NEW SOURCES OF FOOD.

BY W. N. LOCKINGTON.

Advance in civilization is marked by an advance in the choice of food. In the words of Spencer, "There is an analogy between progress in bodily nutrition and progress in mental nutrition. The higher types of mind, like the higher types of body, have greater powers of selecting materials fit for assimilation."

As there is room for much further advance in mental nutrition, so is there for much advance in bodily nutrition. The choice of food has hitherto been determined empirically. Prejudice is the usual guide. A few experiments with foods, and finding some hitherto unused or little known article to be exceedingly nutritious, or to supply a want, they recommend its adoption, but either their recommendation is unheeded, or the new article wins its way into favor with exceeding slowness.

The multitudinous forms of animal and vegetable life could furnish us with many an article of food equal or superior to those in use. We have not yet been through the full range of nature in our search for food. Yet our wide-spreading commerce has made us familiar with many foods that were formerly unknown, so that, prejudiced though we are, our range of food is wide compared with that of our ancestors, or that of a savage, but almost all the plants we grow for food purposes, as well as almost all the animals we eat, are, if not those used by our own ancestors, those which have been used for ages by other peoples with whom we have come in contact. It is the same with animals and vegetables used in the arts. We have adopted them from others—few indeed have had their merits discovered and utilized.

The seed of certain grasses and certain leguminous plants have for thousands of years been the chief sources of nutriment procured by man from the vegetable world, and they fulfill his purpose well; but the two immense orders of *Leguminosæ* and *Gramineæ*, the latter entirely, the former chiefly composed of plants that are adapted for food, could furnish many additional species that would not only vary our dietary, but give us a supply or food under conditions that preclude the growth of species now in use. The number of fruits cultivated might be greatly increased. Almost every section of country furnishes some nut or berry which even in its wild state is pleasant to the taste.

What might not cultivation do for some of these. It has given us all the varieties of plum and cherry, apple and pear, from sour and unpromising originals, and the long category of vines from one European species. Many edible roots, stems and leaves have yet to be discovered or improved into value.

A few species of the order *Cruciferæ* are eaten, while the rest are neglected. Yet the whole order is good for food. A botanist could multiply examples throughout the range of vegetable life, but it will suffice here to give one more; the mushroom or fungus tribe, so little known, so much dreaded, yet containing so many edible species. Again and again it has been shown that the same amount of observation which enables a man to distinguish night-shade from the potato, or carrots from hemlock, would enable him to discriminate between the poisonous and edible mushrooms, yet only an enthusiastic band ever dares to venture beyond the conventional species. The species favored by the Anglo-Saxon is in ill-favor with the Italian, who has a wider range of edible fungi, as have also the Frenchman and the Russian.

As mushrooms can be grown in places where ordinary plants will not flourish, an increased taste for and knowledge of them would be of great benefit to our poor. If from the vegetable world we turn to the animal, we find prejudice and ignorance still more rampant. The Mosaic law is still obeyed in this matter by nations who break it in most others.

The ordinance which restricted the Israelites to the use, for food purposes, of such quadrupeds only as chew the cud and divide the hoof, was in the then state of knowledge a wise and safe one.

All such animals are herbivorous, and are better fitted for food than carnivorous mammals. They are of large size, furnish an abundance of healthy muscle, and have in many instances been domesticated for ages. But numerous other large animals are herbivorous also, and extensive series of small animals are graminivorous or frugivorous, devourers of seeds or fruits. Why should not these be eaten? The omnivorous pig, whose diet, at least in a state of domestication, is not particularly choice, and whose flesh is less nutritious and less wholesome than that of most other mammals, is largely eaten by man, yet the prejudice against horse flesh is almost universal among Aryans.

We occasionally eat a hare or rabbit, but the rest of the rodentia, mostly seed or root eaters, are neglected. The ground squirrels, a plague on the Pacific slope of the United States, would cease to be so were man to make a systematic onslaught upon them to gratify his taste. Their flavor is pronounced excellent by all who have tried them. The taste for this or that particular article of food is to a great extent acquired.

Many who ultimately become fond of oysters dislike them at first. The same remark holds true of many other foods in common use. The muscles of all birds and mammals are suitable for food when in a perfectly healthy condition. More care is necessary in the case of carnivorous mammals, since their flesh decays more rapidly; yet it is doubtful whether one person in ten could distinguish cat from rabbit were they cooked alike and the more tell-tale portions removed.

The strong or fishy flavor of marine mammals and birds would doubtless be objebted to by those whose gustatory nerves had learned to relish high game and Limburger cheese, yet as safe sources of nutriment they would at least be superior to the former.

Civilized nations of Aryan descent devour many mammals and birds, some batrachia and many fishes; but the intervening class of reptiles is almost wholly ignored. Why? Simply because of the pious horror of the snake. Lizards, as they have long tails, are viewed only a little less unfavorably, while tortoises—thanks to their widely different form—are accepted with some reservation; yet the flesh of snakes and lizards is as firm, as nutritious and as healthy as that of fishes, if not more so; and those who have eaten them when among peoples who do not share our prejudices, have had their own shaken. The Frenchman, who is a good cook, eats frogs; the Englishman cannot conquer his prejudice.

Leaving the vertebrata; the choice made by civilized nations among the invertebrata is highly eccentric.

A Spaniard or Frenchman relishes a cuttle fish, which an American or Englishman shudders at; and the harmless snail and slug, *per se* as good food as oysters, are esteemed by some nations and detested by others.

There is little doubt that the great majority of mollusks of sufficient size are healthy food, and that man has yet to discover among them many a *bonne bouche*.

Descending lower still, sea-urchins, sea-anemones and sea-cucumbers are eaten by some highly civilized nations, and who can tell how acceptable they might prove to an Anglo-Saxon could he but conquer the horror he feels at their appearance.

P. H. Gosse, so well known for his interesting works on natural history, tells us how he cooked the common sea-anemone of the English coasts (*Actinia mesembryanthemum*), and how fond his little one became of it, asking for "more tinnies."

Probably the classes of animals which are of least value as food to man are those included in the sub-kingdom Arthropoda, namely, insects, arachnids, myriapods and crustacea, the multitudinous types groaped together as *Vermes*, or worms, and the uni-celled organisms, or Protozoa. Some of the larger crustacea, known as crabs, lobsters, crayfish and shrimps, are eaten as delicacies, and it is probable that many other species are equally edible, but the vast majority of the class is only of value to man inasmuch as it furnishes food for larger marine animals.

Insects are eaten by many wild tribes. Some of the Indians of the Pacific coast find in the abundance of grasshoppers that plague the white man, an abundant store of food. Similar Orthoptera are largely consumed by the

natives of South Africa, and those of some of the Sunda Isles esteem dragon-flies a great delicacy, catching them, according to Wallace, on birdlimed twigs. Though there can be comparatively little nutriment in the soft bodies of insects, yet there is no reason for the horror with which they are regarded, as articles of food, by the Aryan races. A fancy for the flavor of the Rocky Mountain locust would go far toward decreasing the devastation of that dreaded pest.

Some of the marine worms are accounted delicacies by certain tribes, but the greater part of the varied forms belonging to the sub-kingdom must be regarded, so far as they are useful to man at all, as only indirectly so through their consumption by animals he feeds upon. The same may be said of the Protozoa, which, swarming in countless numbers in sea and river, lake and marsh, furnish food for the creatures above them.

Putting aside all question of protection or preservation of plants and animals now used as food, the examples adduced are sufficient to show that the range of foods might, with advantage, be greatly extended.

Much remains to be learned respecting the diseases and bodily states of cold-blooded animals and of the invertebrata before we can use them for food with the same confidence with which we eat beef, mutton or poultry. The diseases of the higher animals are, to a great extent, similar to our own, and we have learned how to discriminate; but we do not recognize the diseases of fishes, crabs and shellfish. The stories of poisonous fish probably arise from this source. Every year we hear of cases of poisoning, well authenticated, from eating mussels, lobsters or other crustacea, or mollusks, which are usually healthy food. All these creatures are subject to diseases which we have not yet studied, and it may be that at certain seasons, such as immediately after reproduction, some of them are unfit for food. This is one well-grounded cause of prejudice, but one which will be removed as our knowledge of the lower forms of life extends.

The animal and vegetable world furnish us with other things besides food. Materials of other descriptions furnish, by their manufacture, a means of procuring food to some, while the articles manufactured are of use to all. Commerce, which has made us familiar with foods previously unknown, has helped us still more in this direction, yet when we consider the great variety of vegetable and animal life, we cannot but believe that much more remains to be discovered, or, at least, utilized.

Other nations, many of them but semi-civilized, others barbarous, have, in these things, been our teachers. As maize and potatoes were known to the Indians before we learned to use them, so was *Phormiumtenax* to the Maoris, and cotton to the Hindoos and Chinese.

When it is remembered what vast industries depend upon the supply of fibrous plants, and, that a fibre with different qualities, as it could be applied to new uses, would start a new branch of trade; when we see how extensive are the manufactures carried on from gum-resins like caoutchouc, or gutta-percha, we must acknowledge that the discovery of a fiber or a resin with new uses would furnish a livelihood to many additional workers. Take paper for example. Until lately this article was made from linen rags, but as the supply of that material fell short of the demand, cotton waste, straw, the Yucca plant, and other vegetable materials came into use, and it is evident that it can be made from almost any fibrous substance reduced to a pulp. Few are the plants that cannot be utilized by man. If valueless for food or for building purposes, a fiber, a gum, an essential oil, a medicinal product, may be found in most.

The constantly-increasing stock of geographical and botanical knowledge brings new materials into the notice of scientists, and the constantly increasing needs of mankind brings them slowly into public notice. The secretion lately found in Arizona, upon the branches of *Larrea Mexicana*, and of another plant, may yet enable us to dispense with the imported lac from Asia. Chemically the two seem identical; practically the despised Indian, here again our teacher, has long ago proved its use in the mending and making of vessels for cooking purposes.

Here is a case of a new material furnished by the animal kingdom, for it appears almost certain that the secretion, like that of wax or honey, is elaborated by the insect from the juices of the plants it feeds upon. Insects, so little used for food, so terribly destructive to our food plants and annoying to our domestic animals, may yet yield to us many useful materials; may yet prove in this respect among the most useful of organisms. Silk, honey, wax, gum-lac, cochineal, all are insect products, elaborated by insects from plants; and the last two are the produce of *coccidæ*, those destroyers of our orchards and orangeries. Does not this point a way to the utilization, in some cases, of our insect pests?

The higher animals may not furnish us with many additional materials. Horn, hair, fur, wool, hides, feathers, bone, ivory, have their known uses. Improvement here is to be looked for rather in new uses for known materials than in the discovery of new ones. But the lower animals may yet yield us many useful substances. The great treasure house of the sea holds more than we have yet learned the use of. Shells, corals, the honey axes of soft-corals, and many other portions of marine animals, may be utilized for something more than show; and other secretions may be found as useful as those of the sepia. But though the number of useful species—useful either directly or indirectly—is so large that it includes probably the greater portion of existing organisms, yet some are far more useful than others, and some are directly injurious to more useful organisms. Such species need not be cultivated, except where they do not come into direct competition with more useful ones; but their consumption or use by man would diminish their numbers and give room for the more useful forms, which are now often permitted by man, even in his own cultivated fields, to be crowded out by the less useful. —*Scientific Press*, Cal.

Two eggs of the extinct great auk were sold by auction in Edinburgh recently, both being purchased by Lord Lilford, one at £100, the other at 102 guineas, probably the largest sum ever paid for a single egg, with the exception of that of the moa, a single specimen of which was sold at the same place in 1865, for £200.

PROGRESS IN UTILIZATION OF SOLAR HEAT.—Since May, last year, M. Mouchot has been carrying on experiments near Algiers with his solar receivers. The smaller mirrors (0.80 m. diameter) have been used successfully for various operations in glass, not requiring more than 400° to 500°. Among these are the fusion and calcination of alum, preparations of benzoic acid, purification of linseed of oil, concentration of syrups, sublimation of sulphur, distillation of sulphuric acid, and carbonization of wood in closed vessels. The large solar receiver (with mirror of 3.80 m.) has been improved by addition of a sufficient vapor chamber and of an interior arrangement which keeps the liquid to be vaporized constantly in contact with the whole heating surface. This apparatus on November 18, last year, raised 35 litres of cold water to the boiling point in 80 minutes, and an hour and a half later showed a pressure of eight atmospheres. On December 24 M. Mouchot with it distilled directly 25 litres of wine in 80 minutes, producing four litres of brandy. Steam distillation was also successfully done, but perhaps the most interesting results are those relating to mechanical utilization of solar heat. Since March the receiver has been working a horizontal engine (without expansion or condensation) at a rate of 120 revolutions a minute, under a constant pressure of 3.5 atmospheres. The disposable work has been utilized in driving a pump which yields six litres a minute at 3.50 m. or 1,200 litres an hour at 1 m., and in throwing a water-jet 12 m. This result, which M. Mouchot says could be easily improved, is obtained in a constant manner from 8 A. M. to 4 P. M., neither strong winds nor passing clouds sensibly affecting it.