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THE

BARLEY, MALT, & BEER QUESTION;

OR, EXPERIMENTS ON FOOD.

AN ADDRESS TO THE FARMERS OF BRITAIN.

BY DR. FREDERIC R. LEES, F.S.A. EDIN., OF LEEDS.

WHAT IS TO BE DONE WITH THE BARLEY WE GROW, IF WE GIVE UP THE USE OF BEER?

The reply to this question has generally been, That there was no *necessity* to grow so much of that particular grain, since the land which bears barley would profitably sustain other species of agricultural produce; Or, that barley might be beneficially employed as *corn for cattle;* Or, after being properly drest, converted into *bread* very superior to the rye, oaten, or second and third rate wheaten bread consumed by the labourer; Or, finally, made into *puddings* far more nutritious and economical, and certainly not less palatable, than those made from rice.

In support of some of these statements, permit me to remark, *en passant*, that barley bread still constitutes the staple food of millions of human beings in various parts of the globe; that it ranks amongst the *cerealea* next to wheat in point of value (estimated by the amount of solid food it contains), taking precedence of oats, rye, and Indian corn; and is therefore, for the purposes of human food, a most important product.*

Even if not used *directly* as the food of man, but given first to form the flesh or fat of animals afterwards slain for his consumption, barley will still occupy a high rank amongst alimentary substances.

It is of the greatest importance to the health and purity of the human constitution, that the food of man should be of a healthy and perfect character, after its kind. But the flesh of animals fed with ill-assorted or improper food, becomes diseased and unwholesome, and introduces the elements of disorder and pestilence into the blood of man. For example, it is now ascertained that cattle fed-up on oil-cake, and the refuse of breweries and distilleries, or similar substances (which are *deficient* in several essential elements of health and nourishment), rapidly become bloated and fat, but at the expense of health; their flesh and organism being seriously diseased. Pigs, likewise, fed exclusively upon potatoes, or other substances deficient in nourishment, will become fat, while they will grow unhealthy. But let a due quantity of ground barley be mixed with the unazotized food of cattle or pigs—food in other respects of a proper sort—and the animals will increase in both fat and flesh, and preserve their own health at the same time. Their flesh, consequently, will become *fitter* for human food.

* In 1000 parts, Wheat contains 950 parts of solid food.

„	Barley	„	920	„
„	Rye	„	792	„
„	Peas	„	930	„
„	Beans	„	890	„
„	Potatoes	„	260	„

The Farmers, however, have not generally been convinced by the reasoning of the Teetotaler on this point, and probably very few of them have fully comprehended the completeness and extent of his assertions. With multitudes, a *single fact*, misunderstood and ignorantly applied, will go further than a *sound philosophy* based upon a broad knowledge of science and nature.

A remarkable instance of this was furnished in a public discussion on this subject, ten years ago, in an agricultural district.* The Objector seized upon a single fact in this way—*the fact that Malt fattened faster than Barley*—and misapprehending the causes and consequences of the fact, announced as the inference therefrom, that 'Barley should be converted into Malt, *because* Malt was BETTER than Barley for the feeding of cattle!'

Now, at the time I admitted the fact, but denied the inference, arguing that 'size' was not 'solidity,' that 'faster' was not therefore 'better,' and that 'fattening' was not the whole of 'feeding.' On the contrary, I contended that the conversion of Barley into Malt was a plan which could not possibly be either the most *profitable* for the feeder, or the most *proper* for the consumer; that, on the one hand, Malt filled up the tissues of the animal with mere *fat*, but could not properly feed its *flesh* or muscle, increasing only the bulk of its body in a mere oily and innutritious deposit, thereby interrupting the free circulation of the vital fluids, and inducing an unhealthy condition of the flesh and organism;—while, on the other hand, the barley would furnish, in proper proportions, those substances which would enable the animal to develop or nourish its *muscular part* to the utmost limit, and also, in the absence of exercise, supply, in sufficient abundance, the merely *fattening elements*.

Even granting, for the sake of argument, that malt was not injurious for the purpose of feeding, it would still be highly objectionable on the ground of the intrinsic expensiveness and waste which it involves.

Firstly, the process of malting Barley entails the loss of a *fifth part* of its entire weight, 5lbs. of barley only making 4lbs. of malt. This loss arises from the process of germination, in which some parts of the grain are re-converted into *carbonic acid* and *ammonia* (which pass into the air as gases), while other parts (including some saline matter) are used up as food by the new sprouts, which are taken off in the form of 'combs.'† Hence,

Secondly, the cattle fed upon malt return a much less quantity of *ammonia* to the soil or farm-yard tank, than those fed upon ground-barley, inasmuch as that element (as well as the carbon) has been dissipated by malting.

Thirdly, there is as much *husk* in the 4lbs. of Malt as in the 5lbs. of Barley, and thus the relative proportions between the most valuable feeding elements of the flour, and the mere chaffy portion, comparatively useless for that purpose, are disturbed for the worse.

Fourthly, to say nothing of the *duty* on Malt, which is a removeable item of expense, the labour and capital engaged in malting must of

* *Masham Discussion*, between T. F. Jordan, Baptist Minister, and F. R. Lees. 1836.

† As malt is drier than barley, however, the loss of solid matter in 100 parts of barley, by malting, stands thus: salts 0,48, organic solids 12,52—13 per cent.

necessity make the intrinsic cost of Malt, weight for weight, greater than that of Barley.

But in order more fully to demonstrate the superiority of the *natural* plan of feeding cattle with grain in its MATURE STATE, over that of feeding them with grain sprouted and burnt—i.e. MALTED—allow me to refer to the two generic purposes of Food in relation to the two-fold wants of the Animal Frame.

1. The living or animated body is in ceaseless motion; its restless machinery of nerve, muscle, and organ, therefore undergoes continual waste, and suffers 'wear and tear' night and day. If young, the animal has also to *grow*, that is, to enlarge the capacity of its organization. Now, whatever *material* in food is fitted (hy its identity of composition with the tissues) to repair this 'wear and tear,' to restore this waste, or to contrihute to the growth or bulk of the vital machine, we will call NOURISHMENT. Nothing else, strictly speaking, *is* nourishment.

2. But there is something else equally essential to what we call Life. No action can he performed, no vital circulation or secretion accomplished, no sensation experienced, without *vital warmth*. If we suppose the body given, the temple in which we live completed, and the circulating fluids of the nerves and arteries placed in their proper channels—we have a splendid Anatomical Model, it may be—hut not a Living Man. There is no play of thought, no flashing of the eyes, no movement of the kingly hand, for there is, as yet, no coursing of the *warm blood* through the thousand passages of that temple, to stir the heart and stimulate the hrain. The Spirit of Life dwells only in Light and Heat: its sanctuaries must be illuminated, and its temples thermalized. The *warming* of the animal-house is effected hy the joint action of fuel and air, as in any other house. The process of hreathing—*respiration*—introduces oxygen (the great agent of comhustion) into the hlood, where it unites with its fatty or carbonaceous elements, which it decomposes, and thus—as in the burning of coal or wood—liherates the caloric (or heat) which the substance had absorbed in its original organization. Now, to that material in food which is fitted to unite with the air inspired into the lungs, and produce warmth hy its decomposition, we give the name of vital FUEL, or 'element of respiration.'

If, however, for want of free exercise and of vital ventilation—of which the lungs and skin are the great organs—this fuel part of food is not hriskly burnt up in the animal economy, nature happily possesses the power of warding off the consequences, by casting the superfluous elements out of the circulating system, and depositing them amongst the tissues in the form of fat—which, in fine, is nothing hut so much oil laid hy for future use.

In accordance with these principles, we find, on proceeding to the examination and analysis of edihle suhstances, that all the various and mixed productions of the vegetahle kingdom employed as food, have been actually divided hy the All-wise Author of Nature into *two genera* or *classes*, corresponding to the two-fold purposes explained. The *first* class emhraces all FLESH-FORMING substances (comprehending albumen, fibrine, and casein, which are rich in azote and the inorganic elements of iron, sulphur, phosphorus, soda, lime, etc.): while the *second* class includes all the FAT-FORMING elements (such as oil, gum,

starch, and sugar, three-fold compounds only, and which are totally destitute of azote and the inorganic elements so essential in the first kind of food).

Food of various kinds, of course, differs widely in the relative proportions which it possesses of the *flesh* and *fat*-forming elements. Some productions (as wheat, grapes, etc.) contain them in such nicely balanced proportions as to preserve the frame in the most perfect health and strength when used as the chief, if not exclusive article of diet; while of other productions we require a more constant variety in order to keep up the health and vigour of the body. Hence, substances in which the two principles of food are both abundant (as grapes and barley in the East, wheat in Britain, oatmeal in Scotland, or maize in America), are generally and aptly honoured with the title—'*staff* of life.'

Now barley-meal, in fact, ranks next to wheat, and contains 14 parts of pure *albumen* to 68 parts of *fuel*, or unazotized matter.*

Thus the analysis of Barley shows that God has beautifully adapted this grain for the two great purposes of the animal economy—*nourishment* and *respiration*; so that, in the absence of any direct experiment on the point, we should be entitled to affirm, *a priori*, that Barley is far superior to Malt for farming and feeding purposes, since the process of germination dissipates much of the azote (or nitrogen) which enters into the composition of the flesh-forming principle, while it induces an excessive proportion of the merely fat-forming part.

As far, therefore, as this aspect of the question is concerned, it is quite certain that an expenditure of £4 in Barley for feeding purposes, is superior to one of £5 in Malt; or, in other words, that all money spent in Malt involves a needless, and therefore, if we are responsible for the right application of our means, a sinful waste of 25 per cent.!

If, however, the mere malting system be in itself discordant with the designs of nature, and a violation of the most clearly established principles of physiological economy, the conversion of the *sweet* and *farinaceous* matter of the malt, by means of brewing or fermentation, into an alcoholic mixture, called ale or beer, is still less in harmony with the established relations of the physical world.

Starch, gum, sugar, and all the *natural* elements of respiration are SOLIDS, not designed to be too rapidly consumed in the system, but to afford a gradual and constant source of fuel and warmth—while alcohol, produced out of their destruction, is a LIQUID, which rapidly permeates the tissues, and robs the blood of the oxygen needed for the combustion of natural elements:—moreover, oil and starch, gum and sugar, are mild and soothing in their contact with the living fibre—while alcohol is *ardent and irritating* in its essential nature, inflaming the flesh, deadening the nerve, corrupting the juices, and even contracting the corpuscles of the vital stream itself! In virtue of the alcohol they contain, therefore, fermented liquors can neither fulfil the thermal functions of the solid and soothing substances furnished for vital fuel,

* It is superior to the staple food of the Scotch labourer, as will be apparent by a glance at Dr. Lyon Playfair's Table of the 'Synoptical Equivalent Value of different kinds of Food.'

Barley-Meal	=	14	parts of Albumen,	68	unazotized matter.
Oats	=	10½	„	68	„
Potatoes	=	2	„	24½	„

nor the necessary and cooling ends of water, since they are possessed of properties *most widely opposite* from those which distinguish *natural* articles of diet or drink.

The conclusion seems irresistible—and it is one confirmed by the experience of millions of temperance men who have returned to the natural practice—that if the great Creator has wisely endowed edible substances with the properties they possess, Man has foolishly 'sought out many inventions' for *transforming and reversing* their qualities. If nature be right, Man *must* be wrong.

The Objector, however, in relinquishing the position that 'Malt feeds *better* than Barley,' may possibly return to the fact, that it has been known to feed *faster*, arguing from thence, that this secures an advantage in point of time, equivalent to a saving in the item of keep.

Admitting that this has sometimes happened, though with the various drawbacks in cost and quality which we have enumerated, I reply that the result is chiefly owing to a purely accidental circumstance, which may just as easily be connected with the Barley as with the Malt. It does not arise from any peculiar adaptation of the elements of malt over those of barley, for the entire purposes of feeding, or from some necessarily higher tendency in the one to rapid assimilation than in the other; but it is simply the consequence of the form in which malt is presented as food (being steeped and ground, and thence more soluble), so that the digestive juice has readier access to the kernel than in the case of unbroken and uncooked barley, and therefore, by more rapidly dissolving the sugar, gum, and starch, introduces a greater amount of those fattening elements into the circulation within a given time.

It is true, then, that Barley unground and uncooked, is less digestible than Malt—owing partly to the resistance presented by the husk to the action of the gastric juice (some grains never being broken at all perhaps, and others imperfectly, by the teeth), and partly to the hardness of the grain itself, and the extreme cohesion of its atoms; but Why, therefore, adopt the laborious and costly process of malting in order to obviate this? Why degrade the *nature*, when you merely wish to modify the *form*, of the grain? Why pay a heavy governmental tax for the mere permission to perform so simple a process in one special way? All that is required is, that you should crush your barley, and then steep or boil it in a little salted water,* or grind it up altogether, and then it will be as digestible, and far more nutritive, than malt. Let the barley be treated in other ways as is the malt—only avoiding the *destructive* germination and kiln-drying—and it will be found, by this simple and economical process, that it is rendered quite as digestible as malt, and capable of feeding and fattening with all desirable rapidity.

Besides, I would observe, there is no one advantage to be derived from malt occasionally administered to cattle, which may not be answered quite as well, and much more cheaply, by the employment of a mixture of molasses (or coarse sugar) and linseed meal. Malting is a very costly method of obtaining sugar—being the result, not of growth, but of *un*growing—of wasteful *de*composition, not of wise combination. It would, therefore, be the interest of the farmers to petition for the repeal of the *Treacle-tax* and *Sugar-duty* rather than of the Malt-

* The cattle are found to relish it better when salted.

tax—in which, doubtless, the temperance world would zealously support them!

It may perhaps be said, that the course of argument I have adopted is in part at least *theoretical*, and that *fact* must be preferred to mere *philosophy!* The numerous recent applications of Farmers to government for permission to *malt* barley and other grains, free, in order to fatten cattle, proves the existence of a strong prejudice in favour of the malting system, which is found to operate injuriously against the temperance cause. It is evidently fancied that there *are* some facts not altogether reconcileable with the teetotal theory. But I unhesitatingly affirm the fallacy of this farmer's faith, and challenge the production of a single fact which is not perfectly explicable upon the principles of the temperance Philosophy. True Philosophy is but the exponent of Fact; the two are not distinct but identical, and must therefore confirm and illustrate each other.

Now it happens in this case, that within a short period, we *have* been enabled to establish the truth of our 'theories,' by a series of most conclusive and carefully conducted EXPERIMENTS—experiments instituted by Government, with the view of ascertaining the comparative value of Malt and Barley in the feeding of Cattle and the production of Milk and Butter. The experiments were made under the direction of THOMAS THOMSON, M.D., Professor of Chemistry, and R. D. THOMSON, M.D., Teacher of Practical Chemistry, in the University of Glasgow, and have been published as a Parliamentary Report. The substance of them, as they bear more immediately upon the present discussion, I will now give.

FEEDING EXPERIMENTS.

Two Bullocks were selected for the purpose.

It was found, by some preliminary trials, that when the beasts were *confined* to an exclusive diet of barley or malt, they soon began to loathe and leave it, thus establishing an old truth, apt to be forgot, that in general *variety of food* is necessary to health, and that even the most nourishing food, unmixed with a coarser and more bulky sort, is unsuitable to the constitutions of both cattle and men.

The experiments for testing the relative value of malted and unmalted grain, consisted in giving the same *quantity* and *quality* of hay, etc., to each bullock, but to one a certain number of lbs. of barley, and to the other an equal weight of malt, *both* being ground into meal, and mashed.

From October 1st to 14th, 1845, the bullock fed on barley increased in weight 109lbs., that fed on malt only 90½lbs.

From November 8th to 22nd, the barley-fed bullock increased in weight 55lbs., the other only 44lbs.

From December 4th to 20th, the barley-fed beast increased 40lbs. in weight, the other only 6lbs.

Thus the Malt-fed beast soon reached its *maximum* of feeding, while the Barley-fed bullock went on increasing in weight, until it gained 53½lbs. over its rival.

'*These trials, continued for three months,*' says Prof. THOMSON, '*leave no doubt that Barley is superior to Malt, weight for weight, as far as fattening bullocks is concerned.*'

EXPERIMENTS AS TO MILK AND BUTTER.

The Report of R. D. THOMSON, as to the relative effect of Barley and

Malt on the Milk of two excellent Ayrshire Cows, confirms all our preceding statements.

It was found that about 9lbs. of grain per day, invariably produced more milk than a greater quantity, showing that only a certain proportion of *concentrated* or rich food should be used. *Variety of food* also contributed to increase the amount of milk.

In one case, when *entire* barley, merely steeped, was given, the milk decreased. 'This arose from a quantity of the barley being ejected without being digested;—the malt, being much more soluble, was not ejected.' Thus we perceive, that the fact of which we have heard so much, 'that malt feeds faster than barley,' weight for weight, merely comes to this—that *digested* Malt feeds faster than *un*digested Barley! This single fact, misunderstood, is a notable instance of fallacy.

'In a brown cow,' says Dr. THOMSON, '100lbs. of barley produced as much effect as 131lbs. of malt: in a white cow, 100lbs. of barley were equivalent to 119lbs. of malt.'

But as 100 parts of Barley make only 80 parts of Malt, it follows, that 100lbs. of barley are *equal in use* to 125lbs. of malt; for as 80 is to 100, so is 100 to 125.

Dr. THOMSON is equally clear concerning the Butter yielded by the Milk in the two cases. 'The *largest amount* of butter was afforded in the brown cow by crushed BARLEY. With *both* animals MALT is *lowest* in the scale.'

The following is a correct view of the result in relation to the milk and butter.

100lbs. of Barley produce	34.6lbs.	dry milk:	and 7.66lbs.	butter.
100lbs. of Malt	26.2lbs.	,,	and 6.35lbs.	,,

GENERAL RESULTS.

Not only was the quantity of solid matter in the milk diminished, but its *quality* was deteriorated. The Soluble Salts, I have already stated, are lessened by malting, and hence the milk cannot contain what the food has not introduced. The Caseine (cheese) was also greatly lessened. The cheese principle was decreased, because it is a flesh-forming substance, containing azote, of which the average amount in barley is 2 per cent., but in malt only $1\frac{1}{4}$:—the Butter was lessened, because malt contains less carbon than barley.

In addition to all this, the cows were losing weight and strength daily under the Malt regimen, while they gained weight and strength when fed on the Barley. After the barley experiment they were found to be 80lbs. *heavier;* after the malt-trial, 42lbs. *lighter*.

Thus it is certain, that in every respect Malt is much inferior to crushed Barley as an article of food for cattle, giving, in the first place, a less quantity of milk and butter; in the second, milk of an inferior quality, deficient in the soluble salts; and in the third place, diminishing the *live-weight* of the cattle, where barley increases it.

Taking all items into account, therefore, we may safely affirm, that 100lbs. of barley are equal in nourishing power—i.e. for the full feeding of the flesh or muscle of the animal—to 130lbs. of Malt; or, in other words, that more than *a third* of all the malted-grain in this country is criminally, because needlessly, destroyed!

Indeed, the Malting-system, as it presents itself to my mind, is a monstrous machinery of mischief, upheld by ignorance, interest, and

appetite, involving a worse than profligate waste of our national resources, and a vast destruction of the rich gifts of a gracious God.

Were the dark rain-clouds to overshadow the land, hiding the rays of the great Ripener of grain from the teeming fields white unto the harvest —were the rain to deluge the ground and saturate the corn, day after day—what fears would be excited, and what prayers put up to Heaven! For what? That the calamity of a spoiled harvest, the germination of the cut or standing corn, might be averted!

Our prayers are heard: the face of the Sun is uncovered, and his warm and ripening rays rush on their radiant paths, to fulfil their mission of mercy! And now the golden grain is all cut down and gathered into the garner—*and what follows?* The ripened produce of three millions of acres of land (including barley, oats, and wheat, for the breweries and distilleries together) is cast into the water of the *steeping-vat*, by the very men who prayed for fine weather, and in order to effect that germination of the corn which their prayers were designed to avert! If, under the direction of a wise Providence, the sprouting of the corn by natural means must still be regarded as a curse and a calamity, how does it forfeit that character (for *malting* is *sprouting*) by becoming an artificial and systematic trade? When the storm is on the sea, and the thunderbolt strikes and fires the majestic merchantman, is it not a calamity? Is it *less* so, when the hands of pirates apply the blazing torch to the gutted vessel? Nay, in truth, is it not more of a curse than before, since *crime* is added to *calamity?*

But for what *end* does this machinery of mischief really work? Not, in truth, for feeding, but for *drinking* purposes! The malting-system is preliminary to that of *brewing*—the foundation of 'a manufacture of human misery' vaster and more fearful than any other which ever impeded the improvement, or blasted the prospects, of our People.

On the other hand, however, how vast would be the benefits and blessings attendant upon the rational use and right application of the fruits of the field! What an immense amount of mischief and misery would be swept away! What a measure of goodness secured! What an impetus given to profitable employment and internal commerce! What an impulse to the progress and improvement of the people! In all these blessings the Farmers of Britain would largely participate, and exult in the increased prosperity of their fatherland.

If, then, in the propositions put forth, I have succeeded in making it evident, that the principles of the Temperance Society are founded upon the Philosophy of sound Experiment and accurate Analysis, and their progress in no way opposed to the best interests of Agriculture—that, on the contrary, their practical adoption is necessarily associated with the growing intelligence, industry, and economy of the People, and these virtues with a great and steady demand for the produce of the soil, tending to an increase of its value—I may conclude with expressing my earnest hope, that the importance of this great subject will commend itself favourably to the Farmers of the Empire, and secure their support to a cause second to no human institution whatever, in the happy influence which it is exerting upon the character of our country and the welfare of our kind.

F. R. L.

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OPINION OF THE AUTHOR OF ANTI-BACCHUS.

"I have read it through very carefully, and have been both edified and delighted with the mass of evidence you have brought to bear on the subject."

Errata.

In consequence of this Essay being written in haste, and the press imperfectly corrected, several typographical and other errors have crept into it, some of which the reader is requested to correct with the pen as follows :—

Page 9, line 32, for "swine-herds" *read* "herds of swine."
12, 12, for "strength," put "strong."
12, last, *put* "were" before "merry."
13, 12 from bottom, put *i* in "methuein."
13, 15, strike out from "as drink," to the end of that sentence.
18, 5 ,, ,, *read* "*archi*oinochoos," "*chief* wine pourer."
20, 6, *for* "azukar," *read* "azúcar."
,, 16, *for* "called," *put* "we have."
,, 17, *for* "this," *put* "*para*."
24, 2, *dele* "sweet."
24, last line, *put* a * *before* "Clio."
26, 11 from bottom, *for* "sagwero," here and elsewhere, *read* "sagueiro."
31, 8, ,, *for* "Angioli Fabroni," *read* "A. Fabbroni," and for "the last," *read* "this."
32, 7 & 8, *strike out* from "like" to "Jews."
,, 10, after "way," *insert* "as the *saba* of the Jews, the *sapa* of of the Romans, and the *sabe* of the modern French."
38, 44, *after* "thy," *insert* "liquors."
,, 51, *dele* "ch" in "demoach," and also strike out the note.
39, 6, *for* "incisions from," *read* "incisions in."
42, ,, *dele* the *vau* in "tirosh."
43, 29, *insert* a *
6 from bottom, *dele from* "zitzhar" to "oil" in line 4; and *put* a * *before* "Here."
56, 24, *after* "not," *insert* "always."
58, 6 from bottom, *dele* "and better."
58, 9, *for* "an inferior certain kind," *read* "a certain kind."
,, 13, *for* "being stupifying," *read* "*causing* head-ache," and *strike out* the next sentence.
59, Strike out the comment in the * *note*, as, on reference, the latin *vinum* is not employed.
63, 31, *read* "Kings xi. 4.)"
64, 27, *read* "it biteth like a serpent and stingeth like an adder."
65, 24, *read* "wine-vat," for "yayin-vat."
67, 24, *for* "It is thus applied," *read* "a form of it is thus applied."
68, note 1, *for* "Kotto," *read* "Kitto."
70, line 18, *dele* "yitzha to produce, and."

PRICE ONE SHILLING.

THE

Strong Drink Question.

TEETOTALISM

HARMONIZED WITH THE SCRIPTURES GENERALLY,

AND WITH

DEUT. XIV. 25-26, IN PARTICULAR;

BEING THE SUBJECT OF

A PRIZE ESSAY,

PROSECUTED AND ENLARGED.

BY

DR. FREDERIC R. LEES,

Author of "the Prize Essay on Deut. XIV. 25," "Metaphysics of Owenism Dissected," "History of the Wine Question," &c.

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