Royal Society for the Encouragement of Arts Manufactures and Commerce

PATRON—HIS MAJESTY THE KING

COUNCIL

Full particulars relating to the work of the Society and conditions of membership may be obtained from the Secretary. The Annual Subscription is Three Guineas; the Life Subscription Thirty Guineas. There is no Entrance Fee.

The Society's Journal, which contains full reports of the Society's Meetings, together with general articles, book reviews, etc., normally issued weekly, is published fortnightly during the War. It is posted free to Fellows.

All communications for the Society should be addressed to THE SECRETARY, ROYAL SOCIETY OF ARTS, 6-8 JOHN ADAM STREET, ADELPHI, LONDON, W.C.2.

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No. 4593 *FRIDAY, AUGUST 8th*, 1941 Vol. LXXXIX

NOTICE

RESULT OF BURSARIES COMPETITION

On the recommendation of the Juries the following awards have been made by the Council as the result of the Society's 1941 Competition of Industrial Designs :—

FURNISHING TEXTILES GROUP

Miss Lorna M. C. Pillow (originally a student of Hull College of Art and Crafts, now a student of the Royal College of Art), winner of last year's Dress Textiles Competition, was awarded a Scholarship of £100.

DRESS TEXTILES GROUP

Mr. Kenneth O'Brien (student of Hull College of Art and Crafts) was awarded a Scholarship of £100.

THE SIR FRANK WARNER MEMORIAL MEDAL was awarded to Miss Pillow for a design which she submitted in the Furnishing Textiles Group.

THE NORTH LONDON EXHIBITION TRUST PRIZE was awarded to Miss Mary W. Duncan (student of Edinburgh College of Art) for a design which she submitted in the Dress Textiles Group.

Reports of the Juries

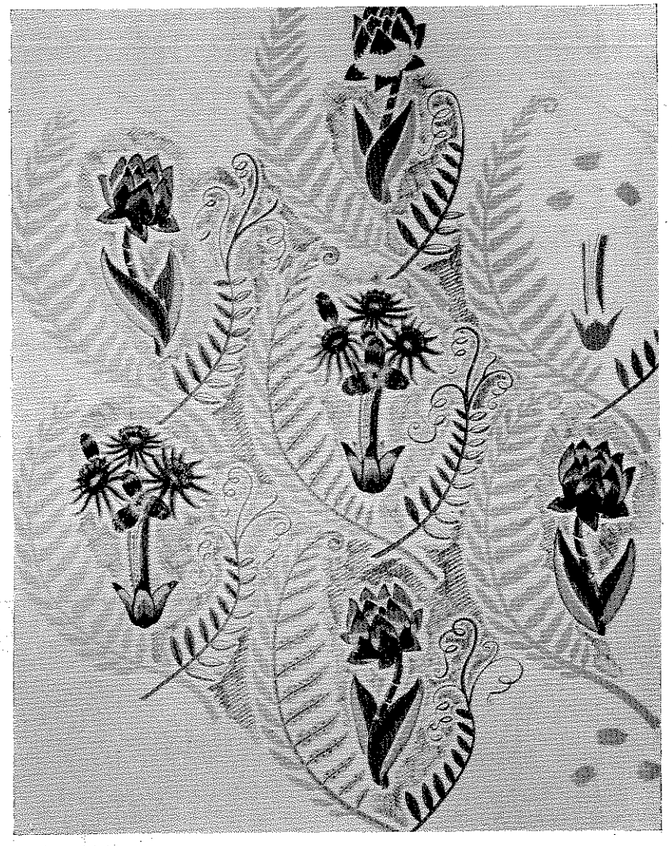
Following are detailed reports of the Juries in the two groups :—

FURNISHING TEXTILES GROUP

The total number of entries received was 19.

The instructions given in the preliminary stage of the Competition were as follows :—

> " Not more than six finished designs for furnishing textiles executed by the candidate within the last twelve months. Candidates may submit designs for woven fabrics or designs for printed fabrics, or both, and if possible should submit cuttings of cloth for which each design submitted is considered by the candidate to be suitable."



Design in four colours for a machine print. Suggested material, very fine linen : LORNA PILLOW.

This design was awarded the Warner Memorial Medal, and was executed under supervision, together with the completed design on the opposite page, in the twelve hours allotted to the candidates in the second stage of the Competition.

Design in five colours for a machine print. Suggested material, glazed chintz : LORNA PILLOW.

The Jury selected six candidates to participate in the final stage of the Competition, which was worked under supervision within 12 hours in the two weeks commencing June 30th.

The instructions given in the final stage of the Competition were as follows :—

> " Candidates are required to prepare, in the 12 hours allowed, two original designs (' original ' not necessarily being synonymous with ' modern ' or ' modernistic '). Both designs may be for a woven textile or both designs for a printed textile, or one may be for a woven and one for a printed textile. The designs should be made in accordance with the following instructions :—
>
> (*a*) *Woven Textiles*—The original design for a woven fabric should be for a 50 inches wide material. The repeat of the design should not be more than 27 inches high, repeating twice over in the width, or less than 11 inches high, repeating four times over in the width. There should not be more than one colour in the warp and two colours in the weft. The candidate should state at the foot of the design the yarns (i.e., silk, cotton, wool, rayon, etc.) he (or she) would suggest using for warp and for weft(s).
>
> (*b*) *Printed Textiles*—The original design for a printed fabric should be for a 30 inches wide machine-printed material. Not more than 12 clear colours should be used. The candidate should show at the foot of the design a chart or plan of the colours used. The repeat of each design should be clearly indicated, without necessarily showing more than one complete design."

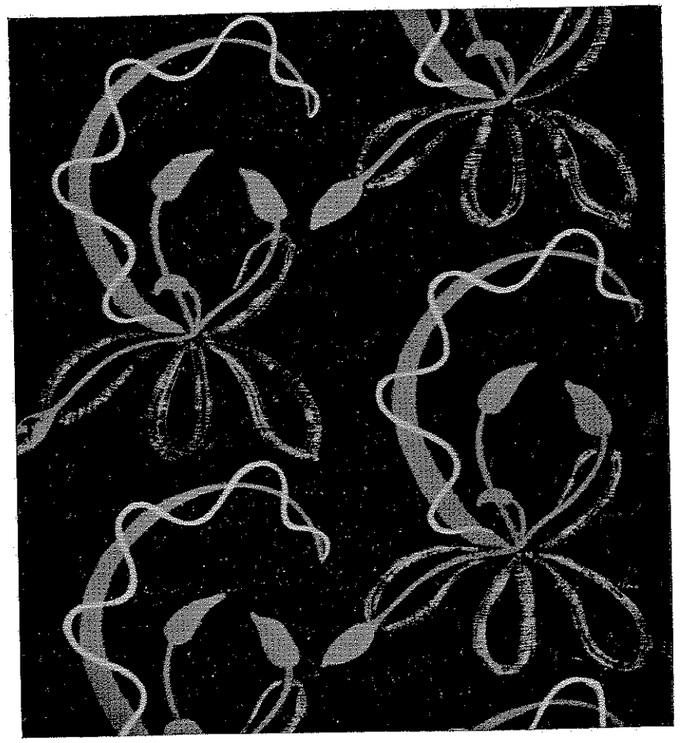
The Jury considered that in view of the prevailing circumstances 19 was a very good number of entries to have received, and that on the whole the standard of designs submitted in the first stage was up to the average. Generally speaking, the candidates had paid careful attention to the conditions of the Competition. It was interesting to note that in selecting six candidates for participation in the second stage of the Competition the Jury, without knowing it, chose students from six different schools : Salford, Manchester, Edinburgh, Newcastle-on-Tyne, Hull and the Royal College of Art. The Jury agreed that the designs in the second stage (worked under supervision) were not up to the standard of the first stage. The one exception to this was the work of Miss Pillow, to whom they awarded the Scholarship of £100. The work of this student, they consider, shows experience, taste, and good drawing, as well as versatility in form. Miss Pillow won a Bursary in the Society's Competition last year, and has by its means been studying at the Royal College of Art during the past session. She was competing this year on equal terms with other candidates and without her identity being known by the Jury.

The Jury also commended one of the designs by Miss A. M. Critcher of Salford School of Art, but the work submitted by this candidate in the second stage proved disappointing.

After careful consideration, the Jury recommended a design by Miss Pillow for the Warner Medal, as being suitable for a wide range of furnishing schemes.

The Jury consisted of the following :—

Mr. E. W. Goodale, M.C. (Chairman) ; Mr. F. H. Andrews, O.B.E. ; Mr. M. Gardiner Morris ; and Mr. Allan Walton, R.D.I.



Woven hanging for a dining-room : ADA M. CRITCHER.

DRESS TEXTILES GROUP

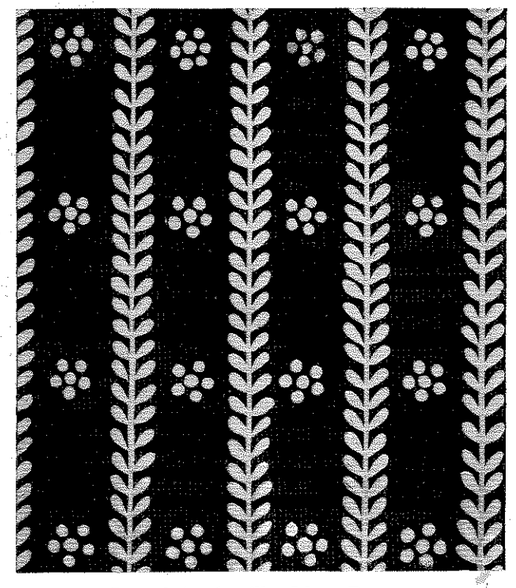
The total number of entries received was 15.

The instructions given in the preliminary stage of the Competition were as follows :—

> " Nine designs for dress textiles, recently executed by the candidate. At least six of these must be for printed fabrics, and it is particularly desired that consideration should be given to surface, discharge,

resist and screen printing. Three designs may be for woven materials, and at least three of the nine designs must be for cotton and/or linen and three for silk and/or rayon. At the foot of each design submitted the candidate must state the purpose and precise material for which it is intended."

The Jury selected twelve candidates to participate in the final stage of the



Dress design for silk : MARY DUNCAN.
This design was awarded the North London Exhibition Trust Prize in the Competition.

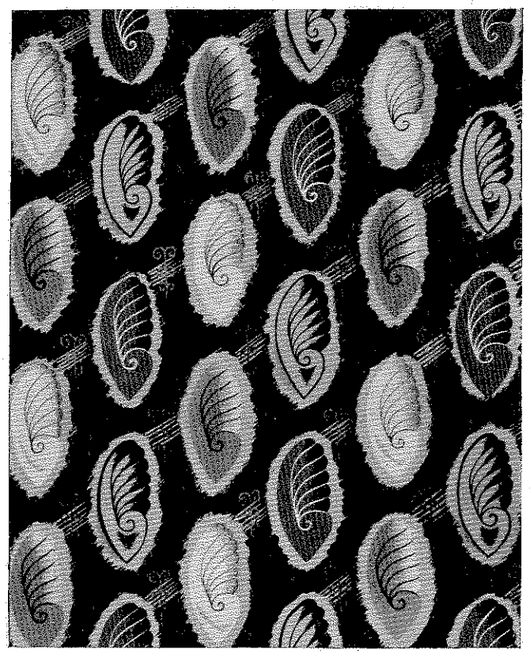
Competition, which was worked under supervision within 12 hours in the two weeks commencing June 30th.

The instructions given in the final stage of the Competition were as follows :—

"Candidates are required to prepare, in the 12 hours allowed, three original designs. The Jury wish the designs to be appropriate for present-day conditions and, therefore, require that the three designs should be for a gay, attractive everyday frock. One of the designs must be completed ready for its process. The other two may be in sketch form. The material for which each design is intended, and the process by which it is to be reproduced, must be clearly stated. The numbers of colours used is limited to three."

The Jury was impressed by the general competence of the work submitted and considered that most of the designs showed that if these designers were given the necessary guidance or even close specifications by those responsible for the vagaries and trends of fashion, they would be capable of making a valuable contribution towards more interesting industrial design.

The Jury commended one of the designs by Miss H. M. C. Wilson, a student



Design for an evening "Robe de Style" *in heavy silk. Screen and discharge:* KENNETH O'BRIEN.

of Edinburgh College of Art, and the whole entry of Miss J. Singleton of Manchester Municipal School of Art.

The Jury recommended a design by Miss Mary W. Duncan, a Student of Edinburgh College of Art, for the North London Exhibition Trust Prize of textbooks to the value of £5.

The scholarship of £100 was awarded to Mr. Kenneth O'Brien, a Student of Hull College of Art and Crafts.

The Jury consisted of the following :—

Mr. C. G. Holme, M.B.E. (Acting Chairman); Mr. T. C. Dugdale, A.R.A. R.P.; Miss M. France; and Miss Anna Zinkeisen, R.D.I.

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In addition to a grant from the Art Congress Studentship Trust, the Royal Society of Arts contributed all the expenses of the Competition.

PROCEEDINGS OF THE SOCIETY

TWENTY-SEVENTH ORDINARY MEETING.

WEDNESDAY, JUNE 11TH, 1941.

MR. CHARLES LATHAM, J.P., Leader of the London County Council, in the Chair.

THE CHAIRMAN said: Mr. F. C. R. Douglas is a Member of Parliament and a Member of the London County Council, and he also occupies the important position of Chairman of the Finance Committee of the latter. The paper which he is going to read to us this afternoon raises very important questions affecting not only national but also international economy. We are perhaps accustomed, when viewing agriculture in its world aspects, to be misled by the apparent prodigality of nature when harnessed by modern industrial and transport technique, and to overlook the fact that there may be a real danger of a permanent destruction of the fertility of some sections of the land of this globe, as I believe has been demonstrated to be the case in certain parts of America. Mr. Douglas deals in his paper with this and other matters in a serious and, in my view, profound manner.

I notice, however, that I am described, as is the case, as the Leader of the London County Council. Mr. Douglas will not misunderstand me when I say that, whether in that capacity or personally, I must not be held to accept all or any of the submissions of his paper.

The following paper was then read :—

ECONOMIC ASPECTS OF SOIL FERTILITY AND NUTRITION

By F. C. R. DOUGLAS, M.A., M.P.

The thesis of which I propose to examine some economic aspects may be formulated in these terms :

The methods of agriculture now practised in this country fail in greater or less degree to return to the soil the organic waste materials which are a by-product

of the life of plant, animal and man. This organic waste is the source of the humus which plays an important and essential part in soil fertility and in the nutrition of plants. Artificial fertilisers are applied to the land and these in many cases hasten the loss and destruction of humus. For the soil itself the most serious consequence is erosion, which may proceed to such a point that the cultivable layer is wholly lost and formerly fertile tracts become desert. Before this point is reached the conditions of life to which the plant has become accustomed during its long evolution are so changed by the lack of humus and the application of artificial fertilisers that its constitution is affected; it becomes susceptible to disease, and its value as food for man (whether directly or through animals nourished upon it) is deteriorated. The ill effects upon man are further accentuated by the use of foods which have been altered by the abstraction or modification or destruction of essential constituents in processes of manufacture, preservation, or storage, while the poor quality of the food is concealed by elaborate seasonings and artificial flavouring that deceive and pervert natural instincts in feeding.

All these things are at least in a large degree, if not entirely, the result of economic changes which have taken place within the last two centuries. In the latter part of the eighteenth century the enclosure of the common lands moved towards its climax. A new incentive to enclosure arose from the development of new methods in agriculture which were quite unsuited to the primitive economy of the three-field and strip systems. The great landowners reaped a double gain in the acquisition of the common lands at a small cost and in the larger return which could be got from them. The substantial part of the people who, up till then, had been secure in the possession of a share in the land—the one ultimate source of life and livelihood—lost their hold upon it, and became a landless proletariat.

At the same time, new methods of manufacture began to be devised which much increased the productivity of labour and gave employment to large bodies of men. The new technique in agriculture made it possible for those who remained in the country, and who became more and more reduced to the status of labourers, to feed the increased population of the towns. Moreover, as sea transport improved in speed and cheapness, more food was imported from abroad in exchange for exports of British manufactures. The reform of our fiscal system and the almost complete abolition of protective tariffs during the first half of last century stimulated this development.

For economic reasons which are familiar to us the manufacturing population congregated into the towns. The population of the towns grew rapidly. Some of them were still incomers from the country, but many were born in the towns and grew up knowing no other way of life. Thus one generation followed another, each knowing less and less of the traditional ways of the countryside and becoming more and more subject to unwholesome conditions.

This new way of life, characterised by the growth of large cities and the

aggregation of a large proportion of the population into them, created fresh problems. The waste matter could no longer be conveniently and cheaply returned to the soil, where it becomes not only innocuous but useful as well. It became a menace to the health of the city population, and novel methods were devised for dealing with this sanitary problem. A part of this waste matter goes down the sewers and is poured into the sea or otherwise destroyed and lost to the soil. Another part is buried in the dumps of household refuse and becomes more or less completely lost, or else is incinerated and wholly destroyed. Moreover, these two kinds of waste matter become separated from one another, and their interaction, which is a characteristic of ancient systems of agriculture, is lost. These methods of disposal were adopted because they appeared to be the least costly means available for ridding the towns of what was at the least a nuisance and at worst a serious danger to public health. Indeed, it is an historical fact that the modern local authority was brought into existence in order to be a public health authority, and a large part of its powers and duties were framed with this end in view.

This, then, is one important reason why the soil ceased to be replenished, but there are others. Specialisation in production was not confined to manufactures. In agriculture also some farmers, and sometimes whole districts, devoted themselves to certain branches of agriculture. Some concentrated upon arable farming and others upon animal husbandry. Where large numbers of cattle were kept and there was little tillage, probably sufficient manure was returned to the land in most cases to keep it in fair condition. This may be one of the reasons why we are now urged to find salvation in the ploughing up of grass lands. On the other hand, where arable farming predominated the supply of manure diminished, for it is expensive as well as inconvenient to transport manure for long distances. At the same time, the farmer was presented with a substitute for manure in the form of artificial fertilisers. He was assured by chemists and biologists, who had not yet realised the infinite complexity of processes which they thought could be reduced to terms of elementary chemistry, that these fertilisers contained all that the plant required. The manufacture of artificial fertilisers became a new and profitable industry, using up in some cases the by-products of other chemical industries. These fertilisers were concentrated and compact; they could be placed in bags and readily transported; they could be reduced to a powder which facilitated the spreading of them over the land by rapid and cheap mechanical processes; and they could be stored indefinitely without losing their potency.

Still more attractive was the fact that artificial fertilisers often gave more luxuriant growth and larger crops, and therefore a larger return to the farmer. They were, especially in the initial period, merely a supplement to manure. The humus in the soil was not rapidly depleted. No danger signal manifested itself to the farmer, and still less to the urban population. It is only recently that

serious anxiety has become aroused about the condition of the land and its consequences for agriculture and health.

The separation in space of the point of production of foodstuffs from the point of consumption was accentuated by a number of technological discoveries which facilitated the importation of more and more food from abroad. At first it was mainly citrus fruits and grains that were imported, because they could best be stored and transported over long distances without artificial methods of preservation. The storage of wheat is made difficult by the tendency of wheat in bulk to "heat," but about a century ago new processes of milling with steel rollers were invented. They lent themselves to cheap, large-scale production of flour, and they had the incidental result of producing a pure white flour. The germ of the wheat, instead of being cut, was bruised into flakes and sifted out with the bran. The flour so produced kept better than whole-meal flour and better than the uncrushed wheat. It could, therefore, be produced in bulk, stored for long periods and carried over long distances. Both the miller and the baker were subjected to less risk of loss by deterioration. The farmers in distant lands were assured of a more extended market. The miller was left with a valuable by-product which he could sell for animal feeding. The baker produced a pure white bread which was attractive to his customers who believed it to be better than other bread. But the consumer of bread lost some things which were necessary for nutrition and for the proper functioning of his digestive and excretory system, and, not knowing the cause of the ill health from which he suffered, endeavoured to cure himself by remedies which produced other injurious effects upon his sytem.

At the same time the development of cold storage and of canning aggravated the trouble, for they made possible the transportation all over the world and the storage for long intervals of time of meat, soft fruits, and other perishable articles. Thus the products of agriculture were consumed thousands of miles from the point of production, and the possibility of returning a corresponding portion of waste matter to the soil from which it had originally come, disappeared. The farmers of this country complained bitterly of foreign competition, but the farmers of the Americas saw themselves placed in possession of an enormously extended market and thought that their fortunes were made. The consumers saw their food cheapened, and generally believed that its quality was maintained, if not improved.

One other illustration may be given, for it concerns an article of universal consumption and the one of most importance for infants and young children. Milk is notoriously susceptible to contamination and difficult to store for anything but very short periods. With the growth of towns the supply had inevitably to be drawn from wider areas and a longer time was needed for it to reach the consumer. This difficulty was in part overcome by the production of tinned milk, whether "condensed" or "evaporated," but this process yielded a product which was not agreeable to many people. Then pasteurisation was

introduced and the difficulties of handling milk on a large scale were much reduced. It could be stored for longer periods without evincing obvious signs of deterioration. It could be handled in bulk in large tanks, and this reduced transport and distribution costs. Bulk transport entailed the mixing of good and bad milk together and the reduction of it all to one grade of infection, but the public was taught that in practice good milk was unobtainable, that there were merely varying grades of badness, and that it was essential for the public health and in order to save the population from tuberculosis, undulant fever and other ills that all milk should be pasteurised. This pernicious doctrine has been within an ace of being completely successful. It is only a small minority, which is able and willing to pay a very high price for it, that is able to enjoy pure, fresh, and untreated milk.

Nevertheless, the agitation for pasteurisation did make use of a fact which is indisputable. It is true that the health of the animal population of this country is not what it should be. Large sums of money are lost every year through animal diseases such as tuberculosis, foot-and-mouth disease and contagious abortion. The loss is not confined to the animals which die or have to be slaughtered, but extends to loss of productivity, and infertility caused by ill health. It is also true that many cultivated plants and trees show signs of weakness and liability to disease. They become infected, and attacked by pests. The cultivator spends large sums of money and much labour upon multiple sprayings and disinfection in order to combat these ailments, and all this adds to his cost of production and has to be paid for by the consumer. Men, too, suffer by the deterioration of their foodstuffs, and although the average age at death is rising, a large part of the population has sub-normal health and suffers from chronic ailments which impair efficiency and reduce the enjoyment of life.

The economic loss involved in all this is enormous, and a gigantic industry has grown up engaged in producing many kinds of elaborate drugs and other remedies for the illnesses of plants, animals, and man. Preventive medicine has hardly yet justified its name; a large part of its energies are devoted, not to investigating, exposing and removing the causes of these troubles, but to a narrow specialism engaged in the vain attempt by means of antiseptics, serums, innoculations and vaccines to prevent one plant, animal, or person from infecting another. This is, perhaps, inevitable. The solution of the problem involves many factors which are beyond the scope of medical practice. It is to be found in a wider synthesis which will take account of the whole complex cycle by which the lives of plants, animals and men are interrelated and interdependent.

The remedy for these evils must be sought for in rational and economic principles. It is not possible to reverse the course of history and to retrace the steps by which we have got to where we now are. Neither is it desirable to resort to arbitrary and *ad hoc* methods. Protective tariffs, subsidies, and other

restrictive devices by which the consumer is obliged to pay a higher price for the articles he buys, or the tax-payer is obliged out of his earnings to increase the income of another, are inherently unsound. Such plans are unlikely permanently to command the assent of a majority of the population and are therefore liable to constant change which does not make for the prosperity of agriculture. It is far better for the farmer that he should have an assured market in this country because people understand why they should buy freshly gathered and properly nurtured foodstuffs, than that he should have an insecure, even though temporarily profitable, market dependent upon arbitrary prohibitions.

A large part of the solution, therefore, must depend upon a re-education of the people so that they may understand what are the essential conditions of that way of living which men have grown into as the result of a long evolution. They must learn that it is not possible in the course of a few generations to readjust men's bodies to very different foods and habits. To attempt to do so must be extremely destructive, if not fatal.

Men do not purchase commodities merely because they are cheap and plentiful. They purchase goods because they want them. If alternative means of satisfying a given want are available, that one no doubt will be preferred which is cheapest, provided it is believed to be equally efficacious. In fact, the alternatives are seldom of identical quality, but people frequently do not realize this. Condensed milk, pasteurised milk, and fresh milk are three different commodities. If people regard them merely as milk, and no more, they will purchase whatever is the cheapest.

Unfortunately, taste does not play the guiding part among men that it does among animals. Instinct does not appear to impel mankind to choose the best foods, but that is perhaps partly because so many people brought up under conditions of Western civilization have never had the opportunity of tasting the natural and unsophisticated foods to which their ancestors were accustomed. Nevertheless, it is true that on the whole people buy the things which they think are good for them, or when they consciously buy something which is less nutritive they believe that this is compensated by the difference in price. If they thought that the difference in quality involved serious danger to health, they would be much more inclined to pay the higher price. But the results of improper feeding manifest themselves so gradually, that no danger signal warns the traveller along the path of ill health. The need for enlightenment in the elements of food and health is therefore imperative, and it has many prejudices and vested interests to overcome.

So far as men know to demand the right things and to eschew the wrong ones, the shift of demand will encourage the right kind of production and discourage the wrong. It may well lead to an improvement in the technique of production of the article which before was least in demand, and that in turn to a cheapening of it. Nor is it necessarily true that a better dietary is in all respects more expensive. So far then as alternative commodities are available,

the problem is largely one of informing the public so that it prefers and demands the better.

But this is only part of the solution. If we must eat more fresh, and therefore home-grown, food instead of imported and preserved foods, then we must make certain that the soil is sufficiently fertile to produce the volume that is needed. If the home grown food that is produced is lacking in nutritive quality because the soil is impoverished of humus, then we must devise means of replenishing it with this essential constituent. The only obvious way of doing this is by returning to the land the city waste which is at present destroyed on sanitary and æsthetic grounds.

The method of doing this has not yet received a full scale and completely satisfactory solution, but there are certain elements which can be laid down with certainty. The matter will have to be handled by the local authorities of this country, for they are responsible for dealing with sewerage and refuse disposal. The problem cannot be solved by merely dumping sewage and house refuse upon the land, primarily because neither of these are in a condition in which within a reasonable time they will turn into humus, and secondly because they are not, as they are produced, in a condition which is agreeable or pleasant to handle. What is required is that both these forms of waste matter should be handled and treated on a fairly large scale so that they are turned into humus before they are offered to the farmer. They must be combined to form a manure which is cleanly and convenient to handle, which can be stored for a reasonable period of time without being offensive, and which is ready to perform its beneficial work for the plant as soon as it is applied to the land without undergoing a further process of composting before it becomes available to the plant. It is also necessary that the value of the product should be tested and demonstrated by properly conducted experiments in the cultivation of the principal crops of commercial importance.

A fertiliser which conforms to the conditions indicated is certain to command a substantial price when the prices now paid for artificial fertilisers are borne in mind. This should afford a sufficient margin to cover the additional costs over its present methods of sewage and refuse disposal which the local authority will have to bear, and in my opinion it is highly probable that when suitable plant has been designed for performing the necessary operations on a large scale, this method of disposal will actually show a profit to the ratepayers instead of imposing upon them the substantial burden which present methods do.

It may be said that many farmers will prefer artificial fertilisers to a product of this nature. So far as they are owners of their farms, it is in the long run to their advantage to adopt methods of farming which will conserve the fertility of the land and enable them to hand it on unimpaired to their children. So far as they are tenant farmers, the position is not quite so simple. They may hope to squeeze the fertility out of the soil and then to quit their holdings. This is a possibility which should be guarded against by proper methods of tenant

right valuation which would take account of the advantage to the soil of manuring and the detriment to the soil of artificial fertilisers. It might also be guarded against by a proper system of valuation for rating and taxation. In this connection it is of interest to observe that in Denmark local rating in the country districts is mainly based upon the land value, and in estimating this the valuer is directed to assume that the land is in a normal condition of fertility; the owner, therefore, does not escape payment of part of the rates by allowing his land to deteriorate, nor does he pay more if by exceptional efforts he raises the productivity of the soil above the average. It is beyond the scope of this paper to discuss questions of land tenure and taxation, and I will only remark that all problems of agriculture would be greatly simplified if we had in this country a system of collecting (whether by rates or taxes) the value of the land for public revenue and exempting from public burdens the houses, buildings and other improvements. Fluctuations in the basic conditions affecting the prosperity of agriculture would then be adjusted by variation in the assessment of the amount payable to the state, whereas at present they are either reflected in violent fluctuations in the selling value of land owned by owner-occupiers or in a struggle between the tenant-farmer and his landlord for a suitable re-adjustment of his rent. It is the endeavour to maintain land value at a high level which is the ultimate reason for the application of protective tariffs, price stabilization schemes, and production quotas to agriculture; and these in turn have created a sharp antagonism between the urban population and the agricultural population that is not likely in the long run to be to the advantage of agriculture.

Apart from the matters to which I have just alluded, the task before us is: to educate the public to understand the basic conditions with which a healthy supply of food must conform; to educate the farmer to understand the conditions with which a healthy agriculture must comply; and to educate the local authorities to understand the important rôle which they must fulfil in providing the farmer with the humus which he requires. These are not easy tasks—there are prejudices and vested interests to overcome—and they will require all the self-sacrificing effort of men of goodwill, but the benefit to mankind will be immeasurable.

DISCUSSION.

MR. PHILIPS PRICE, M.P., said: I am very interested in what Mr. Douglas has said and am in general agreement with it. As I farm in the west country, I naturally appreciate the importance of soil fertility, and all those of us who have to do with the industry realise, I think, that that is the big problem before us. Mr. Douglas has, however, in my opinion, a little over-simplified the matter. It is not merely a question of returning to the soil the humus which was there: there is also the question of getting the soil to develop its own humus, and the discovery of the fixation of nitrogen from the air by leguminous plants, and particularly the clovers, which was one of the great scientific discoveries of the last century, has to some extent

eased the farmer's problem. A further contribution has been made by the great discoveries of Sir George Stapledon in his development of new types of grasses.

We are ploughing up our pasture lands now, in view of the national emergency, but coupled with that there is the process of laying down the old arable lands to clovers again, in order to restore to the soil the nitrogen of which it was robbed by the cereal crops. Even so, I think that what the author has argued is probably true, viz., that on balance there is a loss to the soil, particularly at the present time, in view of the great pressure that is put on the farmer by the War Agricultural Executive Committees to grow crops of cereals.

It is therefore increasingly important to find a further way of bringing back nitrogenous fertilisers in the form of humus, and we must do everything that is possible to induce the local authorities to change their methods of sewage disposal, in which there are enormous vested interests involved. I went to Maidenhead not long ago to see a plant there which is worked by the local authority and a private company and which combines the sewage sludge from the sewage farm with household waste; the two together, decaying in heaps, create after several weeks a kind of mould, which I am told is being used by the local market gardeners. I have raised this matter in the House of Commons on two or three occasions with a view to finding out whether the Ministry of Agriculture is prepared to do anything about it, but they are very reticent and will not commit themselves as yet, because, they say, certain experiments are being carried out in the agricultural department of the University of Reading. It seems to me that these experiments ought to be accelerated so that we can learn the results of them as soon as possible.

Mr. W. R. Lester said: I gather from Mr. Douglas's very informative paper that he considers *all* artificial manures tend to soil exhaustion. At least, I did not notice that he drew any distinction in this respect between the nitrogenous and the phosphatic manures. My experience of farming on a small scale demonstrates that only against the former can the charge be laid. Perhaps, in his summing up, Mr. Douglas may deal with this point.

Dr. W. S. Rogers (East Malling Research Station) said: I agree with the author that the organic waste products of the town should be returned to the country; but the local authorities must arrange for these products to be supplied at a cost which the farmer can afford to pay. At present, they are very much more expensive per unit of manurial value than concentrated chemical fertilisers. I would point out also that this is not the only way of getting humus back into the soil. Various methods, including composting and cover cropping are under investigation at the research institutes, and, as Mr. Philips Price pointed out, the valuable effect of clovers has been known for many years. At the moment, we are growing in some of our plantations leguminous cover crop mixtures, which are supplying humus to the soil at a cost of considerably less than 4s. per ton, and grass mixtures under orchard trees produce humus at a very much cheaper rate. Do not let us lose sight of the relative values of these things, although by all means let us try to avoid the shocking waste of town materials that is going on at the moment and to secure the adoption of a long term economic policy of getting those materials back to the land at a reasonable price.

Sir Albert Howard, C.I.E., said: I should like to offer my congratulations to all concerned in the presentation of this paper—to the author, to his colleagues and to the Society. I have been studying the subject of soil fertility for about forty

years and have read a large number of documents about it, but I consider that this paper is among the very best and most statesmanlike essays on the social implications of soil fertility that I have so far seen. It is certain to arouse widespread interest and considerable discussion, and I hope it will also bring about a very much needed administrative reform, viz., the amalgamation of the Ministries of Agriculture, Food and Health into one body, under a thoroughly competent man. These three Ministries deal with one and the same subject, food, a vital matter which affects not only the present population of the Empire, but also its whole future, and it is a serious disadvantage to have it divided up and dealt with in piecemeal fashion.

Unquestionably the wastes of our towns and cities must be converted into humus for the benefit of the land. Much of this work will have to be done by the municipalities. We must remember, however, that our water-borne sewage system has done one irreparable mischief—it has destroyed the most important factor in the synthesis of humus, the urine of the population. The very best quality humus cannot, therefore, be made from sewage sludge and town wastes only. On the farms near our cities, however, there is plenty of animal urine but insufficient vegetable waste. Arrangements should therefore be made to give the farms the first call on our town wastes and then to convert what remains by means of sludge. The Borough Council of Southwark has led the way by providing the farmers near London with pulverised town waste for the reform of their manure heaps. This is exactly what is needed to strengthen the weakest link in British agriculture and in all western agricultures, viz., the manure heap.

The seaside towns ought to take the lead in the manufacture of humus, because they have available a valuable additional item in the form of seaweed. If they would make humus properly and use it to produce the milk, meat and vegetables required for feeding their visitors, the holiday makers from the towns would reap a double advantage: they would benefit from the change in the climate and also from consuming food grown in a fertile soil.

I should now like to suggest three points which should be borne in mind in our efforts to educate the nation generally and the farmer in particular in the dependence of good food and robust health upon the existence of a fertile soil.

The first is that the value of the humus manufactured by the municipalities cannot be ascertained by chemical analysis. The units of nitrogen, phosphorus and potash are about two-and-a-half times more valuable in the organic than in the inorganic condition. The worth of humus can be proved only by use and experience.

My second suggestion is that a beginning should be made in the marketing and sale of food according to the way the soil from which it is produced is manured. This would have great publicity value; the consumers interested would be assisted in obtaining high quality produce, and the humus-minded farmer would get a better price. I am sure that once people began to buy food produced from fertile soil they would go on buying it.

My last suggestion is based on ten years' work. It has been my experience in getting the Indore process (a method of composting) taken up all over the world that the vested interests which endeavour to obstruct the onward march of humus can easily be side-tracked by making the fullest use of the live wires who are to be found in agriculture, in horticulture, in the medical and teaching professions and among the officers connected with public cleansing. Once practical examples of the effect of humus on the soil, the crop, the animal and mankind are available, all opposition rapidly wilts and arguments based on elementary chemistry cease to be advanced.

MR. J. O. STEED said: The question of food production in this country is not an agricultural question at all, or only in a secondary way: it is an economic question. Therefore it is from the economic standpoint that my mind has approached the subject for many years past, and I was very much cheered when I saw that the author of this paper introduced the word "economic" as the first word in its title. I am struck, however, by the fact that in the year 1941, with the second great world war raging among us and threatening us with starvation, this paper is still based upon the commercial point of view. That is modified at the moment by the force of circumstances, but the whole idea of the paper derives from the conception that unless the people can be induced to buy the more expensive products of the land of this country the situation of the food producer will be hopeless.

Our main foodstuffs cannot be, and never will be, produced in this country as cheaply as we can import them. We may utilise our town wastes, and that is a desirable method of effecting economy, but that will not provide the difference between the extraction of capital value from virgin soils overseas, and the restoration of fertility to our native soil, and until we can provide that difference in the form of price we shall not be able to re-establish food production in this country on a commercial basis. After the last war we were assured that never again should this country be exposed to the danger of starvation, and the Corn Production Act of 1917 was passed through Parliament with acclamation. But in less than five years the whole thing was scrapped, because the Bank of England wished to return to the gold standard and because the price of all commodities had to come within the limit of gold.

The proposition that I wish to submit is that if Great Britain is to continue to carry a larger population than its present home production can feed (we could feed ourselves if we would) we can no longer afford to regard the matter as a commercial proposition. There are many uses to which the land of Britain can be put. We can, for example, grow apples, and there is much to be said for the English apple. But if the land of this country will produce a unique flavour in apples it will also produce unique characteristics in the race, and I want to regard the land of this country as the breeding ground of the race, and to suggest that we cannot afford to define the word "economic" as merely the making of money. We must recognise that the object of an economic system is to grow men.

Let us also recognise the fact that our political system to-day does not provide a means whereby, in peace-time, our land can be kept in cultivation. I should not make that statement without authority, and I should like to read you my authority for it. "The economic problem for Great Britain and her Empire is urgent, vital and dominant. There exists at the present time no constitutional machinery for dealing with it, on its merits, with competent examination, and without political bias and antagonisms. The House of Commons, to which the anxious nation looks to provide a solution, is unsuited, both by its character and by the conditions which govern its life, to fulfil such a task. Nevertheless the task has to be done." That is an extract from the Romanes Lecture delivered by our present Prime Minister in the Sheldonian Theatre at Oxford in 1930.

We have not moved since then. Our House of Commons is as incapable to-day of dealing with economic problems as it was then, for the political power is not strong enough to meet and overcome the monetary power. That can only be done by the military power. Fortunately, however, it looks as if we might be able to rely in future upon the military power to save us from decimation by the monetary power, for is it not obvious that either complete victory or a negotiated peace will make the

retention of strong military forces essential for many years to come? Under these conditions, our food supplies will have to be treated as one of our defence services, so that we may not again be put in the position in which we were placed at the beginning of this war by neglect to develop the wealth-producing capacity of our soil for the protection of the people.

DR. E. C. WILLATTS said: I was especially interested to hear the suggestion put forward this afternoon that we should have a co-ordinating authority for dealing with agriculture, health and food. Hitherto there has been far too much cleavage between the various authorities interested in these matters. The Ministry of Health, for example, has often disregarded the inherent wealth of certain limited types of soil and has allowed areas of those soils to be taken from agriculture to provide room for urban buildings, factories, and so on, which might have been equally well erected elsewhere on less productive land. That is only one aspect of the problem, but it is a very serious one. We need, therefore, to have a careful investigation made of the different types of soil in this country, and, when we have obtained that information, which I think will be forthcoming very soon, we shall need a co-ordinating Ministry which will have over-riding authority to plan the whole of our land. The best arable land should be reserved for growing food, the best pastures for fattening our home-grown meat, the poor land for recreational purposes and afforestation, and so forth. This is a cognate problem to that with which the author has dealt, and I look forward to the time when it will be adequately considered with the problems of soil fertility and nutrition.

PROFESSOR WM. C. MILLER (Royal Veterinary College) said: I am very interested in the paper, but there are some statements in it which I wish to challenge.

In the first place, the author and several of the speakers in the discussion have fallen into the error of making generalisations to fit particular cases. I should like to ask this specific question: What is the scientific basis for the suggestion that animals fed upon land that is in this condition of deteriorating fertility, which we hear about in Britain, have suffered from disease or that the people eating them or their products have so suffered? I would suggest that Britain possesses soil which as a whole is capable of yielding a far greater amount of food per acre than even the virgin lands of Canada and New Zealand; I think that that is shown quite clearly by statistics.

I come of farming stock myself, and I deprecate the position that seems to have arisen in which everyone, irrespective of his qualifications, wants to tell the farmer what his job should be. I do not think there is anything to be ashamed of in British agriculture. I say advisedly, and deliberately, that British agriculture has done more than the agriculture of any other country, including Denmark, to improve the quality of all the products which come from the soil, including man.

Then I would ask: Where in Britain is much soil erosion going on? Where are these areas which are deteriorating? There are many different types of soil, and one cannot make thin, light, sandy soil yield produce in the same degree as heavy, rich loam. Certain areas are derelict, but have they not always been derelict? Is there much, or any, good land deteriorating and going out of production? We must, I think, keep a balanced view of the whole picture.

Again, is not it probable that the pest attacks we now have in this country are due fundamentally to the operation of a biological law? There is a population of lemmings in Norway which, from time to time, is increased and then instinctively reduced because large numbers run into the sea. There is a population of jack

rabbits in Canada which, uninfluenced by man, increases in a rhythmical manner and causes a secondary increase in the fur-bearing animals which live upon it but which gradually comes back to normal or may even become subnormal. I suggest that we see the same biological laws operating in the case of pest attacks in this country. An adequacy of food and an absence, or comparative absence, of natural enemies allows a biological population to increase beyond its normal bounds, even to peak levels; later the balance is gradually restored. To blame husbandry conditions solely for increases in parasitic attacks on crops or animals is a misjudgment of something which has a far deeper and far greater significance and which is on a par with many other biological laws of population change which we see in operation. I suggest that this aspect of the matter needs serious consideration.

I fully agree there is an opportunity for much progress in the matter of returning city waste to the land. But to state that once the local authorities have put their house in order, all that is needed is the education of the farmer is, I think, entirely inadequate. The general public needs educating first, for if Britain wants a proper agricultural policy, it is not the task of the farmer to enunciate that policy; rather is it the duty of the population as a whole to take a lively interest in its own agriculture, and to adjust its social and economic structure so that agriculture will be able to play its full part in the life of the community.

CAPTAIN R. G. M. WILSON (of Iceni Nurseries) said: As a farmer I should like to reply to some of Professor Miller's criticisms of Mr. Douglas's paper. Personally, I welcome the paper and think it should be broadcast to every town and village.

Professor Miller referred to the question of soil erosion in this country and asked where it was to be found. If he likes to spend a day with me I can show it to him on farms in my own district. Soil erosion had occurred on the farm that I took seventeen years ago, and occurs in many parts of Cambridgeshire and Lincolnshire. I am convinced that it is due to trying to produce maximum crops from the soil.

I suggest also that pests and animal diseases are due to our upsetting Nature's laws by trying to specialise. I was a convinced believer in specialisation when I first went on the land, but I was soon taught the stupidity of it. If we specialise we get the land out of balance. On my little farm in Lincolnshire I have tried to grow plants which are healthy, and I have found that when plants are bred specifically for one quality they lose other qualities. For instance, in the case of Royal Sovereign strawberries, in breeding for a high quality one produces a lack of virility.

I do not come of farming stock, but started farming from a "scientific" point of view. The land has taught me to be humble, and I agree that the farmer does need education in a good many things. For example, he needs educating to understand that he has a responsibility for the soil which he is cultivating, and that that soil is a national heritage. I think that the old-fashioned farmers realised this responsibility much more than a good many of the people who occupy the land to-day.

The people, too, need educating. We shall have to educate them to eat good vegetables, though I hope, too, that their own palates will help them there, for I am convinced that the choice of food is not entirely a question of price. I will give you two proofs of that from my own experience. At a time when potatoes were extremely cheap I sent some for sale in a London suburb. The retailer at first marked them at a halfpenny a pound, and could not sell them. Then, after a fortnight, he altered the price to a penny a pound and sold them all. Again, when I was selling live cattle to butchers and was watching the carcases being weighed, children from poor families came in and asked for a shillingsworth of the best steak; it was not the cheap meat

that they wanted. I agree, therefore, with the author when he says that when people are educated to realise the importance of their own health, and that the things that they eat may do them harm, they will not pay so much attention to the question of price.

The LECTURER, in replying to the discussion, said: I do not suggest that the use of artificial fertilisers should be entirely abandoned. I think it is conceivable that there is a use for them, but I want to assert the general proposition that the abandonment to such a large extent of the use of organic materials, which re-create and maintain the humus in the soil, and the use in attempted substitution for them of artificial fertilisers have had a very detrimental effect. We must not forget that that effect is a cumulative one, that it continues year after year under the conditions in which agriculture is carried on in this country, and that, although it may not be noticeable in comparing successive years with each other, in the end it is very appreciable.

On the urgency of this matter, I should like to quote a remark made some time ago by Mr. Jacks, who recently read a paper before this Society. He said: "The unprecedented economic expansion during the nineteenth century has been followed by a worldwide biological deterioration of the land. Probably more soil was lost from the world between 1914 and 1934 than in all previous human history." Mr. Jacks is a man of undoubted authority and very cautious in his statements.

With regard to the suggestion that chemical fertilisers are perfectly safe, I should like to make one quotation from an authority who is known all over the world, Dr. Alexis Carrel. In his book, *Man the Unknown*, he says this: "Chemical fertilisers, by increasing the abundance of crops without replacing all the exhausted elements in the soil, have contributed indirectly to change the nutritive value of cereal grain and vegetables."

I have not made an attack upon farmers. On the contrary, I recognise that they have very many difficulties to contend with, that farming is a very highly skilled occupation and that it has to be conducted under conditions which show enormous variability and which therefore require the very highest skill on the part of the practitioner of the art. But I do want to protect farmers from the idea that they will find salvation by compelling the rest of the population willy-nilly to pay more for their food. I say that that is suicidal. The Corn Production Act, to which reference has been made during this discussion, is an illustration of that. It was passed with the idea of guaranteeing to farmers the very high prices that prevailed in the year 1918, and the urban population simply would not stand it when the war was over and when the price of everything else was falling to more or less normal levels. I insist that you have to educate the public to buy the better quality food, which may in some cases be more expensive but which may, through increased production, become cheaper than food produced on a smaller scale.

I do not assert that we should abandon the use of imported food altogether. Citrus fruits, dried fruits, grains and other materials of human food can be kept for considerable periods without suffering deterioration. It is in the case of the more perishable foods that an opportunity occurs for a larger production in this country, and it is in the case of those foods that the difference in taste is most noticeable and that the habit of using better food will become more firmly established as people begin to appreciate it.

This problem will require a very great deal of exertion if it is to be solved completely. I do not look for a solution from any proposal for rearranging Government departments which are concerned with matters of this kind. There is, in the

suggestion that certain Government Departments should be amalgamated, an assumption that there will somehow or other come to the head of the new Department someone who will be capable of doing the job that one wants to be done; but that does not follow, although it would be the only virtue of the rearrangement. The problem will not be solved merely by juggling with the machinery of government; it requires concentrated, intelligent and scientific work, and it requires Societies such as this to enlighten the public as to the real elements of the problem.

On the motion of the Chairman, a vote of thanks was accorded to Mr. Douglas for his paper, and, also on the motion of the Chairman, the thanks of the meeting were accorded to the Council of the Institution of Electrical Engineers for granting the Society the use of the Hall of the Institution for its meetings whilst its own premises were not available.

The meeting concluded with a vote of thanks to the Chairman.

MR. E. H. SAMS writes: There was no time for me to add to the long and interesting discussion which followed Mr. Douglas's paper. I should, however, like an opportunity to mention a point which was not emphasised that afternoon, viz., the pollution of land and water caused by the present system of sewage disposal. Under our present system fish are destroyed in rivers and sea, so that our fishing fleets have to go to more distant waters for their living, thousands of acres of valuable land are acquired for the dumping of refuse and sewage; the sea around our coasts is, in many places, made unsuitable and dangerous for bathing, and seaweed which used to be a valuable manure has to be thrown back into the sea owing to the offence which it causes when washed up. The cost to the nation for these processes of pollution is between £25 and 10 millions per annum and the returns sickness, disease, and breeding grounds for vermin and other pests. Yet, the cost producing valuable humus from the wastes is less than the cost of dumping them, and the result in increasing soil fertility and improving the nation's health is immeasurable.

GENERAL NOTE.

INTERNATIONAL ARTS CENTRE.—This Centre has been started in London in order to bring together artists of all nationalities and those interested in the arts. Its activities will include lectures, musical and gramophone recitals, exhibitions, and poetry and dramatic readings. The annual subscription is one guinea.

A series of evening leetures and musical recitals is planned to begin this month, and full particulars can be obtained from the Organising Secretary, E. Margaret Dighton, International Arts Centre, 22, St. Petersburgh Place, London, W.2. (Telephone: Bayswater 5194.)

NOTES ON BOOKS

ENGLAND AND THE FARMER. Edited by H. J. Massingham. B. T. Batsford, Ltd. 10*s.* 6*d.*

Much of the ground covered by this symposium has already been covered by Lord Northbourne's *Look to the Land*. Dr. L. J. Picton's contribution on *Diet and Farming*, for example, is almost identical in its arguments, as in many of its references, with Chapter Two of that book. A certain impatience, amounting to testiness in places, makes it the less valuable piece of work. In his preface to the book, Mr. Massingham urges, in fact, that the two books should be read together, a suggestion with which I cordially agree. Chosen, but apparently not guided by Mr. Massingham, the seven contributors put up a formidable case for the revaluation and regeneration of the land of England generally, and for farming as "the critical link in that unceasing flow of material substance which is the physical aspect of man." Lord Lymington on *The Policy of Husbandry*, Sir Albert Howard on *Soil Fertility*, Mr. C. Henry Warren on *Corn*, Mr. Adrian Bell on *The Family Farm*, Mr. Rolf Gardiner on *Rural Reconstruction*, Dr. Picton on *Diet and Farming*, and Sir George Stapledon on *The Reclamation of Grasslands*, all arrive, in Mr. Massingham's words, "at an identical conclusion as to the means to be followed for the salvation of Rural England." Of these essays, Mr. Adrian Bell's is surprisingly clumsy, inefficient and unconvincing; Mr. Rolf Gardiner's is flavoured rather too much with Teutonic ideologies for my liking, though he strikes hard and justly at a church "that is simply not doing its job"; Mr. Warren's essay on corn is apparently an offshoot of his recent book on the same subject, but is very good for all that; Lord Lymington makes a sound and passionate plea, in which there is the very sensible suggestion that "there should be a Chair at Oxford for the right uses of dung." This essay, together with the contributions by Sir Albert Howard, whose examination of the Indore system is masterly, and by Sir George Stapledon, make the backbone of the book. Towards Sir George Stapledon's essay, and indeed towards all his work for the land, there are two courses one may adopt: to devote to it nine-tenths of the review, or to say, simply, here is a great man. I would like to choose the first; I have no option but to choose the latter.

The conclusions drawn by the contributors are black, but nevertheless remain, I suggest, incomplete. The book would have been more telling, to my mind, if the cases of the smallholders and of the farm labourer himself had been included. As it is, the book appears to be rather too rigidly devoted to the thesis that the rural England of to-day is only the blighted skeleton of that fat and golden age of yesterday. Essential though the need for rural regeneration is, a sense of proportion needs to be kept. In reading *England and the Farmer*, therefore, one may very profitably take down from the shelves some such work as *The Village Labourer* and remind oneself that the past, on which Mr. Massingham urges so emotionally that we should model ourselves, was, for the poorer people of the rural community, rarely fat and never golden at all.

H. E. BATES.

PRIMITIVE ART. By L. Adam. Pelican Books. Allen Lane, Penguin Books. 6*d.*

This is a little book of great interest. It should appeal not only to artists but to all who, in the words of Dr. Marrett's foreword "would devote their spare moments to the contemplation of the constructive rather than the destructive energies of the human race." In the purely bibliographical sense it is quite amazingly good value, with its numerous text illustrations and its sixteen pages of photogravure plates.

When we come to a criticial appreciation of its contents we are plunged at once into the deep waters of philosophic problems. What is "primitive"? What is "art"? Dr. Adam himself says: "It is difficult, if not impossible, to give a satisfactory definition of 'primitive man' as distinct from 'civilised man.'" I think one may conclude that the author meant to deal only with "uncivilised" art but could not avoid the inclusion of much that is primitive neither in the technical, the historical nor the æsthetical sense. It is clear, also, that he found the æsthetic

problem the most difficult one to handle. It always is ; for if we answer the question " What is art ? " in the simplest and most fundamental way with : " any object made by the hand of man," it covers far too much ground. If we answer : " any object that conforms to certain æsthetic principles," we discover that no philosopher has yet been able to define these principles with scientifically objective precision. Take alone the word " beauty " of which Albert Dürer despairingly had to admit : " . . . but what beauty is I know not." Even such apparently simple terms as " realism " and " naturalism " present difficulties. I will give one example. Dr. Adam illustrates a statuette by a modern Haida Indian (Plate 27) as evidence of a " high standard of naturalistic wood carving." In my opinion, its standard of naturalism is by no means a high one : it is, for instance, below that of the likewise modern Nigerian sculpture (Plate 31), and both examples are, so far as naturalistic standards of art are concerned, infinitely below the achievement of the puzzling bronze heads from Ife (Plates 6 and 7), which, tentatively given to the thirteenth century A.D., cannot possibly be regarded as *primitive* in any sense of the word.

How controversial the whole subject of the *primitive* is may be judged by an objection which can, I think, be legitimately made against so eminent an authority's as Sir Michael Sadler's view. The author quotes him as holding that we can only appreciate " the strange beauty of the masterpieces of West African sculpture if we put ourselves as near as may be in the place of those for whom the artist carved his figure." I think, on the contrary, that precisely because we are so far away from those for whom the artist carved his figure we realise both the *strangeness* and the *beauty* with a clearer, because unbiased eye.

The *strangeness* of the beauty which is revealed to our eyes usually springs from its unrealism, its divergence from nature, and this divergence is certainly not due, as some have supposed, to the elementary form of primitive art. On the contrary, this unrealism is evidence of sophistication, of the complex if unscientific beliefs of the so-called " savage " who, incidentally, is as rational as a scientist and as logical as a child : they all alike argue from premises of different degrees of falseness.

What in fact is the most amazing quality in " primitive " art is the logic of design manifesting itself in abstractions of singular, sometimes simple, sometimes complex, beauty. It is the degree of perfection or rather consistence in the logic of design (cf. Plates 11, 24, 26 and Figs. 29 and 35 for example) which distinguishes a " work of art "—whether primitive or otherwise—from " ethnographical specimens " or other artefacts.

It will be judged even from this inadequate review of his booklet that Dr. Adam has provided ample information and excellent food for reflection on a difficult but fascinating subject.

HERBERT FURST.

SOME PAPERS AND LECTURES

DELIVERED BEFORE THE ROYAL SOCIETY OF ARTS

The Case for Land Improvement and Reclamation, by *Prof. R. G. Stapledon, C.B.E., M.A.* (1936).

The Art of our Day, by *Philip A. de Laszlo, M.V.O.* (1936).

Artificial Resins, by *H. V. Potter, B.Sc., F.I.C.* (1936).

Luminescence and its Applications, by *J. T. Randall, M.Sc.* (1937).

Applications of Photography to Scientific and Technical Problems, by *Olaf F. Bloch, F.I.C., F.R.P.S.* (1937).

Alloys, by *Prof. W. L. Bragg, O.B.E., M.A., D.Sc., F.R.S.* (1937).

The State and the Worker, by *Rt. Hon. Lord Amulree, P.C., G.B.E., K.C., LL.D.* (1937).

Cement in Constructional Design, by *P. G. Bowie, A.M.Inst.C.E., M.I.Struct.E., A.C.G.I.* (1938).

The Hygiene of a Quiet Mind, by *Lord Horder, G.C.V.O., M.D.* (1938).

The British Cabinet and its increasing Burden, by *Brig. Sir Edward Tandy.* (1938).

Bracken and its present menace to Heather and Pasture, by *Prof. K. W. Braid, M.A., B.Sc.* (1938).

The British Empire. What is it ? by *Rt. Hon. Viscount Sankey, P.C., G.B.E., D.C.L., LL.D.* (1939).

Recent Improvements in Agricultural Machinery : and their bearing on the Home Production of Food, by *S. J. Wright, M.A.* (1939).

Some Aspects and Problems of Indian Archæology, by *Captain Sir Leonard Woolley, M.A., D.Litt., LL.D.* (1939).

Textile Agents, by *C. J. T. Cronshaw, D.Sc., F.I.C., F.R.S.E.* (1939).

Alternative Motor Fuels, by *C. M. Walter, D.Sc., M.Inst.Gas E., A.M.I.E.E.* (1940).

Applications of X-Ray Technique to Industrial Laboratory Problems, by *H. P. Rooksby, B.Sc., F.Inst.P.* (1940).

Plastics as Constructional and Engineering Materials, by *H. V. Potter, B.Sc., F.I.C.* (1940).

Leadership and Character in a Democracy, by *The Rt. Hon. Lord Snell, P.C., C.B.E., LL.D.* (1940).

(Two papers in one *Journal*—Price 2s.).

Copies of the above Lectures and Papers may be obtained from the Secretary, Royal Society of Arts. Price 1s.