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NEWS

MAJOR PROGRAMME OF RESEARCH INTO LOW-DIMENSIONAL STRUCTURES

The third research centre to join Britain's major programme of investigation into "low-dimensional structures" (LDS) has begun operating at the Cavendish Laboratory of Cambridge University.

Low-dimensional structures are formed by the precise deposition of flat, well-defined layers (typically only a few atoms thick) principally of crystalline semi-conductors, and by the formation of narrow channels using ion beam lithographic techniques. In such structures, which do not exist in nature, nearly all physical properties are changed from those of normal bulk solids. Entirely new phenomena appear when electrons in a solid are no longer free to move in three dimensions, and the research programme is therefore expected to lead to important developments in condensed matter physics and possibly a new generation of smaller, faster microchips.

Already the UK Science and Engineering Research Council (SERC) has committed some £9 million to the LDS programme, and a further £15.3 million is likely to be spent over the next four years.

The main elements in the scientific programme are "growth centres", which will provide the precise, complex semiconductor samples needed. Six have so far been approved. At the beginning of the LDS project in 1985, three major grants were approved for growth centres at Oxford, Nottingham and Cambridge Universities. The metallo-organic chemical vapour deposition equipment at Oxford began operating in February 1986, and the molecular beam epitaxy (MBE) equipment at Nottingham in April.

The centre at Cambridge is also based on MBE equipment manufactured in Britain. Its funding is partly supported by British Telecom Research Laboratories and the GEC Hurst Research Centre under the SERC's Co-operative Research Grants Scheme. Three further centres will be at Hull and Warwick Universities, and Imperial College, London, all employing molecular beam epitaxy.

Samples to be produced at the Cavendish Laboratory will consist primarily of layers of gallium arsenide and gallium aluminium a few atoms thick.

A special feature of the Cambridge work is the use of ultra-fine lithography to produce one-dimensional parts in the structures, such as arrays of lines within the layers. There are many interesting possibilities in designing such structues, some of which should exhibit novel electronic and optical properties. The lithography will eventually take place within the ultra-high vacuum of the MBE machine, which was designed and built with this in mind.

The UK electronics industry attaches great importance to LDS research in universities, and to date compa nies have provided well over £2 million in direct support. The variety of possible low-dimensional structures far exceeds that of conventional bulk solids. (Science Series, A Supplement to '*Spectrum* – British Science News' No. 204, 1986 British Information Services, British High Commission, New Delhi 110 021).