

Science Expounded From An Easy Chair

(By Sir Ray Lankester, K.C.B., F.R.S.)

No mistake, said Huxley, is more frequently made by clever people than that of supposing that a cause, or an opinion is unsound because the arguments put forward in its favor by its advocates are foolish or erroneous. Some of the arguments put forward in favor of the exclusive use by mankind of a vegetable diet can be shown to be based on misconception and error, and I propose now to mention one or two of these. But I wish to guard against the supposition that I am convinced in consequence that animal substances form the best possible diet for man, or that an exclusively vegetable diet may not, if properly selected, be advantageous for a large majority of mankind. That question, as well as the question of the advantage of a mixed diet of animal and vegetable substances and the best proportion and quality of the substances so mixed, must be settled, as also the question as to the harm or good in the habitual use of small quantities of alcohol, by definite careful experiment by competent physiologists, conducted on a scale large enough to give conclusive results. The cogency of the arguments in favor of vegetarianism which I am about to discuss is another matter.

In the first place it is very generally asserted by those who advocate a purely vegetable diet that man's teeth are of the shape and pattern which we find in fruit-eating or in root-eating animals allied to him. This is true. The warm-blooded hairy quadrupeds which suckle their young and are called "mammals" (for which word perhaps "beasts" is the nearest Anglo-Saxon equivalent) show in different groups and orders a great variety in their teeth. The birds of today have no teeth, the reptiles, amphibians, and fishes have usually simple conical or peg-like teeth, which are used simply for holding and tearing. In some cases the pointed pin-like teeth are broadened out so as to be button-like, and act as the crushing organs for breaking up shell-fish. The mammals alone have a great variety and elaboration of the teeth.

In shape and size, as well as in number, the teeth of mammals are very clearly related to the nature of their food in the first place, and to their use as weapons of attack or of defence. When the surface of the cheek-teeth is broad, with low and numerous tubercles, the food of the animal is of a rather soft substance, which yields to a grinding action. Such

are fruits, nuts, roots, or leaves, which are "trituated" and mixed with the saliva during the process of mastication. Where the vegetable food is coarse grass or tree twigs, requiring long and thorough grinding, transverse ridges of enamel are present on the cheek-teeth, as in cattle, deer, and rabbits. Truly carnivorous animals, which eat the raw carcasses of other animals, have a different shape of teeth. Not only do they have large and dagger-like "dog-teeth," as weapons of attack, but the cheek-teeth (very few in number) present a long, sharp-edged ridge running parallel to the length of the jaw, the edges of which in corresponding upper and lower teeth fit and work together like the blades of a pair of scissors. The cats (including the lions, tigers, and leopards) have this arrangement in perfection. They cut the bones and muscles of their prey into great lumps with the scissor-like cheek-teeth, and swallow the great pieces whole without mastication. Insect-eating mammals have cheek-teeth with three or four sharp-pointed tubercles standing up on the surface. They break the hard-shelled insects and swallow them rapidly. The fish-eating whales have an immense number of peg-like pointed teeth only. These serve as do those of the seals—merely to catch and grip the fish, which are swallowed whole.

It is quite clear that man's cheek-teeth do not enable him to cut lumps of meat and bone from raw carcasses and swallow them whole, nor to grip live fish and swallow them straight off. They are broad, square-surfaced teeth, with four or fewer low rounded tubercles fitted to crush soft food, as are those of monkeys. And there can be no doubt that man fed originally, like monkeys, on easily crushed fruits, nuts, and roots. He could not eat like a cat. But no one has ever suggested that he should.

A fundamental mistake has arisen amongst some of the advocates of vegetarianism by the use of the word "carnivorous" and "flesh-eating" in an ill-defined way. Man has never eaten lumps of raw meat and bone, and no one proposes that he should do so today. Man did not take to meat-eating until he had acquired the use of fire, and had learnt to cook the meat before he ate it. He thus separated the bone and intractable sinew from the flesh, which he rendered edible and divisible by thorough grilling, roasting, or baking. To eat meat thus altered, both chemically and in texture, is a very different thing from eating the raw car-

cases of large animals. Man's teeth are thoroughly fitted for the trituration of cooked meat, which is indeed as well or better suited to their mechanical action as fruits, nuts, and roots. Hence we see that the objection to a meat diet based on the structure of man's teeth does not apply to the use of cooked meat as diet. The use by man of uncooked meat is not proposed or defended.

Yet, further, it is well to take notice of the fact that there are many vegetarian wild animals which do not hesitate to eat certain soft animals or animal products when they get the chance. Thus, both monkeys and primitive men will eat grubs and small soft animals, and also the eggs of birds. Whilst the cat tribe, in regard to the chemical action of their digestive juices are so specialized for eating raw meat that it is practically impossible for them to take vegetable matter as even a small portion of their diet, and whilst, on the other hand, the grass-eating cattle, sheep, goats, antelopes, deer, and giraffes are similarly disqualified from eating any form of meat, most other land-mammals can be induced, without harm to themselves, to take a mixed diet, even in those cases where they do not naturally seek it. Pigs on the one hand, and bears on the other, tend naturally to a mixed diet, or vice versa. Seagulls normally are fish-eaters, but some will eat biscuit and grain when fish cannot be had. Pigeons have fed successfully on a meat diet; so, too, some parrots, and also the familiar barn-door fowl. Many of our smaller birds eat both insects and grain, according to opportunity. Hence it appears impossible to base any argument against the use of cooked meat as part of man's diet upon the structure of his teeth, or upon any far-reaching law of Nature which decrees that every animal is absolutely either fitted (internally and chemically, as well as in the matter of teeth) for a diet consisting exclusively of vegetable substances, or else is immutably assigned to one consisting exclusively of animal substances. There is no a priori assumption possible against the use as food by man of nutritious matter derived from animal bodies properly prepared.

So far as a priori argument has any value in such a matter, it suggests that the most perfect with exactly the constituents needed by it in food for any animal—necessarily supplying it with exactly the constituents needed by it in exactly right quantity and smallest bulk—is

the flesh and blood of another animal of its own species. This is a startling theoretical justification—from the purely dietetic point of view—of cannibalism. It is, however, of no conclusive value; the only method which can give us conclusions of any real value in this and similarly complex matters is prolonged, full, well-devised, well-recorded experiment. At the same time, we may just note that the favorite food of a scorpion is the juice of the body of another scorpion, and that the same preference for cannibalism exists in spiders, many insects, fishes, and even higher animals.

Another line of argument by which some advocates of vegetarianism appeal to the popular judgment is by representing flesh-food derived from animals as something dirty, foul, and revolting, full of microbial germs, whilst vegetable products are extolled as being clean and sweet—free from odor and putrescence and from the scavenger's microbes. This, I perhaps need hardly say, is a gigantic illusion and misrepresentation. I came across it the other day in a very unreasoning pamphlet on food by the American writer, Mr. Upton Sinclair. Putrefactive microbes attack vegetable foods and produce revolting smells and poisons in them, just as they do in foods of animal origin. It is true that on the whole more varieties of vegetable food can be kept dry and ready for use by softening with hot water than is the case with foods prepared from animals. This is only a question of not keeping food too long or in conditions tending to the access of putrefactive bacteria. It is, on the whole, more useful and necessary, in order to render it palatable, to apply heat to flesh, fish and fowl than to fruits. And it is by heat—heat of the temperature of boiling water—applied for ten minutes or more, that poison-producing and infective bacteria are killed and rendered harmless. More people have become infected by deadly parasites and have died from cholera and similar diseases, the germs of which they have taken into their stomachs with raw and over-ripe fruit or uncooked vegetables and the manured products of the kitchen garden, than have suffered from the presence of disease-germs or putrefactive bacteria in well-cooked meat. Here, in fact, "cooking" makes all the difference, just as it does in the matter we were discussing above the fitness of flesh and bone for trituration by man's teeth. Once we remember that man is not fitted for the "raw meat" diet of the carnivora, but is fitted for the

"cooked meat" diet which he has himself discovered—alone of all animals—we shall get rid of a misleading prejudice in the consideration of the question as to whether civilized men should or should not make cooked meat a portion of their diet, with the purpose of maintaining themselves in as healthy and vigorous a state as possible. Do not let us forget that ancient Palaeolithic cave-men certainly made use of fire to cook their meals of animal flesh, and that probably this use of fire dates back to a still earlier period when, in consequence of this application of the red, running tongues of flame, which he had learned to produce, primitive man was able to leave the warmer climates of the earth and their abundant fruits, and to establish himself in temperate and even sub-Arctic regions.

Experiments on a large and decisive scale in regard to the value of the different foods taken by man and the question of the desirability of cooked meat as part of his diet have never been carried out, nor has the use of alcohol been studied by direct experimental method on a large scale. Inasmuch as the feeding of our army and navy, of prisoners, lunatics and paupers is the business of the state, it is obviously the duty of the government to investigate this matter and arrive at a decision. It can be done by the government, and only by the government. The Army Medical Department is fully capable, and, I am told, desirous, of undertaking this investigation. Five hundred soldiers in barracks would find it no hardship, but an agreeable duty (if rewarded in a suitable way) to submit to various diets, and to comparative tests of the value of such diets. There would be no difficulty in arranging the experimental investigation. Forty years ago similar work (but not precisely as to the questions now raised) was done by the Army Medical Department, under Parkes, with most valuable and widely-recognized results.

There is something about the character of mules that makes their owners at times almost equally stubborn. The following dialogue concerning one, if not two such animals, is reported:

"Why don't you get rid of that mule?"
"Well, suh," answered Erastus Pinkley, "I hates to give in. If I was to trade that mule off he's rehard it as a personal victory. He's been tryin' foh de las' six weeks to get rid o' me."

Odd Striking Clocks

In Worsley, Lancashire, are two clocks which never strike one, being arranged to strike thirteen at 1 a.m. and 1 p.m. One of them is over the Earl of Ellesmere's newly constructed entrance to Worsley Hall, and is the original which the Duke of Bridgewater had placed in the tower in his Worsley depot.

It is said that his grace had the clock made to strike the "unlucky" number so as to warn his workmen when it was time to return to work after dinner, some of them having excused themselves for being late on the ground that they could not hear it strike one. This recalls the incident when the big clock of the Houses of Parliament saved a man's life.

A soldier in the reign of William and Mary was condemned by court-martial for falling asleep while on duty on the terrace at Windsor. He stoutly denied the charge, and solemnly declared that he heard Old Tom (the predecessor of Big Ben) strike thirteen instead of twelve. The officers laughed at the idea, but while the man was lying in prison awaiting execution, several persons came forward and swore that the clock actually did strike thirteen, whereupon the soldier was pardoned and released.

Wells Cathedral contains the most interesting and the oldest self-striking clock in the whole world. It was constructed by Peter Lightfoot, a monk, in 1320, and embraces many devices which testify to the ancient horologist's ingenuity. Several celestial and terrestrial bodies are incorporated in interesting movement and relationship. They indicate the hours of the day, the age of the moon, and the position of the planets and the tides.

When the clock strikes the hour horsemen, fully armed, dash out of two gateways in opposite directions and charge vigorously. They strike with their lances as they pass as many times as correspond with the number of the hour. A little distance away, seated on a high perch, is a quaint figure, which kicks the quarters on two bells placed beneath his feet, and strikes the hours on a bell. The dial of the clock is divided into twenty-four hours, and shows the phases of the moon and a map of the heavens.

An oddity in clocks is the invention of a Frenchman, M. Paul Cornu. It consists of a dial mounted above a reservoir and having a sort of seesaw mounted upon its support. The reservoir holds sufficient alcohol, to last for a month, and this serves as fuel for a small flame which burns at one end. The heat from the flame causes the air to expand in the bulb of the seesaw directly above it. As a result the seesaw moves every five seconds. This movement is the sole motive power which actuates the hands.

In Switzerland clocks are now being made which do not require hands and faces. The timepiece merely stands in the hall, and you press a button, when by means of the phonographic internal arrangements it calls out "half past five," or "five minutes to nine," as the case may be.

A Munich professor has invented a re-

markable sickroom clock. When a button is pressed an electric lamp behind the dial throws the shadow of the hours and hands, magnified, upon the ceiling, so that invalids can see it from the bed without craning their necks or putting themselves to any inconvenience.

A German shoemaker spent fifteen years of his leisure moments in constructing a clock of the grandfather shape nearly six feet high, made entirely of straw. The wheels, pointers, case and every detail are exclusively of straw. The most remarkable fact is that it is reported to keep perfect time, though the durability of this strange piece of mechanism is a matter of doubt.

The Czar is the proud possessor of a unique clock which records not merely the passing seconds, minutes and hours, but the days, weeks, months and years. The clock was invented and manufactured by two peasants, who presented it to the Emperor as a token of their loyalty. In St. Petersburg, too, is to be found a clock having ninety-five faces, indicating simultaneously the time at thirty different spots on the world's surface besides the movements of the earth and planets.

In the Kurpark at Interlaken may be seen a clock constructed of flowers. The plants are arranged in a sort of mosaic and the hour and second figures are made of colored cactus plants. The works of the clock, hidden beneath the roots of the plants, move the hands over the face as the minutes and hours go by, and this novel timepiece does its duty as accurately as if erected in some imposing tower.

SOMETHING NEW FOR THE SEWING BASKET

Very original tape measures are shown by a Broadway jeweler. In one case, the tape measure is concealed under the shell of a silver turtle, with the inscription on the turtle's back: "Pull my head, and not my leg." A pull at the head, and out come the inches and feet of the measure. Within a cunning little silver hat is another measure, and the inscription reads: "Most hats cover the head; but this covers the feet." Still another device has the tape measure hidden within a little whiskey flask, on which are the words: "I made Kentucky famous—in a measure."

A BOOK OF JOKES FOR THE BOY

A little volume of fresh, clean jokes will make a good addition to the boy's birthday gifts. Every boy loves to be considered a joker and the more good jokes he has at his tongue's end the happier he is. Buy a small address book and begin filling it in with all the good jokes you hear. The boy will take the cue and write in the book all the funny things he hears, the appropriate toasts and dinner speech jokes and in time should acquire a very interesting collection.

Miss Mary MacArthur, secretary of the British Woman's Trade Union League, was one of the speakers at the convention of the National Woman's Trade Union League, in Chicago.

The King's Valet

A story is told of a slight passage-at-arms that took place between His Imperial Majesty and the Superintendent of the Wardrobe during the former's last visit to England. It so happened that the Emperor was looking at a collection made by Mr. Chandler of the designs of the stars and badges of various foreign Orders. It was a collection that took many years to make, and one that Mr. Chandler is pardonably proud of, because it is in its way unique and absolutely accurate. The designs, it should be mentioned, were all drawn by the Superintendent of the Wardrobe from the actual stars and badges.

The Kaiser was delighted with the collection, but pointed out that the star of one of the German Orders was incorrectly drawn. It was an Order termed the Double Cross, and practically extinct, for it has not been conferred on anyone during the past fifty years.

The Superintendent of the Wardrobe, however, humbly but firmly insisted that his drawing of the Cross was correct in every detail. The Kaiser declared that Mr. Chandler might be an infallible authority on the subject of British Orders, but he could not be expected to be an equal authority on German Orders, and insisted that the drawing in question was incorrect. Mr. Chandler, of course, could not persist in contradicting His Imperial Majesty, but, as it was evident that the valet remained unconvinced, the Kaiser declared he would refer the matter to King Edward. His Majesty, though he knew his chief valet to be in the right, did not, of course, wish to say so to his royal guest, and, therefore, avowed that the Kaiser must undoubtedly be right, and the drawing must be wrong.

The matter then dropped; but some months later the Kaiser wrote to the Superintendent of the Wardrobe to say that he had looked up the original design of the Double Cross, and had seen that the valet's drawing was, after all, correct; and, at the same time, sent him a beautiful set of engraved designs of all the German Orders.

REPAIRING WESTMINSTER

The work of keeping Westminster Abbey in repair is a very onerous and delicate one and the long line of surveyors of the fabric is a distinguished one indeed. During the last seventy years this matchless church has been in the hands of Mr. Blore, Sir Gilbert Scott, Mr. Pearson, Mr. Michaelthwaite and now Prof. Lethaby.

There have been times in the history of the Abbey when its very existence had been in jeopardy. The first of these occurred about the end of the seventeenth century. Sir Christopher Wren was called in and the work of restoration was carried out with the utmost zeal and thoroughness, though in many of its details its taste was open to much question.

When the late Dean Bradley arrived upon the scene in the year 1882 he found an income derived steadily dwindling in value while the condition of many of the great flying but-

resses as well as the north transept was indescribable. The late Dean himself was wont frequently to describe the north transept when he first inspected it as presenting almost the appearance of a quarry.

It was time for extreme measures, and that the situation was saved at all was due to the vigor and the business acumen of the late Dean. As it was the Abbey had to pay a fearful price. A loan of £25,000 was made to the Dean and chapter by the Ecclesiastical Commissioners. This enabled the authorities to get level with the worst of these structural defects. On the other hand, they were compelled to suspend the sixth canonry, the income derived from which has been employed for many years past is gradually paying off this immense loan.

A CENT'S WORTH OF ELECTRIC POWER

Probably few people have ever stopped to think what a power of electricity is. If you have never thought the matter over it will be surprising as well as interesting to know what can be done with one cent's worth of this marvellous power. Harper's Weekly estimates that on the average rate and discounts of the ordinary consumer, a cent's worth of electricity will operate a 12-inch fan for ninety minutes.

Will operate a sewing machine motor for three hours.

Will keep a 6-pound electric flatiron hot for fifteen minutes.

Will make four cups of coffee in an electric coffee percolator.

Will keep an 8-inch disc stove hot for seven minutes, or long enough to cook a steak.

Will operate a luminous radiator for eight minutes.

Will bring to a boil two quarts of water or operate the baby milk warmer twice.

Will make a Welsh rabbit in an electric chafing dish.

Will operate a 7-inch frying pan for twelve minutes.

Will keep a heating pad hot for two hours.

Will operate an electric griddle for eight minutes.

Will run an electric broiler for six minutes.

Will run a massage machine for nearly four hours.

Will keep the dentist's electric hammer and drill going for ninety minutes.

Will keep the foot warmer hot for a quarter of an hour.

Will run an electric piano for one hour.

Will vulcanize a patch on an automobile tire.

Will heat an electric curling iron once a day for two weeks.

Will pump 250 gallons of water 100 feet high.

Will keep a big glue pot hot for an hour.

Will drive the electric clipper while shearing one horse.

Will raise ten tons twelve feet high with an electric crane in less than one minute.

Will brand electrically 150 hams.

Unique Bank System

Very little is known in this country of the Giro system of banking in Germany. This system has been in use in the state of Hamburg since the establishment of the Hamburger Bank in 1619.

An account is opened in the usual manner, and when payments are to be made the payer instead of preparing a check merely instructs his banker to debit his account with the sum involved and to credit Richard Roe's account with a like amount.

If, however, payer and payee have their accounts in different banks the payer then requests his banker to transfer the amount in question to the bank of the payee, with instructions to credit Richard Roe's account with the amount of the indebtedness.

Convenient blank forms are provided for making these notifications. When the banker receives an instruction of this character, he in turn notifies Richard Roe of the payment to his credit and the name of the payer.

In Hamburg the Reichsbank and five important banks use the Giro system. Representatives of these banks meet several times daily at the Reichsbank, where transactions between their several customers are cleared. In Hamburg very little material money is used in effecting transactions, the habit being to settle all obligations, even of the most insignificant character, by *Überweisungszettel*. When payments are to be made from one city to another this is done usually through the Reichsbank, which has 500 branches, more or less, throughout the empire. All transactions are undertaken without cost to either payer or payee, and on the contrary deposits subject to this modified form of checking usually draw one per cent interest per annum.

The advantages of the Giro system fall partly under the head of security and partly of convenience. Danger from forgery is eliminated, as the notification sent to a banker by a payer could not by any possibility be utilized advantageously by criminally disposed persons. The only inconvenience observable arises from the fact that receipts for payment are not acknowledged on bills as rendered, unless such receipts are specially sought by messenger after the bank exchange has been made.

It is customary in small local transactions for a payer to note at the foot of bills the date of payment through his banker, and in case of possible dispute the bank is always prepared to clear up misunderstandings. Concerns doing a large volume of business and obliged to make numerous payments daily are spared the annoyance of preparing hundreds of individual checks, as they have merely to write out a list of names and amounts on a long sheet, which they send to their banker.

"I'll work no more for that man Dolan."
"An' why?"
"Shure, 'tis on account av a remark he made."
"An' phwat was that?"
"Says he, 'Casey,' says he, 'ye're discharged.'"

RULE

FRUIT CULTURE

By W. J. L. Hamilton

What is a No. 1 apple? It is defined by act of parliament, but any wholesale fruit merchant, or of any co-operative association, will tell me that each fruit grower has his own subject, as exemplified by boxes. But, this unevenness of a very injurious effect upon the fruit, and upon the price it real-

If all fruit packers had the same subject, and all graded alike, to know by the brand, exactly what they are paying for, and our fruit would place itself in the markets of

Any judge of fruit cannot fail to be struck by the magnificent fruit exhibited by the local agricultural shows and at the Victoria and New Westminster fruit (and particularly apples), so or "No. 1," does not approach this excellence.

Our fruit is unexcelled, but is not fit to, through much faulty grading, and this will have to be remedied, and realized in full the adequate returns which are our just due. It is one short cut to success in this matter, and that is by establishing school at which pupils can be trained and pack apples properly and above standard of quality.

If all learn to grade and pack standard, these pupils, if sent out to different co-operative packing throughout the province, will see to standard is maintained, thereby ensure quality of each grade of fruit, ever part of the province it may come.

I believe in local packing stations out the fruit growing districts. These should be in charge of a foreman (educated as outlined above), who employ under him the children of the thereby educating them in fruit grading, and at the same time keep district the money paid to those who fruit, instead of sending it to China frequently the case, as some of the packers we have are Chinamen (not goodness). No man should pack his the temptation to slip in an odd apple up to the mark is sometimes too each man should roughly grade his boxes of as large a size as he can handle (but not too deep), load them off to a spring wagon, and convey to local packing station, where they can and careful account of each man's pack-

I feel sure if this were done properly and the fruit growing districts of the province would rapidly settle up, raising of property and stimulating all the industries of British Columbia, not to the revenues.

Cold Storage for Fruit
In a previous article I treated of school to teach apple grading and packing of sending the pupils to local packing as foremen.

I also sketched the objects of the stations. In this I want to treat of step in the evolution of our apple industry means whereby the fruit grower can adequate returns for his products. Apples are boxed, the question arises is to be done with them. It is evident they have to be dumped upon the once, low prices will rule, and frequent orchardist will find himself out of pocket.

Something of this kind happens with our present lack of organization. Then, the apples must be placed in cold and held for high prices, and not to must be placed on the market at once.

But this cannot be done as long as are a number of local associations throughout the country, each acting independently of the others, as then the quantity on the market at one time cannot be controlled.

Besides cold storage plants are expensive, the great outlay crippling the factory working of the association. Centrally working also means a considerable of working expenses, and a central association controlling all the local ones has a much powerful voice when dealing with such forces as railway and steamship companies, wholesale agents, and especially legislative assemblies, Provincial or Dominion.

Such a central association having capital under its control than local associations (as it controls all these), and dealing with great quantities of merchantable commodity a great power in the land, and could fully arrange to have wholesale firms throughout the world act for it in the matter of its fruit to the best advantage.

Of course, this central organization be more legislative, so far as controlling subordinate local association than commercial, in that it would sell not itself, but only for the local co-operative parties which had called it into being over which it had a controlling influence it would be, as it were, a co-operative ment the members of which should be by and from the different local organizations.

This might in time become a men the provincial authorities, if, as is too frequently the case, party politics were drawn in matter, and any friction occurred, but politics have nothing to do with fruit grading and the mistake would be fatal.

But there is a simple remedy for a story, as Kipling would say, "that is a story."