[b][url=https://waldorflibrary.org/images/stories/Journal_Articles/GoldenBlade_1953.pdf]" GOING THROUGH THE MILL"[/url][/b]

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A century ago, when it was taken for granted that a business would be handed down from one generation to another, a father would put his son "through the mill" to prepare him for his responsibilities.

This meant that the youth would start at the bottom of the concern and work his way through every process of the mill or factory alongside the other workers.

Today the expression "going through the mill" has a certain disciplinary and even punitive meaning. My own apprenticeship was served in the building trade, and although I have changed my vocation more than once since then, I have always been grateful for the things I learnt whilst cutting the rough Yorkshire sandstone and listening to the rough Yorkshire philosophy of the old stonemasons with whom I worked.

Between the years 1914 and 1919 I was situated in a part of the world where, although we did not suffer action hunger, there was sufficient belt-tightening to drive our thoughts to food and how it was to be secured in the future for a wife and young family. With this in mind, my first concern on getting back to England was to acquire a little farm, and although of course food production did not start immediately, I shall never forget the satisfaction it gave me to go into the barn and just look at the store of potatoes and sacks of wheat that I had been able to buy from a neighbouring farmer.

And yet in the dark, quiet evenings of that first winter, in spite of a good supper and warm fire, there was always the bogey on my shoulder; dark, cold, fear that things were not going to turn out as planned. It was not the work that frightened me, nor was it the hardships and known risks of farming. It was a feeling of pending disaster. My original idea had been to keep poultry, rear them on natural lines and feed them and ourselves entirely from our own land. It seemed so simple and so safe then, and now it was proving unpractical and uneconomical. If I was going in for farming at all, I must adopt modern methods and ideas - incubators, intensive or semi-intensive laying houses, and buy cheap imported grain for feeding. Fortunately, not being chemistry-minded, I did not think of using chemical fertilisers, but I soon found myself gradually being drawn into a man-made system, based on the laws of finance rather than on the laws of nature.

The further I went along these lines, the worse the difficulties into which I got. All the time the price of eggs and poultry was falling, and British agriculture was being abandoned and ignored by the government and the workers alike. To add to this, the poultry were not doing well. The rate of mortality among the chickens was alarmingly high, and then, as though to make quite sure that I should understand, fate struck me down with an illness which sent me to bed for several weeks.

On recovery it becomes clear that I was now physically unable to carry the farm as previously and for this and other reasons a rearrangement of my work, and indeed of my whole outlook on life, became necessary.

It was then that I first came across the teachings of Rudolf Steiner. In the Agriculture Course of lectures, the key was put into my hands for the solution of my farm problems. The picture that Dr. Steiner there gives of the earth as an organism - not an isolated, closed organism, but supported and nourished by forces coming from the whole surrounding universe - gave me the guiding line I had been wanting.

From now onwards my aim was to convert my poultry farm, so far as my resources would allow, into a balanced organism. It was at the end of the year 1928 that I first started making compost and the bio-dynamic preparations and sprays. In a few years' time I was growing small crops of wheat and getting it milled for bread-meal for ourselves and a few friends. The reaction of the friends was very encouraging, and I was soon supplying the friends of friends in an ever-widening circle.

And then the country mill, where I was sending the grain to be ground, went out of business. By this time there did not seem to be a suitable miller left to whom I could entrust my wheat, so out of sheer necessity I was driven to making a mill of my own. This proved no easy task, and as it had to be done in time spared from the work of the farm, it took several years to complete.

It was in 1940 that the new mill was actually licensed and ready for working, and in 1941 came the "Home Grown Wheat (Control) Order," by which a grower was required to sell the whole of his threshed wheat to an approved buyer. I was informed by the Ministry that, although, I was an approved buyer I should not be allowed to use my own wheat for milling. Eventually however, after a good deal of correspondence, which led to a question in Parliament, I was granted a special licence to produce wholemeal four from my own wheat.

No sooner were these milling troubles settled, than I not only received an order from the War Agricultural Executive Committee to plough another field (to this, naturally, I had no objection), but attached to the order were instructions to apply lime and certain chemical fertilisers. I explained to the Committee that for the past twelve years I had been applying the bio-dynamic methods, and that therefore no chemical fertilisers were necessary. After the W.A.E.C. representative had inspected the farm, the order in respect of the "artificials" was withdrawn. The resulting crop proved highly satisfactory, and when the local committee came to look at it, one of them remarked, "Whatever it's had, it seems to have suited it."

Although the farm was producing only a comparatively small quantity of wheat (ten tons in the highest year), I was able to draw some conclusions as to the results of the application of Rudolf Steiner's indications, both in the growing of the wheat and in the milling of it for bread-meal. Having direct contact with each consumer, I was able personally to learn from, and deal with, any complaints and criticisms.

The complaints of course came, as I still had much to learn, but as time went on the criticisms became more and more favourable. There seemed to be some special quality about the bread, discernible in the good flavour, which reminded my customers of the home-made bread of fifty years ago. Some said it was so satisfying that they felt they could make a complete meal from it.

Questions constantly in my mind now were :—"How can this good food be made available to everyone? How can the system be extended? What are the important points to be observed in order to retain the essential nature of the product?"

For one thing, in order to ensure delivery from stack to table in a perfectly clean and fresh condition, the system should be developed on a regional basis. There should be thousands of these stone-mills situated on farms, or working in close connection with farms, each mill serving the district around it, and the miller in direct contact with producer and consumer.

But to begin at the beginning-that is, with the wheat itself. The first indication of a line to take came to me from our Agriculture Course. Throughout these lectures, and indeed in many other lectures, Rudolf Steiner emphasises the importance to plant, animal and man of the element silicon; or, as it is more commonly known, when combined with oxygen, silica. Silica is everywhere, not only in the solid rocks and sand, but also very finely distributed throughout the atmosphere and the crust of the earth.

The nature of silica is to work in the periphery of organisms in the skin or outer sheath, and in the sense-organs, which are also a skin formation. We find it in the bran of the wheat berry. The greater part of the mineral salts contained in wheat are in the bran. Jago, in *The Technology of Breadmaking*, gives the following as a mineral percentage content of ash of bran;
Silica 0.97 ;
Potash 28.19;
Lime 2.50;
Magnesia 14.76;
Phosphoric Acid 52.81; and smaller amounts of other elements.

Any textbook on flour-milling or agricultural botany will give details of the construction of the wheat grain. It is described as a nut-like fruit, termed by botanists as a caryopsis. It contains a single seed or kernel contained within a thin shell – the bran. The dorsal side of the grain has a smooth and rounded surface, and at its base is the germ, which is, or contains, the dormant young wheat or "brush", and among the hairs the remains of the styles are found.

The germ is embedded in a sheath-like organ called the "scutellum", to which it is attached mid-way between the leaf-and-stem system and the root system of the young plant. The epidermis of the back of the scutellum is called the epithelium; through its cells the dissolved materials of the endosperm are absorbed by the embryo when germination occurs. The germ and scutellum, though weighing only 3% of the whole grain, contain all the

vitamin E and 60% of the vitamin B of the wheat berry. Practically all this is taken out in the first process when making white flour.

There are six layers of bran. The three outermost layers (*epidermis, epicarp*, and *endocarp*) form the outer coat of the seed. Next comes the *testa* - the layer containing the pigment which gives the golden colour to the ripe grain. And then there is the *hyaline*, (meaning "glass-like"') layer. Lastly, in close contact with the endosperm (which forms the main starchy content of the grain) lies the aleurone layer, rich in protein. It was the glass-like - or let us say silicic hyaline layer that especially interested me.

In the bio-dynamic methods we make use of the contracting quality of silica. Spraying vegetables with a biologically-prepared homeopathic solution of silica gives them an added firmness and crispness, and has been found to delay the bolting of lettuce for from two to three weeks. Silica also plays an important part in some of the herbal preparations with which our compost and manure heaps are treated. Here we make use of silica in its role as a collector of what Dr. Steiner calls the "cosmic chemistry".

When lecturing in London recently Dr Pfeiffer the eminent biologist and farmer told of wheat on his farm in America which had been grown for twenty years in bio-dynamically treated soils and had never had chemical fertilisers. Samples of the 1948 crop were sent to the Institute of Technology in Chicago. A spectrum analysis was made both for major mineral elements and for "trace" elements. The mineral content came out the second highest of any American wheat, the highest having been grown on virgin soil in Texas. The number of elements found was 21, including all the trace elements usually recognised, and even silver. Average American wheats show only 15 or 16 elements.

This capacity of silica for attracting other elements is known to all soil scientists.
In The Scientific Study of the Soil (Comber, 1948) we read (p. 132) : "Silicon is an invariable constituent of plants grown in soils, and investigations at Rothamsted and elsewhere show that soluble silicates have an effect in cases of phosphate deficiency. Either the silicon in some way functions in place of phosphorus, or what is more probable, the silicate by some obscure means facilitates the uptake of phosphorus compounds.

To return to our examination of the wheat grain. In Flour Milling Processes (J. H. Scott, 1951) under the heading "The Behaviour of Moisture in Wheat", the writer says: "It now seems to be definitely established that much of the moisture taken in or given out by the grain is by way of the skin, and it is therefore porous to some extent…. [The moisture] made its way slowly along the grain towards the beard end. This transference of moisture occurred more rapidly in the region of the bran than it did at the centre of the grain…. Penetration through the bran was apparent slowed down by the hyaline layer outside the aleurone layer. It was concluded that the beard end of the grain always received its moisture through the bran... No indication of moisture entry through the crease could be detected.... Capillary action was detected on the outside surface of the grain towards the crease, but not away from it. It would appear from this that the beard must normally pass out excess water."

Reading the accounts of these most interesting scientific investigations one gets a picture of moisture from within and moisture from without being repelled, or rather propelled by the

hylaline layer up through the length of the grain, and, in its passage, leaving its burden of minerals in the bran. In the manufacture of white flour the bran is totally discarded.

And this is not yet the whole story. What is this "crease dirt" that we read about in the textbooks as something that must be eliminated in order to produce pure white flour? Inside the crease, and running the full length of the grain from the point at which it is attached to the parent plant up to the base of the style, is the "placenta". The placenta is composed of a number of hollow tubes, which are described by Dr. Lionel Picton in his book Thoughts on Feeding, (Faber, 1946), in this way: "These tubes continue those which run up in the straw from the soil. They carry many minerals in the sap, which are so conveyed to the grain, and, apparently, those which the grain does not immediately use are dumped - so to speak - just underneath the crease, so that this staff or leash in the grain is exceptionally rich in minerals". The so-called "crease-dirt", like the bran, has no place in white flour.

We can learn a little more about the working of silica from the beard at the extreme end of the grain. Under the microscope, the hairs of the beard look like little hollow glass tubes. Their purpose, as we have already heard, is to pass out excess water, and this seems to come about in the following way: when the water reaches the beard it is suspended between the hairs like little cups, thus exposing the greatest possible surface and hastening evaporation.

So, throughout the wheat plant, we can visualise the activity of silica, surrounding and conveying the mineral-laden moisture, expelling the water and conserving the minerals. And when the wheat is harvested in the stook and stack, this maturing process is continued under the most favourable conditions of temperature and aeration, each grain protected by its own silica sheath of bran and chaff. It is extremely doubtful whether we can replace these processes of nature with the combine harvester and artificial drying. And there is worse to follow.

Practically all Wheat, on entering a modern flour milling concern, is put through a vigorous process of washing and scouring or scrubbing, the aim of which is to remove as much as possible of the outer coat of the bran and the contents of the crease. After this, whatever the method of milling or subsequent treatment, the product can never righty be called ‘wholemeal’

In a lecture entitled "The Countenance of the Earth", given at Dornach in July, 1922, Dr. Steiner speaks about a duality in man. It is a battle between the forces of carbon and the forces of silica. If we were dependent entirely upon the carbon, we should be linked up with the earth alone and become entirely materialistic.

There is also a reference to this in the Agriculture Course (VIII, 18): "Indeed, the exaggerated use of potatoes is one of the factors that have made men and animals materialistic, since the introduction of potato-cultivation into Europe. We should eat only just enough potatoes to stimulate our brain and head-nature. The eating of potatoes, above all, should not be overdone." We need the siliceous process to counteract this materialistic thinking:

Again, in "Spiritual Science and Medicine" (IX, 126), Dr. Steiner says that "all the substances derived from the ashes of plants are closely related to the siliceous process outside ourselves.

As we have seen, the silica and mineral elements are chiefly in the bran of the wheat, whilst the endosperm, (the largest substantial part of the grain), is composed almost entirely of starch, a hydrocarbon. So, in the cultivation of wheat, we have the possibility of balancing the silica and carbon forces in our food, for wheat is such an amenable plant. But the varieties of wheat most popular today, with both farmers and millers, are those which yield the greatest amount of white flour.

The leaders of ancient Persia, who first taught the cultivation of the soil and the growing of wheat, no doubt knew this connection between man's thinking powers and the consumption of wheaten bread. The Avesta, the Holy Scripture of Iran, given by the prophet Zoroaster, contains directions on agricultural matters, and there wheat is placed above all other cereals as the best food for mankind. It is a significant fact that, throughout history, we repeatedly find a nation living on wheaten bread at the spear-head of civilisation. In this respect one might say that the history of civilisation is the history of bread, for the whiter the flour, the more materialistic became man's thinking and the more mechanical his methods of preparing food.

We will pass on now from the wheat to the mill. In a lecture reported in the Journal of the Royal Society of Arts, (Jan. 1950), Mr. Kent-Jones, of the British Millers' Research Association, has the following to say: "What happens to that important part of the grain, the germ, and particularly to the protective covering of the germ, the scutellum? The germ itself, containing much fat or oil, tends to flatten when the fractions rich in germ pass between the rollers, and it congregates in certain places in the milling system…. Few people realise that, although as much of the germ as possible is now retained in the flour sack, by no means all the germ finds its way there. Always, even today, the bulk of the germ becomes disintegrated and still appears in the offal. It is difficult to see how this can be prevented in modern mills. Even when the extraction is as high as 85%, the more important portion of the grain from a vitamin point of view - the scutellum - tends to congregate in what are called the lower reductions."

Having read that, and realising that the scutellum, although only a mere 1.5% by weight of the whole grain, contains no less than 60% of the total vitamin B content, I think we need hardly spend more time on the consideration of the details of the working of modern mills.

The primary aim of flour milling is gradually to reduce grain to a meal sufficiently fine to enable us to make it into bread. The roller mill endeavours to achieve this by means of a number of mills constructed of steel rollers. After each passage between a pair of rollers, the ground material is subjected to one or more separations (scalping, grading, dusting, purifying, flour-dressing), before being passed through other roller mills for further reduction. In a stone-mill, gradual reduction is done in one operation; and in the making of wholemeal, of course, there are no separations.

But that is not all there is to it. If the finer qualities and virtues of the wheat are to be retained, reduction must be carried out with as little violence as possible. Friction and pressure, and the consequent heating of the flour, must be reduced to a minimum.

Strange as it may appear at first sight, there seems to be no better way of achieving this than by grinding with stone, and the best material for the purpose, and the most accessible (to me at any rate), is millstone grit, quarried from the Pennines. The Romans, and probably their prehistoric predecessors, recognised the merits of this material and used it, especially for the bottom stones of their querns.

Derbyshire Greystones, as they are called, (though many are actually quarried in Yorkshire,) are peculiarly well adapted for the manufacture of millstones, because the coarse texture keeps a pair of stones from too intimate contact and permits air to penetrate. The grinding face of the stones is cut with a series of furrows, designed not only to distribute the stock outwards over the whole working surface, but also to cool both the stock and the stones. The more numerous the furrows, the cooler the grinding. The faces of the stones are slightly concave, so that there is a little more room between them at the centre, called the ‘eye', where the grain comes in, than there is at the edge, where it passes out as flour.

The runner stone is balanced on top of a spindle and the space between it and the fixed bedstone, at the centre eye, is just sufficient to admit a grain of wheat, while at the periphery the stones should almost, but not quite touch. They should allow the bran to pass out in flakes without entirely breaking it up.

The grain, entering through the eye, is drawn in between the stones. First the bran is rubbed off, and then the inner part of the grain is gradually reduced to flour, with its natural particles preserved. The way in which the wheat is impelled through the mill is a wonderful piece of mechanism almost like a living process, that of swallowing. It is truly a meeting of the mechanical and the biological.

If a finer meal is required, this should be obtained by sifting out some of the bran, not by a heavier milling, which would heat the meal and so destroy some of the vitamins. Some of the small modern mills are not at all suitable for making wholemeal flour. The grinders are made of some synthetic composition, and they revolve at a great speed, making the flour quite warm with the friction.

I once had some wheat ground with one of these machines, and some of the same wheat ground at the same time in my own mill with Derbyshire greystones. The two samples were immediately sent to an analyst to be tested for vitamin E. His report stated that the vitamin E content of the meal ground with the greystones was 25% higher than that of the meal ground with the composition stones. The analyst added: “Vitamin E is especially susceptible to oxidation in the presence of heat. This oxidation is also catalysed by the presence of small amounts of iron, and I am of opinion that these facts are responsible for the loss of vitamin E which occurs in modern milling".

It may come as a surprise to many people to learn what an enormous amount of heat is generated when two apparently smooth surfaces are rubbed together under even slight

pressure. In the Times Review of the Progress of Science (Spring 1952) there is a very interesting article called Friction and Lubrication by Dr. F. P. Bowden, F.R.S., in which he says: "The surface temperature developed when a metal slider rubs on steel, at a speed of about 10 feet a second momentarily reached white heat (1,000° C.) at local points of contact although the metal appears cool.

Two points emerge from this: one is that iron or steel are not the best materials to use for flour milling, and the other that pressure and friction can produce intense local heat, even though it is imperceptible without the aid of special electrical apparatus.

Recently when I was shewn round a modern a modern flour mill I was most impressed by the enormous amount of capital that was aloud out in machinery. I couldn't help comparing this with the modest little plant necessary for making wholemeal. I calculated that for every pound spent in setting up a mill to produce wholemeal flour, it would take fifty pounds to produce the same amount of white flour: a glaring instance of receiving less and less for an expenditure of more and more.

When I began this account of some of my experiences whilst "going through the mill", I spoke of the fear of starvation that drove me to take up farming as my vocation. The shortage of food seemed it became evident that it was a national complaint. to be a personal of family affair at that time, but as the years passed it became evident that it was a national complaint. To-day it is recognised as a world problem, if not the world problem of the future.

Statisticians tell us that if we cultivate all the land at our disposal and make use of all present-day methods with machines and chemicals, the food provided will still not be enough to keep up with the increase of the earth's population for very long, the way things are going now. It is not so much labour-saving machines as food-saving machines that can help us. In the past we have too often tried to adapt food production to the requirements of the machine. This idea will have to be reversed, and machinery applied only where it does not detract from the quality and feeding value of the food.

The resources of the earth have been explored and exploited almost to the limit. We must now turn for our support to the limitless spheres of the universe and the imponderable forces behind all created things.