Conclusion

Such is a very rough-and-ready sketch. I am profoundly aware that already a few courses organised on these lines exist and that much may be learned from them. I am also aware that the best results of such a course could be obtained only if it interlocked with the teaching in the clinical years far more closely than does the present preclinical course. Such interlocking is implicit in the structure of the new course's third year: much of the sociology, for example, would be taught by medical men from the fields of social medicine and of the psychology of industrial and group relations. Doubtless some crusading zeal could be lavished on the last years of our present curriculum too! But I am trying to be very strictly practical; everything I have suggested could actually be put into practice—as an experiment—without too much trouble with regulations, I believe, at any of a number of medical schools in the United Kingdom.

The General Medical Council in its 1957 *Recommendations as to the Medical Curriculum* has removed its previously rather detailed recommendations about the teaching of particular subjects. The present recommendations have been drawn up specifically to foster experimentation with the curriculum: they " refrain from specifying the period of time to be allotted to particular subjects or the sequence in which they should be taught . . . and from specifying subjects in which separate examinations should be held ". The Council make a particular point of asking schools not to regard their activities as " in any way limiting their own right, which may equally be described as a duty, to experiment with different courses and various methods of teaching ".

The present proposals should be viewed in the light of this recommendation. Summing them up one could say they imply a three-year preclinical course covering all the present ground of 1st M.B., 2nd M.B., and general pathology, but reorientated in consecutive courses entitled Cellular Biology, Organisation of Mammals, and Organisation of Man. Biochemical genetics enters the course at the start; ethology is part of it all along. The growth process is used to introduce anatomy and physiology and at the same time behavioural development. The concepts of maturation and learning introduce normal psychology, family studies, sociology, and finally a discussion of the role of the doctor—or various sorts of doctors—in our society.

I am sure much more thought and a great deal of experiment must go towards making a real course in human biology for doctors; but I think we ought to face squarely the implications of the modern nature of medical practice in our society. I believe we should seriously consider giving thought to the reorganisation of the curriculum from the point of view of the human biologist. We might further invite the views upon this of a variety of disciplines outside our own to see what their representatives conceive of as the doctor's role and his training for it. In this way we would gradually work towards the time when we could envisage setting up an experimental training in line with these emerging conceptions, and in which studies of human biology would exert their true usefulness in the training of medical men.

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INVESTIGATION OF ABDOMINAL MASSES BY PULSED ULTRASOUND

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VIBRATIONS whose frequency exceeds 20,000 per second are beyond the range of hearing and therefore termed " ultrasonic ". One of the properties of ultrasound is that it can be propagated as a beam. When such a beam crosses an interface between two substances of differing specific acoustic impedance (which is defined as the product of the density of the material and the velocity of the sound wave in it), five things happen:

(1) Some of the energy is reflected at the interface, the amplitude of the reflected waves being proportional to the difference of the two acoustic impedances divided by their sum (Rayleigh's law). Therefore the greater the difference in specific acoustic impedance between two adjacent materials the higher will be the percentage of energy reflected. This fact makes a liquid-gas interface almost impenetrable to ultrasound and is important in relation to gas-filled intestine within the abdominal cavity.

(2) Much of the energy which is not reflected is transmitted into the second medium but is somewhat attenuated.

(3) Some refraction may occur, particularly when the ultrasonic beam is not at right-angles to the plane of the interface.

(4) Some of the energy may be absorbed and produce heat. The ability to absorb ultrasound varies with different tissues —e.g., that of bone is considerable.

(5) Cavitation may be produced if considerable energies are present at the lower ultrasonic frequencies. This phenomenon, whose mechanism is not yet fully understood, can develop when the negative sound pressure exceeds the ambient hydrostatic pressure, giving rise to small temporary voids in the material. Cavitation becomes increasingly difficult to produce as the frequency of the ultrasound is raised, and usually develops only when the ultrasonic energy is applied continuously or in pulses of much greater duration than those we use. Nervous tissue is more susceptible than other tissues to cavitation (Fry et al. 1950).

For diagnostic purposes reflection and transmission are the important phenomena. Transmission is ruled out in our type of investigation because of the multiplicity of interfaces within the abdominal cavity and the impenetrability of tissue-gas boundaries. The recording and mapping of echoes from the reflecting interfaces is therefore the method of choice, which has been extensively used for many years in industry for detecting flaws in homogeneous materials, particularly metals, and the information so obtained may in some instances be superior to radiography, even with 2,000,000-V X-ray machines.

The use of ultrasonic echoes in studying human tissues promises to be much more complicated because of the great variety of tissues concerned and, it is believed, the not very large differences in specific acoustic impedance between them. It is therefore not surprising that results so far do not appear to have matched the technical ingenuity which has been shown in recent years.

A-scope Presentation

To confirm that echoes were obtainable within the body we started modestly with this method of presentation,