

In 2004 the CUDOS program of Flagship projects deconstructed a photonic integrated circuit into a number of key science and technology building blocks, one per Flagship. The demonstration of these would lay the path towards the development of practical integrated photonic devices.

At the end of 2010, over six years since the start of the Flagships, we can claim success in many of the technologies crucial for photonic integration. We have succeeded in writing waveguides of exceptionally low loss in both linear and nonlinear material. We have used nonlinearity to achieve nonlinear switching at terabit data rates, exactly as we had predicted. We have harnessed slow light to dramatically reduce the threshold at which these nonlinearities can be excited. We have shown that sub-wavelength

optical structures in one, two, and three dimensions can be used to control and tune these nonlinear interactions over dramatically shorter length scales than had previously been predicted.

The importance of the science underpinning these advances is highlighted by the journals in which the results were published: *Nature Photonics*, *Advanced Materials*, *Physical Review Letters*.

This report details our achievements during 2010 in each of these areas, and contains brief summaries from each of our Chief Investigators, our science leaders, of their contributions to the CUDOS research program. The report also marks the end of each project; in 2011 we will commence a new program that builds on the successes of the last eight years.

