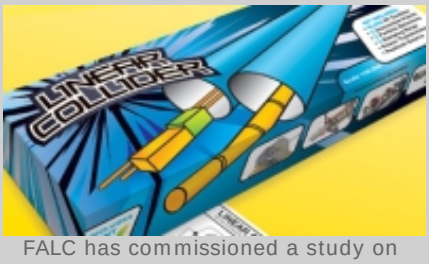
ILC industry thinks outside the box

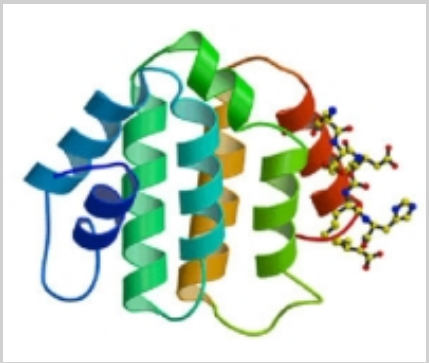
What do the International Linear Collider and nuclear waste transmutation, cargo inspection or food and water sterilisation have in common? Technology. The same technology that the ILC will use to explore the fundamental nature of the universe may also have potential applications in other areas of science and industry. This is what a group of ILC scientists and industry met to discuss at an ILC Technical Applications Workshop on 15 May in Dulles, Virginia.

Hosted by the Linear Collider Forum of America, Ken Olsen, the president of the organisation which now has 31 members in the U.S. and Canada, arranged for industry members to attend the meeting, share their own company's specific technological interest and then brainstorm potential applications with ILC scientists. Bill Umbenhaur of Everson Tesla, for example, wanted to know more about long-term medical applications. But Dean Hoffman of Sciaky was interested in general lab services and machines. Charged with thinking outside the box, the attendees divided into smaller groups: superconducting linear accelerators, superconducting cavities, high power rf technology, instrumentation and detectors.



FALC has commissioned a study on the technical benefits of the ILC, something that will push scientists to think outside the box.

Nuclear waste transmutation was a topic of discussion for the superconducting linear accelerator group, led by Cornell University's Maury Tigner. Using a high-powered continuous wave beam, a superconducting linear accelerator could potentially process nuclear waste, easing the need for storage facilities like Yucca Mountain that will one day reach a capacity. "The physics is understood, but the target technology would need work for this application," said Tigner. The challenge would be shutting it down and starting it up again rapidly, but the group agreed that this might be an engineering problem that is solvable. In addition to nuclear waste, a superconducting linac may also be used to treat sewerage, using an electron beam to kill bacteria.



The superconducting technology used in XFEL accelerators will allow scientists to study the motion of proteins in real time. (Image courtesy of KEK)

The Detector Group concluded that using the high power beam from a superconducting linac, together with the large-area, low-cost detector technology that is being developed for the ILC, rapid scanning of cargo for contraband might be possible. The linac beam would excite the material inside the container and the resulting emissions would be measured by the detectors, fingerprinting the material fast enough for spotting contraband. An alternate scheme using the deflection of naturally occurring cosmic rays is also being investigated.

As for possible medical applications, meeting attendees concluded that while linear accelerators could be used for radiation therapy, their complexity and current high price makes it difficult to compete with the room temperature accelerating cavities that are currently used by hospitals around the world. The high-power and efficient beam that a superconducting cavity can produce, however, still holds potential for the medical industry. The ILC will continue to push superconducting technology forward, possibly making it more practical for use in a doctor's office one day.

Studying the motion of proteins in real time is another possible medical application for superconducting cavities. The X-Ray Free Electron Laser (XFEL) accelerators, which use the same kind of superconducting cavities that the ILC will develop, will produce quick, short x-ray pulses that will be 1000 times faster than existing sources in today's medical facilities. These super-fast pulses will make it possible to record time-resolved images of chemical reactions. "This will give scientists a glimpse on a time scale never before possible," said Fermilab's Shekhar Mishra who attended the workshop and led the discussion for superconducting cavity applications. "Imagine being able to see how a drug is changing the molecular structure of proteins in real time. This will give the scientists a unique tool to create pharmaceuticals that can fit the shape of a certain human biological molecule and thereby deliver their effect in a very specific way."

Scientists and industry members will continue these discussions, and all of the conclusions from the meeting will be used in a study on the technical benefits of the ILC, commissioned by the Funding Agencies for Large Colliders (FALC). Similar discussions are also taking place in Europe and Asia, and all of the outcomes will be summarised in a report to be published this November. Paul Grannis, of the Department of Energy, is a member of the FALC sub-committee that is conducting the study and attended the recent workshop. "There is a well-understood set of scientific goals for the ILC, and the impact of ILC technology on other scientific facilities will be large" he said. "There also needs to be a case outlining the possible practical applications, without overstating their potential. Some of the immediate benefits can be rather clearly seen; the longer term applications are harder to foresee, but they are perhaps the most rewarding."

-- Elizabeth Clements