THE FLORA OF BOMBED AREAS*

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THE vegetation which develops spontaneously on the derelict bombed areas clearly provides us with a means of assessing the efficiency of the diverse methods of dispersal of the constituent species. But in utilizing their study for this purpose several factors must be taken into account.

Many such areas present ruined houses of such a character that there is little or no exposed soil upon which plants can grow. The activities of demolition squads or reconstruction labourers may partially or entirely preclude the possibility of plant growth. Hence the poverty of the flora on many sites cannot be adjudged as evidence of inefficient dispersal.

In general, the most diverse floras in the London area are to be met with towards the west, and there tends to be a diminished diversity of species as we pass eastwards towards the City. This trend can doubtless be attributed in part to the direction of the prevailing winds but also in some measure to the increasing frequency and size of gardens in the West End which provide sources of weed and other seeds.

In determining the variety of the flora, the efficiency of the dispersal mechanism exerts the major role in determining the range of occurrence in suitable habitats. The number of the areas examined in which any particular species has been observed, that is, its frequency, will be used to give us an approximate measure of the efficiency of its dispersal. The number of individuals of a particular kind on any one area, that is the abundance on a site, may also be an indication of efficiency of dispersal or merely of subsequent spread.

After the great fire of London in 1666, it is recorded by Ray that the ruins around St. Paul's were abundantly colonized by the London rocket (*Sisymbrium Irio*), but 150 years later the plant would appear to have become a rare plant and I have entirely failed to find a specimen on any of the sites examined. Of all the plants of our bombed areas the most frequent, though often not the most abundant in the early stages of colonization, is the rosebay willowherb (*Epilobium angustifolium*), a plant we often associate with burnt areas on heaths. The greater frequency of heath fires which accompanied the advent of the motor-car and the growth of cigarette smoking is probably in large part responsible for the rapid spread of this wild flower in recent years. In Hertfordshire, for example, the rosebay willowherb was a scarce plant half a century ago whereas it is now common throughout the county, and a similar change has taken place south and west of London also. Thus there are to-day sources of seed supply all around the Metropolis.

The association of the rosebay willowherb with burnt areas is probably due to a variety of causes among which, not the least important, is that its seeds only germinate freely in well-illuminated areas, and the occurrence of a fire usually ensures freedom from shade.

Secondly, soil which has been subjected to heat is known to be somewhat toxic to many plants until after the lapse of some weeks when, through oxidation, the deleterious chemical substances have been rendered innocuous. But some plants, notably certain mosses such as *Ceratodon purpureum*, and

Funaria hygrometrica, the liverwort *Marchantia polymorpha* and the rosebay willowherb, are especially tolerant of such conditions and are all striking and characteristic features of the 'old hearths' in the West of England woodlands where charcoal-burning is still carried on. These plants can therefore develop before the soil becomes sufficiently favourable for other competitors to flourish.

Again, growth of the willowherb is markedly stimulated by nitrates, and the production of these may be promoted by burning in two ways; first by the fertilizing action of the ash constituents, which also stimulate the growth of the willowherb directly, and secondly, by the partial sterilization of the soil. That it is such indirect effects, rather than direct effects, of the fires which favour the willowherb's growth is indicated by the abundance and frequency which it exhibits on woodland clearings where similar soil changes accompany the sudden access of light.

A relatively small plant of rosebay willowherb will produce two hundred seed-pods each of which may contain nearly four hundred seeds, so that a young plant might well yield about eighty thousand seeds in a single season, while the yield of a large adult individual would far exceed that figure. Each seed is about a millimetre in length and bears some seventy long silky hairs forming an effective parachute which opens out in dry air but closes when the air is moist. The whole thus forms a beautiful and most efficient aid to dispersal by air currents, which is brought into action under conditions most favourable to the carriage of the seeds.

We can, therefore, scarcely be surprised that the rosebay willowherb is one of the first flowering plants to appear on bombed sites or that it should have been found on nearly ninety per cent of those examined. Owing to its spread by means of underground shoots, it tends to form dense patches which may extend over a yard in a season, and this feature, combined with the height it can attain and its perennial character, render the plant a successful competitor against other species, and quite commonly, where established some time, it becomes the dominant type. But when Curtis wrote his famous 'Flora Londiniensis' nearly 170 years ago, the species was evidently only a garden escape in the London area and still infrequent a century later.

Second in importance both as to frequency and abundance is the common groundsel (*Senecio vulgaris*). The average seed production is much lower than that of the willowherb, numbering about 1,100 potential offspring per plant; moreover the groundsel is much shorter and an annual. In addition to their dispersal by wind, the fruits become sticky when moist, owing to which they are liable to be carried on the boots of pedestrians and the feet of birds. But the rather small output per plant is compensated by the fact that several generations of plants ripen their fruits in a favourable season, and unlike those of some of its congeners the fruits will germinate at almost any time of the year when the temperature is favourable.

Two other members of the genus *Senecio* are conspicuous and common features of bombed sites, and both have an interesting history. The commoner of these, found on 56 per cent of the areas, is the so-called Oxford ragwort (*Senecio squalidus*), a native of Sicily, which in its native home frequents volcanic ashes, so may well find the site of a burnt-out building a congenial habitat. The first record for Great

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Britain is at Oxford in 1794. There Sir Joseph Banks noted the plant as growing plentifully on the walls and in and about the city. Cultivated specimens are in Bobart's herbarium, so that there can be little doubt it was grown in the Botanical Gardens at Oxford and thence escaped to become naturalized in the neighbourhood. But though we next hear of the plant in Berkshire, the other counties to which it spread during the nineteenth century were not the contiguous ones, but north Devon (1835), Worcestershire (1836), west Suffolk (1849), east Kent (1875), Buckinghamshire (1897), and west Sussex (1898). At the present time the Oxford ragwort is to be found in approximately 62 per cent of the English counties as well as to a limited extent in Ireland and Scotland. In London the Oxford ragwort was first recorded in 1867. The greater prevalence towards the south is in accord with the plant's Mediterranean origin.

The fruits of the Oxford ragwort are larger and heavier than those of the groundsel and less readily carried by the wind. An average-sized plant will probably produce between fifteen and twenty thousand fruits as compared with the 1,100 of the groundsel. Still, if the latter produced two generations only in a year, compared with the one of the Oxford ragwort, the potential offspring at the end of the season would be well over a million. Some of the fruits of the Oxford ragwort may germinate in the autumn, but the majority would appear to germinate in the spring.

The sticky groundsel (*Senecio viscosus*), which was found on 45 per cent of the sites, is easily distinguished from the common groundsel by the much larger size to which it can attain and by the covering of sticky glandular hairs. The chief home of the species is southern Europe, and it is perhaps native as far north as Belgium. It is probably an introduction to Great Britain, although some botanists have claimed the species as native to certain coastal districts. The sticky groundsel was first recorded as growing in Great Britain by Ray in 1666, from banks in the Isle of Ely, but, despite its possible sojourn in England of nearly three hundred years, only during the past twenty-five years has the rate of spread of the sticky groundsel been rapid. Thus in 1915 the number of counties in which the species had been recorded was only slightly larger than in 1900, though it should be noted that these embraced additional areas far removed from the main southern group. Between 1915 and 1940, however, this groundsel had been recorded in no less than fifty-two of the seventy-one English counties and vice-counties and from twenty-seven of the forty in Scotland.

As a casual the sticky groundsel was found near the Caledonian Hospital in 1838 and de Crespigny records its occurrence near Kensington Railway Station in 1887. Now it is to be found on nearly half the derelict sites, and on some of these it is common or even abundant.

Each head produces an average of about seventy-three fruits, whilst the number of fruit-heads per plant is about eighty-four. Hence the normal production of fruits by a single plant would be about six thousand. But one very large plant, on which the fruiting heads were counted, had produced no less than 1,196, or an output of approximately eighty-six thousand fruits.

Despite the southern provenance of the sticky groundsel it is comparatively hardy, and I have found plants still flowering after spells of frost when the temperature fell to 23° F.

Another very common and frequent plant on our sites is the coltsfoot (*Tussilago Farfara*). Here the fruits are very small and bear a silky parachute of hairs which ensures wide dispersal; moreover, as with the rosebay willowherb, there is rapid vegetative spread which accounts for the large colonies that it soon forms.

The coltsfoot is very tolerant of heavy clay soils and has always been a feature of vacant sites in the suburbs, where mortar rubble remedies the deficiency of calcium in the London clay. The early ripening of the fruits enables the seedlings to pre-empt a place in the sun before the arrival of competitors. Each head may produce some 300 fruits, and as many as twenty or thirty heads may occur in a tuft, representing a possible output of between 6,000 and 9,000 fruits.

The seedling will form inflorescence buds in the autumn of the first year and these flower the following spring, whilst other axillary buds develop as rhizomes at the ends of which additional rosettes of leaves and tufts of flowers are formed. By means of these underground shoots, which may attain to a length of thirty inches, a large area can soon become occupied by the leafy rosettes, whilst the connecting rhizomes between them die and decay in about three years after their formation. From these facts it will be appreciated why the coltsfoot is so efficient a colonizer and so pernicious a weed.

Another plant, which though present on only about 40 per cent of the areas examined, is normally abundant where it does occur, is the Canadian fleabane (*Erigeron Canadensis*).

The history of this North American species would appear, so far as Europe is concerned, to begin about 275 years ago when, according to tradition, it appeared on the Continent from seeds which had dropped out of the stuffed skin of a bird. For Great Britain, the first record appears to be one from the London area some twenty years later. In 1836 it occurred on old walls at Chelsea, at Hampton Court and elsewhere, whilst by the time de Crespigny wrote his "New London Flora" in 1877 the Canadian fleabane was frequent on waste ground in London and especially on the railway embankments that had been constructed, as an outcome of the new means of transport developed during the early 'forties of the last century.

By the end of the nineteenth century the plant was established as an alien weed of waste places in some ten counties south of the line from the Bristol Channel to the Wash. Now it is to be encountered in most of the English counties south of Yorkshire, in a few of the Welsh counties as well as in the south-eastern parts of Scotland.

The seeds germinate in the autumn and pass the winter as rosettes which send up a flowering stem in the following summer. A large plant was found to bear about 6,500 flower-heads, and the average is well over seven hundred. The number of fruits which each head produces is about thirty-five. Each fruit is small and flattened, about a millimetre in length, and bears at the tip a parachute of some twenty-five toothed hairs.

Kerner von Marilaun estimated that an average plant would produce 120,000 fruits, and the large plant just referred to would have yielded about 233,000 fruits. It will be apparent, therefore, that the production of fruits by the crops of plants such as we see occupying some of the bombed sites must be prodigious.

Other common members of the same family on

the bombed sites are the sowthistle (*Sonchus oleraceus*) and the dandelion (*Taraxacum officinale*), but there is one member of this group which, although found on only about 14 per cent of the areas examined, is of particular interest. This is *Galinsoga parviflora*, a native of Peru, that was first recorded as a naturalized plant in England as a garden weed at Richmond in 1860 and two years later from Middlesex. It had originally been cultivated in the Gardens at Kew in 1796, whence it spread to the immediate surroundings.

The fruits from one head are of two types. The small number of white ray-florets produce fruits which are larger than those produced from the central flowers, and each has at its summit five or six short feathery processes which represent the pappus, though far too small in relation to the size and weight of the fruit to ensure dispersal by wind. The yellow tubular flowers, which occupy the central area of the flower-head and number between 10 and 30, produce much smaller fruits. Each of these disk fruits bears a parachute of narrow elliptical, almost petal-like, processes fringed with hairs which facilitate the dispersal of these fruits for short distances by the wind. Both types of fruits are beset with a number of short bristle-like hairs which tend to make them cling readily to rough surfaces, while the flattened form of the fruits facilitates retention. It is perhaps due to this that transport by human agency may occur also.

The larger ray-fruits would appear to be more efficient as a means of ensuring the persistence of the species once it has reached a locality, whereas the smaller fruits, though more susceptible to adverse conditions, are better suited for transport to a distance and thus for the evasion of competition. A moderate-sized plant of *Galinsoga* will produce about four thousand fruits.

As we might anticipate, several grasses are common on the bombed sites, and of these *Poa annua* is the most abundant, whilst *Lolium perenne*, *Agrostis alba* and *Holcus lanatus* are widely distributed. The presence of these, together with *Dactylis glomerata*, *Poa pratensis*, and also, though more rarely, of oats and wheat, suggests their origin from seeds escaping from the nosebags of horses. To this source also can probably be attributed the frequent presence of red and white clovers (*Trifolium pratense* and *T. repens*), the former on about one quarter of the bombed areas.

Chickweed (*Stellaria media*), though widespread, is by no means everywhere, and this is probably an outcome of the mode of dispersal. The seeds of the chickweed become sticky when moist, and as a consequence are frequently carried on boots or less commonly on the feet of birds. This is true also of the seeds of the ribwort (*Plantago major*), which become mucilaginous when wet. Hence, as we might anticipate, it is especially on those areas where pedestrians can enter with ease that the species just mentioned most commonly occur.

Of the large number of bombed sites examined, many have yielded only a few species, but the total list recorded numbers ninety-five vascular plants. In this assessment no areas have been included which were in part the sites of former gardens, but only such as might reasonably be assumed to have been previously unoccupied by vegetation. The only exception to this generalization is where the species already present were known, so that the new arrivals could be identified.

It is evident from a study of all the species which have been recorded from these sites that wind

carriage is by far the most important means by which the seeds and fruits are introduced. The species which are dispersed in this manner comprise 30 per cent of the total. Moreover, if we confine our attention to those species growing on more than one quarter of all the sites, we find that eight of these are dispersed by the wind and only four are dispersed by other methods. Further, the members of the Compositæ which have a parachute mechanism upon their fruits are among the commonest species present, while other members of the same family which do not develop such a pappus, as, for example, the yarrow (*Achillea millefolium*), the mugwort (*Artemisia vulgaris*), the scentless mayweed (*Matricaria inodora*), and the nipplewort (*Lapsana communis*), all occur on only a small proportion of the sites examined, and the pineapple weed (*Matricaria suaveolens*), which has spread so rapidly in recent years, is quite a rare plant.

It is interesting also, in this connexion, that the only garden plant met with on several sites is the purple Buddleia (*Buddleia variabilis*), sometimes in appreciable numbers at considerable distances from possible sources of seed. The ripe capsule contains a number of very light seeds in which the body is minute whereas the seed coat is extended as a flattened wing at each end.

The widespread rosebay willowherb, as previously stated, has plumed seeds and it shares with the plume-fruited groundsel the distinction of being the commonest species. The only other species on these sites with plumed seeds are two species of willowherb, which are both infrequent (*Epilobium montanum* and *Ep. hirsutum*), and the goat willow (*Salix caprea*). Seedlings of the latter tree have been seen on 16 per cent of the areas studied.

In view of the relative inaccessibility of many of the bombed sites, it is scarcely surprising that those species which depend to any appreciable extent for dispersal by carriage on the boots or clothing of pedestrians are generally somewhat infrequent. One might perhaps have expected bird dispersal to be an important means of introduction, were it not for the character of many bombed sites, which may well make them rather unattractive to birds until such time as vegetation has rendered them a source of food.

Elder bush seedlings (*Sambucus nigra*) and the woody and black nightshades (*Solanum dulcamara* and *S. nigrum*) probably owe their presence to this mode of introduction, but the more frequent occurrence of tomato seedlings is, one suspects, a result of human dispersal. Nevertheless, though the species which are probably dispersed mainly by birds are often quite infrequent, they are the next in importance as regards the number of kinds involved, since they comprise 20 per cent of the total. Of the remaining species, probably 14 per cent are mainly dispersed by human agency, leaving some 34 per cent for which the main agent of dispersal is uncertain.

It is evident then that the immigration of these plants is due mainly to the transport of their seeds or fruits by air currents. Some of the seeds, like the spores of the ferns, are so small as to behave like dust particles; other seeds and fruits present a large surface in proportion to their weight, and this is especially true of those which bear a parachute of hairs.

But observation and experiment show that most of the fruits and seeds shed from a plant do, in fact, fall to earth at no great distance from their point of

origin. The common ragwort (*Senecio Jacobaea*), though uncommon on the bombed sites, may serve as an example, since the dispersal of its plumed fruits was studied under natural conditions in New Zealand by Poole and Cairns. Trays were placed at intervals along lines radiating from a group of fruiting plants, and the numbers shed at the different distances were counted. The radiating lines of trays were evenly spaced with respect to the points of the compass, and though more fruits attained the longer distances before coming to earth when travelling in the direction of the prevailing wind than in the reverse direction, the vast majority of the fruits fell within a circle 180 ft. in diameter, with the parent individuals occupying an asymmetrical position 120 ft. from the circumference before the wind and 60 ft. to windward. My own experiments with poppies, using an artificial wind created by means of a fan (cf., "The Reproductive Capacity of Plants". Bell, 1942), show the same feature in an accentuated form with the slight difference that since the seeds are here jerked out of the capsule pores, by the action of the artificial gusts of wind on the stiff stalk of the fruits, the maximum fall of seeds was 20–40 in. away from the capsules, not immediately around their base. That this is true also for natural conditions is indicated by field studies on the mullein, where the proportion of seeds attaining varying distances from the parent was estimated from the number of seedlings developing in a uniform habitat. The maximum fall is about 12 ft. from the parent.

Such facts lead us to appreciate that even these highly specialized seeds and fruits fail to attain any great distances by wind action alone, and indeed accounts of wind dispersal have hitherto failed to recognize the fundamental part which is played by upward convection currents in ensuring such dispersal as shall mitigate competition among the offspring.

It has been pointed out by Prof. D. Brunt that, under uniform conditions in still air, if the surface of the soil be heated up by the sunshine, convection cells are formed in which the rising column of heated air ascends for a distance, depending mainly upon the temperature differences involved, and which spreads out and descends at a distance from this rising column approximately equal to the height of the latter. Clearly, a minute seed or a plume fruit caught up in one of these convection currents would be carried up a certain distance and then again brought down at a distance from the parent plant roughly corresponding to the height to which it had attained. The efficacy then will in no small degree turn upon the average height and frequency of such convection currents. I am indebted to Prof. Brunt for the information that convection currents over London might be expected frequently to attain a height of 500 ft., though appreciably greater heights of several thousand feet may sometimes obtain. Their efficacy for dispersal will depend upon the coincidence of the period of ripening of the fruit, commonly early autumn, or late summer, with a period of warm dry weather and sunshine; so, I think we shall agree, that in the English climate it is reasonable to state that very rarely will such conditions coincide with the occurrence of convection currents of more than average altitude.

If no other factor intervened, we might then expect, on the basis of these assumptions, that a species in the London area would spread at a rate of somewhere about a mile in ten years. Actually,

we have a rate of advance of this order provided by *Galinsoga*, which, entering Richmond in 1860, traversed about nine miles in the subsequent eighty-three years, or an average of a mile in rather more than nine years. In windy weather the convection cells of the air are changed in form, but the distance between the upward and downward currents is not appreciably modified. If, however, by a fortunate accident a seed or fruit is carried out of the circulatory air current into the wind current above, it may be carried long distances before again coming to earth.

The larger the surface that the propagule presents relative to its weight, the more chance there is of this happening; hence it is scarcely surprising to find that the rate of spread shown by *Senecio squalidus* and *Senecio viscosus* is not only more rapid but also shows a much more varied rate of extension of its range. For example, the sticky groundsel during the period 1900–15 spread to locations 50–200 miles from the nearest previous habitats, whilst during the next twenty-five years a further discontinuous extension of up to 180 miles was recorded. Species with efficient means of wind dispersal do, in fact, appear to present normally a slow rate of spread around the centres of occupation and also extension to new centres often very remote from the previous stations. These latter may well represent the occasional fruits or seeds which are carried up by convection currents into wind currents that are more than local. If the rate of fall of propagules in still air is determined for different species, their relative efficiency for long-distance carriage can be approximately estimated. It must, however, be realized that the efficiency increases at a more rapid rate than the decrease in the rate of fall.

The following represent averages of a number of determinations in still air of the rate of fall of ripe seeds or fruits of the species concerned and are expressed as the time taken to fall through a distance of 10 ft.

<i>Epilobium angustifolium</i>		33.4 sec.
<i>Senecio vulgaris</i>		10.0 sec.
<i>Buddleia variabilis</i>		5.4 sec.
<i>Senecio viscosus</i>		4.6 sec.
<i>Galinsoga parviflora</i>		3.4 sec.

The rate of fall of the seeds of the rosebay willow-herb is seen to be far slower than that of the seeds of *Buddleia*, but these latter fall more slowly than the fruits of the sticky groundsel or *Galinsoga*. The individual seeds of the willowherb varied in this respect, probably depending to a great extent upon the development and divergence of the hairs which the seeds bear. One seed fell 10 ft. in 13½ sec., whilst at the other extreme another seed occupied 66 sec. in traversing the same distance. The degree of divergence of the hairs constituting the parachutes of these seeds or fruits is mainly influenced by the humidity of the air, the hairs closing together when the air is damp and diverging more and more as the air becomes drier. It will be apparent that such hygroscopic response not only ensures that the seeds and fruits will tend to be detached from the plant under climatic conditions most favourable for their dispersal, but also that they will tend to come to rest once they have settled on damp soil. It will also be appreciated that the parachute of a seed carried up by a warm convection current of dry air may well exhibit partial closure when it reaches the cooler conditions above, and thus descent down the 'walls' of the 'convection cells' is facilitated.

The facts we have just considered make it apparent that the dispersal mechanisms are in large measure responsible for the high frequency of the rosebay willowherb and the common occurrence of the groundsels. The dust-like spores of the mosses, ferns and fungi, which are commonly encountered on the bombed areas where conditions are favourable to their growth, are almost equally well dispersed, and if any further tribute to the action of upward currents were needed it is furnished by the occurrence of many of the commoner species of these bombed areas on old buildings at considerable heights above the ground.

Actually the order of arrival of the various kinds of plants, though to some extent determined by the nature of the soil and the changes which it undergoes with the passage of time, is in no small degree a measure of the relative efficiency of their means of dispersal.

Dispersal, both throughout the country in general and on the bombed sites in particular, is found to be a dual process—a short-distance dispersal which is more or less continuous in space, and a long-distance dispersal which is strikingly discontinuous and, being dependent upon the coincidence of favourable circumstances, somewhat erratic in its incidence.

Discontinuity, which has always been regarded by biologists as a sign of antiquity, is thus seen to be also an attribute of youth. Where the efficiency of dispersal is low, contiguity of occupation will preponderate, but where favourable environmental conditions are infrequent and dispersal efficient, discontinuity may tend to persist.

FUNCTION AND FUTURE OF UNIVERSITIES

MORE than one organization is discussing the post-war development of university education. A committee of the British Association on post-war university education has been at work on this problem for more than a year and has already published an interim report (*NATURE*, 150, 716; 1942), and the Association of University Teachers is also discussing a draft report of a committee which has been considering the future developments of university education. It was a happy inspiration, therefore, which caused the Association of Professors and Lecturers of Allied Countries in Great Britain to arrange for a conference at which they could discuss with their British colleagues both the fundamental question of "The Function of a University in a Modern Community" and the equally vital problem of "Methods of Practical Co-operation between Allied Universities in the Future". The conference was held on April 10, by kind permission, in the rooms of the Royal Institution.

Prof. A. L. Goodhart (United States), who presided at the conference, in his opening remarks dwelt on the fact that a reconstruction of the world after the War, if we are to have a permanent peace, must have an intellectual and a moral basis. The purpose of a university is the establishment of truth, but it is not enough to establish truth 'in an ivory tower'. Universities have an active and not a passive part to play in the modern community. We must also realize that education must not stop with youth; it is a life-long function which can never end. Here again

the universities can play a leading part by taking charge of adult education, which means the education of the community.

Sir Richard Livingstone expressed the opinion that the modern university has not shown any direct influence on the spiritual and moral life of the world; no influence comparable to that of the University of Paris in the thirteenth and fourteenth centuries, of the English universities in preparing the English Reformation, or of Fichte and others in the early nineteenth century. They have not helped the democracies to create any countervailing philosophy to the teaching of Nazism. They have given the world the guidance it needed in science, economics and sociology, but not in the knowledge of good and evil. Hence they have failed to help civilization where it most needs help. They send into life men who are good political technicians but poor statesmen. The universities should demand of all their students that, in addition to their main subjects of study, they should attend courses in three subjects which are a part of the indispensable equipment of educated men—the influence of science on civilization, religion and philosophy, and so learn something of the fundamental problems of life.

This important aspect of university teaching, so essential for the understanding and future maintenance of peace, was dwelt upon by several subsequent speakers. The evils of the absence of instruction in the fundamental problems of life were stressed by the Minister of Education for Poland, Prof. St. Kot. Magnificent education and technical proficiency obtained without acquiring a knowledge of religion and philosophy are liable to be devoted to the service of evil causes. It is the youth of the universities that fill the ranks of the fanatics—marching, beating up their opponents and terrorizing democratic elements.

The Yugoslav Minister of Education, M. Trifunovitch, in considering the functions of a university, indicated that it may vary somewhat according to the community. In a large and rich country, it might be possible to train considerable numbers of scientific workers, but in a young peasant State like Yugoslavia, it is a luxury and threatens to produce an intellectual and unemployed proletariat. The universities should train the young men, the living force of their nation, to collaborate so effectively that the vitality of the nation might be steadily raised and its material and spiritual progress ensured. The preparation of graduates for certain branches of the Civil Service is one of the functions of the Yugoslav universities, but he emphasized the point that the university diploma itself should not open automatically the royal road to certain higher ranks of the Service; the latter should depend on the subsequent acquisition of practical knowledge and experience.

That the universities, apart from the specialized training they give in the sciences and the arts, should also provide the education for the learned professions is a generally accepted thesis. This should include the training of teachers, of whom, however, only about 20 per cent are directly trained by the universities in England and Wales. If provision should have to be made at the universities for all teachers in training, some 30,000 additional students would seek to enter the universities. Mr. P. R. Morris, director of education for Kent, told the conference that "the attitude of the universities towards this great problem will, in no small measure, determine the influence of the universities on the community at large and also their relationship to the educational system". The