



Bulletin and 'The Times' newspaper. Clive Marsh, our Chief Scientist, gave an invited lecture to the Chief Scientific Advisor to the Ministry of Defence, Professor Sir Keith O'Nions and his Technical Executive at The Royal Society. The presentation and supporting exhibition illustrated the technical challenge of sustaining nuclear weapons in a test ban era and the investments being made in advanced technologies, novel scientific facilities and skilled people.

Programme of work

One important aspect of the science programme at AWE is our interaction with our international collaborators. These collaborations can range from individual scientific investigations to joint major experimental efforts.

During 2002 AWE and the Los Alamos Nuclear Laboratory (LANL) exhibited their considerable teamworking skills and project management abilities in the successful completion of a collaborative experiment at the United States' test facility in Nevada.

One key criterion in the high power computing and hydrodynamic experiments used to validate complex predictive models is a detailed understanding of the behaviour of plutonium under extreme pressure and temperature. We have gathered data from explosively-driven experiments using surrogate materials but, since plutonium has unique characteristics, we welcomed an opportunity offered by LANL to conduct a sub-critical experiment.

The information gathered from the experiment, named "ETNA", was required to validate and develop AWE's computational modelling capability and form a baseline against which changes in manufacturing processes, or deviations observed in our stockpile, can be addressed.

The results were some of the best and most useful data ever captured from this type of experiment.

As a result of this exciting and effective partnership with LANL, we are looking forward to further, more ambitious, collaborative ventures of this type.

The considerable progress made in 2001 in materials science continued in 2002. Advances were made in understanding the key materials ageing processes in the nuclear warhead stockpile. Our capability to assess these processes increased with the commissioning of new equipment and laboratories. Research and development on a variety of physical and chemical sensors also progressed. In addition, the use of high energy X-rays for 3-dimensional computer tomography was further developed for non-destructive evaluation.

Along with progress on materials ageing, research work continued on calixarenes (cup-shaped molecules 'designed' to capture heavy metals) for their use in a portable uranium detector instrument and for water purification.

Overall, 2002 was a year of significant achievements in strengthening our science and technology environment and progressing our technical programmes in support of our mission.

Looking forward to 2003 and beyond, we face a number of exciting challenges. In the next two years we hope to see progress on both the HRF and ORION laser; completion of a number of key stewardship experiments; upgrades to the new super-computer; a state-of-the-art conference centre and accommodation complex.

These investments, built upon the base of the achievements of the past few years, will put AWE in the position of continued success in its mission and will provide continued excitement as an environment for science and technology excellence.

For example, our production of external publications in refereed journals and conference proceedings in 2002 increased by some 15 per cent over the previous year. We also entered into stronger partnership with other science and technology organisations such as the Rutherford Appleton Laboratory and DSTL.

In a significant step towards a stronger research environment, we introduced an element of fundamental discretionary research into our programme. This AWE Discretionary Research Fund (ADRF) seeks to support research studies that have a highly innovative character, a long-term technology perspective, and the potential for significant impact for our core mission work. Examples of work funded by ADRF in 2002 include constitutive theories for viscoelastic materials, optical initiation systems, and alternative approaches in radiography.

We took up opportunities to publicise these excellent scientific achievements and programmes with articles in the scientific journal 'Nature', the Institute of Physics