenna developed specifically for this application and frequency," says Fear. The team created their own antenna, and is also exploring alternate designs.

Developing a model on which to test the antenna was also a challenge. They eventually settled on a PVC tube to simulate the skin of the breast, a plastic rod for the tumor and air in between for the breast tissue. Microwaves "see" much the same difference between air and plastic as they do between tissue and tumor. "It's a really primitive model," Stuchly admits. "We're checking if our method can be implemented without investing in anything expensive." The team hopes to move eventually to a more realistic model.

The initial results of their research show promise. Using their basic model, they are able to detect the presence and location of the "tumor," or thin plastic rod. The team is confident the method can work, though Fear is quick to add "probably not next week!" Stuchly agrees. "A lot of work is still required to make it feasible for clinics."

The method is well worth the work. The radiation used in confocal microwave imaging is non-ionizing, which means that the radiation won't break any molecular bonds in the breast tissue. This could make the process safer than mammograms, which use ionizing x-rays. Also, confocal microwave imaging wouldn't require compression of the breast tissue, as mammograms do.

Fear is eager to continue her work on confocal microwave imaging. With one in nine women predicted to acquire breast cancer in their lifetimes, Stuchly speaks for Fear and many other people when she says "keep your fingers crossed that this method pans out."



Diana Nethercott photo

Fear (right) and Stuchly with the custom antenna their team designed

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facts from the EDGE

- Dr. Elise Fear completed both her MSc and PhD in electrical engineering at UVic. While here, she was the student representative for the Engineering in Medicine and Biology Society of the Institute of Electrical and Electronic Engineers (IEEE) and an organizer of the UVic Women in Science and Engineering group. She now holds a Natural Sciences and Engineering Research Council-supported post-doctoral position at the University of Calgary, and will be taking up a faculty position there next year.
- Dr. Maria Stuchly is a professor in the electrical and computer engineering department. She holds the NSERC/BC Hydro/TransAlta Utilities/Bell Mobility Industrial Research Chair in Electromagnetic Fields and Living Systems. Her current projects include research into the effects of power lines and cellular telephones on the human body.
- A group of undergraduate students have also worked with Fear and Stuchly as part of their fourth-year research project. Two co-op students — Andrew Law and Jeff Bill — are currently part of the confocal microwave imaging team.

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- The undergraduate students who worked on the confocal microwave imaging project prepared a Web site as part of their evaluation. It gives a great overview of the project, describes how confocal microwave imaging works, and goes into the details of designing the antenna and model and analysing the data. **www.ece. uvic.ca/499/2001a/group08/BreastCancer. html**
- The US Institute of Medicine published a report earlier this year about new methods of breast cancer detection. You can read "Mammography and Beyond: Developing Technologies for the Early Detection of Breast Cancer" on their Web site. **http://search.nap.edu/books/0309075505/html/**
- The Canadian Breast Cancer Network is "the national network and voice of breast cancer survivors." Their Web site is rich in resources, including a searchable database of breast cancer support groups, articles on breast cancer advocacy, and bulletin boards for current information on a variety of topics. **www.cbcn.ca**
- More than 1,000 delegates will gather in Victoria June 4-8 for the World Confrence on Breast Cancer, at which they will share ideas and plan action for the eradication of breast cancer around the world. **www.worldbreastcancerconf.ca**