

ALFRED WATSON MEMORIAL LECTURE

THE UNIVERSITY AND VOCATION

BY SIR JOHN HABAKKUK

THERE is an old distinction between liberal education and professional education; between on the one hand the cultivation of the powers of the mind as an end in itself, and, on the other hand, education to a specific end, the efficient performance of a professional activity. The precise nature of the distinction and the exact labels used may vary, but some such demarcation has been a recurrent theme in writings on education, I suppose since Aristotle.

The distinction was articulated most clearly by Cardinal Newman 125 years ago in his *Discourses on the Scope and Nature of University Education*. Newman is as good a starting place as any. "Liberal education", he wrote, "is the process of training by which the intellect, instead of being formed or sacrificed to some particular or accidental purpose, some specific trade or profession or study or science, is disciplined for its own sake . . .". Its purpose is, "to open the mind, to correct it, to refine it, to enable it to know, and to digest, master, rule and use its knowledge, to give it power over its own faculties, application, flexibility, method, critical exactness, sagacity, resource, address, eloquent expression". Intellectual excellence in this sense is an end in itself; just as general bodily health is good in itself, worth seeking and cherishing even if we do not intend to dig roads or build bridges.

Newman contrasted this with professional education. The distinction was not that liberal education was superior in the sense of calling for higher mental faculties; professional education might be highly intellectual. Nor was the distinction one of usefulness. There was no doubt about the usefulness of the trained mind devoted to a specific profession. "General culture of the mind is the best aid to professional study . . . the man who has learned to think and to reason and to compare and to discriminate and to analyse, who has refined his taste and formed his judgment and sharpened his mental vision, will not indeed at once be a lawyer, . . . or a statesman, or a physician . . . or a man of business, or a soldier or an engineer . . . but he will be placed in that state of intellect in which he can take up any one of [these] callings with an ease, a grace, a versatility and a success to which another is a stranger". The distinctive feature of professional education was that it "ministered to something beyond, some ulterior end; it was devoted to some specific profession not 'the culture of the intellect'".

The distinction as put by Newman was bound up with a very restricted view of the subjects suitable for a liberal education, and particularly with a view of the central role of theology which few of us would share. But even when we are discussing subjects which are linked to the practice of a particular profession we do make a distinction which is in some ways analagous. We draw a distinction

between the fundamental principles of the intellectual discipline which underlies a particular profession, and the problems which arise in the actual practice of that profession. Thus, in examining legal education the Ormrod Report draws a distinction between an academic stage and a vocational stage. At the academic stage the object is to familiarize the student with the basic concepts and theories of his subject as well as to provide a wide educational background. The vocational stage is dominated by the needs of the practitioner in dealing with the actual problems which arise, e.g. in trials or advising on evidence. I illustrate from the example of law. But there is a comparable distinction in engineering or medicine. The difference is not that we use our minds at the academic stage and not at the vocational. The difference is between two different types of operation. In an academic study, as Dr Stephen Bragg has aptly expressed it, the object is to explore "the common principles correlating particular aspects of apparently disparate phenomena". The aim is to deepen understanding; we generalize. When we have to face particular problems that confront us in practice we have to draw on a diversity of subjects; we particularize.

Without probing further the strength of this distinction I want to consider a series of related questions. What should be the balance between the academic and professional elements? At what stage should professional elements be introduced? How should the various stages in the education of a professional man be co-ordinated? In what institutions should various forms of education (and particularly the professional) be given? The various professions, of course, vary greatly in their institutional framework, in the power of their professional associations, and in the sort of knowledge they require of their practitioners. In law the academic component is large in relation to the professional, and the academic education is for the most part given by those who have never practised. In Medicine the clinical professors are eminent practitioners and a longer period is spent on professional training than on medical science. Detailed answers to the questions I have posed would require a familiarity with particular circumstances which clearly I do not possess. But there are some general issues of professional education and training which can usefully be considered.

These general issues are matters of much more concern than they were even 30 years ago. In the first place, professional education and training are very labour-intensive activities. Opportunities for achieving a continuous increase in their productivity—by better organization of operations, by substituting capital for labour, by technical progress—are not available as they are in other sectors of the economy. So that, as real incomes rise, professional education—as indeed all forms of education—tends to become a relatively more expensive activity. This is quite apart from any increase in the expertise required of the professions. But, of course, over the last 30 years there has been a growth in the knowledge relevant to the performance of the professions. As the President of Harvard said: "One of the most striking developments since the war has been the growing dependence of our society on expert knowledge. In contrast to the situation that prevailed only two generations ago, there are few positions of leadership that can be reached

today without some form of advanced training beyond the college (i.e. undergraduate) level." This means that the period before a man or woman becomes a full professional is longer and that the various stages have to be co-ordinated.

There is a particular reason for considering the role of the university in education and training for the professions. A higher proportion of the age group now go to the university. The recent British Association report on "Education, Engineering and Manufacturing Industry" shows how far-reaching have been the effects of the switch to the 'degree route' to the professions from the older route via employment and part-time study.

As a result of the increase in professional expertise and the increase in the university population, many professions old and new have become graduate professions. The universities are major suppliers to the professions. Over 3,000 doctors and dentists, 8,000 engineers and technologists, some 2,500 lawyers, 500 architects, many surveyors and town planners graduate each year from British universities and large numbers of graduates from a diversity of disciplines enter business, accountancy, the social services, and central and local administration.

There can be no doubt therefore about the importance of the questions. In principle—and it is sometimes helpful to consider a question in the abstract—people can be educated and trained for the professions in a variety of ways. There are two broad possibilities: the education and training elements can be separated from each other or they can be combined.

Consider first the arrangements where the two elements are split. Under one form of these arrangements, the university takes responsibility for only the educational element, and postgraduate professional training—its content and assessment—is the responsibility of professional bodies and often provided on the job. The training of an actuary conforms, perhaps, to this pattern. Or, a variant, the postgraduate professional training is the responsibility of a specialized institution designed for the purpose. On a relatively small scale the Institute of Technology at Cranfield is such an institution. So is the R.A.F. College at Cranwell under the graduate entry scheme. In former times the Inns of Court were specialized institutions in this sense. Or, another variety, education at the university and training on the job can be dovetailed into each other, as they are in the sandwich courses in engineering which, in the thick courses involve two years at the educational institution preceded and followed by a year in industry.

Now consider the second main possibility, where the educational and training elements are combined. They can be combined and both be undertaken in the university. This is the way in which the training of secondary school teaching is organized in this country: the postgraduate year combines theory and practice under the auspices of the university. It is in general the way in which teachers in higher education are trained. It is also an arrangement found in some American universities which have great professional schools. The undergraduate has an education which is not only academic but general; it covers a variety of subjects usually not related to his subsequent profession. He then has at the Graduate Professional School an education for his profession which combines academic

and professional elements. The typical U.S. law course, for example, is a highly professional graduate course.

There is another variant, in which the teaching and training are combined—but in a single specialized education institution separate from the university. The best examples of such a single institution are the German *Technische Hochschulen*, which train engineers in both theory and practice. Another is the *École Normale Supérieure* which provides the cream of the lycée and university teachers and which is institutionally distinct from the university, though drawing on the university for some of its teaching. In our own country specialized service institutions like the Royal Military College at Shrivenham provide an analogy. In principle the specialized institution need not be educational. Education and training can be provided in hospitals; or indeed in factories—e.g. the so-called universities of 21 July which are attached to certain Chinese factories and provide full-time education in engineering for selected factory workers.

There are thus many ways of providing education and training and examples of most of these are to be found in this country. But taking a broad historical view and generalizing widely, the most common arrangement in the U.K. has traditionally been for the university to be responsible for the educational component and for the professional training to be the responsibility of professional institutions, and often provided on the job. A student took his undergraduate degree (which might or might not be related to his profession) and then proceeded to study for his professional qualification. This is in contrast to arrangements in Continental Europe, where courses are longer and where graduates must commonly complete both the educational and the training elements before they can obtain their degree. Our way of doing things was partly forced on us by our shorter length of university courses; but partly it is an explanation of the shortness, and where the pattern has been departed from, i.e. where more professional training is given, e.g. in medicine and architecture, the courses are longer. It is partly the result of the proliferation and prestige of professional bodies in this country—but this in turn is due in part to the limited interest universities used to take in vocational education.

And apart from such institutional factors, these arrangements were sustained by a long-standing view that the university should confine itself to the cultivation of certain general intellectual qualities. This of course was Newman's view. For him, the scope of the university was Liberal Education—the formation of the mind, the cultivation of the intellect as an end in itself, the achievement of intellectual proficiency; not the training for a specific profession. And this is the answer many would still give. Speaking for his own university, one Vice-Chancellor said, "I believe we should stick to the view—which many experienced employers share—that the task of a university is not to give its graduates a training for a job or cram them full of information but to educate them, draw out their powers of thought and imagination in the study of whatever subject arouses their interest, encourage them to penetrate beneath the surface of conventional wisdom, to wrestle with questions to which there is no answer in the textbook, to

recognize the limitations of their knowledge . . . and so acquire a confidence in themselves which will not collapse when confronted with the real problems they will meet when they leave the university."

That was the traditional pattern and its justification. But it is clear, if one looks at what universities actually do, that it no longer corresponds entirely to the facts. Several universities have from the start provided some elements of professional training and the involvement of universities in professional training has increased and is still increasing, under pressure of the need to consider the education and training of the professions as one continuous, coordinated process.

Start first with the education and training of doctors, because of all the great professions this is the one in which the universities have been most closely involved in professional education. The structure and substance of the education and training of doctors have been the subject of much discussion, culminating in two enquiries, presided over by Lord Todd and Sir Alec Merrison respectively. From these discussions there has come a coherent set of proposals, for the three phases in the education of the doctor. The first phase—lasting some 5 years—includes a training in medical science and at least two years of fundamental clinical education; and the aim is, in the words of the Todd Report, "to produce not a finished doctor, but a broadly educated man who can become a doctor by further training". Responsibility for the education at this phase rests on the university. There follows a period of clinical training lasting something like two years and comprising a series of posts, largely N.H.S. posts, providing a wide range of general clinical experience. The object of this phase is to make a generally trained clinician of the medical graduate. The responsibility for controlling the education of the individual graduate from a U.K. medical school is to rest with the university from which he graduated and money is to be provided by the university for this purpose. Finally there is to be a phase of specialist education (including specialist education for general practice)—perhaps another two years—consisting of a series of appointments while the doctor prepares himself for the membership or fellowship of the appropriate Royal College or Faculty. This phase is essentially to be controlled by the Colleges and financed by the Department of Health and Social Services. And overall there is the General Medical Council with a responsibility to coordinate all stages of medical education, which are regarded as a continuous, coordinated process.

In medicine a clear pattern of education and training has emerged. In the first phase the student acquires a body of fundamental knowledge, principles and concepts; the second is a phase of what Kenneth Swann has called "planned experience under supervision" in which the knowledge and concepts are applied to specific practical problems; the third stage consists of unsupervised but monitored experience in which the performance of the practitioner is measured against previously agreed objectives.

The legal profession too has developed a three-phase system. Under the recent proposals of the Council of Legal Education the education in the core subjects is to be the responsibility of the education institutions, universities, and polytech-

nics. This is followed by a year's vocational course where the stress is on the study of practitioners' problems. The course is at the Inns of Court School of Law under the Council of Legal Education (and given largely by practitioners); and provision is made in the course for practice sessions in advocacy and drafting. Then comes pupillage and training on the job. These proposals constitute a rationalization of existing arrangements. But it is laid down that students should not take in their year's vocational course subjects already taken in their university course, i.e. there is to be a clearer division of labour between the two stages. And if one looks at the content of the university undergraduates courses in law it surely is the case that in recent years they have become more professional—the amount of Roman law, legal history, philosophy of law has diminished. And the distinction between the core subjects and the subjects of professional training looks fragile, as perhaps is shown by the difference of opinion about the place of company law.

Medicine is a strong profession with powerful professional bodies which control standards and a supervising authority which awards licences to practice and oversees the professional conduct of members. And the legal profession shares these characteristics. Engineering is a much less homogenous profession than either; its professional bodies have less power over the profession and it has no licensing authority. And the arrangements for the training of engineers are more diversified and some would say they represent a more primitive stage of organization. Educational institutions have concentrated on teaching the science and technology underlying the practice of engineering; while training in the practice of engineering has—until relatively recently—“been left to industry, and to consulting and other organizations under arrangements monitored by the professional engineering bodies and recently also by the Training Boards”. This sort of arrangement has in some circumstances worked very well. As Lord Bowden has reminded us, in the early part of this century Metropolitan Vickers organized at Trafford Park a system of postgraduate apprenticeships and many of the men they trained went on to firms elsewhere. Their apprentice school was closed down; but many firms, the nationalized industries, Rolls Royce, G.E.C. etc., train graduates. In the period of training, however, there has been little contact between the university and the firms. There has been a gap. There is also a strong feeling that the training of engineers should contain elements of management studies.

There have recently been many proposals to remedy these deficiencies. The Engineering Professors' Conference has recommended a fourth-year course which would be concerned with Professional Studies in Engineering Practice on the lines of the later years of most Continental European Courses and comparable in some ways with courses in clinical medicine. This course would provide a “bridge for students passing from the study of engineering science to professional practice and further training in industry and elsewhere”. Industrial experience would be a requirement and industrial economics and allied subjects “would be considered integrally in the treatment of engineering practice”. Thus it is hoped

to integrate engineering science with practical training in industry and appropriate management skills. The U.G.C. is planning with selected universities a fourth year which in some respects corresponds to this prescription.

The development of teaching companies funded mainly by the Science Research Council and the Department of Industry is partly an attempt to fill the gap between theory and practice at a later stage in the training of an engineer. The analogy sometimes drawn between the teaching company and the hospital is evidently not a close one. You cannot organize industrial firms to fulfil the same role for engineers that teaching hospitals perform for doctors. But the inspiration behind these moves is the same as that behind recent changes in medical education. There are signs—signs of varying strength—of comparable impulses in other professions: the adaptation of courses at postgraduate and also undergraduate level; efforts to coordinate education and training and the increased involvement of the universities in the process.

In business or management studies the special graduate schools are now well established but in some ways the most significant development has been the integration into graduate studies, and even into undergraduate studies, in many universities of subjects relevant to business: programming techniques, critical path analysis, inventory management, portfolio analysis, cost accounting. There has also been at the undergraduate stage an increase in options, e.g. in mathematics courses, which might not have been provided but for the fact that they qualify the candidate for certain exemptions in his subsequent professional examinations. There have not only been changes in the education for old professions. Very rapid provision has been made for professions which are in some sense new. The great expansion of social work in the early and mid 1960s has led to the setting up of Schools of Social Work in certain universities. The increase in the knowledge relevant to professional activities, has produced in some cases a great extension of taught graduate courses, many of them designed for practitioners and sometimes for a fairly narrowly defined career. There are graduate-taught courses in everything from equine studies to computer management and naval studies.

Of the major professions, the one which most conspicuously lacks a coordinated education and training programme is public administration. There are courses and institutions concerned in the field—from diplomas in hospital administration to the Civil Service College at Sunningdale—but nothing remotely comparable to what exists in medicine, law or even business studies. Is this a good or bad thing? How fortunate it is that the exigencies of time provide me with an excuse for not committing myself to a view.

To sum up: there has always been a vocational element in some courses in some universities. But over the last two or three decades there has been a marked increase in courses directed to the needs of particular professions, and more fundamentally, as the result of attempts to coordinate the education and training for the professions, the universities have become more closely involved in the process.

There are some genuine fears about these developments. There is first of all the fear that, if they become involved in professional training, the universities will produce men and women who are, in fact, less useful to the professions. In the professionally-orientated disciplines the study of principles and basic concepts may become attenuated in order to find room for the more specialized and applied aspects of the subject, which are designed to take a man as swiftly as possible to the point where he becomes a qualified practitioner. Courses geared to immediate professional need can be intellectually very barren, with no broad central theme or framework to give them coherence or meaning. Such courses cannot foster the wide range of intellectual qualities which are necessary if professional men are to be adaptable and imaginative. These are no doubt badly conceived vocational courses. But there is a more fundamental danger to which even well-conceived vocational courses are liable. Courses which concentrate on the practical problems of a profession can become so pre-occupied with immediate needs that they lose the perspective needed to apprehend the larger issues that the profession will eventually have to face as the result of social change.

Moreover courses which develop too closely in relation to the need of one profession may be much less useful than a course which sticks to the basic principles relevant to several professions. Intellectual disciplines prepare people for a variety of callings, not only for the strong and cohesive professions, with long-established and authoritative professional bodies, e.g. medicine, but for the subsidiary and less organized professions. Moreover even a strong and cohesive profession covers a very wide range of activities; even a medical education has, to quote the Todd Report, to "educate students for such differing careers as general practice, specialist practice in medicine or surgery, and psychiatry". Furthermore forecasts of demand for particular types of professional expertise are extremely unreliable even in the short run, and a profession whose training has been too specifically vocational will find it difficult to respond to changes in employment opportunities. In the longer run, over the course of a lifetime, with the rapid increase of knowledge, the skills required of a particular profession—the circumstances in which a particular profession operates—may change dramatically. Professional men are more likely to be able to respond to these changes if their initial education has been wide.

There is an allied fear: the fear that professions will require the student to commit himself to the profession too early in his life. The recent changes in examinations for the solicitor's profession, for example, put a heavy premium on the study of law at the undergraduate stage. It is important, wherever possible, to keep the avenues to the professions open to those who have taken an initial degree in subjects not directly connected with a particular profession. Many of the ablest young men and women want to postpone the commitment to a profession until they have had a general education. The legendary days of the man who studied classics as an undergraduate and then turned to medicine are over; the chemist, mathematician or historian who becomes a lawyer is now rarer. But most graduates still enter professions to which their undergraduate

subject is not directly relevant. There are professions where the body of technical knowledge is within the scope of men and women who have received a general undergraduate training and are prepared after graduation to undertake the necessary period of professional training. Many students still have a strong and well-considered preference for this pattern of studies and we must make arrangements for them which are as flexible as those which prevail in the U.S.A. There is some danger that professions will become infected by the Diploma Disease and require excessive training—mastery, attested by examination, of a range of disciplines greater than the performance of the professional activity requires. A degree should not be the only entry into the professions.

The burden of these fears is that, if universities become too involved in meeting the short-term needs of particular professions, they will be less able to serve the long-term needs of many professions. There is another and different fear that preoccupation with professional training will encroach upon the central functions of the University—the pursuit and transmission of knowledge of the highest quality about intellectually difficult subjects. Attention to the intellectual requirements of particular professions—particularly to a narrow and temporary interpretation of those requirements—may direct resources away from this activity. There is the obvious danger that, unless additional money is forthcoming, any responsibility for training will be at the expense of the universities' other activities. Australia, I believe, relied on the universities for post-graduate medical training, but since the universities were not adequately funded for the work, the assumption of responsibility may have been at the expense of the undergraduates. Professional training may also, and more insidiously, create an atmosphere which is unfavourable to the pursuit and transmission of knowledge. There are other functions of a university which may be impaired if the university becomes too involved in practical affairs. Universities, it has been said, must stand at some distance from the world if they are to develop the critical faculties of their students, and—one might add—if they are to provide, as they have provided, moral and social leaders.

There are therefore risks. But some of the risks are themselves reasons why the universities should become involved in professional training. It is because professional training can become narrow that it should be carried out alongside those who are receiving a liberal, non-professional education. It is good that accountants should be training in departments of economics and alongside those destined for other professions. It is important too that professional training be conducted where research is being undertaken in subjects relevant to the particular professional expertise. It is one of the great strengths of the American professional graduate schools that they combine professional training with research. The new knowledge accumulated by research must be accessible to those who need to incorporate such knowledge in their teaching; and this is easiest where the channels of communication between liberal and professional education are open. We all at some stage get locked into the prevailing presuppositions of our professions. Professional competence is more common than im-

agination—the ability to envisage different circumstances to those at present prevailing. Universities do have wider perspectives, longer time horizons and a certain large-mindedness.

There is another reason why universities should become deeply involved in professional training. In the future, it is clear, there will have to be an extension of the arrangements for periodically bringing up to date the expertise of practitioners. In most professions this up-dating will necessarily be a joint responsibility of university and profession.

But I would not delate upon these advantages to the professions did I not also believe that involvement in professional training at an appropriate level was on balance advantageous to the university. There is a limited, but not negligible consideration which I would mention. Some students—of high intellectual ability—work best when the applications of the knowledge they are acquiring is within sight. But there is a more fundamental reason. The argument for teaching, for example, business finance or operations research, is that they are rigorous disciplines, they are intellectually challenging, they deal with complicated subjects, and their study will have a stimulating effect on research and teaching in other subjects.

There are no doubt dangers as well as advantages in the universities' involvement in education and training for the professions and some tension between the educational and professional elements. Different institutions will strike a balance in very different ways. According to their history and their particular interests, some universities will take a broader and some a more constrained view as to which professions are suitable for the universities, which elements of training can be included in the syllabus, and at what stage. Where the needs are so diverse and the future is so unclear it is right that the balance should be set by a variety of judgments. A pluralistic approach to professional training has a lot to be said for it. There should be several avenues into the professions. And if this results in several sorts of architect and different sorts of engineer that is a good thing. It is right that some engineers should be trained who can enter the profession straight away and fill a distinct and defined role; and that others should be trained to cope with the unforeseen, a cadre for the future.

Not all professions or subjects of professional training are appropriate to the University, but, in deciding which to include, I do not think universities are influenced primarily by distinctions between liberal and professional of the kind with which I opened this discourse. They ask whether the subjects are intellectually exacting. Are they vehicles for the communication of new applications of knowledge? Will they have a fruitful relation with existing subjects of study? I do not deny the distinction between education and professional training, but it always was rather fuzzy and the change in the nature of the knowledge necessary for professional proficiency makes it now a very fragile guide to action. Indeed, the power of that distinction has been unfortunate. I suspect the dying cadences of Newman's prose persisting in the minds of civil servants and ministers underlay one of the greatest mistakes in the organization of British higher

education in this century—the creation of the binary system. The notion, which informs the 1972 White Paper, that the universities should devote themselves to learning and the Polytechnics to professional training bears no relation at all to the actual facts and is indeed alien to the oldest traditions of universities which owe their origin to the need to educate and train lawyers and doctors.

The involvement of universities in professional training is, in my view, inevitable and on balance beneficial to both the universities and the professions. Some people would want to deal with the problem in a different way—by the development of specialized institutions. The Select Committee on Public Expenditure revived an older proposal that certain universities should be designated as special institutions for the development of applied scientists. The argument for specialized institutions is often supported by references to foreign experience which I believe are mistaken. There was a very curious passage in the Department of Industry Discussion Paper “Industry, education and management” . . . we do not have technical or vocational institutions which are of the same kind as, for example, M.I.T. or Cal Tech in the U.S.A., the *grandes écoles* in France or the *Technische Hochschulen* in Germany”.

The *Technische Hochschulen* are of course vocational in the fullest sense, though they are trying hard to diversify. But to apply this term to the rest of the institutions is misleading. M.I.T. and Cal Tech are not ‘vocational’ institutions. They are universities with a scientific and technological bias. The *grandes écoles* are a more difficult case. The distinguishing feature of these institutions is not that the education they give is vocational (though it is in some cases) but that they are small institutions with highly selective entry on the basis of a stringent competitive examination taken normally after 2 years’ intensive post *baccalauréat* study and that they exist alongside universities who are required to admit all holders of the *baccalauréat*: they are small, highly selected islands in a sea of non-selection. As to their vocational nature, the most famous of them, the *Polytechnique*, whose main object is to provide the country with engineers, in fact devotes more time in its curriculum to cultural subjects than to scientific subjects.

Some of the admiration which the *grandes écoles* attract in this country is admiration for a feature general to all French education. The French have tried more deliberately than we have to combine general and technical education—to include technology in liberal education. But this has nothing specifically to do with the *grandes écoles*. There are real disadvantages in so rigorously selected institutions; they have certainly had a bad effect on the French universities, and particularly on the study of science in them. There are some things we can learn from the French system—particularly perhaps from the *École Nationale d’Administration*—but we have a selective university system containing a wide variety of institutions; we should build on what we have.

[Delivered 24 October, 1977]

ABSTRACT OF THE LECTURER'S REPLIES TO QUESTIONS

Sir John Habakkuk confessed that he did not know how higher education would be planned if it became more linked with the professions. It was a major problem in America where there was currently a large over-production of professionally trained people. The problem arose there because a much higher proportion of the population went on to further education, something like 50% compared with the U.K. where the figure for all forms of further education was about 14% or 15%.

It was very difficult to say whether the American situation was exceptionally America, or whether it was exceptional in the sense that it is the situation which occurred during severe economic depression, or whether it represented the shape of things to come—that is to say, whether it is a point on a curve at which others—including ourselves—would one day arrive.

The proportion in higher education in the United Kingdom was so low that there is not a general problem of professional unemployment, although from the experience of recent Law graduates there was possibly beginning to be one in Law. He gathered that it was extremely difficult even for able people now to get Chambers. How did one cope with the problem of producing the right numbers in the professions? One could rely on the market; the market worked with a lag and there was a danger of getting a sort of pig cycle; but it did work. It was surprising how rapidly sixth formers formed views which are often as reliable as those of Royal Commissions on the likely future demand for a particular profession; through the experience of friends, their seniors at school and University, knowledge about the openings in professions did seep back. They tended to over-react, and there was a price—in the years of boom demand an excessive number of people go in. But it may very well be that the market was still the most effective way of regulating the supply of trained people for the professions.

Another method was an estimate of demand made by some central body. In the case of teachers such estimates proved to be wide of the mark, and this was not because the people who made the estimates were not hard working and intelligent; it was because of unpredictable changes in birth-rates. Taking the history of forecasts of demand for doctors. Willink thought there were enough doctors: Todd thought there were not enough: and so there were three new Medical Schools. Southampton, Leicester and Nottingham; and more recently *Lloyds Bank Review* contained an article asking "Are there too many doctors?"—the implication being there were. One could argue that that sort of centralized judgment is likely to lead to greater swings than the more pervasive market mechanisms. The third possibility was for the educational institutions and the professional institutions to get together and to make their own estimates.

Asked what was the potential loss to a profession, if it no longer had to teach its own recruits, the lecturer thought that the real problem was whether and to what extent options were made available either at the undergraduate or at the graduate stage which would not be made available if they were not linked to the needs of a particular profession. Specialized options in mathematics courses are an example. In business studies, to take another example, there were options like business finance or operations research or cost accounting, which were intellectually stimulating and certainly difficult, which had links of a fruitful kind with other subjects, which some Universities thought could reasonably be included in an undergraduates course, which other Universities thought it better to put at a graduate level. But whether at the undergraduate or the graduate stage, the inclusion of the specialized topics did ease out the study of more general topics in the broad field of economics.

There was very strong pressure to include such courses. It was a pressure which partly arose because training in some professions was now so long, and he thought it quite reasonable to include these options. He did not see why it should affect the ability to teach one's successors, although they would not be taught precisely the same field of subjects as one was taught oneself.

He spoke with great diffidence, but it was the case that some Universities do include courses in Actuarial Mathematics, they did include specialized options in this field. Did the profession think that to be a good thing or would his audience have preferred people who had taken a normal mathematics course—if such a thing existed without the specialized option?

Asked to expand his comments on the pursuit and transmission of knowledge, Sir John considered that people working in a particular field of study had rather different temperaments, often with a

different technical background. Some saw the possibilities of extending knowledge in a certain direction. The classic instance was DNA where the structure of knowledge in the 1950s indicated certain anomalies and the need to explain led to a great break through in biology. Others in the same general field would be more sensitive to immediate problems set, for example, by a natural resource shortage or by the need to produce certain goods more cheaply, or to perfect a process. The way the subject developed depended upon the balance of those considerations among the people actually working in the field. They were the only people who really knew what the technical possibilities were. An outsider might say what it would be desirable to know; but without a detailed knowledge of the possibilities and constraints, direction from above in research was usually wasteful.

There was a mechanism whereby the people actually involved in the field of extending knowledge sensed the points at which further exploration is worthwhile. Some went for the points which are thrown up by the intellectual anomalies of the present state of knowledge; some might go for the point where they thought a social need is likely to be satisfied. Which course an individual took was to some extent a matter of personal temperament and general outlook.

Universities and academics within Universities took very different views on whether the choice of a profession or vocation should be made at the beginning or end of a university course. Some engineers among the lecturer's friends held very firmly to the desirability of a relatively unspecialized course in engineering science which took the student through basic principles and theorems for three years.

On the other hand, some institutions made very specialized courses available, in, for example, electronics or environmental engineering. It was very reasonable that there should be different types of course available at different institutions.

Perhaps the people at school did not realize fully the nature of the options that were available to them. There were good arguments for an engineering science course, but there were also very good arguments for a course which allowed one to specialize at an early stage. Mechanical Engineering had spawned a whole series of rather specialized applications. It took a long time to produce a highly specialized engineer in some limited part of the subject and some Universities should provide a means for doing that.

North Sea Oil had prompted a large number of new University courses for the production of people with the engineering expertise required for that particular operation. They might be left on the shelf when that operation was over its initial pioneering stage; but Sir John could not see how otherwise the engineers needed could be obtained in the time available.

He believed that there should be a variety of course, determined fundamentally by the divergent judgments of different universities or different university departments. The 'ex-CATS, those universities which were developed from the former Colleges of Advanced Technology (who are a very important group of British Universities) on the whole tended to have courses with a number of rather specialized options. They took a man further to the point where he could apply knowledge to a limited part of the field.

Asked to comment on the distinctive features of the Continental system of university education, Sir John said that French Universities attached importance to learning by rote, they had more uniform syllabuses and more central direction, and had had ever since the days of Napoleon. They had a centralized system where at any given point in time all the schools will be doing the same thing and the Universities will be doing much the same thing. It must be remembered that French Universities had to take everybody who take the *baccalauréat*. They did not have a *numerus clausus*, so they were swamped by people. On the other hand French education combined scientific and arts subjects in reasonable proportions for a longer period of a student's life than in the United Kingdom. The *Polytechnique* which trains the élite of French engineers actually had in its syllabus a higher proportion (judging by the number of hours) of so-called cultural subjects than engineering. Also they combined training as well as the educational elements. It is because the French Universities have to take everybody at "A" level that there is a need for the *grandes écoles* which are highly élitist institutions. One had to study for them for two—sometimes three—years after the *baccalauréat* and then to sit a most exacting examination to get into them. They were really very small institutions, pools of selection in a University system which has no element of selection.

The lecturer, asked to comment on whether market or other forces should influence the regulation

of entry into professions, instanced chemistry as a very special case. Chemistry boomed in the late 1960s, and the early 1970s but subsequently its long-term prospects did not appear to be so buoyant. There had really been a very remarkable increase in the demand for other science subjects in 1975–77, in particular engineering and metallurgy. Applications for virtually all subjects had gone up, but the applications for the technology subjects, and indeed science in general, with the exception of chemistry, had gone up markedly.

That was partly a matter of market influence, as opposed to intrinsic preference on the part of the undergraduates for particular subjects. There was a very limited case for Government intervention because the State so often got the things wrong. Teachers were a case in point: they were after all employed by public institutions. The government might be expected to get the demand for teachers right because it was not speculating about the future behaviour of private industry.

Central direction tended to get things going wildly in one direction. A large number of people applying different sets of preferences, different knowledge, different prejudices, to the facts and making decisions which reflected a balance of different judgments, were more likely to arrive at a better result.