

SCIENCE RESEARCH COUNCIL

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SCIENCE BOARD

PHYSICS COMMITTEE

Proposal for the establishment of a high-powered laser facility - progress report

At its meeting on 31 May 1973 the Committee considered a report entitled 'Proposal for an SRC central laser facility for the production and study of high-density plasma' which had been prepared in consequence of the Plasma Physics Panel's survey of university research.

The Committee considered that the proposal rested unduly on the production of superdense plasma, that in turn is dependent upon a particular technique and would require success in an experiment about which very little is known except its extreme difficulty. The proposal still appeared to be too like a request from a university group to study fusion, which could be regarded as a matter for support by AEA and subject to technological needs. What is wanted is a broader scientific case giving full emphasis to the whole range of possible physics interest in the use of high-power laser sources. The Committee believed that such a case would justify the provision of a central facility.

Following discussions with the Chairman of Council a new Panel was convened to take this matter further. The minutes of its meeting of 29 November are attached for the Committee to NOTE.

SCIENCE RESEARCH COUNCIL

Meeting of a Panel set up to discuss the establishment of a high-powered laser facility, on 29 November 1973 at State House.

Present: Professor B R Coles (Chairman)
Professor D Bradley
Professor A F Gibson
Professor S R Ramsden
Dr R A Smith
Professor S D Smith

Staff: Dr J A Fendley
Mr M J Russell

The Panel was convened to discuss future actions towards the establishment of a high-powered laser facility.

1. Proposed scope of the operation

The Panel recognised two goals at which the operation might aim:-

- (1) the development of high-powered linear laser systems;
- (2) going beyond that building a multi-channel laser system for compression experiments.

The Panel felt strongly that any programme should be directed to the latter goal. Although interesting work could be done with a single-channel system, the exciting results would come from studies of superdense matter, from which a new physics would evolve with far-reaching effects in astrophysics and quantum electrodynamics. The cost of such a programme would be in the region of £4M.

At the same time, useful work on laser-matter interactions and non-linear optical systems would stem from building single-channel systems. If it proved that the programme had to be terminated at this stage (at an estimated cost of £1M) useful work would have been done, but much greater value would be expected to stem from the remaining £3M.

The earliest stages of a development of this kind could be carried out in Universities, but a central facility would be needed for the building of high-powered lasers. From this stage it would be necessary to second staff from Universities, and this could lead to problems in the development of their careers. An important by-product of this programme would be the production of a cadre of physicists with experience in the handling of high-density plasmas, who will be badly needed if fusion should ever become an important technology. University staff were not on the other hand, appropriate for the engineering work involved in a programme of this kind.

The Panel stressed that it did not consider that the development of a high-powered laser in a new frequency range was a sensible goal. It was, however, possible that one of the outcomes of laser compression studies would be the development of an X-ray laser. If this were so, the chosen site would be a suitable location for an intense X-ray facility.

2. Interaction with other ongoing programmes

Current activities of the Atomic Energy Authority and of the Ministry of Defence (AWRE) were mentioned. The work of AEA was constrained by its association with EURATOM, and was, in any event, strictly limited in scope, being confined to 'maintaining a presence' in the area, largely through computer simulation studies. The scale of effort was not expected to increase substantially in the foreseeable future. AWRE maintained an interest in weapons development. Both were directed towards fusion, and the Panel drew a distinction between the technology of fusion and the laser compression experiments now contemplated. It felt that the earlier submission to the Physics Committee had suffered from too great an emphasis on fusion.

Throughout the world some thousand workers were active in this area. The Panel was anxious that a programme should be established which competed internationally at the boundaries of knowledge and was of a quality that would attract active collaboration overseas. This would be especially important when the second stage of the operation was reached. On the most pessimistic interpretation, work elsewhere might have demonstrated that laser compression was impossible and the latter part of the programme a dead letter. A more hopeful view was that knowledge gained elsewhere would influence the course of the later stage of the UK effort. For these reasons it would not be possible at the present time to specify accurately the precise programme to be followed in those later stages.

3. Immediate actions

It was agreed that Professors Bradley, Gibson, Ramsden and Smith should draw up a proposal for a programme on the lines set out above. Professor Bradley would act as convener. The report previously put to the Physics Committee contained much material relevant to the present case. The field was still a very fast-moving one, and the situation might well have changed substantially in six months' time. The Panel should meet again in the first week of February to discuss the document prepared by Professor Bradley and his collaborators, which, it is hoped, would go before the Physics Committee at its meeting on 21 February 1974.

4. Date and place of next meeting

To be fixed in accordance with (3) above.