

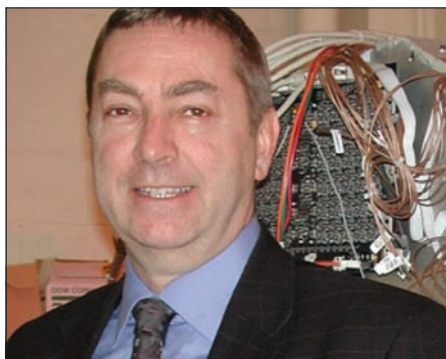
A new challenge for particle physics

TRIUMF's new director **Nigel Lockyer** looks to the future of co-operation in particle physics, and Canada's role in this increasingly global adventure.

Particle physics often describes itself, and correctly so, as having brought countries and people together that previously had been unable to co-operate with each other. In Europe, CERN was born out of a desire for co-operation. This was evident later, for example, when Russian and Chinese scientists worked well together within the US throughout the Cold War. This spirit of connection across national boundaries led to success for our science – and for us all as scientists. The strong innate desire to understand our universe transcends our differences. Our field was in many ways, or so we like to say, the first and most successful model in modern international relations. CERN embodies this co-operation.

Nowadays, however, we cannot rest on our laurels. This co-operation is happening in almost every other field of research; international facilities and multinational teams of researchers are no longer unique to particle physics. So what is the next level of co-operation for us? To some it might be obvious. We should continue to strive for a seamless global vision of science projects, and we should distribute those projects around the world so as to maximize the benefits of science in all countries, large or small, rich or poor. The ITER and LHC projects perhaps exemplify global projects: the world unites to select, design, build and operate a project. Particle physicists, as everyone knows, are considering another one, an International Linear Collider (ILC).

The Global Design Effort (GDE) for an ILC is not “flat” globally, but is a merging of regions. The world has been divided into three geographical areas: Asia, the Americas and Europe. In this mixture, Canada is an interesting case study. TRIUMF, Canada's National Laboratory for Particle and Nuclear Physics is located in Vancouver, on the Asia-Pacific rim, yet only a few miles north of the US border. TRIUMF, though a small laboratory, hosts more than 550 scientists, engineers, technicians, postdoctoral fellows



and students, and more than 1000 active users from Canada, the US and around the world. Historically, TRIUMF and the Canadian particle-physics community have made significant intellectual contributions to the major projects – both on the accelerator side and detector-physics side – in Europe at DESY with HERA and ZEUS, LHC and ATLAS at CERN, and most recently in Japan with T2K at JPARC. Canadian particle physicists have also been active in experiments in the US, such as SLD and BaBar at SLAC, CDF and D0 at Fermilab and rare-kaon experiments at Brookhaven National Laboratory.

TRIUMF also has a world-leading internal radioactive-beam programme using the ISOL technique, familiar at CERN's ISOLDE. TRIUMF's nuclear physicists are collaborating with China and India and have strong ties to France (Ganil), Germany (GSI), the UK and Japan. TRIUMF is truly global, reflecting that Canada is close to Europe in culture, close to the US geographically and culturally, and is on the Asia-Pacific rim. Canada also continues to merge the culture of nuclear and particle physics, just as CERN is doing at the LHC with ALICE, ATLAS and CMS. A good example is the Sudbury Neutrino Observatory (SNO; p26), where particle and nuclear physicists came together and did great science. SNOLAB will also merge nuclear and particle physics to pursue neutrino and dark-matter searches (p19). TRIUMF's infrastructure and technical resources allowed Canadian physicists to help

build SNO and will be important in the future for experiments at SNOLAB.

TRIUMF is not yet fully engaged in the ILC effort. Given its history, it is obvious that it will want to participate significantly. Canadian particle physicists are big proponents of an ILC and believe that it is a great opportunity and that it has tremendous discovery potential. However, the area of TRIUMF's involvement and with which regions it will partner is under discussion.

One fact remains: involvement in any international science project must also feed back to help the internal national programmes. Advances in accelerator technology and detector development for the LHC help the entire national science programme, including nuclear physics, life sciences and condensed matter physics. ILC and superconducting radio-frequency (SRF) development will also be important for Canada and TRIUMF's internal programmes. The latest ILC technology will bootstrap other vanguard technical developments in each country just as we hope that the globally distributed computing for the LHC, such as TRIUMF's Tier-1 centre, will have a similar impact.

A strong national science programme supports educational advances and is necessary for innovation and economic prosperity. We should keep this in mind as the world considers the ILC and other large projects, such as next-generation neutrino observatories or underground laboratories. TRIUMF's and Canada's strategy is to develop niches of national expertise while participating in exciting international science projects such as the LHC and ILC. The development of such niches is essential to the future prosperity of our field.

All of this will require strategic regional and global planning in particle and nuclear physics. Surely, we are up for this challenge!

After investing in ATLAS and LHC for many years, Canada and TRIUMF are looking forward to a decade or more of great discoveries.

Nigel Lockyer, TRIUMF director from 1 May.

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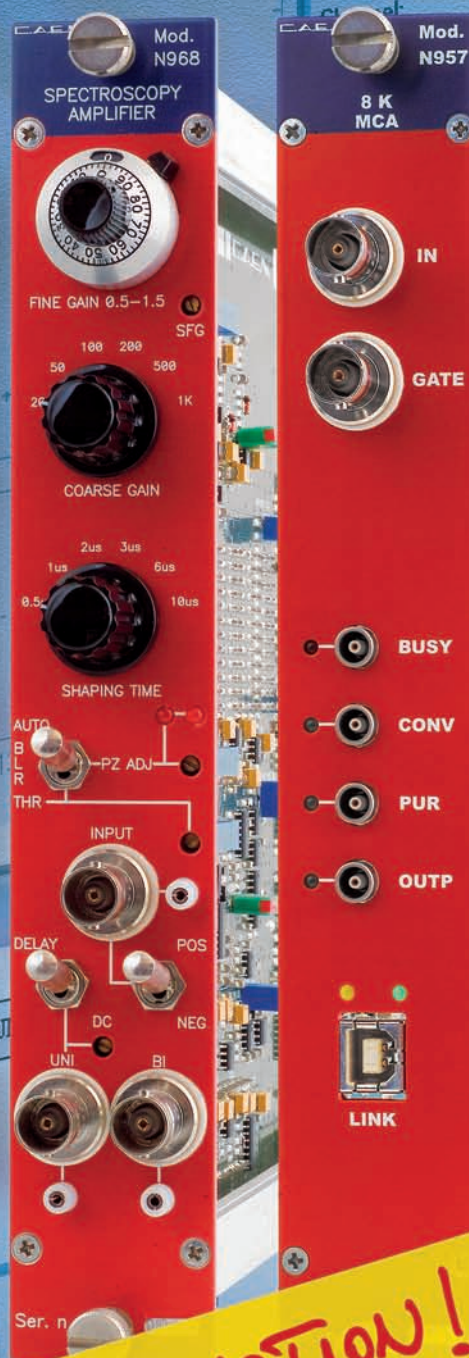
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