1.1 Primitive and Archaic Medicines

We do not know what primitive men thought or did about their health problems, beyond what little the study of their fossil remains and the accompanying artifacts may suggest. For example, we know that many primitives knew how to suture wounds and set broken bones, and that some of them practiced trephination. However, we do not know why they did the latter: whether to treat migraines or to release evil spirits.

By contrast, anthropologists have found out something about the ideas and practices of modern primitives. For example, the Amazonian Indians, who are among the most backward, use several plants to which they attribute healing or magic properties. Some tribes believe that they protect children from evil spirits by rubbing them with some plants. Others eat plants that, although poor in nutrition, are appreciated for their shape, color, or some other trait. This usage is enshrined in the doctrine of signatures, popular in Europe in the sixteenth and seventeenth centuries, according to which certain plants cure diseased organs because they resemble them in shape. And as recently as in the 1960s, Che Guevara, the physician turned revolutionary, was amazed to learn that his Congolese comrades believed that a certain magic potion had made them invulnerable to the colonialists’ bullets.

A philosopher may think that the Amazonian tribesmen are dualists, in the sense that, while their practices are materialistic, their explanations are spiritualistic. Perhaps he will add that the Amazonians are half empiricists and half apriorists — the former because they learned their practices by trial and error, and the latter because other practices owe nothing to experience. For example, frequent bathing is an effective prophylactic habit,
whereas tribal mutilations, deformations, and scarifications are harmful, as is the insertion of thorns or bones in the skin.

We also know something about the medical beliefs and practices prevailing in the earlier civilizations, partly because some of them persist in ours. Despite their marked differences, all of them shared the belief that some or all diseases were caused by gods, evil spirits, or witchcraft (Trigger 2003: 620). Hence, sacrifices to supernatural entities were thought to help the application of natural remedies.

But in daily matters, it was always considered advisable to take practical measures, for the gods might be bribed and, in any event, they were busy with cosmic affairs. So, in practice, the sick person in the ancient world paid two fees: to his healer and to the god in charge of his particular disease. This was the ruling medical practice in all the early civilizations, whether in Eurasia, Africa, or America — a mixture of religious ceremony with more or less successful empirical practices (see, e.g., Mata Pinzón 2009; Sigerist 1961; Valdizán 2005; Varma 2011).

The Hippocratic, Ayurvedic, and traditional Chinese medicines, which had already peaked two millennia ago, stand out. They were the most important medical legacy of antiquity because, though unscientific by modern standards, they broke with the magico-religious tradition; they were thoroughly secular and even materialist rather than spiritualist. Moreover, all three contained some nuggets of true knowledge and a few efficient practices, particularly concerning prophylaxis, diet, and lifestyle.

In the West, the Hippocratic school is the best known of all the traditional medical traditions. We owe to it the thesis that diseases are natural processes beyond the reach of the gods; that the disease of every kind has its own peculiar course; that most disorders heal without intervention; and that to keep well, as well as to recover health, we must observe certain simple hygienic rules, such as eating and drinking in moderation. We also owe the same school the attempt to find general laws and rules — an attitude common to all the sages of ancient Greece.

The ancient Egyptians had a lot of special mathematical and medical knowledge, but they did not bequeath us a single general theorem or general medical rule. In particular, the famous Edwin Smith papyrus from 1,500 B.C. contains studies of 48 wounds in various parts of the body. The descriptions of the wounds and their treatments were detailed, objective,
and rational. But they do not suggest any generalizations; they are strictly empirical, in contrast with the official ideology, which worshipped one god for every one of the 200 known diseases.

Empiricism is of course the sticking to experience and the corresponding rejection of magic and religious ideas. The same philosophy inspired also radical skepticism about theorizing, as exemplified by the brilliant if destructive Sextus Empiricus. Radical skepticism was certainly reasonable at a time when almost all the extant theories were false or, as in the case of Aristotle’s, they contained some religious ingredients.

Skepticism about scientific theories ceased to be reasonable and progressive when David Hume embraced it at the beginning of the eighteenth century, when classical mechanics was flourishing and the earliest biological and medical hypotheses emerged. Hume, an implacable critic of religion, also rejected Newtonian mechanics because it contained concepts, such as that of mass, that go beyond phenomena (appearances).

(This phenomenalism of Hume and his followers, from Immanuel Kant to Auguste Comte to Ernst Mach to Pierre Duhem to the logical positivists of around 1930, overlooked, opposed, or distorted all of the deep scientific theories, every one of which involves concepts referring to imperceptible entities and processes, from atoms and force fields to evolution and the innards of stars. Kant was well aware that phenomenalism is anthropocentric, but he was wrong in claiming that its adoption was “a Copernican revolution,” for in fact it was a counter-revolution. Pierre Duhem realized this when he launched his attack on Galileo, whom he called “the Florentine mechanic,” and proposed his own “physics of a believer.”)

From the time of the consolidation of the scientific attitude, around 1800, empiricism was frankly regressive; it opposed all the bold new scientific theories, such as electrodynamics, atomism, and astrophysics, and it slowed down the renewal of medicine on the basis of chemistry, pharmacology, and biology. From then on, the philosophy that best favors the search for factual truth is what may be called ratioempiricism, which proposes a synthesis of reason with experience, as practiced in the experimental trial of medical hypotheses, such as those of the existence of oncogenes and of strong ties between the immune system and the rest of the body. However, let us go back to antiquity.

The transition from shamanism to Hippocratic medicine was slow and had an intermediate phase: the secular, rationalist, and materialist
speculations of Thales, Empedocles, Anaxagoras, Democritus, Epicurus, and other pre-Socratics. These great thinkers speculated boldly, but they also argued and rejected the recourse to the magico-religious. Of course, the “elements” they imagined (water, air, soil, and fire) turned out to be complex, not elementary, and we now know that atoms do not move incessantly in a straight line. But we grant that the enormous variety of things around us comes from combinations of atoms of only 100 species, and that these constituents are material, not spiritual, as a consequence of which they are studied by physics and chemistry, not theology.

We all admire the great achievements of the Hippocratic school, but we must discard nearly all their explanations for, although they were rational and materialist, they were also speculative. In fact, the nucleus of the Hippocratic conception of disease is the hypothesis of the equilibrium of the four humors: blood, phlegm, yellow bile, and black bile. (The black bile, or melaina chole, has not been identified. It has been conjectured that it was an invention designed to satisfy the school’s love of the number 4, which would also be the number of “elements.”) Sickness would come from an imbalance of humors, which the medic has to correct. For example, if he suspects that there is an accumulation of blood in the feet, he will bleed them. (It would take two millennia to discover that blood circulates.)

Since not all humors are concentrated, neither are their disequilibria. This is why the humoral pathology is holistic. Therefore, so are the corresponding therapy and prophylaxis: the Hippocratic medic treated his patient as a whole. He prescribed global treatments: hygiene, diet, and lifestyle. This may have been the most lasting contribution of archaic Greek medicine: recommending good preventive habits.

Their holism did not prevent Hippocratic doctors from speculating about the functions of the few organs they distinguished. For example, Hippocrates adopted the hypothesis of the Sicilian medic Alcmaeon, that the brain is the organ of the mind, whereas the ancient Egyptians believed that the function of the brain is to secrete mucus, and Aristotle believed that its role was to cool down the blood, and the ancient Chinese held that the spleen is the organ of the mind.

Alcmaeon and Hippocrates were then the forerunners of biological psychology and psychiatry, the alternative to their magico-spiritualist,
idealistic, and dualist counterparts. They also inspired the popular classing of personalities (or temperaments or constitutional types) into phlegmatic, sanguine, and bilious.

With hindsight, it is easy to ridicule the humoral pathology. But it was the first to try and explain symptoms by proposing a concrete mechanism that involved only material entities, the four humors, three of which were familiar. Besides, this medical hypothesis, unlike the others, was not isolated but was part of a whole worldview that included another three quartets: Empedocles’ four elements, the states warm–cold–dry–humid, and the four seasons. Those four constituents reinforced one another, which helps explain the popularity of Hippocratic medicine during two millennia. (See Figure 1.1.)

The Ayurvedic and traditional Chinese medicines too were centered in equilibrium ideas. Three millennia ago, the Vedas postulated that every disease consists in an imbalance among three bodily systems — *vayu*, *pitta*, and *kapha* — which they did not bother to describe. Note their preference for the number 3, whereas the Greeks favored 4, the Mesopotamians 7, and the Chinese 2 and 5.

![Fig. 1.1. The humoral pathology was part of a four-part cosmology (redrawn from Sigerist 1961, p. 323).](image)
In all these cases, the medical theory fit the ruling worldview. But in the case of the Ayurvedics, this adjustment was only partial, as it ignored the tens of thousands of Hindu gods. And the corresponding therapy worked only with material means, such as salves and herbal teas, while the sacred scripture held that the universe is spiritual, whereas everything material is illusory. Nor is such duality rare or surprising: life must go on while paying the gods their due.

The followers of traditional Chinese medicine — just like the Ayurvedics and the Hippocratics — sought harmony. In their case, the desirable balance was that between the Yin and the Yang — an idea that agreed with Confucius’ political principle of seeking social harmony. Those alleged basic properties were named but not described with any precision, and consequently they lent themselves to arbitrary interpretation. The same holds for the Qi (or chi), usually translated as “life force or energy,” and is assumed to flow along the “meridians” or canals. These alleged anatomical entities are carefully drawn in the anatomic Chinese atlases produced for the past two millennia, but no modern anatomist has found them, and no physiologist has ever detected the Qi said to flow along them.

Suppose we are seen by a traditional Chinese doctor. What will he do to find out what ails us? He will examine our body, in particular the tongue and hands, in search of visible signs. He will put special attention to the shape and color of the tongue. If it is pale and swollen, and with a thick white coating, the diagnosis will be “Yang deficiency”; a red and cracked tongue will indicate “Yin deficiency”; and a pale and deformed tongue with teeth marks will be clear evidence that the patient is lacking in Qi. In turn, Yang deficiency indicates feeling cold and back pain; Yin deficiency indicates hot flashes and insomnia; and Qi deficiency points to fatigue and worry. Nothing seems to point to any of the most common infections or chronic diseases; it’s all instant diagnosis of conditions one can live with.

Don’t ask the traditional Chinese doctor what Yang, Yi, or Qi are, nor why Qi flows only along the “meridians”; nor what may obstruct the Qi flow, nor about the mechanism whereby a needle inserted in the right place will restore it. What matters is that the healer is sure that the said excesses or deficiencies occur and will be easily corrected by sticking
needles at places invented two millennia ago, or by sipping infusions of certain herbs of unknown composition. He won’t offer evidence of any sort, nor could he, given that he does not know what Yang, Yin, or Qi are, nor how they could be experimentally wiggled and measured. The traditional Chinese medic does not expect his patients to ask such questions, any more than a Christian priest expects his parishioners to ask him for evidence for resurrection. Both rely on the gullibility of their clients, who have been educated to believe without evidence and without explanation. There is no discovery in all that because there is no research — hence no research fraud. But at least traditional Chinese medicine is naturalistic rather than either shamanist or religious.

Chinese traditional medicine handles the human being as if he were an inscrutable black box with buttons and color lamps, and it treats its practitioner as a robot whose task it is to press buttons as indicated by a tradition-given code that pairs off colors with buttons. (This code is part of the Yellow Emperor’s Inner Laws, the canon of the lore, composed between four and two centuries B.C.) Neither medic nor patient knows the nature of the sickness or the treatment. By contrast, scientific medicine and its practitioners look like translucent (or semitransparent) boxes: in principle everything can be examined, analyzed, tried out, and discussed. And no medical treatise is expected to be unalterable. Moreover, every day there is a medical novelty announced in the specialized journals, and consequently a significant part of the knowledge of today’s medical graduate is expected to become obsolete in just five years from now.

In any event, since the traditional Chinese medic conceived of disease as an imbalance between the Yin and the Yang, his task consisted in guessing the said imbalances from symptoms, and in restoring the former — a task he attempted to carry out by performing acupuncture and prescribing massage, and diets including medicinal teas — of which there were more than 10,000 kinds. In this regard, in resorting exclusively to material means, the traditional Chinese medic was far superior to the shaman or priest. But in both cases what really worked, when it did, was presumably a placebo. Only experiment could say what, if anything, really worked. But experiment was invented two millennia after Chinese medicine was invented, and its contemporary practitioners do not experiment. (See Chapter 7.)
1.2 Achievements and Failures of Traditional Medicine

The above-mentioned hypotheses on balance or harmony are so imprecise, that they are untestable, hence unscientific. However, some of them can be refined and become the subject of experimental test. In particular, the modern version of the idea of bodily balance is the physiological concept of *homeostasis*, the constancy of the *milieu intérieur* that Claude Bernard conceived two millennia later, and Walter Cannon refined a century after Bernard.

One century after Bernard, it was found that the said balance results from negative feedback mechanisms. For example, the skin temperature is regulated by the hypothalamus, and the heart rhythm by the medulla oblongata. The search for bodily mechanisms is beyond traditional medicine, which at most delivered correct but superficial descriptions of overall processes, such as digestion.

Traditional medicine claimed to describe and explain all the known diseases (only modern medicine admits limitations). But it was unable to accomplish this task for lack of the biological knowledge required to correctly explain either the origin or the course of any disease. In sum, ancient medicine was nearly impotent because it was prescientific.

One might say that, contrary to Hippocrates’ expectant and prudent attitude, the contemporary internal physician seeks to maintain or restore the normal values of the parameters that characterize the internal milieu of the healthy organism, such as temperature, blood pressure, acidity, and sugar and cortisol levels — all of them measurable and alterable by various means. (Incidentally, homeostasis, or “the wisdom of the body,” as Cannon famously called it, goes only so far: sometimes the immune system “goes haywire,” as is the case with the autoimmune disorders, from diabetes to AIDS.)

Besides, the ancient conjectures about bodily equilibrium, though imprecise and speculative, are materialistic, so that their advent was an enormous advance over the previous spiritualist fantasies (Varma 2011). This progress was not only conceptual but also practical because, if a disease is a natural fact, it may be treated by natural means — heat or cold, bath or compress, enema or herb tea, massage or knife, and so on — instead of either standing idly by waiting for the shaman’s incantation, the
sacrifice of a rooster to Aesculapius, or a visit to the health sanctuaries of Epidaurus or Lourdes to work.

In sum, the traditional Greek, Indian, and Chinese medicines were naturalistic. Hippocrates said so clearly: he held that nature cures as much as it sickens, whence the medic’s task is to help nature along. The more-or-less explicit adoption of a materialist philosophy placed the earliest medicines proper at the margin of the ruling philosophy, which grew, albeit very slowly, in the shadow of the Christian and Islamic religions. This philosophical marginality allowed Western medicine to advance without paying much heed to the dominant religion or philosophy. Another factor that contributed to the independence of Western medicine with respect to the dominant ideology was its low social standing: medical practice was taken to be a mere craft and therefore no challenge to theology.

Finally, the Hippocratic postulate of the vis medicatrix naturae (healing power of nature) “was one of the greatest discoveries medicine could make” (Sigerist 1961: 326). First, because most diseases cure spontaneously thanks to the leukocytes synthesized by the bone marrow, the antibodies synthesized by the immune system, and other self-repairing mechanisms such as autophagy, or the digestion of damaged or redundant cells. For example, most inflammations and muscular pains disappear during the night; usually common colds do not last longer than a week; and brain concussions persist for only a few minutes to a few months. Second, that was a great discovery because in antiquity, when so little was known about the human body, drastic interventions could do more harm than good.

However, medics did not always observe Hippocrates’ prudence. During two millennia, they routinely prescribed frequent bleedings, laxatives, diuretics, and emetics, along with drugs that turned out to be dangerous toxics. In the West, bleeding was applied enthusiastically between Galen’s time and 1850, without any experimental evidence, to treat almost all diseases.

Until a century ago, the medicine chest of any Western middle-class family contained toxics like calomel (a mercury compound), taken regularly as a laxative; laudanum, an opiate used as analgesic; and belladonna, a powerful psychotropic that, in addition to alleviating pains, dilated the pupils of flirtatious ladies. Even nowadays, there is no shortage of physicians who prescribe piles of medicaments without first making sure that they do not interact among themselves, or whether a change in lifestyle,
such as eating less and walking more, might suffice. In short, we are going through a hypermedication epidemic (Agrest 2011) — at least in the advanced nations. Much the same holds for surgery: much of it, especially in the USA, is unnecessary, as shown by statistical data (Groopman & Hartzband 2011). Surgery is much less frequent in the nations where medics are paid by the state.

The abuses of “official” medicine have provoked a resurgence of medical quackery, in particular homeopathy, acupuncture, and naturopathy. Such return to the past is just as irrational as giving up on democracy in view that it is limited, slow, and subject to corruption. The successful treatment of any disease is not less science but more of it combined with a moral conscience. For example, the recent success in curing AIDS patients is the result of high-level biomedical research. We shall come back to this subject in Section 1.3.

Finally, let us ask how effective the three main ancient medicines have been. This question has more than an antiquarian interest because all three are still being practiced nearly everywhere to the detriment of people, the flora, and the fauna. The current consensus seems to be as follows:

1) the medics of the Hippocratic and Ayurvedic schools proffered some good prophylactic advice, particularly concerning diet and personal hygiene;
2) some Hindu medics invented a few surgical procedures, particularly in plastic surgery, but of course they used neither asepsis nor anesthesia;
3) recent randomized controlled trials (e.g., Cherkin et al. 2009) have shown that acupuncture, the center of traditional Chinese medical medicine, is useless except as an analgesic placebo;
4) the Ayurvedic pharmacopeia is fantastic, since it contains about 7,000 medications to treat the 100 or so known medical signs, such as fever, diarrhea, and anemia;
5) only a few of the 11,000 Chinese medicinal herbs have been subjected to controlled clinical trials; for example, the Cochrane Summaries for July 8, 2009, inform that 51 studies on the anticarcinogenic action of green tea, involving 1.6 million subjects, were inconclusive; and it is known for sure that only a handful of Chinese medical herbs, among them the antimalarial artemisin, are effective;
6) contemporary scientific medicine makes no use of any of the three main traditional medicines beyond a few prophylactic and dietetic rules, and of the maxim *Do no harm*; and

7) the traditional medicines failed to distinguish symptom from sign or objective indicator; they measured no variables except for the amount of blood extracted; and they did not perform any clinical trials and kept no statistics, except for mortality during epidemics, and that only from the mid-seventeenth century on.

Before taking the next step, let us recall the crucial contribution of philosophy to the transition from traditional to modern medicine. The shift from myth to science, which attained maturity only at around 1800, was not sudden but extremely slow, and it was marked by an important middle phase: the rational and materialist speculation of the likes of Thales, Anaxagoras, Empedocles, Democritus, Epicurus, and other great pre-Socratic thinkers. These philosopher-scientists speculated, but they also offered reasons and rejected magic and religion. Besides, they sketched a naturalist (or materialist) worldview that favored medicine because it assumed that all diseases, even the mental ones, are natural processes, and because it did not revile the body.

As we noted earlier, we now know that the “elements” that Empedocles imagined are not simple, but we agree that they are material rather than spiritual. We also know that nature “obeys” laws, and that the belief in lawfulness helped get rid of belief in witchcraft, divine arbitrariness, and destiny. This new attitude helped replacing consulting oracles and accumulating isolated data with the search for regularities — laws of nature and man-made behavior patterns, in particular health care practices.

This combination of rationality with materialism and with the realistic principle of the autonomous existence, lawfulness, and intelligibility of the universe was unique and it was modern *avant la lettre*. This may also have been the main contribution of pre-Socratic philosophy. It was indeed a new way of looking at things and exploring them, that overcame confusions, obscurities, fantasies, and irrational fears. What a contrast to the obscurantism and pessimism of the self-styled postmoderns, in particular the radical skeptics and the constructivist-relativists! These philosophers inhibit the search for truth because they deny that it is possible and
desirable; they suspect that scientific research is a political conspiracy, and attempt to pass off obscurity for profundity. Some of them also believe that the world is “a text or like a text” (see, e.g., Balibar & Rajchman 2011). However, let us go back to the fresh and productive speculations of the pre-Socratics.

The phase of philosophical speculation intermediate between magical and scientific thinking covered three aspects: logical (rationality), ontological (naturalism), and epistemological (realism). (See Table 1.1.)

Contrary to received wisdom, the Indian thinkers of the same period thought very similar ideas (Tola & Dragonetti 2008). And it is possible that they contributed to the traditional Indian medicine being just as secular and naturalistic as their Greco-Roman counterparts. On the other hand, the Indian philosophers did not help the birth of science, perhaps because the Vedas, the Indian sacred scriptures, had a ready-made answer to everything. The ancient Greeks, by contrast, were not smothered by a detailed religious worldview and were not watched by a priestly caste, so they were free to ask questions of all kinds and to answer them with little censorship. This is how, between the sixth and the fifth centuries B.C., the pre-Socratic philosophers emerged, who generated not only medicine but also science, the branch of culture that flourished only in Greece. Yes, the Greek Miracle did happen, but of course it was wholly man-made, it did not last long, and research — the mark of science — did not touch medicine until the Scientific Revolution of around 1600, to be examined in the next chapter. Let us now take a look at some fossils of the primitive and archaic healing arts.

Table 1.1. The main traits of the process that transformed the mythical into the scientific intellectual culture. Think of the following sequences: Hesiod–Thales–Galileo, and Mythico-religious–Hippocratic–Scientific medicine.

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logical</td>
<td>Confusion → Rational argument → Exact concepts.</td>
</tr>
<tr>
<td>Ontological</td>
<td>Mythology → Speculative materialism → Scientific ontology.</td>
</tr>
<tr>
<td>Epistemological</td>
<td>Dogma → Plausible conjecture → Confirmed hypothesis.</td>
</tr>
</tbody>
</table>
1.3 Contemporary Medical Quackery

What became of the primitive and archaic medicines? They are still with us under the name of *complementary and alternative medicines*, or CAMs for short. This is a broad panoply of therapies lacking in both scientific basis (knowledge of mechanism) and evidence (randomized controlled trials). The vast majority of the practitioners of these “alternative” medicines — or rather alternatives to medicine — are individuals without a medical background, or MDs who conceal their university diplomas so as not to shoo away people who distrust science.

Most inhabitants of the so-called developing nations seek the help of medical quacks. In the USA, nearly half the population resorts to “unconventional” medicines, in particular chiropractic, homeopathy, acupuncture, and herbalism — despite the warnings of *Consumer Report*, which people consult and listen to before buying really important things, such as cars and domestic appliances.

Some CAM therapies, in particular the herbalist, Ayurvedic, and traditional Chinese ones, are thousands of years old. Others, like homeopathy, chiropractic, iridology, and osteopathy, are far more recent. Let us briefly examine three of the most popular CAMs: holism, homeopathy, and naturopathy.

*Holism* is one of the New Age slogans, for it suggests the opposite of analysis and reason, which in turn are targets of the enemies of modernity. Holistic medicine, usually advertised as novel, is nothing of the sort. Indeed, treating the patient as a whole is a characteristic of the primitive and ancient internal medicines: they had to treat patients as black boxes because they knew neither anatomy, nor physiology, nor biochemistry. By contrast, scientific medicine treats patients like translucent boxes, that is, systems that can be dismantled, at least conceptually, with the help of modern biology: it is *systemic*.

The conceptual or empirical analysis of a concrete system, from atom to body to society, consists in identifying its composition, environment, structure, and mechanism. These components may be schematically defined as follows:

*Composition* = Set of constituents on a given level (molecular, cellular, etc.)
Environment = Immediate surrounding (family, workplace, etc.)
Structure = Set of bonds among the components (ligaments, hormonal signals, etc.)
Mechanism = Process(es) that maintain(s) the system as such (cell division, metabolism, circulation of the blood, etc.)

This analysis evokes six groups of ontological (metaphysical) doctrines, some of which have an ancient pedigree:

Environmentalism The environment is omnipotent. Examples: behaviorism, and the hypotheses that all diseases are caused by either “miasmas” or social conditions.

Structuralism A whole is a network — the set of connections among its parts. Examples: connectionist psychology, and the sociological thesis that only communication networks matter — as if there could be graphs without nodes.

Processualism A concrete thing is a bunch of processes. Example: Alfred North Whitehead’s metaphysics.

Holism The whole precedes and dominates its parts. Examples: Aristotle’s metaphysics and traditional Asian medicines.

Individualism A whole is the set of its parts. Examples: ancient atomism and the thesis that health depends exclusively on the individual’s habits — whence sanitary policies are useless and therefore wasteful.

Systemism The universe is the system of all systems. Examples: d’Holbach (1770), Bertalanffy (1950), and Bunge (1979).

The first five doctrines are logically incorrect. Holism and individualism are mistaken because the concepts of whole and part define one another: one cannot exist without the other. Environmentalism is false because every concrete thing is active: it is certainly influenced by its environment but not wholly generated by it. Structuralism is false because, by definition, there is no network without nodes (individuals). Lastly, processualism too is wrong because every process (e.g., growth) is a sequence of states of some concrete thing: neither processes without things nor immutable things.

In conclusion, only systemism remains of all the six structural ontologies listed above. (In addition, there are three possible substance ontologies: materialism, spiritualism, and dualism.) This ontology, initially proposed in
the mid-Enlightenment by Paul-Henri Thiry, Baron d’Holbach, postulates that every really (materially) existing thing is a system or a component of some system. Arguably, systemism is the ontology that fits the modern sciences, from quantum physics and biology to psychology and historiography (Bunge 2012a). And, because it entails emergentism, systemism overcomes reductionism in its various forms, in particular mechanism, biologism, and sociologism.

Scientific medicine too is systemic because it is based on anatomy and physiology, which show that the parts of the body, though distinct, are interconnected. For example, the brain ceases to feel, think, and decide normally when not well irrigated; and reading a word, a process that occurs in the parietal cortex, may evoke a visual image in the back of the brain. And hormones of various kinds, which carry chemical “messages,” reach every part of the body.

But of course, scientific medicine is analytic as well as systemic, in that it distinguishes distinct organs, every one of which has specific functions, that is, processes that occur only in them. Moreover, systematicity implies analyticity, for understanding a system involves analyzing it. Systemicity also includes the valid component of holism, namely the thesis that “a whole is more than the set of its parts,” in that a system possesses global properties that its parts lack.

These global or systemic properties are usually called emergent (see Bunge 2003a). Examples: solid state and the property of being alive. All the diseases are emergent processes because they occur only in initially healthy organisms, even though some of them, such as cancer and Down syndrome, have molecular roots, whereas others, notably stress, have social causes.

Caution: the preceding definition of emergence differs from that given by the standard dictionaries, according to which emergent is whatever defies analysis. Following this definition, “emergence” would be an epistemological category (or belonging to knowledge), not an ontological one (belonging to the world). For example, the radical reductionists, from Epicurus onward, held that there is no death because the elementary constituents of an organism are conserved. And Richard Dawkins found the very existence of organisms paradoxical, since only genes would matter. Actually, only a biology without bios would be paradoxical.
Evidently, the structure of a system — that is, the set of connections among its parts — is just as important as the latter. For instance, a cell dies — it becomes a collection of molecules when its membrane disintegrates and stops synthesizing proteins and metabolizing. The property of being alive is emergent, as are the properties of thinking and socializing. And the emergent properties are peculiar to systems, in contradistinction to collections or sets.

To better understand the relations and differences between the analytic and the systemic, it helps comparing a modern anatomical atlas with a medieval one. In the latter, the organs were disconnected from one another, whereas in a modern atlas they are shown interconnected, some directly and others through the brain, which acts as the central control system. Besides, modern medics examine and treat their patients at all levels, from the molecular to the social. For example, a routine blood analysis includes the identification of certain proteins, and a clinical consultation may involve finding out facts about family, work, and even neighborhood conditions. And just moving to a better neighborhood can have a strong and lasting effect on subjective well-being (Sampson 2012). Moral: look for both bottom-up and top-down streams.

In sum, modern medicine is systemic and thus analytic as well, whereas traditional medicine was holistic. When claiming to treat the patient as a whole, the traditional healer missed the peculiarities of the parts. This feature explains the ineffectiveness of the holistic therapies, since the membranes of all cells contain receptors, all of which are specific, that is, systems that are stimulated or inhibited (blocked) only by molecules of certain types. For example, sildenafil, the active drug of Viagra, acts only on the penis, whereas the aphrodisiacs act only on receptors in brain cells of both sexes. The opiate receptors are widely distributed in the nervous system. By contrast, the insulin receptors are far more commonly distributed in the body; they are found in muscle and adipose tissues because of the affinity of insulin for sugar, the body’s energizer.

The drugs that act on receptors of more than one type are called “dirty.” A typical “dirty” drug is the antidepressant chlorpromazine, the first antipsychotic to be synthesized. Since “dirty” drugs affect not only their intended targets but also unintended receptors, they have side effects, in some cases adverse, but in others beneficial. For example, chlorpromazine
acts also as a tranquilizer and as an anti-addictive, and codeine relieves pain but also induces euphoria.

Almost all known receptors are proteins, and these are molecules at least 100 times bigger than the classical drugs. (The so-called biologics, synthesized by the immune system or extracted from living things, are far bigger molecules.) The shape and electric charge of receptors fit only a few out of the millions of known molecules: this is why they are highly selective, that is, have no affinity with the rest.

This selectivity is a natural selection mechanism. An organism incapable of distinguishing beneficial from harmful molecules would be unviable. Incidentally, the existence of selective receptors refutes Nietzsche’s opinion that a morality “beyond good and evil” favors life. Before the emergence of organisms, around 3,500 million years ago, there was neither good nor evil in the universe — which is why physics and chemistry do not use the concept of natural value.

Let us go back to the mechanism of action of medicaments, for it is highly relevant to the distinction between CAMs and medicine proper. The incident molecule, such as that of a drug, is effective only if it fits the receptor enzyme: this is the lock-and-key mechanism. This explains why the vast majority of modern medicaments are specific, that is, they act only on some parts (e.g., tissues or organs) of the body or on certain pathogens. For example, adrenaline stimulates the heart because the membrane of the heart cells contains adrenaline receptors, which do not occur in other organs.

The specificity of such receptors also explains the mechanism of action of what Paul Ehrlich, their discoverer, called “magic bullets.” These drugs only kill certain pathogenic organisms. For example, Salvarsan, invented in 1910 by the same scientist, was the earliest effective drug against syphilis. The receptors, of which more than 2,000 species are known, constitute the clue to scientific pharmacology, in contradistinction to the traditional and modern “alternative” medicines, all of which ignore the very existence of receptors.

Admittedly, the preceding is an oversimplification, since many molecules are effective only when in the company of others. In other words, in many cases it is not enough to activate (stimulate or inhibit) a given receptor, but it is necessary to activate simultaneously another two or more
receptors — which should not be surprising in a systemic perspective. Still, in all cases, what counts is not the entire organism but only a minute part of it. Let this be a warning against holism, which claims to treat the whole body while ignoring every part of it.

Let us turn to other CAMs, starting with the most absurd of them all. Homeopathy is not holistic, except in that it ignores the whole of science, for it admits the need to use specific medicaments. But the homeopathic specifics are imaginary, since homeopaths neither conduct nor use pharmacological studies showing the effectiveness of their nostrums at the molecular level. Nor do they carry out clinical trials to check whether their patients do better than those of the “allopaths.” Indeed, they indulge all the time in the post hoc, ergo propter hoc (“after that, hence because of that”) fallacy. The ancients ridiculed this fallacy by referring to the rooster who believed that he caused the Sun to rise when he crowed.

Moreover, homeopaths do not do any research; they only apply the “laws” that Samuel Hanemann stated two centuries ago, and they compile anecdotes of alleged cures — but, of course, they do not keep track of their failures. Furthermore, homeopaths do not use any of the diagnostic tools of “allopathic” (modern) medicine, such as the microscope, X-rays, and biochemical, bacteriological, and parasitological analyses. Nor do they check the effectiveness of their remedies, which nowadays are manufactured by big companies that do not invest in research. All their alleged medicaments are high dilutions of “active principles,” mostly of vegetal origin. These dilutions are so high, that what the patient buys is nearly pure water or, in the case of pills, nearly pure excipient.

In fact, a homeopathic remedy is prepared by successive dilutions of a natural product — vegetal, animal, or mineral. At every step, a hundredth part of the remains of the previous step are extracted and poured in a flask containing 99 drops of alcohol. Thus every time, one-hundredth of the previous quantity is obtained. For example, in dilution No. 5, only \((1/100)^5 = 10^{-10}\) of the initial amount remains; and after 30 dilutions, the number recommended by the father of homeopathy \((1/100)^{30} = 10^{-60}\) remains — which is less than one molecule per galaxy (see Sanz 2010). Whereas existentialists believe that all is nothing, homeopaths believe that nothingness is everything.

18 Medical Philosophy: Conceptual Issues in Medicine
Of course, one often hears of healing due to homeopathic treatments. But, since homeopaths do not conduct any controlled experiments, one must suspect that the improvement, if real, was the work of their immune system — or of the ubiquitous and ever serviceable Doctor Placebo, as Shang et al. (2005) proved. And, even if the (unknown) percentage of positive cases were appreciable, one should not discard the (unknown) number of deaths caused by the non-intervention of standard medicine. For instance, the unchecked proliferation of cancer cells is caused by the inhibition of apoptosis (programmed cellular death), whose molecular root cannot be affected by a few drops of colored water. In the case of a homeopathic treatment, due to the negligible amounts of supposedly active principle, there is no possible biological mechanism mediating between input and output: there is only illusion. In short, homeopathy is a black box with water, money, and illusion coming in, and money and self-deception as outputs.

Our second example of a CAM will be naturopathy. This is a component of naturism, which in turn is the philosophical doctrine that everything evil comes from deviating from nature. Naturism should not be mistaken for naturalism, the ontology that rejects the supernatural and holds the identity of the universe with nature, as well as the reduction of everything human to animality (see, e.g., Krikorian 1944; Shook & Kurtz 2009; Mahner 2012). Whereas naturalism is a worldview, naturism is basically a value judgment: “The natural is better than the artificial.”

Naturism, a part of the Stoic philosophy that flourished in ancient Greece and Rome, was revived by Rousseau in the eighteenth century, and was continued in the next by the German Romantics, in particular Goethe, whose lemma was “Back to nature!” In the twentieth century, naturism was involved in three very different social movements: anarchism, the youth movement (eventually hijacked by the Nazis), and radical (or “deep”) ecologism.

The popularity of naturism in Germany did not affect the eclosion of pharmacology in the same country. But, when joined with Nietzsche’s vitalism, naturism acquired political partners one century after Romanticism: anarchism in the Latin countries, and Nazism in the Germanic realm. It also changed the lifestyles of millions of youths, who adopted vegetarianism, camping, nudism, a sexual morality without duties, and anti-intellectualism. (Note the paradoxical similarities with the “hippie” movement in the 1960s.)
The radical (or “deep”) ecologism of the late twentieth century inverted the biblical myth that nature is God’s gift to man; it held that, quite on the contrary, humankind should sacrifice itself for nature. In particular, the polluting industries, such as mining and the chemical industries, should be eliminated. This campaign has had a positive result: it has stimulated the development of “green chemistry,” which seeks to replace the same products using less polluting reactants than the standard or “brown” chemistry, which is perfectly possible in many cases. It also flagged the mining industries that are causing irreversible environmental disasters, in contaminating the soil and water sources. In sum, there is a rational and feasible alternative to both radical ecologism and the untrammeled exploitation of nature taught by the Bible. However, it is time to get back to CAMs.

The case of naturopathy is epistemologically similar but ontologically dissimilar to that of homeopathy: both involve the ignorance of the scientific method, but the former handles causes, and consequently obtains some effects. Indeed, unlike the proverbially minute and therefore innocuous homeopathic doses, the natural remedies in reasonable doses are incorporated into the metabolism and thus alter it to some extent. Even a cup of mint tea has some effect — roughly that of a glass of water in addition to a placebo effect. Besides, when boiling water, one kills the myriad bacteria contained in the water extracted from wells or ponds.

Roughly half of the 100 most-used pharmaceutical drugs have a vegetal origin. It is also true that the drinks made from a few herbs have some beneficial effects at short range. But some popular natural products have adverse effects, some directly and others because they interact with pharmaceutical drugs (De Smet 2002). For example, licorice, ginseng, and valerian are toxic, and St. John’s wort, which used to be recommended for mild depression, interferes with oral contraceptives and other drugs. In any case, the few rigorous clinical trials of natural products have been conducted by scientists, not by naturopaths. None of the thousands of trials published in journals of traditional Chinese medicine have been rigorous (Tang et al. 1999).

Every time a medic considers prescribing a natural product, she should ask two questions: which, if any, are the adverse effects of that product, and what is the suitable dose? (The biomedical researcher will add a third question: which is its mechanism of action?) But the sale of such products is not regulated because it is usually believed that, being natural, they must
be as harmless as kitchen vegetables. Unlike the herbalist, the manufacturer of synthetic remedies has the legal obligation of responding to those two questions on the strength of laboratory assays and clinical trials.

Now, the trial of natural remedies is a very hard task because every herb, root, seed, bark, or mushroom contains molecules of dozens of different kinds. Hence, unless they are identified and tried one by one, it is impossible to find out which is the “active principle” and which, if any, are the harmful molecules.

(Incidentally, molecules cannot cause anything since, by definition, causes and effects are events, not things. The cause in question, when it exists, is the incorporation of the molecule as a reagent in a metabolic process or some more basic process, such as the stimulus or inhibition of some protein. Again, the National Rifle Association is right in holding that guns do not kill. But it is egregiously wrong in claiming that the availability of guns does not increase the likelihood of using them to kill — which is their only possible use.)

Because the composition of a natural product is never known in detail, one cannot know all the biochemical mechanisms that it triggers, accelerates, or slows down when ingested. This ignorance justifies the naturapaths’ proceeding by trial and error rather than using the scientific method, which they reject anyway. By contrast, when the composition of a substance and the salient traits of the disease it is expected to interfere with are known, one may frame and test precise hypotheses about the possible outcomes of the action of the substance in question.

Still, in recent years, some heterodox therapies have been subjected to rigorous clinical trials. In particular, between 1999 and 2009, the National Institutes of Health have invested millions of taxpayers’ dollars in checking the effectiveness of a variety of “alternative” therapies, from “healing at a distance” to Vedic and Chinese medicaments, magnetic fields, and many herbs and mushrooms, without any positive results (Mielczarek & Engler 2012). The methodological moral is obvious: trial and error is intellectually sloppy and socially wrong. But only hypotheses compatible with the bulk of scientific knowledge should be subjected to time-consuming and expensive clinical tests. Besides, such trials should be paid for by the companies that peddle natural products; this is demanded by the methodological principle that those who make a claim should bear the burden of
its proof. At any rate, scientific breakthroughs occur within science, not against it.

The above does not involve rejecting out of hand all the natural products. We know that some of them are therapeutically effective, and that others contain molecules employed in the synthesis of drugs. But others, such as ephedra and aconite, have proved to be toxic. One-fifth of the most frequently prescribed Japanese medical herbs have been found to be toxic (Sakurai 2011).

It is also known that all therapies are effective to some extent, due to two factors. One of them is the vis medicatrix naturae, or spontaneous recovery, so highly valued by the Hippocratic school, and whose mechanisms are being investigated by immunology. The second factor that enhances the virtues of any treatment is the set of placebo effects. These are real even when the placebo objects, such as prayer and homeopathic water, do not act at the molecular level. (More on this in Chapter 7.)

In conclusion, the CAMs handle products of unknown nature (composition and structure), that they apply to persons who have not been properly studied, and with effects whose kind and intensity are not well known. They start from ignorance, act in ignorance, and come back to it. The circuit is: ? → ? → ?

The CAMs are just as groundless and ineffective as the traditional ones, with some important differences. First, whereas the latter contained some reasonable prophylactic and dietetic rules, the CAMs have contributed nothing true or useful to health care. Second, whereas the traditional medicines were artisanal and transmitted mainly through oral means, the modern CAMs are coupled to big pharmaceutical companies and are being intensely publicized. Third, medical superstition was justified at a time when there was no biomedical research, but nowadays the latter is highly developed, so that what used to be mere involuntary error is now large-scale swindle.

How to explain the popularity of the pseudosciences in such an important, well-cultivated, and regulated field as health care? Like any other social fact, this one has multiple causes. Here are some of them.

1) The CAMs constitute the medicine of those who ignore the scientific method, and these are the vast majority in any society.
2) Any pseudoscience can be learned in a few days, whereas learning any science or technology takes many years.

3) CAM is the medicine of the patients abandoned by “official” medicine, which has not yet been able to heal them; for example, Paul Feyerabend, of “Anything goes” fame, suffered intense back pain until he met a London witch who cured him; this experience was enough to sweep away all his science and all his philosophy of science.

4) Cultural relativism, which is often preached in the name of open-mindedness, denies the possibility of finding objective and universal truths, so that it holds that the differences between shamanism and scientific medicine are cultural or ideological. The influential Flexner Report (1910) devoted a long chapter to a severe condemnation of what it called “medical sects,” among which it included homeopathy and osteopathy, and it criticized “tolerance” in matters of health care. One century later, some universities have forgotten that report and are now teaching those pseudosciences — the medical equivalent of decriminalizing crime.

5) Many people mistrust the pharmaceutical industry because it lives off suffering and because some Big Pharma firms have been guilty of inexcusable mistakes and crimes, such as bribing doctors so that they would prescribe drugs that failed to pass rigorous trials, such as Thalidomide, Vioxx, Avandia, Avastin, and other harmful drugs. (In 2009 Pfizer was fined US$2.3 billion, and in 2012 GlaxoSmithKline US$3 billion for such crimes.) But obviously blaming some companies should not involve rejecting pharmacology.

6) Counterculture and its academic counterpart, postmodernism — cultivated mainly in faculties of humanities — are consumed by a broad sector of people who feel disgusted by whatever smells of science.

7) Academic obscurantism, in particular the rejection of the intellectual ideals of the French Enlightenment (rationality, scientism, and progressivism). Such obscurantism, which until the 1960s was typical of political conservatism, is now shared by self-styled leftists who judge science from a political viewpoint instead of doing politics informed by social science.

8) The yellow press and publishers of all stripes, including some university presses, have spread plenty of texts that reject rationality and the
scientific method, such as the bestsellers *Ageless Body* and *Timeless Spirit*.

9) The UN’s World Health Organization (WHO) acknowledges that “Evaluation of quality, safety and efficacy based on research is needed to improve approaches to assessment of traditional medicines,” and yet it “urges national governments to respect, preserve and widely communicate traditional medical knowledge” (WHO 2011). And the National Institutes of Health invest US$128 million per year in CAMs. In short, medical quackery, that used to be a part of folklore, now comes also from above.

10) Political conservatism breeds scientific obscurantism, like that of former U.S. President George W. Bush when he opposed the medical use of stem cells and pushed for the replacement of evolutionary biology with the religious doctrine of “intelligent design.” This provoked his successor, Barack Obama, to declare: “We have watched as scientific integrity has been undermined and scientific research politicized in an effort to advance predetermined ideological agendas” (White House 2010).

In conclusion, the pseudosciences are more popular than the sciences because gullibility is far more widespread than critical thinking, which is not acquired by compiling and memorizing data, but rethinking what had been learned. It is surely a duty of scientists, technologists, physicians, philosophers, and journalists to expose the frauds of CAMs, as Martin Gardner (1957), Robert Park (2000), R. Barker Bausell (2007), Ben Goldacre (2010), and a few others have done, as well as the *Skeptical Inquirer* magazine and the *Quackwatch.com* site. The CAMs are sects: they combine dogmatism (the refusal to face facts and debate rationally) with radicalism. And, of course, sectarianism is dangerous in all walks of life, particularly in politics and in health matters.

And it is the duty of public health outfits, such as the WHO, as well as of medical schools, to protect the public from medical quackery, starting by canceling the accreditation of universities that teach CAMs. This measure was taken in the USA on a national scale when the Carnegie Foundation published its report on medical education in the USA and Canada (Flexner 1910). But since then, the medical pseudosciences have recently reappeared around the world, even in prestigious universities,
often in the name of openness. Evidently, tolerance is indicated within science, as well as in matters of taste or opinion. Moreover, we should celebrate scientific and technological heterodoxy, for it is nothing but great originality. But we should be intolerant to medical charlatanry because it is bad for health and it degrades culture (Bunge 1996b).

Coda

The history of medicine may be divided into four periods: primitive, archaic, early modern, and contemporary. Primitive medicine, practiced by shamans who claimed to possess extraordinary faculties, and who often wielded great cultural and political power, mixed magico-religious superstitions with effective recipes to heal wounds and treat a few diseases. They gave analgesics, laxatives, and emetics; they bandaged, sutured, or cauterized wounds and set broken bones; and they sucked the poison injected by snakes and insects. But sometimes they also took and prescribed hallucinogens, or claimed to heal wounds by smearing them with excrements or by applying salves on the weapons that had caused them.

The archaic medicines that emerged in the early civilizations were far superior: they were wholly secular and gave some good advice, such as bed rest, keeping clean, and eating and drinking in moderation, but they also prescribed herbs and ointments that were innocuous in the best of cases. The traditional Chinese medics abused their needles, which were totally useless and sometimes propagated bacteria. And the Hindu medics prescribed thousands of vegetal derivatives without any proven therapeutic value.

The most rational of the ancient medics were those of the schools of Hippocrates and Galen, famous for their prudence and for giving some good prophylactic and dietetic advice, from bed rest to drinking only barley water. But neither these physicians nor the shamans could use anatomy or physiology, for these sciences were born in early modern times.

In the ancient Greco-Roman world, the birth and development of medicine proper were favored by the naturalist ontology of the pre-Socratic and Stoic philosophers, as well as by the rationalism and scientism of Aristotle and his disciples, mainly Theophrastus and Alexander of Aphrodisias. In ancient India, the rationalism and naturalism of the
Chárvaka, Sāmkhya, and Jain schools played a similar constructive role, except that in that country, scientific research emerged only during the twentieth century. But at least traditional (Ayurvedic) Indian medicine, like the Hippocratic and Galenic schools, kept free from magic and religion.

Creative and secular intelligence became all but extinct with the rise of Christianity in the West, and with the Mongol conquest in India a millennium later. In both cases, scientific curiosity and rational debate about worldly matters ceased almost completely during these centuries, until they reappeared in the West with the Renaissance. (In Asia, modernity was involuntarily carried by European colonialism — along with some diseases.) Medicine and philosophy were, of course, important parts of those processes of development, decadence, and rebirth. In the next chapter, we shall review the radical changes in medicine since the Scientific Revolution that started around 1550. This deep cultural transformation wiped off the cobwebs of tradition, which from then on was seen as deserving to be studied but not worshipped.