theatre at University College would be crowded with apparatus, upon which he demonstrated, as he spoke, many of the experiments he was describing; and woven into each account was the historical background of the subject, enlivened by anecdotal illustrations often drawn from his own recollections and experience.

His great services to every aspect of British physiology are indicated by the many bodies of national importance on which he served with devotion of much time and effort, among them perhaps most notably the Medical Research Council. He was elected FRS in 1925, FRCP in 1929, was knighted in 1951, received honorary degrees from the Universities of Birmingham (his birthplace) and London, was a fellow of University College London, and of the Royal Veterinary College, London, and an honorary member of many learned societies, including the Physiological Society, which gave him especial pleasure.

# Correspondence

## Is Botany Dead ?

SIR,—I have followed the article by Sir Frank Engledow and other correspondence on "Is Botany Dead ?" with great interest (*Nature*, 220, 521, 541 and 834; 1968). It seemed to be generally agreed that the main contributory factor to the present disinterest in the subject was its bad image to the public at large.

Various ways of solving the problem have been put forward, but none of these seem to attack the root cause. This, in my opinion, is the fact that botany has now split up into many varied branches, each of which is now considered as a separate science. Thus all the major research done on plants, and the exciting discoveries resulting from this, come under the heading of molecular biology, genetics, biochemistry, etc. This relegates botany to the pursuit of nature fanatics, flower pickers, amateur gardeners and the like, which takes it out of the realms of modern science.

The solution to this is either to drop the word botany from scientific usage—maybe to be replaced by "plant sciences"—or else to make a concerted effort to re-establish the link between it and its many subsidiaries in the eyes of the ordinary man.

Yours faithfully,
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## Scientists Informed

SIR,—During this year, we have had the International Federation for Information Processing Conference and many official reports on the subject of information retrieval and associated computer science topics, all of which have portrayed an unsatisfactory state of affairs strangely at variance with claims made for specific projects in the mass communication media. The report of the Parliamentary and Scientific Committee on the subject revealed a deplorable lack of communication between the specialized groups involved and concluded that the scientific and technological information network of the country was as good an example of a non-system as it was possible to find. More recently (*Nature*, 220, 320; 1968) the Royal Society conference on the subject called attention to the inadequate progress made since its last deliberations in 1948 and concluded that the remaining problems of computer based information retrieval would not be solved until machines expressly designed for the purpose were evolved. If investment and volume of activity in the field had been small, this state of affairs would be understandable, but in fact vast sums of money have been spent, particularly in the United States, and the volume of literature in the field almost constitutes a mini-information explosion in its own right. Clearly, the causes of failure cannot be attributed solely to the scientific difficulty of the problem, for a great many able minds have considered it from many specialized points of view.

Having recently brought my own work in the field to the point of implementation, I have been taking a strategic look at official and academic attitudes to present and future information retrieval problems. Not only are the conclusions of the bodies mentioned here supported, but there is abundant evidence that there is little interest in seeking solutions outside conventional hardware and software philosophy. Few, if any, computer scientists recognize that the information handling as distinct from the numerical processing aspects of computer design are at the present moment theoretically inadequate. There is certainly no enthusiasm for a specific information handling machine, despite the fact that such a project would represent a better investment in both academic and commercial terms than many of the projects currently being funded, some of which are undoubtedly doomed to obsolescence in the prototype phase. Computer scientists seem to be more motivated by professional chauvinism and the politics of fund raising than concern for extending the theoretical base of computer science and there is abundant evidence of over-specialization. Few, if any, think beyond the confines of numerical mathematics and conventional boolian logic.

Other professional groups involved, information scientists, statisticians and librarians, likewise tend to be unable to see beyond the narrow confines of their own art. Many statisticians seem unable to grasp the fact that the real information retrieval environment is statistically inhomogeneous and librarians tend to look on the computer merely as a way of mechanizing their traditional approach to subject matter. In all groups there is a curious dichotomy between privately expressed interest and enthusiasm and official conservatism and complacency.

What then is the answer to this problem which affects almost every branch of scientific endeavour ? Firstly, some of the massive new funding of projects needs to be directed to areas where there is a possibility of fundamental long term advance, rather than merely rehashing of existing technology to produce short term political and commercial gains. Secondly, experts in the various fields have got to be prepared to extend their knowledge to the point where they can see realistic generalized solutions related to other people's disciplines. And, finally, there must be official implementation, not just lip service, to the idea that original and adventurous thinking in science is worth supporting. Competition in the field of ideas is, in the long term, a sounder investment for a country of limited productive capacity than financial jiggery-pokery.

To conclude on the specific topic of this letter, it is my contention, based on my own work, that the development of an information retrieval computer could be brought to prototype phase within one year for a cost in the region of £100,000. The device would be based on an autocoded internal metalanguage structure for associative memory and learning functions. Input, output and most programming operations would be in natural language, from a VDU keyboard. The metalanguage processor could be built from standard logic elements and any commercial computer with variable word length and multi-programming facilities could be used as a basis for design. In addition to commercial opportunities in one of the few computer markets which is not overcrowded, the device would have applications in linguistics, pattern recognition, computerization of medical records and mathematics of higher finite group spaces.

Yours faithfully,
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