CLASSICS TO GO

FIELD, FOREST AND FARM

JEAN-HENRI FABRE

Field, Forest and Farm

Jean-Henri Fabre

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CHAPTER I

THE STAFF OF LIFE

With his nephews as willing companions and eager listeners, Uncle Paul continued his walks and talks in the pleasant summer afternoons.

“Bread is made of flour,” he began, “and flour is wheat reduced to powder under the millstone. What an interesting mechanism that is, the flour-mill, driven by water, by the wind, sometimes by steam! What wearisome effort, what waste of time, if we had not this invention and were forced to do its work of grinding by sheer strength of arm!

“I must tell you that in ancient times, for want of knowing how to grind wheat, people had to content themselves with crushing it between two stones after parching it a little over the fire. The coarse meal thus obtained was cooked in water to a sort of porridge and eaten with no further preparation. Bread was unknown.

“Later the plan was hit upon of kneading the meal with water and of cooking the dough between two hot stones. Thus was obtained a crude sort of biscuit, about as thick as your finger, stodgy and hard,and mixed with charcoal and ashes. It was preferable to the porridge, the insipid paste, of the earlier time, but far inferior to the poorest bread of to-day. To make a long story short, by trial after trial success was at last attained in the making of bread like ours. It became necessary then, without possessing

anything to compare with our mills, to grind wheat in large quantities.

Wheat

“Flour was obtained by triturating the wheat in a hollowed stone with a pestle. This latter was sometimes light enough to be operated directly by hand; sometimes, to produce quicker results, it was so large and heavy that it had to be

turned in its stone mortar with the help of a long bar. Such was the first mill. With appliances of this sort I leave you to imagine how long a time was required for the production of a single handful of flour. For bread enough to feed one person at one meal, wretched slaves were kept toiling from morning till night and from night till morning in turning the pestle."

"What cruel masters they must have had!" exclaimed Emile.

"Yes, the slaves were harnessed to the bar like beasts of burden; and when, weakened with fatigue, they did not go fast enough, a rawhide was applied to their bare shoulders. These unfortunate millers were poor wretches taken in war and afterward sold in the market with the same indifference with which a drover sells his cattle. Such, then, were the hardships that led the way to the modern mill which to-day, with a few turns of its water-wheel, and to the cheerful accompaniment of its *tick-tack*, can make flour enough for a whole family.

"But let us leave the mill and turn our attention to the following interesting experiment. Take a handful of flour and with a little water make it into dough. This done, knead the dough with your fingers over a large plate while an assistant moistens it continually with water from a pitcher. Keep the dough well in hand and continue kneading it, flattening it out and gathering it together again, turning it over and over under the fine stream of water poured from above.

"Examine carefully the water that passes over the dough and washes it. It falls into the plate as white as milk, showing that it carries with it something from the flour. This something will finally settle at the bottom of the liquid,

and we shall find it to be a substance not unlike the starch used for starching linen. In fact, it is starch, or fecula, as the chemists call it—neither more nor less. Thestarch used in the laundry is obtained in considerable quantities by similar means: dough is washed and the whitened water, left undisturbed, deposits a layer of starch which has only to be gathered together and dried.[1]

“So much, then, is made clear: flour contains starch, but it contains something else also. There is a limit beyond which the washed dough yields no more starch; it is useless to knead it, the water falls colorless into the plate. What remains in one’s hands after this prolonged washing is a soft, gluey substance, having something of the elastic quality of rubber. Grayish in color, it has a rather pronounced odor. When dried in the sun, it becomes hard and translucent like horn. It is called gluten from its gluelike character, its viscosity.

“Now this substance, so unattractive in appearance, all soft and sticky and getting clogged between the fingers—this gluten, in short—do you know what it is? Don’t try to dispute me, for what I am going to tell you is the exact truth. In its composition gluten does not differ from flesh. It is vegetable flesh, capable of becoming animal flesh by the simple process of digestion, without any material loss or gain. Therefore it is gluten, first and foremost, that gives to bread its great nutritive value.

“Of all the cereals wheat contains the most gluten, with rye holding second place. Maize and rice, as well as chestnuts and potatoes, are wholly lackingin this ingredient; and for that reason flour made from them, rich though it be in starch, is not at all the kind of flour for bread. This will explain to you the superiority of wheat over all other farinaceous grains.

“Wheat, the only cereal that can give us white bread, that superior bread which nevertheless is not always to your taste unless spread with a little butter, does not grow in all countries. Open your atlas and run over with your finger the countries bordering on the Mediterranean; your travels will embrace the principal regions where wheat flourishes. Farther north it is too cold for the successful culture of the precious cereal; farther south it is too warm.

Rye

“But that is not all. In the privileged regions not every district is adapted to this incomparable crop: wheat needs the mild temperature and fertile soil of the plains, not the harsh climate and dry slopes of the mountains. Let us consider France in particular. Its plains produce excellent wheat, but not enough to feed the entire population; therefore in the hilly and cooler regions, where this cereal cannot be raised, recourse is had in the first place to rye, which yields a bread that is compact, brown, and heavy, but on the whole preferable to any other except, of course, wheat. This rye bread is the customaryfood of the country in the greater number of our departments.

“The raising of rye becomes in its turn impossible in regions too cold and too sterile. There then remains, as a last resort, barley, the hardiest of cereals, which is found in the mountains until we reach the neighborhood of perpetual snow, and can be raised even in the frigid climate of the extreme North.

“You ought to taste the miserable bread made from barley in order to find our bread good—or, I might better say, in order to find it an exquisite dainty even without butter or jam. Barley bread is full of long bristles that stick in the throat; it contains more bran than flour; it is bitter, stodgy, and of a disagreeable odor. Oh, what sorry stuff! And yet many have to be content with it, and are only glad if they can get enough of it.

Barley

“In the greater part of the world wheat, widely distributed by commerce, furnishes bread only for the tables of the rich. The rest of the population knows nothing, as a rule, of this article of food, has never so much as seen it, and at most has only heard of it as a rare curiosity. In place of bread the people eat here one thing, there another, according to the country. Asia has rice, Africa millet, America maize. In India and China the people have hardly anything to eat but rice boiled in water with a littlesalt. Half the entire world has practically the same diet.

“The plant that produces rice has a stalk resembling that of wheat, but instead of ending in an upright ear it bears a cluster of feeble and pendent branches, all loaded with seeds. The leaves are narrow and ribbon-shaped, rough to the touch. This plant is aquatic. In order to flourish, it must send down its roots into the submerged mud and spread its foliage, excepting the tip, in the flood. Marshy shallows, inundated a part of the year, are adapted to its cultivation.”

“But what do they do where there are no such marshes?” asked Louis.

Rice

“When such marshes are lacking, the ingenious Chinaman floods the lowlands with water from some near-by stream until the ground is all soft and muddy. He then draws off the water through a series of little canals, and works the mud with a light plow drawn by a buffalo, a kind of ox with a long beard hanging from its chin and a mane waving on its back.

“The seed once sown in the furrows and the young plants started, the water from the stream is again made to flood the fields, where it remains until harvest time. Then for the second time it is drawn off, and the reaper, sickle in hand and with the black mud up to his knees, cuts down the rice-laden tops of the stalks.

“Maize, or Indian corn, is the staple food of South America, as rice is that of Asia. Many call it Turkish wheat, a name doubly inappropriate, for in the first place this grain is not indigenous to Turkey, but to America, and in the second place it has nothing in common with the wheat from which bread is made. From America its cultivation has spread to our part of the globe.

“The ear of maize is very large and is composed of full, rounded kernels, yellow and shiny, closely packed in regular rows. Like rice, maize furnishes a fine flour of pleasing appearance but lacking in one essential: it contains no gluten. Hence the utter impossibility of using either rice or maize for making bread, despite the good appearance of the flour made from them.

“Nevertheless maize is a very wholesome article of food, and one of great value in the country, where the appetite is sharpened by open air and hard work. Only it is not in the form of bread that it best yields its nourishment, but rather in that of porridge, or boiled meal and water.”

1 Laundry starch is now obtained chiefly from rice and from pulse.—*Translator.* ↑

CHAPTER II

THE HISTORY OF TOBACCO

“Before taking the form of the powder which the user of snuff pushes up into his nose to tickle his nostrils and promote sneezing, before being rolled into the cigar or reduced to that crisp, moss-like substance which the smoker stuffs into his pipe, tobacco has had a previous existence as a plant bearing this same name. A stalk about one meter in height, large, clammy leaves of a strong odor, bright red flowers each shaped like a narrow funnel and expanding into the five points of a star at the orifice, dry capsules filled with innumerable little seeds—there you have the tobacco plant.

Tobacco Plant

“Only the leaves are used, and these only after undergoing certain processes that intensify their natural properties and cause them to lose their green color. Rolled into compact little cylinders, they become cigars; cut very fine, they take the form of smoking tobacco. Reduced to powder, they furnish what is known as snuff.

“America, the same land to which we owe thepotato, also gave us tobacco. When, almost four centuries ago, Christopher Columbus discovered the new world, one of the first landings he made was on the large island of Cuba. Apprehensive of danger in the forests from the savage tribes on every side, Columbus sent scouts ahead to reconnoitre the country.

“The sailors forming this party encountered on the way, to their extreme surprise, numerous Indians, both men and

women, holding each a sort of lighted fire-brand between the teeth and inhaling the smoke. These fire-brands, called ‘tabagos,’ were made of a plant rolled up in a dry leaf. There, then, were the first smokers and the first cigars recorded in history.

“The natives of Cuba and the neighboring islands had, we infer, been addicted to smoking for a long time, probably for centuries, when the Europeans first appeared among them. They had their rolls of dry leaves, or tabagos, and their smoking appliances of soft stone or baked clay, appliances called by us ‘pipes’ and by them ‘calumets.’ Tobacco, in fact, played a prominent part in their medicine, their superstitious observances, and their political assemblies.

“Consulted as to future events, the soothsayer first of all inhaled the smoke of several tabagos, while the other persons present, seated in a circle, vied with one another in the energy of their smoking, their ultimate object being to enwrap themselves in a dense cloud. Then from the midst of this cloudthe soothsayer, his imagination wrought to a high pitch by the fumes of the tobacco, delivered his oracles in unwonted terms that made the hearers believe they were listening to the voice of God.

“A like ceremony was observed in the assemblies held for discussing public affairs. Seated on a stone and inhaling the smoke from his calumet, the orator who was about to take the floor waited in passive silence while the chiefs of the nation approached him, one at a time, to blow into his face plenteous puffs from their pipes and to commend to him the interests of the tribe. These fumigations concluded, the orator abandoned himself to his eloquence amid the enthusiastic acclaim of the assembly.

“Seeing the islanders smoking, Columbus’s companions wished to try this singular custom for themselves. To the gratification of this desire the Indian lent his ready assistance: he showed them how the tabago is rolled, and how the calumet is filled and lighted. Though history is silent on the subject, it is clear that the first sailor to undertake the inhalation must have been seized with that fearful nausea which no novice in smoking can escape. A stomach of any delicacy would have been forever repelled; the harsh gullet of the mariner found a certain charm in the thing when once the trying experiences of initiation were over.

“The taste for smoking was so soon acquired that, on their return to Spain, the companions of Columbus very quickly extended this Indian custom in their own country. Before long, too, there was discovereda new way to use tobacco: some one conceived the idea of reducing the leaf to a dry powder and stuffing it into the nostrils, sniffing with each pinch of the powdered substance. The Indian had discovered smoking tobacco; the European in his turn invented snuff.

“Spain and Portugal numbered their smokers and snuff-takers by the thousand when, in 1560, tobacco made its first appearance in France. Nicot, French ambassador at Lisbon, sent as an object of curiosity to his sovereign queen, Catherine de Médicis, some seeds of the fashionable plant and a box of tobacco in powdered form. Charmed with this gift, the queen quickly contracted the habit of taking snuff. To please her, tobacco was cultivated, and snuff-takers soon became numerous in all the provinces. It was said that a certain great personage of the period took as much as three ounces daily. He certainly must have had his nose well tanned.

“From one nation to another the use of tobacco gradually spread, but not without serious opposition. The Turks are to-day passionately addicted to smoking, extremely fond of their long pipes; yet hear what sort of a reception they at first gave to tobacco. Against smokers and snuff-takers their emperor, Amurat, issued an edict severe to the point of cruelty. Every delinquent was condemned to receive fifty strokes with the rod on the soles of his feet.”

“That ought to have driven tobacco out of the country in short order,” remarked Jules.

“That was merely a warning to first offenders,” returned his uncle. “For a second offense the luckless person caught in the act had his nose cut off. It was a radical measure to discourage the snuff-taker: no more nose, no more snuff. But the smokers, after this horrible mutilation, persisted in their smoking.

“A king of Persia devised what he thought would cure even this habit: every one caught with a pipe in his mouth had his upper lip cut off. At the same time, of course, every nose proved guilty of snuff-taking fell under the executioner’s knife. But the atrocious edict of the Persian king proved as futile as that of the Turkish emperor. Despite all the noses struck off, all the lips cut away, all the feet made to tingle under the rod, the use of tobacco still continued to spread. These fruitless severities had to be abandoned.

“Other regulations sprang up here and there, less cruel, but sufficiently fruitful in fines, imprisonments, vexations of all sorts. Still nothing was of any avail; smokers and snuff-takers remained incorrigible. Finally, taking wiser counsel, the government authorities conceived a plan for making this passion, which no severity had been able to subdue,

yield them large revenues. The government itself became exclusive vender of the very article it had at first proscribed with such rigor. France alone derives a yearly revenue of almost three hundred million francs from the sale of tobacco.”

CHAPTER III

THE ORIGIN OF FERTILE SOIL

“Fertile or arable soil,” resumed Uncle Paul, “constitutes only the surface layer of earth, that which is worked by the farmer’s implements and yields nutriment to the roots of plants and promotes their development. In one place you will see bare rocks and utter barrenness; in another you find fertile soil to a depth of an inch or two, scantily carpeted with grass; and again, in a third, you come upon rich earth so deep as to maintain abundant vegetation. But nowhere does this fertile layer have an indefinite thickness: at a depth never very considerable a subsoil having the qualities of the neighboring mountains is sure to be found. How then has there come to be formed this layer of earth whence is derived all the nutriment required by plants, animals, and men?

“Undermined all winter, and even the whole year round on high mountains, by the ice that forms in their slightest fissures, rocks of all kinds break into small fragments, divide into grains of sand, fall into dust, and furnish the powdery mineral matter which the rain washes away and deposits in the valleys. This as a rule is the origin of broken stones, sand, clay, and fertile soil. Ice by its expansive force hasdetached them from the tops of mountains and the waters have swept them away and carried them further. One can form an idea of the action of ice in crumbling rocks to make soil of them and enrich the valleys, by examining the surface of a hard road at the moment of thawing.

Firm underfoot before freezing, this surface loses its firmness after a thaw and is pushed up here and there in little finely-powdered clods. At the moment of freezing, the humidity with which the soil was impregnated turned into ice which, increasing in volume, reduced to fine particles the surface layer of the road. When the thaw comes, these particles which the ice no longer holds together form first mud, then dust. In exactly this manner arable land was formed by the disintegration of rocks of all kinds, which were reduced to particles by the action of frost.

But soil suitable for agriculture contains not only powdery mineral matter, but also a little mold from the decomposition of vegetable matter. To give you an idea of the causes which from the very earliest times have little by little fertilized this rock-dust with vegetable mold, let us take the following example.

Geography has taught you what a volcano is. It is a mountain whose summit is hollowed out in an immense funnel-shaped excavation called a crater. From time to time the ground trembles near a volcano and formidable noises similar to the rolling of thunder and the booming of cannon are heardfrom the depths of the mountain. The crater throws up into the air a lofty column of smoke, dark by day, fiery red at night. All at once the mountain is rent and vomits up through the crevices a stream of fire, a current of melted rock, or lava. Finally the volcano quiets down; the source of the terrible flood dries up. The streams of lava harden and cease running; and after a lapse of time which may be years they become quite cold. Now what is to become of this enormous bed of black stone similar in character to the slag from a forge? What will this sheet of lava covering an area of several square miles produce?

“This desolate, blasted expanse seems destined never to be clothed with verdure. But in any such assumption one would be mistaken. After centuries and centuries a vigorous growth of oaks, beeches, and other large trees will have taken root there. In fact, you will see that air, rain, snow, and, above all, frost attack in turn the hard surface of the lava, detach fine particles from it, and slowly produce a little dust at its expense. On this dust there will spring into being certain strange and hardy plants, those white or yellow patches, those vegetable incrustations, calculated to live on the surface of stone and known as lichens. These lichens fasten themselves to the lava, gnaw it still more, and in dying leave a little mold formed from their decaying remains. On this precious mold, lodged in some cavity of the lava, there is now a growth of mosses which perish in their turn and increase the quantityof fertilizing material. Next come ferns, which require a richer soil, and after that a few tufts of grass; then some brambles, some meager shrubs; and thus with each succeeding year the fertile soil is added to from the new remnants of lava and mold left by the preceding generation of plants that have gone to decay. It is in this way that gradually a lava-bed finally becomes covered with a forest.

“Our own arable land had a similar origin. Sterile rocks, hard as they are, contributed the mineral part by being reduced to dust through the combined action of water, air, and frost; and the successive generations of plant-life, beginning with the simplest, furnished the mold.

“Notice how admirably, in the processes of nature, the smallest of created beings perform their part and contribute as best they can to the general harmony. To produce fertile soil there is needed something more than the frosts and thaws that crumble the hardest rock: there is need of plants hardy enough to live on this sterile soil, such

as tough grasses, mosses, lichens, which gnaw the stone. It is through the medium of these rudimentary plants, so pitiful in appearance and yet so hardy, that the dust of the rocks is enriched with mold and converted into a soil capable of bearing other and more delicate plants.

“It is not in cultivated fields that you will find those thick carpets of mosses and lichens, valiant disintegrators of stone; it is on the mountain-tops that they can be seen at their work of crusting overthe smooth rock in order to convert it into fertile soil. It is from these heights that this fertile soil has descended, little by little, washed down by the rain, until it has fertilized the valleys. This work is going on all the time; in hilly regions plants of the lowest order are constantly adding to the extent of arable land. The little threads of rain-water that furrow these regions carry away with them some of this humus and bear it to the plains below.

“What a worthy subject for our thoughtful study is this formation of arable soil by these legions of inferior plants, obscure workers indefatigably crumbling the rock! What immense results obtained by the simplest means!”

CHAPTER IV

DIFFERENT KINDS OF SOIL

“Four substances, mingled in very variable proportions, enter into the composition of fertile soil, or arable land, namely: sand or silica, clay, limestone, and humus, or vegetable mold. Each one of these ingredients separately would make but very poor soil, quite unsuited for agriculture; but united, mixed together, they fulfill the conditions necessary to fertility. Arable land generally contains all four, with the predominance sometimes of one, sometimes of another. The soil takes the name of its most abundant constituent. Thus have arisen the names, silicious soil, argillaceous soil, calcareous soil, and humous soil, to designate the fertile lands dominated respectively by sand, clay, limestone, and humus. Compound terms are also used. For example, when it is said of a certain soil that it is argillo-calcareous, it is meant that clay and limestone are its chief constituents.

“Sand consists of particles, more or less minute, of very hard rock, sometimes opaque, sometimes as transparent as glass, and always easily recognizable by its property of emitting sparks when struck with steel. Flint and white pebbles belong to this kind of rock, which is called silex, silica, or quartz.These three expressions mean about the same. Sandy soils have little consistency, are easily permeated by water, and freely absorb the sun’s heat, which makes them very subject to drought.

“The name of granite is given to a rock composed chiefly of silica and which forms whole mountains, as in central France and in Brittany. The soil formed by the gradual disintegration of this rock is sometimes called granite soil. It is not very good for agriculture. Chestnut trees prosper in it, as well as certain wild plants characteristic of this kind of land. The principal ones are the various species of heather and the purple digitalis. Heather, with its dainty little pink blossoms, carpets in richest abundance the poorest of sandy soils. The purple digitalis is a large-leaved plant whose flowers, red on the outside, striped with purple and white inside, are arranged in a long and magnificent distaff reaching almost to the height of a man. The flowers are in the shape of long tun-bellied bells or, rather, glove-fingers; hence the plant is sometimes called foxglove, sometimes lady’s fingers.

“The soil composed of substances thrown up by volcanoes is also sandy, and is called volcanic soil. It is generally black and sometimes very fertile.

“Sandy-clay soil is found in the valleys of great rivers. It is the most fruitful and the easiest to cultivate. Such are the soils of the Rhone valley, the valley of the Loire, and that of the Seine. It is still more fertile if it is flooded by the stream at high water. Then the river deposits a rich slimecomposed of clay and organic matter washed down by the current.

“The soil of heathy or shrubby land is composed of fine sand and of humus from the decayed leaves of heather and other plants. It is only used for flower gardens, and furnishes an example of what might be called sand-and-humus soil.

“Clay is a soil which, when moistened with water and thoroughly kneaded, becomes a soft and tenacious dough,

suitable for molding into any desired shape. When perfectly pure it is white, and is known as kaolin, a rare substance of which porcelain is made. Plastic clays are those that are unctuous to the touch, forming with water a yielding mass that hardens with firing. They are used in making pottery. Smectite, or fuller's earth, is a clay of very different character, not pliable when moistened, but very absorbent of grease and hence used by fullers for cleansing cloth of the oil left on it in weaving. Ochres are clays colored either red or yellow by iron-rust. They are used in coarse painting. Red chalk belongs to this class of clays. Marl is a mixture in variable proportions of clay and limestone. According to which constituent predominates, it is called argillaceous or calcareous. Subjected to the action of air and moisture, marl becomes flaky and crumbles to dust. Marl is used in agriculture to improve the soil.

"A clay soil is quite the opposite of a sandy soil: water makes it swell and converts it into a sticky paste which clings tenaciously to farming implements.Once wet, it is cold, that is to say it dries very slowly. A spade can only divide it into dense clods slow to crumble in the air and not fit for receiving seed. The farmer must be careful to drain off the water and break up the ground by working it before and during frosts. It is improved by mixing with it sand, coal-ashes, and lime. Wheat flourishes better in a clayey soil than in any other kind.

"Clayey soils are recognized by their vegetation. The wild plants peculiar to this kind of soil are colt's-foot and danewort. Colt's-foot is also called horse-foot from the shape of its leaves, the outline of which reminds one of a horse's hoof. The leaves are white underneath. The flowers are yellow like little marigolds, and they appear at the beginning of spring before the leaves. Danewort is a kind of herbaceous elder of about half the height of a man. Its

small white flowers are succeeded by berries full of a violet-red juice.”

CHAPTER V

DIFFERENT KINDS OF SOIL

(*Continued*)

“Limestone is the rock from which lime is obtained. It is composed of carbonic acid and lime. To obtain the latter, the limestone is subjected to intense heat in a furnace or lime-kiln. The carbonic acid escapes, is dissipated in the air, and only the lime remains. In arable land limestone is found rather often in smaller or larger pieces, but more frequently as a fine powder which the eye can scarcely distinguish from the other constituents, especially clay. The water of rivers and other streams almost always contains a small proportion of dissolved limestone. Thence comes the thin layer of stone that accumulates little by little on the inner surface of bottles, coating the glass. Some waters contain enough of this dissolved limestone to deposit a mineral crust on objects immersed in them, as mosses and aquatic plants, and to obstruct their aqueducts. The clearest water, in which no foreign substance can be seen, absolutely none, nevertheless contains dissolved limestone, just as sweetened water contains invisible sugar. In drinking a glass of water we drink a little stone at the same time. Our body, in order to grow strong and increase in size,needs considerable calcareous matter for the formation of bones, which are to us what its solid framework is to a building. This material, so necessary to us, is not created by us; we obtain it from our food and