
Concluding Remarks

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Concluding remarks

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This has been a meeting where we have heard of great technological opportunities afforded by current research and development in building, but where we have not limited ourselves to discussing what research and development could achieve but rather have tackled from the outset the harder problem of how the advantages they offer may be realized in practice. Sir Maurice Laing reminded us that ‘the children of Israel made bricks’ while suggesting that building is still by and large a labour-intensive industry. There is, he argued, no lack of inventiveness by architects, engineers, scientists, marketeers, contractors, but there are difficulties inherent in the structure of the industry (difficulties to which other speakers also referred) that militate against effecting change.

Sir Maurice proposed a ‘private-enterprise’ road to improving matters based on a new organizational pattern, with a single contractor responsible for all aspects of a project: design and construction, together with control of performance, costs and time. The incentives to such a contractor to be research-orientated would be far greater than at present.

Other possibilities of improvement, this time through governmental initiative, were illustrated by Mr Finger in his description of the Operation Breakthrough programme, where federal assistance is given to a wide range of housing projects that meet certain quality-assurance conditions; this gives an attractive incentive facilitating acceptance of that technology which already exists but is not yet widely used. Mr Finger stressed the importance of framing specifications in the form of performance criteria (rather than of criteria regarding methods of construction). He reminded us also of the fundamental requirement of good site planning.

Mr Bishop described further paths to improvement through application of operational-research techniques. These suggest that difficulties in getting adequate utilization of capital equipment militate against full-scale industrialized building being likely to supplant on-site fabrication. An intermediate course seemed economically sounder: what he called ‘catalogue building’ that makes very full use of components from existing dimensional coordination series. This philosophy demands the generation of a ‘component-orientated market’.

A similar philosophy underlay the much later contribution by Mr Goodman which described a modern Department of Health and Social Security approach to hospital design, stressing modules, dimensional coordination and integration of services. Mr Goodman went on to show the great potentiality of high-speed computers in design, through the concept of a ‘harness-checkerboard’ pattern, together with a knowledge of traffic-relationships between Departments, being used to produce a program identifying the basic structural design and all the main necessary structural elements.

Professor Heyman sounded a more cautionary note regarding the use of high-speed computers in another part of the design process: structural analysis. He reminded us that computer programs in this field, however sophisticated mathematically, cannot produce results better than the fundamental assumptions on material properties used in them, which are often crude

indeed. For example, plastic deformation cannot be neglected in the design of steel structures, as (fortunately) is being more and more widely recognized.

Professor Heyman reminded us of an important alternative to an inadequately based numerical analysis: namely, actual physical modelling on a greatly reduced scale. A similar solution was later advocated by Mr Parkin for analysis of the acoustics of large halls. Just as the aerodynamic properties of aircraft shapes cannot be determined by computer and still need preliminary reduced-scale model testing in wind tunnels, so these structural and acoustic problems may be still too complicated to permit prediction of characteristics otherwise than by such preliminary physical modelling.

Both Professor Heyman and later Professor Harper described the problems of education for the building industry. They drew distinctions between undergraduate education, where the emphasis should be on fundamental material likely to be of long continuing relevance, and postgraduate education whether on the job or in post-experience courses where more emphasis will be placed on current practice and the presently feasible innovations.

Sir Ove Arup reminded us of a vital ingredient in a design that scientific analysis may neglect: delight! He emphasized the need for integration of engineers and architects into a true team activity, producing 'total design' with no gap between the vision and its embodiment. The scientists want to explore nature while the designers want to change nature. A true collaboration, however, may effect that harmonious synthesis of partly conflicting aims and obstinate facts which results in structures that are all of a piece, rather than too strong at one point and weak at another; structures with wholeness and clarity; structures in which 'we can feel at home'.

I should like to thank everyone who contributed to the fine exhibition of novel building materials held concurrently with this discussion meeting. This reinforced much of what Mr Allen and Dr Nurse had to say about the possibilities for the architect offered by many new materials developments: particularly concerning new concretes (with a better appearance, especially in wet weather) and other pleasing materials such as glass-fibre reinforced gypsum. Some other recommended variants on old themes included the use of synthetic clays, of large clay building units, and of steels weathering to an attractive brown colour.

All the bigger changes in materials are difficult to pioneer, however, since huge penalties threaten the designer whose pioneering work ends in disaster. Mr Allen reminded us that there also are educational problems involved in avoiding this: problems of instilling at the middle design levels an understanding of how to design with the new materials.

The Meeting's second day paid especial attention to environmental matters, beginning with Professor Ingerslev's very comprehensive review of noise control. The importance of planning and zoning was very clear from his presentation: noise annoyance is enormously reduced if industrial areas are kept separate from residential areas, and the latter are caused to include only local traffic.

Mr McGrath gave us a penetrating account of where air-conditioning is going, particularly in the United States where already the peak electricity demand is highest in the hottest days of summer! Such considerations led him to emphasize the need for systems less wasteful of energy, with preference given to refrigeration plant operated by heat (in practice, absorption refrigeration) rather than by mechanical energy, and to the same trend towards central plants producing district heating advocated later by Dr Aler.

The design and planning philosophies to which Mr McGrath's forecasts led him were quite remote from those of the traditional outward-looking American homes and communities: he

saw a future with increasingly more inward-looking, 'introspective' home units, highly insulated from outside noise and weather, but perhaps including semi-private sunbathed courts and roof gardens. This philosophy seems particularly attractive to introspective individuals, and probably also to the air-conditioning companies!

On the larger scale of the community, however, Mr McGrath encouraged us to see the introspective home owners of 1984 sharing in the use of extensive parks and playgrounds and of many other facilities. These might perhaps include Mr Parkin's multi-purpose halls, where at the flick of a switch controlling the regenerative reverberation system the acoustical characteristics can be changed from those desirable for speech to those required for concert performances. . . .

It was fascinating to hear from Dr Aler of the experience already accumulated in Sweden on district heating, where much more than half of the large town of Västerås is already heated by waste heat from power stations, and where the last stage of bringing the cooling water down to a desirably low temperature in winter is by running it under the roads to keep them clear of snow! Even more fascinating were the Atomic Energy Company's long-term plans, involving 500 MW electrical-power plants making available 1100 MW of district heating, with the probability of application in the nineteen-eighties to most of the Greater Stockholm area. In Britain, where different aspects of urban services are in the hands of different nationalized industries and other bodies, we have much to learn from descriptions like Dr Aler's of the possible results of planning urban services as a whole.

Mr Roberts reminded us of another remarkable development from Sweden: one where refuse is pneumatically collected, moving at 100 km/h along steel pipes. In other parts of his talk he vividly illustrated how romantic was the beauty of a well designed sewage works. . . . Above all, in his comprehensive review of urban services engineering, he gave us a perspective of the future possibilities and economics of water conservation.

He showed that high costs militate against some approaches to water supply, such as distillation of sea water (but a distillation plant is under construction in Jersey), and (especially) great estuarine-barrage schemes. The Rhine Delta scheme will however be watched with keen interest while Britain's own possibilities in Morecambe Bay and the Wash are further analysed. In the meantime the desalination methods that are much nearer the minimum power consumption imposed by thermodynamics, such as freezing and reverse osmosis, will be intensively studied in the hope of making them really practicable.

Lastly we have just heard from Professor Harper about the needs for strategic applied research in the building field. He divided the areas of research into improvement, innovation and environmental strategy, but a questioner (Dr J. C. R. Hunt) emphasized in the context of providing adequate homes for our population the importance of work not only on innovation but also on renovation! The Meeting may fittingly congratulate the University of Manchester Institute of Science and Technology on having, 13 years ago, created a Chair of Building, of which Professor Harper is the distinguished occupant.

In concluding, I have great pleasure in thanking the large audience for coming and taking part in this attempt to see as a whole all the vast spectrum of technological problems which relate to a single great industry and to relate them to a view of the long term future of that industry. Finally, I and my fellow organizers would like to give special thanks to all our speakers for the consistently high level of all their presentations, which have made this discussion meeting such a truly memorable event for all of us who have taken part in it.