

figures for Lepidoptera are 9 and 15 per cent; for Coleoptera, 44 and 46 per cent; for Hymenoptera, 14 and 17 per cent; and so on. This means that various animals are captured by birds approximately in proportion to their numbers, and no selective discrimination between groups on the part of birds is apparent. In other words, the predation takes place in much the same way as if there were no such thing as protective adaptation.

As regards various devices interpreted by selectionists as protective, their value can be gauged by the relative abundance of animals with such devices in birds' stomachs. The data in this respect are very discouraging to selectionists. It is not surprising, of course, that animals with coloration harmonising with their surroundings are eaten freely, since this can be interpreted as the selection in action. Much more important is the fact that animals presumably protected by poisonous secretions are also consumed in proportion to their numbers and, therefore, cannot be said to enjoy any protection. A beetle, *Macroductylus*, is definitely poisonous and many young birds are killed by eating it, but it is, nevertheless, eaten freely, and the advantage of being poisonous is not obvious. Again, all spiders are venomous, but the 10,000 records of spiders having been eaten by more than 300 species of birds emphasise the complete disregard by birds of this method of protection. All the members of the group of Rhynchota (bugs) are always regarded by selectionists as being specially well protected by their taste or unpleasant smell. The fallacy of this statement is made clear by the 22,395 records of Rhynchota found in stomachs, the percentage of the records being in close agreement with the relative abundance of these insects.

Bright and contrasting colours of insects are usually considered as 'warning', and the Coccinellid beetles,

or ladybirds, represent a classical example of 'warning coloration', possibly developed by selection and serving to advertise their unpalatability. There are, however, 1455 records of Coccinellids found in the stomachs of 127 species of birds; since up to 15 insects have been found in one stomach, their 'warning' coloration and the inedibility must be a fiction. Another equally well-known example of a specially protected group of insects is represented by the ants, and their immunity from attacks is said to be so great that many other arthropods secure protection from enemies by mimicking ants. The 12,000 records of ants eaten by well over 300 species of birds make the status of ants as a protected group untenable. Some birds eat ants in very large numbers, and up to 2000 ants have been found in one stomach. It is particularly noteworthy that even ants of the family Myrmicidae, notorious for their stinging habit, are not avoided, as is shown by 1200 records of their presence in stomachs, containing in some cases up to 400 individuals. Wasps are considered also as regular models for mimicry, being themselves presumably well protected by sting and also 'warningly' coloured, but 140 species of birds eat them, up to 30 wasps at a meal.

The whole book is full of examples of this kind, most carefully collected and thoroughly analysed, and represents an array of arguments of which selectionists will find it very difficult to dispose. The principle of proportional predation is exhibited so clearly and forcefully that a discrimination in the choice of prey by birds (and other vertebrates, also considered in the paper) is shown to be simply non-existent. Indeed, the data at hand denote a complete indiscriminate, the very antithesis of selection, and the phenomena classed by theorists as protective adaptations are shown to bear no relation to the survival of the fittest.

B. P. U.

Aluminium in Foodstuffs

THE meeting of the Society of Public Analysts on June 1 was devoted to papers on the effects and estimation of aluminium in foodstuff.

A survey of the physiological effects of aluminium was given by Dr. J. H. Burn. He said that the first extensive investigation of the physiological effects of aluminium salts was made in 1886 by Siem, working under Prof. H. H. Meyer. Siem found that doses corresponding with 30-40 grains of alumina for a man had no effect whatever when administered by mouth to cats daily for four weeks. When the aluminium salt was injected under the skin, the fatal dose varied from 0.25 to 0.30 gm. of alumina per kilogram. These results, indicating that aluminium has some toxicity when injected, but is harmless by mouth, have in substance been confirmed by many subsequent workers.

Siebert and Wells examined the pathological changes produced by injecting alum and aluminium chloride; they found that anaemia was manifested after nine or ten daily injections, a fall in the hæmoglobin percentage and in the red cell count being recorded. In the spleen, pigmentation, thrombosis, and fibrosis were observed.

The experiments of McCollum and his colleagues, and those of Myers and Mull, show conclusively that the addition of aluminium salts to the diet of young rats has no ill effect on growth, health, and reproduction, even when four successive generations are observed. The experiments of Myers and Morrison, and of Underhill and Peterman, show that when aluminium compounds are given by mouth to dogs, only insignificant changes in the amounts of aluminium in different tissues are found. It follows that alu-

minium salts are not absorbed from the alimentary tract, except in traces.

As a result of a scare in the United States that the use of aluminium baking powders was dangerous to health, the Department of Agriculture instituted a board of inquiry. The report, published in 1914, described experiments on twenty-six university students carried out in three different universities, who were given amounts of alum varying from 0.2 gm. to 10 gm. daily for about six months. It was unanimously reported from the results of these experiments that the amounts of alum likely to be consumed as a result of alum in baking powder, estimated as up to 1.16 grain of aluminium per person per day, are much too small to have any ill effect. The amounts of aluminium which arise from aluminium vessels were estimated from analyses carried out by Massatch to be about 0.1 grain per person daily.

Indeed, the possible dangers arising from aluminium utensils have been very thoroughly investigated by many workers, on many species of animals; they have also been investigated with equal thoroughness on man. These dangers are non-existent. Clinical reports that symptoms of abdominal pain are relieved by discontinuing the use of aluminium can be ascribed to psychological effects.

Dr. L. H. Lampitt and Mr. N. D. Sylvester outlined a method for the accurate determination of small amounts of aluminium in foodstuffs, in which the Aurin tricarboxylic acid lake is formed under standardised conditions, the red colour of the final solution being measured in the Lovibond tintometer. Separation of aluminium from the 'wet ash' of the foodstuff is effected by a preliminary precipitation

with ammonia, the aluminium being obtained in alkaline solution. Other metals which are liable to be present have been proved not to interfere. The actual determination is carried out on an aliquot portion containing 0.01-0.06 mgm. of aluminium. Using 20 gm. of sample, so little as 0.2 part per million of aluminium can be determined.

The results obtained indicate that the aluminium content of foodstuffs is increased by only a few parts per million after cooking in aluminium utensils. For example, the aluminium content of milk was increased from 0.4 to 0.6 part per million after boiling in an aluminium saucepan, and to 2.5 parts per million after standing overnight. Apples before cooking contained 2 parts per million of aluminium, and after boiling in an aluminium vessel for thirty minutes with sugar and water they contained 14 parts.

Mr. P. L. Bilham described a spectrographic method for the determination of small quantities of aluminium. The aluminium of a biological material is concentrated on to a special electrode. The spectrum is then excited by a condensed spark discharge, modified to remove air-lines as much as possible, and a quartz spectrograph is employed to photograph the spectrum. The plate is developed under standard conditions and then compared with sets of standards on plates prepared under precisely similar conditions. The results show that aluminium is detectable down to 0.01 mgm., and that the intensities of the lines at 3944 Å. and 3961.5 Å. can be used to judge the amount present up to 0.2 mgm. The method is, of course, specific for aluminium and of a reasonable accuracy.

Carnegie Grants for Libraries and Museums

THE eighteenth annual report of the Carnegie United Kingdom Trust, for the year ended Dec. 31, 1931, has recently been issued.* The opening paragraphs reflect the influences of the financial position of the country upon policy, inasmuch as the main object of the trustees in the immediate future will be one of consolidation rather than the inauguration of new and pioneer schemes. In their view, the urgent demand for drastic economy in national and local expenditure, coupled with the restriction of private generosity, compels limitations of policy. Grants from the Trust will be made in order to maintain and stabilise activities which have already been assisted and have themselves tended to move forward under their own momentum. But grants for entirely new purposes are to be few in number, and to be made only for exceptionally strong and urgent reasons. These decisions, however prudent, must inevitably bring disappointment in various quarters, but, at any rate, they cannot fail to be understood.

Though most people are aware how wide the net is cast, it may be useful and opportune at this juncture of affairs to recall some of the more important schemes which have received allocation of revenue. Outstanding among these is the acquisition of freehold property in Bloomsbury, intended to form the headquarters of the National Central Library and of the Library Association, in an area contiguous to and ultimately destined for occupation by the new buildings of the University of London. The total sum contemplated for this undertaking is large, amounting in fact to about £60,000. It is believed that the two institutions, housed as neighbours, will play an essential part in completing the unification of the nation's library service. For the first time in its history the

* The Carnegie United Kingdom Trust. Eighteenth Annual Report (for the year ending December 31, 1931), approved by the Trustees on March 11, 1932. Pp. ii+95+4 plates. (Dunfermline.)

Library Association will be in possession of premises of its own, large enough for practical operations, and consistent with its dignity as a national body established by Royal Charter. It is hoped that the quarters will be ready within about eighteen months. Complementary in interest is the information that the trustees are still prepared to receive applications on behalf of municipal libraries serving populations between 10,000 and 70,000. Aid is given for book-purchase only, and will be made to such authorities as are prepared to carry out, as fully as financial conditions permit, the main principles of approved modern practice.

Substantial grants have been allotted to various research associations and societies—among these we note British Non-Ferrous Metals, Wool Industries, Linen Industry, British Rubber Manufacturers, British Flour Millers, London School of Economics, Entomological Society, Society for Psychological Research. Rural and Social Service includes schemes affecting community centres, boys' and girls' clubs, youth hostels, and village halls. Enterprises relating to activities in the departments of music and drama have received attention; while the sympathy and support extended to rural preservation schemes and playing fields is a record of much interest.

The trustees' 'museum policy', initiated rather more than two years ago, is still in the experimental stage, and there may be a temporary period of inaction. Thirteen centres had accepted or been offered grants up to the end of 1931 for reconstruction purposes. These grants are conditional upon the adoption of a scheme prepared by an expert appointed by a joint committee of the Trust and the Museums Association. The substitution of modern cases, the disposal of miscellaneous and irrelevant material, adequate display and labelling, coupled with the adoption of a progressive policy on the lines recommended in Sir Henry Miers's report, are essential considerations.

Finally, the remarkable development of county libraries, closely fostered by the Library Association, established in local areas, demands a few words. Throughout Britain generally the story is one of judicious expansion. At the end of the year 1930-31, some sixteen millions of the population of the United Kingdom were served through 14,000 library centres, almost all of which were administered by voluntary librarians and enlisted voluntary helpers. In no other country as yet could it be stated that any village librarian, in addition to his periodic supply of anything from 50 to 2000 books, can obtain for borrowers access not only to the county stock of, say, 50,000-150,000 volumes, but also through the county headquarters to nearly 5,000,000 volumes held or procurable by the National Central Library, and that, as a rule, special books may be sent by post for private study.

University and Educational Intelligence

CAMBRIDGE.—The governing body of King's College, having made provision for four additional fellowships open for competition to graduate members and research students of the University, is offering a fellowship to be associated with the name of the late Mr. E. B. Stringer. Candidates must be members of the University, less than thirty years of age on March 1, 1933, who have worked in (i) chemistry, (ii) experimental physics, or (iii) the chemistry or physiology of plant or animal life. Applications should reach the Provost by Nov. 1.

DUBLIN.—At a meeting of the Senate of the University of Dublin, Trinity College, on June 29,