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FOODS FOR MAN:

ANIMAL AND VEGETABLE.

A COMPARISON.

BY

BENJAMIN WARD RICHARDSON,

M.D., F.R.S., &c.

MANCHESTER:

THE VEGETARIAN SOCIETY, 75, PRINCESS STREET,
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1891.



VEGETARIANISM

(V.E.M.)

That is, the practice of living on the products of the Vegetable kingdom, with or without the addition of Eggs and Milk and its products (butter and cheese), to the exclusion of Fish, Flesh, and Fowl.





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FOODS FOR MAN

P R E F A C E .

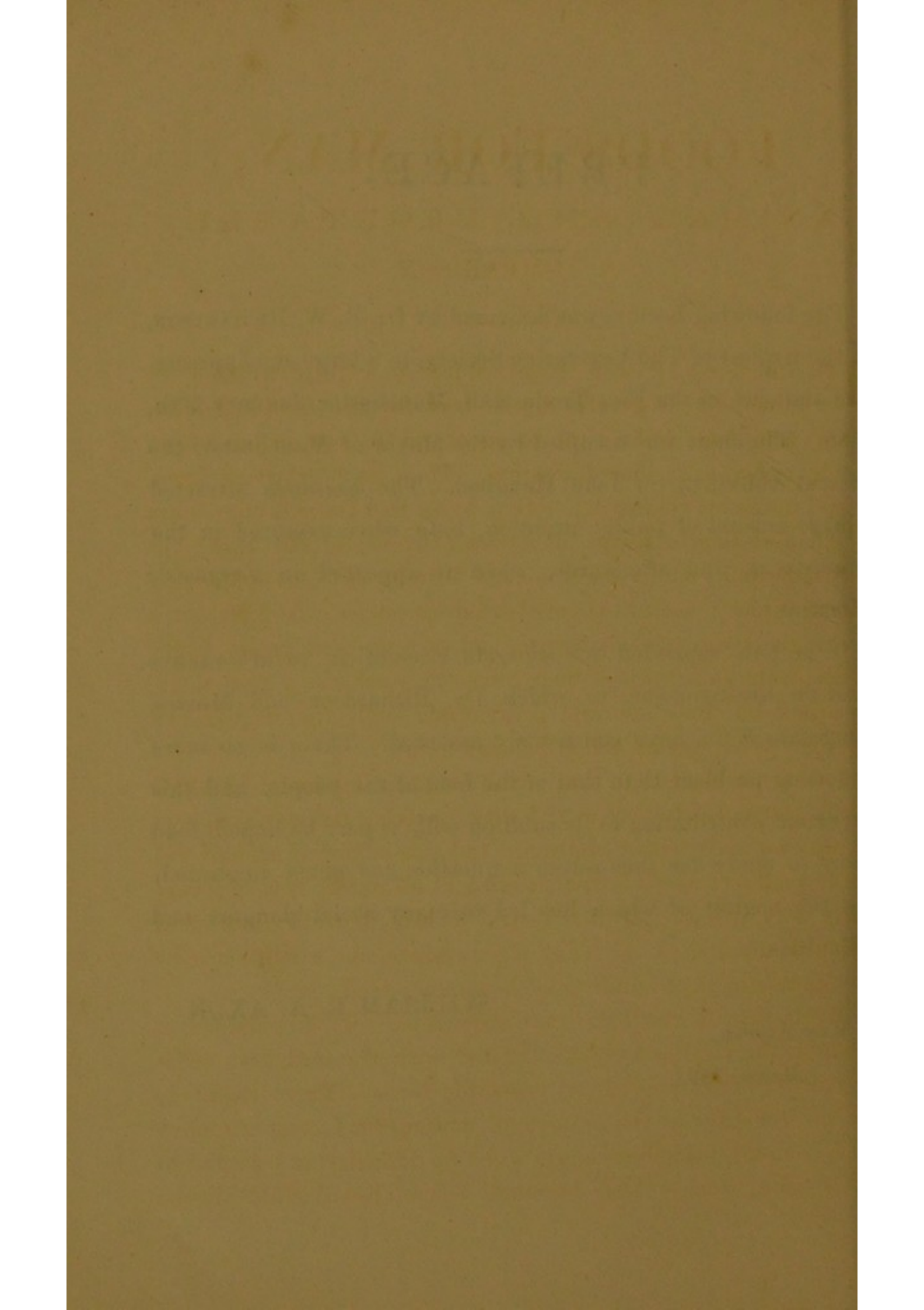
THE following Lecture was delivered by Dr. B. W. RICHARDSON, at the request of The Vegetarian Society, to a large and appreciative audience in the Free Trade Hall, Manchester, January 20th, 1888. The chair was occupied by the Mayor of Manchester, the present Alderman Sir John Harwood. The discourse attracted a large amount of public attention, both when reported in the newspapers, and afterwards, when it appeared in *Longman's Magazine*.

It is now reprinted for separate circulation, in accordance with an arrangement, to which Dr. Richardson and Messrs. Longmans & Co. have courteously assented. There is no more important problem than that of the food of the people, and this important contribution to its solution will, it may be hoped, lead many to study for themselves a question too much neglected, and the neglect of which has led to many social dangers and difficulties.

WILLIAM E. A. AXON.

MANCHESTER,

March, 1891.



FOODS FOR MAN:

ANIMAL AND VEGETABLE.

A COMPARISON.

IN this lecture it will be my object to inquire whether an animal or a vegetable diet is best for the human family. They who have invited me to speak on the subject have been boldly generous in their invitation. They, as vegetarians, know that I am not a vegetarian. They know that the savoury odours of the flesh-pots of Egypt, of ancient Greece, of old Rome, of Saxon Britain—and even of modern Britain, redolent in Mansion House dinners—still tickle my barbarous senses. And yet, such is the generosity of their nature, and such is their entire confidence in the soundness of their cause, they ask me, a flesh eater, to speak on their one and great topic with the well-known freedom of expression which belongs to me.

I shall not hesitate to avail myself of their kindness. I shall speak just as freely here as if I were speaking before a congress of my own professional brethren; and this is how it should be, for if a subject does not bear looking at all round, it is in a very sorry way indeed. If the Venus of Milo herself admitted of being admired from one point of view alone, she would never be the grand object of admiration she so universally is.

My lecture is entitled "A Comparison." It is intended to compare the vegetarian system of diet with the ordinary modes of mixed diets of animal and vegetable foods. There ought to be no difficulty in these days in making such comparison, or such comparisons; there ought to be no difficulty in teaching to every man, woman, and advanced School Board child all the

leading facts on which the comparisons rest; lastly, there ought to be no feeling of prejudice in any mind against discussing this matter on all sides, and to the very bottom; for if there is one subject more than another that is vital, that is national, and that, above all others, touches the future existence of our country, for good or for evil, for prosperity or adversity, it is the subject that we have under our consideration at this moment.

When we sit down to study seriously the many topics for comparison which come before the mind, there is presented at once a difficulty from the number in view. I must not attempt too many in the short time at my disposal: I will take *four* of the more important, under the following heads:—

1. Animals in general, and man in particular, in respect to diet—animal or vegetable.

2. Foods (animal and vegetable) in respect to their relative efficiency for the maintenance of life.

3. The comparison of supplies of foods from the two sources of supply—animal and vegetable.

4. The comparison of health and strength under the two sources of supply.

In discussing these points I shall avoid, to the utmost of my power, all technical and hard terms, my business being to speak to the young as to the mature, to the unlearned as to the learned.

I.

THE FIRST COMPARISON.—MAN AND ANIMALS.

Touching the first comparison, we may commence by recalling the simple fact that there are, according to natural order, two classes of animals, one of which is destined to receive its sustenance from the plant world, the other from the animal world. The first of these—and this is a most important point to remember—the first, the plant feeders, are, amongst all the

higher types of animals, the true food finders of the second—the flesh feeders. In plain words, without the plant feeders there could be no feeding at all, and no continuance of life.

As may be expected, when the above-named fact is borne in mind, the physical characters of these two classes of animals are most distinct, and the inference is irresistible, that in the commencement of life on the earth the plants came first from the inorganic world, and that the animals, which alone find food from them, followed. It is probable that if we could inquire into this question in the lowest forms of life, we should discover the same arrangement in action; but however it may be in the lower, it is clear that in the highest series of the two types of animals—plant feeders and flesh feeders—the plant feeders came *first*; and, still, in the animal kingdom altogether, the most numerous of the higher forms are those which derive their supplies from plants.

If we cast our eyes over the whole of the animal kingdom with which we are most familiar, we see this fact standing forth in the most striking manner. Our domestic animals of most service to us are vegetable feeders. Our strongest animals are vegetable feeders, and man himself in many parts of the earth is exclusively a vegetable feeder.

Primitive man, wherever he was first cast, whether in one centre or in more than one, must, of necessity, have found his food in the plant world. We cannot imagine him commencing his career learned in the arts of hunting, killing, and cooking the lower animals for food.

Many infer from this circumstance that the argument in favour of the vegetarian practice is copied direct from nature, signed and delivered by her.

Not quite so fast. There is one interposing barrier to the free acceptance of vegetarian deed and act of conveyance of food

from nature to man. Nature herself, of her own right royal will, makes for animals, herbivorous and carnivorous, one distinctive animal food: a secretion from the living animal organism, a fluid which is a standard food—meat and drink in one—the fluid known under the name of milk.

Against absolute vegetarianism then we may fairly set up one exception derived from Nature as the unerring guide.

On observing the habits of animals we discover another natural fact. We find that animals of quite different natures, in respect to primitive selection of food, possess the power of changing their modes of feeding, and of passing over, as it were, from one class to the other. This change is distinct but limited, and we must accept it with all its extension on the one side, and with all its limitation on the other. The fruit-eating ape can be taught under privation to subsist on animal diet; a dog can, I believe, be taught to subsist on vegetable diet. But it would be as impossible to teach a sheep to eat flesh as it would be to make a lion feed on grass.

One more exceptional view deserves and requires to be noticed. It is made much of by those who are opposed to the vegetarian movement, and I fear I may have made too strong a use of it in past times. It is called the anatomical argument, and it is set forth in this form. There is, it is argued, a certain specific difference in the constructive characters of the digestive apparatus of the two sets of animals, herbivorous and carnivorous, which difference is sufficient to indicate a perfect line of separation between the one type of animal and the other. The statement is one which, under the correction of legitimate restriction, must be admitted. The restriction is this. We have to go to the extremes of the scale on both sides in order to reach the unchangeable line of distinction. A ruminant animal has an intestinal canal which measures from twenty-eight to forty times

the length of its own body. The canal, as a digestive apparatus, is also very complicated; it may have four stomachs, in each of which a special digestion is carried out. But a carnivorous animal, a lion, for example, may have an alimentary canal so short that it measures not more than three times the length of its body, and a digestive apparatus so simple that food could not digest in it if it had not been already digested in the body of another animal. Now please observe what this is supposed to teach. It is supposed to teach that certain animals are constructed to be and become the living laboratories, so to speak, for the preparation of the food of other animals. The argument is specious, and seems to be exceedingly clear. Unfortunately for it—or fortunately, as my vegetarian friends on the platform would say—it is not a good argument from a social and economic point of view; for the animals which are the providers and preparers of food by becoming food for others are of all others the most useful and the least harmful. We could very well spare the lion from the face of the earth, but sheep and oxen and such like useful creatures, how could we spare them?

I think it is quite a fair statement on the vegetarian side to say that if all the animals that could not be trained into herbivorous habits were to be universally destroyed, the world would lose nothing worse than the beauty of a tiger, a panther, an eagle, and the other animals of prey.

Please understand me. I am not advocating the destruction of these beautiful savage animals; there is not, under the severest vegetarian system, the slightest reason that one of them should fall—not a single boa-constrictor even need go. But I am showing that they might all go and no one be one penny the worse, in so far as the social economy of the world is concerned; and that is the subject that is before us at this the present moment.

The idea here broached leads to the further suggestion that every animal that is really useful may be brought to subsist, and to subsist well and healthily, on the world of plants; by which I mean all herbs, all fruits, and all vegetable substances that are edible. For while it is true that between the extremes of the herbivorous and of the carnivorous classes there is a wide anatomical distinction, the fact remains of the existence of an intermediate range of animals of different species so nearly like to each other, in respect to digestion, that the habits of one can, after a time, assimilate to those of the other. Moreover, some true vegetable feeders have a comparatively simple digestive apparatus. We are bound, therefore, to admit, even on anatomical grounds, that Nature allows a very wide licence in the way of provisioning for her people. At the same time she sets, probably in all cases, the right example at first, leaving the changes that may afterwards occur to accident or necessity, never to primitive choice, however closely long continued habit may confirm the original departure.

MAN.

The position of man in the animal kingdom, as a feeder, is very clear indeed. Man stands on the intermediate platform. Man in his present state of organisation can subsist either on animal or vegetable food. If he were originally constructed on what may be very properly called the single basis, he has, at some time in history, diverged from the single to the double basis, an evolutionary exploit which is quite within the bounds of the virtue of necessity. The question itself is basic. If man was constructed, originally, to live on the products derivable from the world of plants, and has merely departed from the original intention by sheer ignorance and bare necessity, then it is now time that he, in the light of a brighter knowledge and a

happier circumstance, should come back to the first and truer condition.

The evidence on and by which we can solve this difficult and all-important question can only be derived from two sources—the one physical, the other moral.

In search for the physical evidence we must turn to the construction of man. We must ask whether, by his build and construction, he is formed and framed for vegetable or for animal food. Is there any indication that his construction favours the one food more than the other? Let us look at this matter with a little care.

In the study of this point we have to consider the teeth or food-grinding organs, the secretions of the mouth, the stomach, the first part of the alimentary canal beyond the stomach, and the remaining portion of the canal or intestinal tube.

As regards the teeth, it must be admitted that in relation to the subject in hand they literally and truly cut both ways. In the complete set of thirty-two there are twenty for grinding, eight for biting, and four for tearing. Grinding teeth are required for animals which live on grains and other hard vegetable substances; biting teeth are necessary for animals which nibble soft substances like grasses and some fruits; tearing teeth are essential for animals which actually tear tough and resistant structures, like flesh, to pieces.

In man the grinding teeth largely preponderate; and how well fitted these teeth are for grinding seeds, grains, acorns, and the like, the teeth of our very old forefathers tell a significant and true tale. In man the biting teeth have a conspicuous place and a very decisive function; with them, even to the present, the skilled biter can cut through the finest thread, a feat equivalent to dividing the most delicate filament of food fibre that grows from the earth. The teeth are vegetable weapons;

they are the best of weapons which the out-and-out vegetarian can use ; they assist him both in practice and argument. But then there remain those four tearing fangs, those canine or dog's teeth, so firm, strong, and savage.

The canine or tearing teeth stand out strikingly in favour of the view that man is formed for eating flesh ; but it cannot be said by the staunchest flesh eater that the flesh-eating tendency is the strongest altogether. No ; it is certain that the balance turns fairly the other way. It may, however, be argued that the very fact of the existence of only four tearing teeth gives countenance to the belief that Nature has supplied the human animal with fangs for devouring animal flesh if he is obliged or desirous so to do. This is true, but only to a limited extent, because we now know that even the teeth, firm as they are, become by constant habit of life changed in form and character. The canine tooth itself, even in the dog, has been exceptionally so modified from this cause as to lead to a characteristic type of structure indicative of the influence of manner of life on growth when extended through many generations.

On the whole, I am bound to give judgment on the evidence of the teeth rather in favour of the vegetarian argument. It seems fairest of fair to read from Nature that the teeth of man were teeth destined—or fitted, if the word destined is objected to—for a plant or vegetable diet, and that the modification due to animal food, by which some change has been made, is practically an accident or necessity, which would soon be rectified if the conditions were rendered favourable to a return to the primitive state.

If from the teeth we pass to the process of digestion which goes on in the mouth, the evidence, as far as it extends, is also in favour of the vegetarian theory. The saliva secreted daily—to the extent of twenty ounces—has a specific chemical function :

it acts on the starchy matter of food, helping to transform it into the more soluble saccharine form essential for ready assimilation and for the application of the starchy substance as heat-producing sustenance in the living laboratory. This is clearly a provision for vegetable food, not for animal. For starch, a vegetable product, the provision is perfect: but I know of no animal product to which it could minister in a similar perfect manner. It is true that the fat of animals serves the same purpose as starch in supplying the fuel from which the body gets its natural warmth, but then it is also true that the animal fat is the derivative of starch and of saccharine substances, and the inference clearly is that this elaborate mechanism for the secretion of saliva is intended for the digestion of the prime vegetable substance.

When we proceed to the study of digestion in the stomach we find a neutral argument; there the process that goes on for the solution and digestion of food is well adapted either for animal or vegetable food of the right kind. The digestion which is carried on in the stomach is virtually all directed to one object, the preparation of that part of food which is to be appropriated in the organism to the nourishment or building up of the fleshy or muscular organs. In the stomach the albuminous and truly flesh-forming substances are made ready for absorption and assimilation. Thus the stomach can digest animal flesh (muscle), eggs, and all such like foods, while it cannot digest the fats, the starches, or the sugars. So far, therefore, the stomach is a flesh-digesting organ, and is fitted for animal diet. On the other side, it is equally adapted for some parts of vegetable food. The vegetable products, to be used as food products, contain when they are correctly used—please mark the word *correctly*—just the same flesh-forming substances as flesh itself, and require in consequence the digestive juices for their preparation. From

experimental observations which I have made, but which I must not enter upon at this moment, I am of opinion that the vegetable flesh-forming substances may be as easily digested when they are presented to the stomach in proper form as are the animal substances of like feeding quality. But, putting this aside, the fact remains that, whether the food intended to make flesh be from the animal or the vegetable world, the function of the stomach towards it is the same, and as far as stomachic digestion is concerned the balance is equal. The stomach of man can digest either animal or vegetable flesh-forming foods.

After food has passed through the first digestion in the mouth and the second digestion in the stomach, it goes through a third process in the upper part of the alimentary canal. In this third digestive act, the preparation of the starchy and saccharine parts of the food is completed, while other substances of an oily or fatty character, which have not been acted on by the previous digestions, are subjected to effective changes by which they also are made ready to enter the circulation: the starches and sugars are further transformed and the fats are turned into emulsions, by which means they are rendered miscible with the chyle. Lastly, in the further course of the alimentary canal there is a final or completed process by and through which all that is applicable for sustenance is separated from what is useless. These last changes are brought about by the secretions derived from the liver, the pancreas or sweetbread, and the first part of the intestinal surface in the small intestine.

In the final processes of digestion, the balance of evidence is in favour slightly of the arrangement for the digestion of plant food. The liver furnishes a fluid—the bile—which is wanted for both kinds of food products; but the pancreas yields a secretion which, like the saliva, is most useful for completing the digestion of the starchy and saccharine principles of aliment.

By weighing the facts that now lie before us the inference is justified that in spite of the very long time during which man has been subjected to an animal diet, he retains, in preponderance, his original and natural cast for an innocent diet derived from the firstfruits of the earth. If under this head we put fruit in the first place, and include grain under the same head (as we are quite justified in doing), we may say that the evidence is, decisively, on the side of the vegetarian argument, and may declare with the distinguished French physiologist Flourens—who of all men was free from bias—that man is a fruit-eating animal.

Much is made of the fact that the length and extent of the alimentary surface of some plant-feeding animals—like the sheep, the ox, and the buffalo—are so different from that of man that man cannot be considered as by any possibility to belong to feeders of their class. It is true there is a great difference, so great a difference that Flourens himself was influenced by it. Flourens was misled on this matter, as I and others have been, by a mistake in the mode of taking the measurement—a mistake which has recently been pointed out to me by a gentleman who spotted it as an error at one of my own lectures, and who was good enough to write to me in explanation. I consider the fact very important. We have hitherto calculated in this wise. We have said that the length of the digestive apparatus of an animal like the sheep is some twenty-eight times the length of the body of the animal; while the length of the same apparatus for digestion in an animal like the lion is only three times the length of the body. In man the length of the digestive tract is six times the length of the body—therefore man is nearer to a lion than to a sheep, because six is nearer to three than it is to twenty-eight. But in this mode of calculating man has been reckoned up from head to foot, which is not at all fair. It is

right to reckon the trunk of the man only, and then, as my friendly monitor shows, the tables are sharply turned: then in a man of medium stature the length of the alimentary surface is sixteen times that of the body, and sixteen is nearer to twenty-eight than three is to six.

Admittedly, it is just a point nearer: twice three is six, but twice sixteen is thirty-two, not twenty-eight. The balance, therefore, turns over from the flesh-feeding lion to the plant-feeding sheep. The difference is not considerable, but it is amply sufficient to meet, fairly and decisively, the argument adduced by Flourens from the anatomical side, and largely used on his authority, that man is nearer to a flesh-feeding than to a plant-feeding animal.

To some the complicated digestive apparatus of those pure plant-feeding animals called ruminants, or cud-chewing animals, is thought essential for a vegetable feeder, and if this were so, man would have no place whatever on that side of life. But really the difficulty here suggested does not affect the question.

There are pure vegetable feeders which are not ruminants at all, but which take their food at regular intervals and at short meals like other reasonable beings. And in fact, as one of our greatest living natural historians suggests, the ruminants might never have taken to chewing the cud at all except for their merciless fate of having to carry with them a meal much larger than they could dispose of quickly, to some secret hiding-place in order to consume it slowly, free from the attacks of marauding flesh-feeding enemies, and in such a way as to make it last as far as possible.

I venture to bring this first point under discussion to a close by expressing—

1. That man as an animal can live on a mixed diet of animal and vegetable food.

2. That he can live on a pure animal diet under habit or necessity.

3. But that in the strictest sense of the truly natural life he is a feeder on the fruits of the earth; a frugivorous animal.

The above are the physical considerations. To them may be added those of a moral kind to which I referred in the opening part of this section of my discourse.

On the moral side, as it seems to me, the argument is in favour of the vegetarians. The food which is most enjoyed is the food we call bread and fruit. In all my long medical career, extending over forty years, I have rarely known an instance in which a child has not preferred fruit to animal food. I have many times been called upon to treat children for stomachic disorders induced by pressing upon them animal to the exclusion of fruit diet, and have seen the best results occur from the practice of reverting to the use of fruit in the dietary. I say it without the least prejudice, as a lesson learned from simple experience, that the most natural diet for the young, after the natural milk diet, is fruit and whole-meal bread, with milk and water for drink. The desire for this same mode of sustenance is often continued into after years, as if the resort to flesh were a forced and artificial feeding, which required long and persistent habit to establish its permanency as a part of the system of everyday life. How strongly this preference taste for fruit over animal food prevails is shown by the simple fact of the retention of these foods in the mouth. Fruit is retained to be tasted and relished. Animal food, to use a common phrase, is "bolted." There is a natural desire to retain the delicious fruit for full mastication; there is no such desire, except in the trained gourmand, for the retention of animal substance.

One further fact which I have observed—and that too often to discard it, as a fact of great moment—is that when a person of

mature years has, for a time, given up voluntarily the use of animal food in favour of vegetable, the sense of repugnance to animal food is soon so markedly developed that a return to it is overcome with the utmost difficulty. Neither is this a mere fancy or fad peculiar to sensitive men or over-sentimental women. I have been surprised to see it manifested in men who were the very reverse of sentimental, and who were in fact quite ashamed to admit themselves guilty of any such a weakness. I have heard those who, gone over from a mixed diet of animal and vegetable food to a pure vegetable diet, speak of feeling low under the new system, and declare that they must needs give it up in consequence: but I have found even these (without exception) declare that they infinitely preferred the simpler, purer, and, as it seemed to them, more natural food plucked from the prime source of food, untainted by its passage through another animal body.

It may, however, be asked why, if this be the fact, milk should be so remarkable an exception as a favourite and natural food, especially in early life? The answer to the objection, fair as it is, is both simple and sound. Milk is an exceptional food intended for an exceptional period of life, with, as we now know, an exceptional provision for its digestion. In the digestive fluids of the stomach there exists a special ferment by which the flesh-forming part of milk, the cheese or caseine, is specially digested. This ferment continues in action throughout life in some persons, but not in all; so that there are some who can digest milk at all times, and others who cannot digest it at any time. In those who too exclusively feed on flesh meat and starchy substances the particular milk ferment ceases to be produced, and the digestion of milk ceases to be a natural act. In those, however, who are taught from early life to feed on the vegetable foods called the pulses—peas, beans, lentils, and others of the same

kind—this difficulty does not occur, for these substances contain caseine, just as milk does, and require a similar ferment.

The mention of this fact conveys, incidentally, a good practical lesson for vegetarians, namely, that they should, from the first, train the young under their care to receive a proper, but not too large an amount of lentils and other foods of that class, in which caseine is present as the flesh-forming constituent.

I do not think I can put the position of our first study more fairly forward, and I pass, therefore, to the next point:—The comparison of foods, animal and vegetable, in regard to their relative efficiency for the sustainment of life.

II.

THE SECOND COMPARISON.—ANIMAL AND VEGETABLE FOODS.

In studying the relative efficiency of animal and vegetable foods for the maintenance of life, we must first recall what it is that foods supply for the support of such maintenance. Broadly we may divide the requirements into four groups. At the head of those stands *water*, which we have nothing to do with now, but which forms 68 per cent. of the body, and the true feeding power of which has not until lately been duly appreciated. After water come those substances which keep alive the animal fire—substances like fats and oils from the animal world, and starch and sugar from the world of plants. Thirdly, there is the constructive food, the muscle and flesh-forming food, represented on the animal side by the fleshy parts of animals, and on the vegetable side by the gluten of wheat and other grain, and by the albuminous parts of other plants; essential food, but compared with water and with the heat-producing substances, extremely small in natural quantity, much smaller than is commonly supposed. Lastly, there is the mineral part of food

intended for the construction of the solid portion of the skeleton ; by weight a very insignificant part indeed, but in effect most important as determining the build of the solid framework of the body.

We have all these constituents in both kinds of food, animal and vegetable. In animal food we have fat, flesh, and mineral matter ; in vegetables and fruits we have sugar and starch (heat-producing substances), gluten and albumen (vegetable flesh, if I may so say), and the true mineral substances, in most correct form and quantity. Both sources yield all the required supplies ; but which source yields the supplies in the choicest and best form ? That is the question.

The common belief is that the animal form is the best, and I have often heard the poor bemoaning their hard fate (because deprived of flesh food) at a time when they really have had in their hands a better and more wholesome food than their wealthier and more luxurious neighbours, if they only knew it. Unfortunately they do not know it, a reason the more urgent that they should be taught to know it. Let me in proof of this draw attention to one or two comparisons.

If we make an analysis of the primest joints of animal food, legs of mutton, sirloin of beef, rump steak, veal cutlet, pork chop, we find as much as 70 to 75 per cent. of water. There are some vegetables which contain much more water, viz., potatoes, turnips, cabbages, and carrots ; but there are other vegetables which contain less water. Oatmeal, for example, contains 5 or 6 per cent. ; good wheaten flour, barley meal, beans and peas, 14 ; rice, 15 ; and good bread 40 to 45 of water. Taking then, the value of foods as estimated by their solid value, there are, it will be observed, a great many kinds of vegetable foods which are incomparably superior to animal. Peas, beans, oats, barley, and wheat are of this class. In the animal foods named above,

there are from 25 to 30 parts of solid matter to the 100 : in the vegetable foods specially compared with them there are from 80 to 86 parts.

If we compute from the solid matter the value of flesh-forming and strength-producing foods in the animal and vegetable products we find some other useful facts. In a leg of mutton we may have 10 per cent. of albuminoids, or flesh-forming substance ; and 8 to 9 of fat, or heat-producing substance. Let us compare that with wheat as a favourite vegetable substance, and we may have in the solid matter of wheat 11 per cent. of albuminoids, or flesh-forming substance ; and 70 of heat producing substance, or starch with a little fat. Wheat is, by this calculation, much more valuable than the leg of mutton, and the vegetarian would, I dare say, with fair argument, challenge many further similar comparisons. Coming, in fact, directly to matter of quality or goodness, it may honestly be admitted that, weight by weight, vegetable substances, when they are carefully selected, possess the most striking advantages over animal, in nutritive value.

Amongst fruits we find many kinds which may be accepted as lying intermediate between fleshy foods and vegetable foods. We may take, for example, the comparison between the banana and some pure animal substance, say a specimen of cow's milk of good quality. The analysis from which this comparison was derived showed that the banana contained 74 per cent. of water, 5 of flesh-forming substance, 20.3 of heat-giving substance, and 0.7 of mineral food. The analysis of the milk showed that the fluid contained 86 per cent. of water, 5.3 per cent. of flesh-forming material, 8 per cent. of heat-giving substance, and 0.7 of mineral matter.

I make this comparison simply to show how near the two classes of foods may approach to each other. The banana is like

a condensed milk, richer in solid fuel food than milk, but containing less water, and admitting of being prepared like milk on addition of water.

Animal and vegetable can in fact yield equal efficiency under competent skill in the preparation of foods from them. But up to this time, in what are called civilised communities, so much more skill has been developed in the preparation of animal foods for the table than has been bestowed on vegetable, that in order to give the vegetarian system the faintest chance a new school of cookery must be introduced throughout the land, in which there shall be taught not only modes of cooking, but the actual dietetic value of everything that is cooked and sent to table. The vegetarian plan has suffered vitally hitherto from ignorance on this score. Some persons have been initiated into the system by being taught to try to subsist on vegetables containing from ninety to ninety-five per cent. of water. They have failed, as a matter of course, and have thrown the blame on the system, not on their ignorance in relation to it. Others have been inducted into it by being led to take, at first, vegetable foods extremely rich in flesh-forming substance; and, unable to digest what they have taken, have hastened to the conclusion that the food was too heavy and could not be borne. Mistakes of the kind require to be reformed altogether, as a matter of simple knowledge, apart from any particular system or the advocacy of it, and as a rule of domestic information and order.

Until this is done there will always be a grand difficulty in the universal food reform on vegetarian lines. Until then many persons will be found who, in spite of their repugnance or other objection to animal food, will digest food that has been prepared for them by passing through the systems of other animals better than when they themselves take it first hand from the plant. The pulses produce in some persons flatulency and dyspepsia. Oat-

meal causes in many persons heat and dryness of the skin, even when taken with lime-juice or fresh fruit; and other difficulties could be named which, at the present, beset the vegetarian in his path. These difficulties can be largely got over by an improved education in the art of cooking; and I confess, with perfect candour, that if I could on all occasions get for my meals the same foods as are to be obtained in the best vegetarian dining-rooms I should not willingly take any other kind of food. In time, I doubt not that the present centres for good vegetarian diets will become schools for the nation, and that every hotel in the kingdom and every private dwelling will have its vegetarian cook or housewife. It will take a long time for this to come about, but it will assuredly come.

Meantime men of practical science ought to be at work to assist with their skill in this mighty reformation. An inquiry is demanded on the point whether the transmutation of vegetable food which now is obtained by the digestion and passage of the food into the tissues of lower herbivorous animals, may not be effected by chemical processes, apart from the intermediate animal altogether. When the most scientific instruments possessed by man were the flint-head, the iron lance, the boomerang, the sling and stone, and other weapons for destruction of the inferior animals, or, when improving on these, man advanced to the process of herding and feeding animals for slaughter, this question of transmutation of vegetable food could not be thought of. In the present day the circumstances are entirely changed. We know now to a nicety the relation of the various parts of food for the construction of the living body from food, and there should be no difficulty, except the labour of research, in so modifying food taken from its prime source as to make it applicable to every necessity without the assistance of an intermediate animal at all. Changes quite as difficult have been accomplished by scientific

research in the laboratory, and if men of science will, in patient research for a few years, follow up artificial digestion and condensation of vegetable foods by synthetical imitations, assuredly the perfect production of perfect food from the vegetable kingdom, without the aid of the intermediate lower animal, will be another triumph of science over nature. In the presence of such a development food of the best kind would become the cheapest of all products, and would be so under the control of man that new races of men, constructed on better food than has ever yet been prepared, would rise up to demonstrate the greatness of the triumph by their improved physical endowments, and their freedom from certain diseases which must always occur so long as other living animal bodies are demanded for the reconstruction of the human body.

III.

THE COMPARISON OF SUPPLIES.

The third question suggested in my programme relates to the two sources of supply of food in reference to the economy of life and of the national wants or necessities.

In the great scheme of Nature, carried out in her complete scale and design and taken in the light of one sublime planetary project, the principal of life is self-supporting. Nothing in Nature, not a crumb that falls from the poor man's table, can ever be lost even as food.

While, however, nothing is lost in Nature; though the amount of life on the earth is probably always the same; though death balances life, life death; though the animal life is ever safe while the vegetable life is maintained; and though the vegetable life is quite safe while the inorganic elements and the forces which move them are maintained; there is constant danger, in individual communities, so long as life itself is at war with itself,

and one sphere of life is dependent on the temper of another. To this little issue, resting on human passions, do the divine schemes of the universe itself, in their relation to men, sometimes come at last. Far-seeing statesmen, therefore, are not surprised at the phenomena which, to common minds, come as surprises. They know that national affairs which, in respect to the planet as a whole, are purely local and do not affect it in the least in its course, may nevertheless lead to the most extreme local catastrophes, and we in England ought to be aware that no disturbing local influence is more serious than this one of our food supply. As an Englishman's house is his castle, so England is, to the world, a castle for Englishmen; and the fact that the thirty millions of occupiers of that castle, cannot, under existing conditions, find sufficient food from their own grounds, is the most solemn of all political problems. It is true that some think we are protected with the facility with which we can now obtain foreign supplies of all varieties of food. But really by that very process our foreign food yields the larger part of the material by which our own lands are fertilised, and from which, through the land, we derive the comparatively small amount of food which it supplies. Thus we, in fact, temporarily import land from abroad, a process which may go on very well so long as those abroad will send us what we want, but which will be a pitiful resource if, at any time, those abroad either require all they have for themselves, or in anger refuse us what we require.

I touch on this point in order to indicate that we have no necessity to run any risks of this nature. If the arguments which have gone before are true, and if the firstfruits of the earth, the grain and fruits, are sufficient when they are properly treated to sustain life well and soundly, then England, as a field of fruit and grain duly cultivated, is a great castle provisioned richly for any emergency and for any time.

In this matter I fully believe that the vegetarians are right. If we would make ourselves quite safe there must be no stall-fed animal introduced into the grounds, to be reared, to be housed, to be fed, to be tended, to be kept free from disease, to be cleansed, to be driven to market, to be killed, to be dressed, and in the end, after all this trouble and expense, to be used only in part for food.

Buffon calculated in his time that the number of men on the earth had become one thousand times greater than that of any other species of powerful animals. By this time this difference has greatly increased, and as the day must come when the increase of man will be such that vegetarianism will be an absolute necessity, it would be well to take time by the forelock, and learn to go to the first-fruits if we would feed England from English soil.

Even then we must save!

One hundred millions worth of precious body-feeding grain, spent at present on body and soul-consuming strong drink, must be retained in the national garner for life instead of death.

IV.

HEALTH AND STRENGTH FROM FOOD.

We approach now the last head, namely, the comparison of health and strength under the two sources of food supply, animal and vegetable.

I would introduce this topic with two remarks which will tend to make the transition from one system of diet somewhat easier than many think it is. There are certain foods, like milk, cheese, butter, and eggs, which have never tasted independent life, and which the vegetarian might fairly admit amongst his supplies. This is a good concession at first to the flesh eater. Again, there

is a certain moderation in the use of animal flesh, which, for the sake of himself and his own life's welfare, the animal feeder ought to give to himself. Independently of the vegetarian question altogether, there is a lesson yet to be taught and learned about the consumption of animal food before any sure advance can be made. It must be instilled into the mind of the people at large—rich and poor alike—that with a diet in which animal food, in the form of flesh, is largely used, it is almost inevitable that an excess of such food will be consumed, not for the benefit of the body, but for the trouble and embarrassment of the body in its vital labour. As a matter of fact, the quantity of flesh-forming food required for the bodily wants is small, beyond all the ordinary prevailing conception on the subject. A well-educated Englishman—I mean one well educated on general subjects—would wonder beyond measure if he realised the enormous amount of work an Indian can do on a mere handful of rice and a few dates. But his wonder would be far more increased if in the physiological laboratory he were shown and made to understand *three* facts. (1) The exceedingly small amount of flesh-forming matter that is called for to make up the waste of the muscular organs. (2) The enormous amount of wasted material which is thrown off or laid by without ever having been applied to any useful purpose in the body. (3) The tremendous measure of living energy that has been expended in throwing off from the body substances which ought never to have been put into it.

In very plain words, yet very true, whenever we add dead flesh to living, beyond the bare necessity, we are imposing a tax on our own active existence. We should never do so foolish a thing if we avoided animal food; and this is another good score for the principles of those who would go to the world of plants for the sustenance of the world of human life. It is without

question that the best balance, the most correct balance, of all the necessities of food for man is found in the world of plants.

It is held also by many (even amongst those who are not vegetarians) that some serious diseases which now affect the human family would be prevented if animal food were not part of human sustenance. It is urged that flesh derived from diseased animals finds its way freely into the human body, and that by its introduction diseases are introduced.

The fact that the flesh of diseased animals does find its way into the market and on to the table is beyond question. Our wise and discerning Jewish brethren have taught us this truth in unmistakable form. They, in obedience to their ancient law, have all their animal food duly inspected. Their returns on the subject are worth recording. In 1878, out of 22,308 oxen killed in London no fewer than 7,885, or nearly a third, were rejected as diseased. Out of 3,330 calves 785 were rejected. Out of 41,556 sheep 13,019 were rejected. In the year 1879, in the course of fifty weeks, out of a total of 22,387 oxen 9,531 were rejected; out of a total of 3,691 calves 1,028 were rejected; of 38,302 sheep 11,826 were rejected. In 1880, from July 1 to December 25—twenty-five weeks—out of 13,116 oxen 6,143 were rejected. Of calves numbering 1,964 as many as 634 were rejected; and out of 19,743 sheep 5,535 were refused for food because of the presence of disease.

If this analysis be applied to the animal food consumed outside the Jewish pale in the United Kingdom, about one-third of such food gives some evidence of disease; so that flesh-eaters who are not Jews are partaking of diseased flesh during four months of each year of their lives.

The information is very startling when it is put forward in this plain and unvarnished way. Fortunately it is qualified by the correction that in the process of cooking the diseased meat

the evil consequences are very largely removed. Still it is not a pleasant subject for reflection.

The vegetarians may claim here a very strong case on their side. It would not be fair, however, to say that they have it altogether their own way. There is, unquestionably, a certain conveyance of disease through vegetable foods, not generally from disease in the food itself (although in the case of spurred grain or ergotted grain that even has occurred), but from uncleanness, and especially from uncleanness in fruit; dangers which cleanliness and careful preparation for the table can alone prevent.

In respect to the propagation of disease it seems to me just to declare that the danger is much less and much more easily preventible on the vegetarian than on the animal system of diet. I think, too, I ought to add that some constitutional diseases, such as scrofula, gout, rheumatism, obesity, and certain forms of troublesome dyspepsia or indigestion, are more favoured by an animal than by a vegetable diet.

As to strength of body, when the vegetarian diet is conducted on a sensible scale, and is supplemented judiciously by additions of milk, butter, cheese, and eggs, I can have no doubt that the whole of the animal strength and power of work, physical and mental, belonging to any man or woman, can be got out of it.

I have seen a man positively die from an obstinate adherence to one particular mode of vegetable feeding; die reduced to a mere skeleton by his plan; but, again, I have seen a man die positively from an obstinate adherence to one particular mode of flesh feeding; die fattened like an animal ready to be sent to an agricultural show. These are extremes in both systems, and are not found in the representatives of the reasonable members of the community. Both modes of diet give the opportunity of courting death either by starvation or by repletion. We have to think of

their moderate application in regard to vital physical and mental strength, and while, on this point, I give no decided opinion on either side, I admit that some of the best work has been done and is being done on a vegetarian regimen.

SUMMARY.

Summing up the four chapters above submitted, I would draw from them the following conclusions :—

(1) Man, although possessing the capacity of existing on an animal diet in whole or in part, is by original caste adapted to a diet of grain and fruit, and, on a scientific adaptation of his natural supplies, might easily be provided with all he can require from that source of subsistence.

(2) The vegetable world is incomparable in its efficiency for supply of food for man, when its resources are thoroughly understood and correctly applied.

(3) The supplies of food for man are most economically and safely drawn direct from the vegetable world.

(4) Diseases may be conveyed by both sources of supply, but need not be conveyed by either. Diseases may be generated by misuse of either source of supply, but need not be, and under judicious management would not be, generated by either.

Under a properly constituted fruit and vegetable diet strength of mind and of body may be as fully secured as under an animal or mixed animal and vegetable system.

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