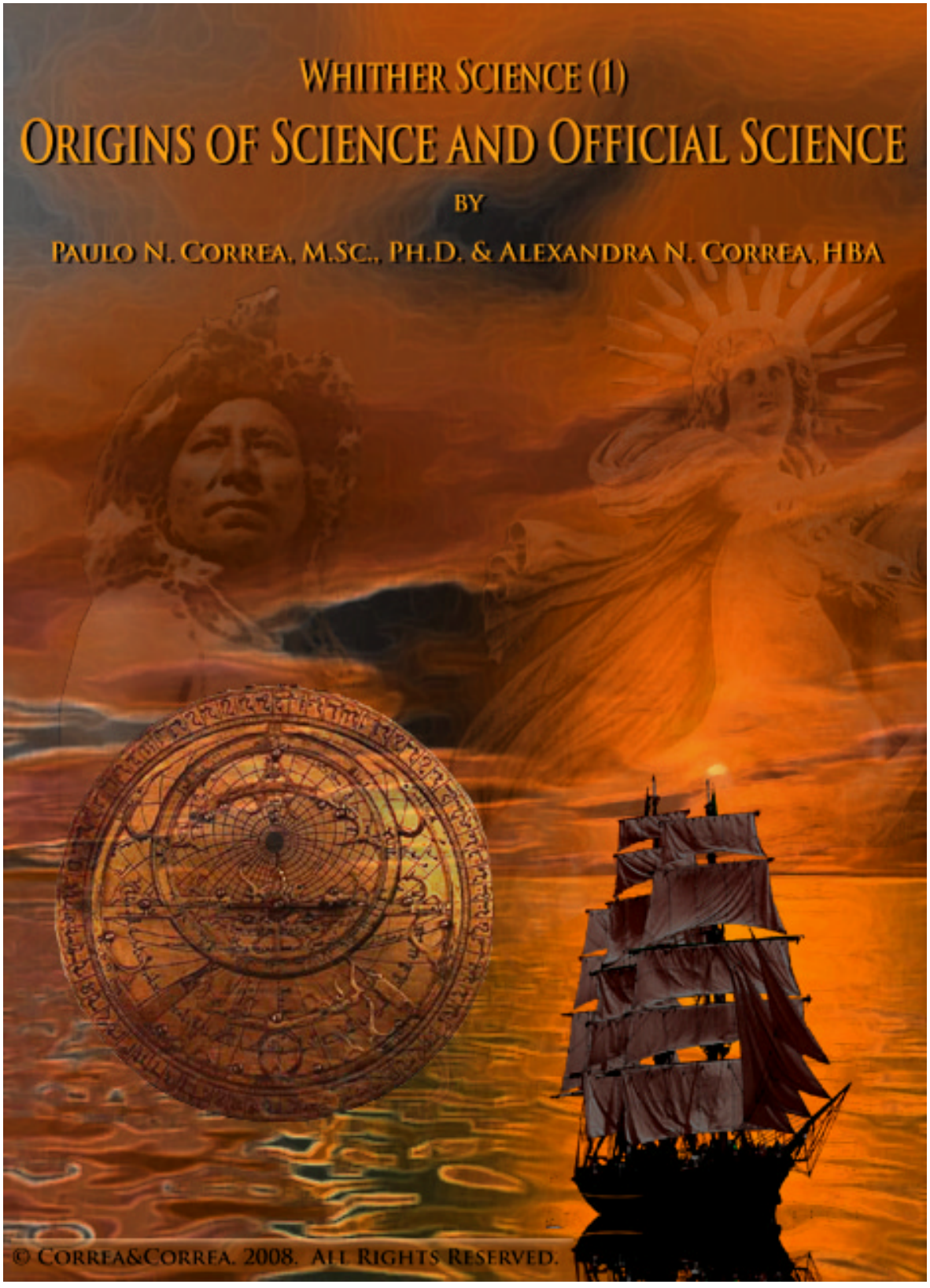
WHITHER SCIENCE (1)
ORIGINS OF SCIENCE AND OFFICIAL SCIENCE
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WHITHER SCIENCE?
SCIENCE AND WHAT HAS BECOME OF ITS METHOD (1)

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I. ORIGINS OF SCIENCE AND OFFICIAL SCIENCE:
Culture and the scientific method

"It is apparent that there exists in the universe a subtle fluid, a very fine substance, a vapor or spirit that permeates all bodies and is in constant motion. Some bodies, like our Sun, are sources of this imponderable substance, and others bathe in it, retaining as much of it as they may according to their nature or the consistency of their arrangements.

This subtle substance is the true soul of the universe, that which guides and livens or vivifies, that which is partaken of by all the beings that exist, and it constitutes the totality of all the parts there are. It is the being of all beings, that which engages them into a constant becoming.

This universal soul, this primordial breadth, is the purest of fires that consumes, not itself, but all that it creates and to which it imparts all manners of motion - this consumption being everywhere marked by the release of heat. In the fire that combusts matter, there is more of this finer fluid being released than there is present in the atmosphere, and in the atmosphere more than there is in water, and in water more than there is in the ground. Minerals, plants, animals are all beings that capture more or less of this fluid in different arrangements of perception, sensation and intellection. This constant feeling (or groping) activity and its coupled and incessant motor component forms what one designates at once as emotions, as the animal spirits or souls that animate the body of every sentient being and form the organic impulses of a body. The melding of these souls in a body, and the power to accumulate ever more of this subtle fire in its bodily enclosure, render sentient beings capable of thought, of functional conceptualization. Now the soul of a body, the composite of these spirits, likely dissipates with the death of man as it does with the death of beasts, because the nature of man is no different from that of animals. We could be wrong, but since there is no proof to the contrary, it is easy to conclude that what poets, priests and theologians tell us about the world, its nature and the existence of an afterlife is little more than a chimera invented and sold by the yard, for reasons that only fools cannot rightly guess."

(Deviated freely from *The Three Impostors*, section *Of the Soul*, VII)

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1. Animist Knowledge, and Savage Culture as the Invention of Language and Thought

One may, today, define science as the pursuit of an inquiry into the nature of beings and their becomings (or transformations) that adheres to the empirical method (called 'the scientific method', see below). To call 'science' this inquiry and its fruits is intended as a demarcation of this empirical knowledge (at once practical and theoretical) from all other forms of knowledge (eg instinctual, intuitive, etc). This demarcation may actually go as far as indicating that there is no other knowledge that might be accurate, actual or even adequate, except knowledge that *is* scientific, ie obtained and confirmed by the scientific method.

Before there was a formal definition and an effective practice of science, however, there was knowledge - knowledge that was already empirical (conveyed by sense-perception) and that was, within its parameters of reference and with the tools available to it, effective, and therefore adequate to a degree. It suffices to consider the above-quoted deviation of a much deviated and impious text, now some 700 years old: it sticks to sense-experience, yet arrives by logic at the postulate of a subtle substance, an Aether, underlying all the organic and inorganic 'souls' that 'animate' a body or bodies. It expresses a naturalist return to animist conceptions. And it places its thrust upon a combat against superstition, fantasy.

Indeed, historically or archeologically, knowledge as the form for the accumulation of thought *was* an animist creation. There was much *realization* in the thought of so-called 'savage' or 'primitive' peoples - the tribal cultures of hunters and gatherers - and the sum of this knowledge was largely entrusted to shamans. Elsewhere [1], we have made allusion to the ethnographic and archeological aspects of the origins of knowledge, and the special arrangement of savage cultures that placed the institution of shamanism at once within, and *outside and beyond* the territory of culture.

It suffices here to draw out the fact that the derision of animism by other cultures (despotic or civilized) was and is largely grounded in incomprehension of the animist articulation of knowledge. Nowhere is this incomprehension more in evidence than in the translation of savage languages, as Aether or "Great Spirit" or "Great Eagle", etc, become translated by God, Father in Heavens, etc. Animist cultures dressed up the human over the animal body, they 'tailored' the human mold, with the stated and articulated objective of strengthening the direct perception of organic impulses. These cultures had no cultural filters of desire, and they proceeded by coding those animal or organic desires pertinent to the reproduction of culture or society, and in those societies, *coincident* with their biological reproduction. To follow **Friederich Nietzsche**'s theory in *The Genealogy of Morals*, and **Gilles Deleuze**'s commentary on same [2], the intent of animist culture was to create a *sovereign* human being, one that could stand beyond culture itself. The immediate task of culture was to code certain fluxes of unconscious organic activity so as to endow humans with a memory of words, a memory of sound codes or calls (a music) applying to limited territories of activity. Culture enabled human beings to develop consciousness and thus maintain an ever-fresh flux of perception, a larger reservoir of energy ready to invest perception, to sharpen it and make it more adequate to action and more

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loyal to nature. Common to all these cultures is this added social investment in sense-perception which permits the interconnected birth of language, consciousness and intellection - all the elements of thought. Thought emerges as the relation that articulates words to express an idea, a sensation, a perception. It is made possible by the memory of words (a spoken language) and by increasing the flux of energy allocated to the consciousness which that memory enhances. It is this pressure which is responsible for the development of a cortex and a central nervous system, and ultimately permits the verticality of station.

A *sovereign* human being would be one who no longer needed culture in order to think and be master of his animal desires - one who would stand beyond culture, both as its achievement and as its undoing; one who would remember 'his word' (the promises that solidify alliances) without the cruelty of culture having to be there to remind him; one who would be capable of promising and remembering, and thus be master of 'his life' by the mastery of 'his time' and 'his word'.

The animist concept of knowledge is not a mystical concept. There is no concept of a transcendent God in animism - all souls, animal or not, being inseparable from their totality as soul of the universe. Spirits are immanent to bodies, seated in organs and to be coded by a complex system of scarifications of the body. And spirits fall in with their essences - all the bison spirits, for example, partake of a bison-becoming, what could loosely be translated as being animated by 'the spirit of the bison'. **Wilhelm Reich** comments on the animist perspective: "Nature was regarded as 'animated', but this animation was derived from man's own real sensations and experiences" [3]. Both **Nietzsche** and **Reich** emphasized the projective nature of animism, **Reich** going as far as suggesting that the difference between animism and mysticism lay in the fact that animism projected "natural, undistorted organ-sensations", whereas mysticism projected "unnatural, perverted ones".

Perhaps more accurately, projection itself (including production of an image that is projected) is a mere byproduct of the animist arrangement, from the savage construction and use of culture. A circumscribed desire is repressed by savage culture - that is the condition of its being coded. But the repressed is not distorted or disfigured by the representation; both the "representative of the repressed" and the "repressing territorial representation" retain their explicit relation, as a block of code - and projection plays no fundamental role in this. Mysticism arises only with systems of despotic representation that displace the representative of the repressed, distort it and replace it by the projected image: the "displaced represented", an idea, the image of an idea, a distorting projection that now tells or shows to a *populus*, a mass, a populace, what it is that *though desired*, *appears* to be repressed. It is the false image of desire and not the real repressed, not the desire that is actually repressed - but it comes to occupy the position of the repressed, *as if it were the repressed*, as if it were desire itself [4]. Hence the drives lent to human nature by despotic representation are no longer the 'natural', animistic drives or 'animal spirits', but their perversion in the form of a second nature, oedipal drives in a paranoiac state, *newly naturalized drives*. It is only then that the projective logic of a representation takes hold of cultural systems and begins in earnest *the social representation of desire*.

Animist culture is not separable from its own mode of graphism, a form of 'writing' carried out by

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shamans. The surface of bodies, the skin, is treated as a map of the organs, as the surface of an inscription, of a tattooing, a writing on the flesh which is not yet phonetic and thus not yet writing as such. Yet, it is also more than pictorialism, since there is articulation of sound and words with the graphism of the idea; ideas are graphic, and yet writing is not phonetic.

Shamans strove to evoke or repress the 'animalistic' spirits, to connect directly and energetically with them - and, as the works of **Richard Evans Schultes** [5], Director of the Harvard Botanical Museum, and **Robert Gordon Wasson** [6]so profusely demonstrate, it is a considerable medical pharmacology which shamans were able to amass in wildly diverse savage cultures, by effective experimentation with minerals, plants and animals, and careful observation of specific effects on human beings and their social forms of 'organization':

"The secret knowledge of the earth had to do with everything that stands on the ground. There were particular sets of movements, words, unguents, potions that were applied to people, animals, insects, trees, small plants, rocks, soil." [7]

It is a phenomenal, supermillenary work of experimentation and investigation that shamans performed over their sense-perception and their dream-states (or dream-work), to extract non-ordinary perceptions ("visions"), to reach beyond the sense-perception, that was both enriched and diminished by the cultural mold of human beings. It is a work of culture performed beyond culture, and even against culture - as the ambivalence of the situation of shamans towards their tribe or village so often illustrates.

Science and medicine were therefore, in a very real sense, an animist creation, the invention of shamans. Thought and a memory of words were the savage invention of animist culture, whilst the knowledge of nature and self which shamanic thought and experimentation made possible was laid beyond the territory of culture itself. The animist shamanic knowledge is grounded in nature, its link is perception and its articulation thought, the thought of perception *and* the thought of a method for its alteration and refinement by deliberate experimentation.

One should perhaps speak here, in this context, of shamanic knowledge as an *experimental proto-science* (or proto-medicine), in the sense that it is not yet science, but the true embryo of science. It is not yet science to the parallel extent that it cannot yet escape representation, a territorial and animist representation, and that its representation has no computational or quantitative system. But it is science because it is knowledge of nature that effectively acts on life. This, however, is that part of the shamanistic affair with knowledge which is a rather complex affair because the knowledge that shamanism strove after was not knowledge in words or in numbers, but what **Carlos Castañeda**'s books best describe as a 'silent knowledge': the knowledge of non-ordinary perceptions, of perceptions beyond the perceptible, of perceptions in dreams and through dreams, of finer sensations ultimately perceived as energy processes, processes of change or becoming, processes of alteration or transformation. The objective of shamanic knowledge was not a written or numerical code of nature, but 'heightened awareness', a knowledge with no mediacy, a knowledge beyond culture and its words or word-music. It is only secondarily that, through animist representation and projection, the occult,

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the non-ordinary perception, can be seen and 'figured' by taking on a form, can be evoked, named.

There is, therefore, from the earliest beginning of shamanism, a distrust of ordinary perceptions, a distrust of sense-perception as our reason composes it. In the *Fire from Within*, **Castañeda** writes something to which we shall return again and again in the present inquiry: "We perceive. This is a hard fact. But what we perceive is not a fact of the same kind, because we learn what to perceive". There are perceptions and perceptions; some are wrong and some are adequate; some are ways not to perceive, and some are too fine to put into words. Shamanism was the search for higher, formless, energetic perceptions, an experiment in altering sense-perception in the hope of finding a cognitive model that employed neither words nor numbers, but was able to reach beyond the appearances of ordinary perception, to act directly upon the nature of beings and their processes (processes of becoming, of change and motion): a direct cognition of energy processes. An experiment in learning from finer, different perceptions, from their *dynamics*.

So, we have two distinct and complex inventions or creations - we have culture, which brought forth language, a memory of words, permitted the development of consciousness, thought and intellection, and contributed to the verticality of the human station; and we have another event, made possible by culture but situating itself outside and beyond culture, the invention of shamanism - the inventions and discoveries made by shamanistic experimentation with nature and the body.

The secrecy attached to shamanic knowledge was everywhere in savage societies a defense against its malignant potentiality. To the very extent that it distrusted sense-perception and made possible finer perceptions, and treated all thought as *dementia* and all perception as hallucination, as dream state, shamanism unwittingly opened the door to its downfall, to its own transformation into a religion. If the imperceptible could be sensed and perceived, but special techniques were necessary to do so, then the accessibility of this knowledge to only a few who would actually engage in its practices, guaranteed *the honesty* of that silent knowledge, as well as its its practical and empirical truth. Release of this knowledge to non-practitioners would no longer permit it to retain that honesty - any and all tall tales would be sanctioned, all lies and bluffs would become viable. It would be the age of the fantastic imagination, the age of religion.

2. The perversion of Shamanic Knowledge

'Science', or 'sciences' in the sense established by history and not archeology have a very different origin and articulation than animist, shamanic proto-science. They require a very different form of social institutions - a reorganization of society on the model of a State apparatus, a new social power in the hands of a bureaucratic priesthood, a degradation and usurpation of the role of culture, a model of thought that is exclusive and totalitarian, a Religion of the imaginary and the transcendent, an Official Science that appears to stem from Religion, an Official Magic.

One may attribute more directly the origins of Official Science to the Greeks and Hellenic culture, as **Michel Serres** has done [8], but it seems to us that its real archeological origins are tied in to the

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political division of society into rulers and ruled, that is, to the emergence of the State and its religious culture. This is a complex transition, and - to pay homage to **Pierre Clastres** and **Helena Clastres** [9] - archeology and ethnography suggest that its ultimate fulcrum was the institution of shamanism. The "beyond animist culture" which savage culture itself engendered, became in turn the main element that decoded culture, that destroyed it as it was - that served to denounce culture, the narrow-mindedness of social ills, be it the excess power of warriors, the insufficiency of the coding and its skin-searing pain, the incapacity of chieftains to mediate conflicts, the failure of hunts or harvests, the bouts of disease, etc.

Pierre Clastres identified the sudden and persistent migrations led by *karai* (shamans) that attracted together people from different cultures as a threat posed to animist cultures by secondary developments of the shamanic institution: there is a promise made of a 'Land of No-Evil', a promise of a better world, a promise of an institutional world beyond culture, of a good and fertile land rich in game, plants and water, devoid of reasons for strife. Armed with the dream of paradise, 'black-shamans' placed their bid for power. The opposition to war, the derision of chieftainship, the contempt for savage custom, the gathering of adherents from different tribes and cultures in one sweeping migration, the near-indefinite status of the migration - all these are sociological traits of the erosion which the development of shamanism brought to bear upon savage cultures. One could legitimately characterize this perversion of shamanism as the transition from 'animist magic' to 'black witchcraft'. More importantly perhaps, this transition that takes place outside of animist culture is one that displaces knowledge from the realm of the perceptible, even if finely or non-ordinarily perceptible, to the realm of the imaginary. Knowledge ceases being animist because it becomes subject to a *bluff*, a complex bluff: the *karai* effectively says - "There is a better world; I can take you there *if* you follow me, if you *believe* in what I *see*". The better world may one day concretely become a valley on which a migratory mass of peoples will sedentarize, or it may become a world-beyond, an after-life that is said to surround one already with all the dead spirits of notable ancestors, the new animal spirits, ghosts that rule men, demi-gods.

Indeed, in many places and at many times, the melding resulting from *karai*-led migratory movements may well have resulted in sedentarian occupations of river valleys and basins, in Royal societies with their well developed cults of the ancestors and their divinization of a Despot and his lineage. The steps leading there are multiple and varied. They are undoubtedly strewn across time since the Middle Paleolithic - reflected in temporary utilization of caves, in their employment for burial practices of a magical nature - going back to the Neanderthal caves in La Ferrassie in France and Shanidar in Iraq. The social movement that displaced territorial cultures, that decoded savage mores and their graphic mode of 'representation', was easily well over 300,000 years in coming [10].

How does the shamanic bluff, the sign of a *dishonest* knowledge, become institutionalized as a religious lie? As we said above, the problem is already evident in shamanism: how can cognition of non-ordinary perceptions be controlled or verifiable if the experience is not readily accessible - only through rituals, for a few select individuals, by the acquisition of hidden and often obscure knowledge, etc? In the visions of savages and their shamans, the fear of bluff was often expressed in the form

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of a doubt - that some trickster spirit could induce a false or erroneous vision. What protected shamanic knowledge - its isolation and segregation beyond culture - also left it exposed to the risk of degeneration. What would prevent cognition of non-ordinary perceptions from being a mere rant of the imaginary, the fantasies of a confused mind?

For as long as that cognition, or the act that searches for it, was kept separate from the ordinary reality of culture, it could not cast doubt upon sense-perception, upon the ordinary sense-perceptions created, coded and ordered by culture itself. But it suffices for a shaman to become even more "deterritorialized", to become a meandering shaman who upholds a discourse and a migrant activity that are corrosive of the tribal structures and territorial values, for the transition of shamanism into a primitive form of messianism to become possible. When it occurs, what were visions or a guiding dream, now become the source of an apocalyptic messianism, asserting with certainty that a vision is a personal revelation, a divine election of a ruler in search of a people of believers. The greatest fantasy and superstition now usurp the role of a knowledge of the non-ordinary, in the form of a *doctrine* of the 'divine', qua fantastic. Once a doctrine of non-ordinary perceptions was formed, shamanic practice could always succumb to the temptation to use it to exercise a power of command that no other social institution had ever deployed; it could bluff through the entire nature of non-ordinary knowledge, distort it and thereby become dishonest. Eventually, it would learn to complement ordinary perception with fear-driven imagination, fantasy, superstition, religiosity; not with any practice or experience of non-ordinary perceptions.

It is the 'black witchcraft' of the *karai* that first introduces transcendence into thought, and does so with a fundamental bluff - the *karai* 'knows' what he does *not* know and what effectively *cannot* be known, and asks only for trust and belief in his doctrine. The communion of a people in the body of a single despot or a priest-sorcerer, is the lethal form of eroticism that mystics claim to experience, and the basis of mysticism or mystical belief. Following **Wilhelm Reich**, mysticism "usurped the realm of life sensations" by "tampering with the form and function" of natural processes [11]. The imaginary now takes over ordinary sense-perception, the image becoming pre-eminent over the sensation.

With the *karai*, the social figure of the shaman ceases to be at the service of animist cultures, ceases being an outside of these cultures, to become the mediator of a new power (*Potestas*). He now becomes the enemy of savage cultures, the element that initiates their territorial displacement - that *historical* alteration that will eventually usher in, from within, a very different form of social organization, one that will divide society into political castes, into rulers and ruled. Slowly, and from furthest out from any center, the position of the shaman migrates from the outside into the center of society - a phenomenon repeating across different peoples and cultures, and succeeding proportionately to the credulity engendered in a growing mass of followers, believers, the led; thus proportionately to the social acceptance gained by the religious bluff, by the *religious falsification of knowledge*.

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3. Despotic, Royal or Legal Science

At the transition from 'black witchcraft' to a full-fledged religious priesthood lies a gap filled by the creation of State-organized societies, the invention of written language (phonetic writing) and the *reduction* of culture to despotic representation. Royal priesthood is the form of the bureaucracy of the originary State (Ur-Staat). It inherits mystical belief in transcendence from perverted shamanism, but adds an overcoding system of reconnections or 're-ligations' that explain all spirits by reference to the powers of the despot and the royal or divine lineage. Only the despot can desire or has desires, all desires existing only because they are extensions of the despot's desire, sanctioned by it and made possible through it. This constitutes the fundamental form of identification common to all mysticisms, the principle of transcendency that embodies the reality of *Potestas*. Royal Law legislates the despot's desire into a social reality. In the despot's desire there is a communion of all the desires of a collectivity.

Royal Science is the first or the original incarnation of Official Science, the form in which Official Science is born - but born as a component of Official Religion, the religion of the State. It is born as a despotic science, and has no existence separate from that of religion. It is religion, or its validation through engineering (hydraulic, architectural or monumental, etc) and computational (eg astrology, astronomy) modes. Religion is knowledge of the imaginary (the imagined afterlife, a world of discarnate spirits, a world of inexplicable powers, a world of divine providence, fatum), knowledge of the transcendence of overcodes (in parallel to the despot's desire forming the divine unity of all desire, the Law now 'surcodes', or over-codes, the codes or territorial manners, *mores*), knowledge of the legislated order of the 'universe' (the divine and revealed order), knowledge of the Law (something never too precise, anyway) that rules over life. But religion is also science, the 'only science'; and thus Official or Royal Science remains essentially indistinguishable from religion.

The beginning of scientific observation that lies at the foundation of the science of Astronomy in the most archaic sedentarian-agricultural societies - the Chinese, Summerian, Assyrian, Chaldean and Egyptian despotisms of antiquity - is likely the first clear mark of *the religious origins of Official Science* in despotic States. These were theocratic societies that in all cases present an agrarian order managed by a priestly-bureaucratic caste, with large State-operated-and-owned works of water control joining a system of dispersed villages surrounding a fluvial basin. Religion is the very structure of despotic representation common to all these formations. It becomes institutionalized as a cultural representation projected first and foremost on the skies, with the powers of gods projected onto the stars, on their fixity, on their figural clusters and regular motions. The stars and thus the gods rule the earth, and their course is dominated by eternal laws (the Circle of Existence, etc).

From the Asiatic systems to the Greek Iron Age, culture is taken up by despotic representation. **Gordon Childe** quotes **Francis M. Cornford**'s insight into the main object of thought of the Greeks - not "external nature as revealed by the senses", and certainly not a healthy skepticism of these senses, but "a representation of reality as a suprasensible extended substance which is at first both alive and divine" [12]. The savages had a principle of reality, a living, thinking totality - but despotic or royal peoples had a principle above reality, a divine order of nature, a principle of causation, albeit

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imaginary and arbitrary.

Since Astronomy was then but the reading of the designs of divinity and the only gate that could assure predictability, fertility and prosperity, it became the central discipline of Royal Science. Hence the development of Astronomy is intimately tied in to the new social desires of what **Karl Wittfogel** called the 'hydraulic civilizations' of Oriental Despotism [13]. These desires evolve into 'secondary needs', the new socially-engendered needs or utility: the despotic need to have a calendar (the 'utility' of the calendar) and a static order to Time; the 'need' to count and quantify a variety of fluxes, to create agricultural stocks of seeds and harvests, to control the distribution of waters, to switch the openings of irrigation and navigation canals on or off, to control the movement of goods, to limit the mining of metals, to organize large pools of collective labor, etc. So, the religious origins of Official Science stem from the *practical and empirical knowledge that buttresses that imaginary or religious 'knowledge' of desire*: the new technologies for sedentarian agriculture (the till, the system of irrigation channels, step-culture, etc), the engineering of a new architecture (systems of roll, drag, ropes and pulleys, stone templates, etc) and the hydraulic engineering of irrigation grids, dams and waterfalls. The Archaic State emerges as a farming village or village network connected by an arborescence of canals that irradiate from a center. **Anton Pannekoek** explains the reasoning or justification of these ancient despotic societies:

"The large rivers irrigating these plains - the Nile, the Euphrates, the Huang-Ho - filled their beds with silt, overflowed in certain months and flooded the fields, devastating or fertilizing them, or at times excavating a new bed. The water had to be directed continuously and checked by dykes, by a deepening of the rivers, or by the digging of canals. Such control could not be left to individual districts with their often conflicting interests. Centralized regulation was necessary, and only a strong central authority could guarantee that local interests would not prevail over general interests." [14]

Royal Science deploys a space not unlike the theorematic space of Euclidean geometry. It is a space of stria, a system of interconnecting locks that operates with parallel lines, which it believes are infinitely straight. There are two sets of dimensionalities to Royal Science in despotic societies - vertical and horizontal. The vertical dimensionality that ranks high and low, ruler and ruled, takes its model of hierarchy from gravity - as the hierarchic model of Royal Science, the pyramid. The horizontal dimensionality that forms a grid takes its model from hydraulics and geometry, from the parallel organization of laminar flows. Step-culture is an example of how the two dimensionalities interact in hydraulic-despotic cultures - transforming a mountain into a step-pyramid by pumping up water or diverting flooding, organizing a vertical irrigation from higher to lower step, with graded plant cultivation, and a horizontal flux along parallel conduits that channel the flux, eliminate turbulence, create pond-pools, and permit gentle overflow from the tanks subdividing the steps.

The model of gravity first upheld by Royal Science was a geocentric one, and in accord with the objective falsity of sense experience. In fact, it appears likely that **Ptolomy** derived his ideas on planetary retrogradation and orbital epicycles from Chaldean astronomers. In this context, the first heliocentric revolution in Astronomy occurs with **Aristarchus** of Samos (310-230 BC) - even if the extensive observations of a **Tycho Brahe** and a **Johannes Kepler** that would be required to validate the heliocentric model were missing. No matter, though: indicting **Aristarchus** on the charge of impiety and

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heresy against Official Science became, in the words of the stoic **Cleanthes**, "the duty of every Greek", because **Aristarchus** had thus set "the Hearth of the Universe in motion" [15]. What threatened to break the static equilibrium of despotic Official Science was the introduction of motion that came with the decentralization of the Earth.

Our thesis, then, is that science has a two-fold origin - a shamanistic origin that invents a certain protoscience and methods of singular experimentation, and a despotic or priestly origin that extracts from this protoscience a Royal Science which, however, remains dependent upon religion, as an integral component of State-religion. Moreover, we are also proposing that to the extent that an Official Science is not separable from religion it merely extends or prolongs the institutionalization of 'perverted shamanism', serving as a continuation of the bluff that wandering shamans carried out with knowledge when they sought to instill fear. Through their bluff, they had extracted a mass and melded it. Now, everywhere around the globe, despotic civilizations emerged that fixed those masses to the soil and provided them with a religious organization, a caste society, and a despotic representation, an hydraulic system. So the perverse shamanic bluff continued, and extended, with a vengeance, from this life to the imagined afterlife. Official Science began as State science, as Royal Science; and its models - gravity and hydraulics - are based on weighty solids and orderly liquids, on the exclusive recognition of that which is weighty, stable, static. The Royal Science of despotic societies treats fluids as if they were solids, fixes the perspective angle as a static point, striates and measures space with an external and arbitrary ruler. To the extent that it is part of religion, Royal Science in the despotic age was *only and de facto an official proto-science*. To the extent that magic, superstition, imagination, dictate, etc, fill its articulations and are the essence of its projections, it was *only and de facto an official pseudo-science with elements of a proto-science strewn about*. But it was also, for the same reason, a thought of transcendence, a mystical mystification of nature. Hence, in a certain acception of the term, Official Science during the despotic age was never really science, or a science - exactly and inversely to the extent that it was still religion, that, in order to pose as knowledge it needed representation, and then deception, lies, falsification, distortion; that without these, it could no longer hold together the demographically massive new society, fixed onto valleys and river basins and forming village networks. **Polybius** (203-118BC) says that the greatness of the Romans was due, *not to science, but to superstition*; that "superstition has been introduced into every aspect of the private and public life with every artifice to awe the imagination. For the masses in every State are unstable, full of lawless desires, irrational anger, and violent passion. All that can be done is to hold them in check by fears of the unseen and similar shams. It was not for nothing but of deliberate design that the men of yore introduced into the masses notions about God and views on the afterlife" [16].

Perhaps this is the deeper truth as to why Official Science can never embrace science itself - it needs that minimum of superstition and religiosity by means of which it introduces arbitrary order and earns the title Official, acquires the dominant consensus that one calls 'mainstream' or 'established'; for only then - when it is armed with that minimum of superstition - is it rigidified enough to rule. Thus, at its origins, Official Science was already imbued with the fundamental *rigor mortis* of superstition, myths, and fads of the imagination. Only then could it constitute 'science' able to control the living. And, in all epochs, it tends to blend just the right amounts of science and superstition that it

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needs to be of service to the designs of Power.

4. Separation of Official Science from Religion and the Cartesian Split

The Christian religion constitutes perhaps the only religion which, through scholasticism and protestant dissidence alike, permitted the emancipation of Royal Science from Religion, beginning with a revolt against scolasticism, which was also a revolt against the rule of Aristotelianism in matters of natural philosophy. Paradoxically, it was the earlier scholastic adoption of Aristotelianism that permitted this later split or emancipation: knowledge of the natural world was not to be confused with knowledge of divine revelation, as it had been in polytheist cultures. Natural science was by definition made distinct from a science of the divine. **Thomas of Aquinas** (1225/6-1274), in his commentary "*Exposition of Boethius on the Trinity*" (V, 1, c), defines the object of natural science as "matter and motion" and its method as that of reasoning (raciocination and demonstration), whereas divine science aims to know God ("chief among its knowable objects") and employs the method of intellection or understanding. Most interestingly, **Aquinas** attributes to mathematics an existence intermediate natural and divine sciences, as "it is more certain than either of them", because "its thinking is cut-off from motion and matter" and "the objects of mathematics fall within sense-experience" and are thus not so far removed from "the objects of sensation" as are "the objects of divine knowledge". Mathematical science, or analytical science, was thus elevated in the scholastic world as a consequence of the adaptation of Aristotelian naturalism and Platonic formalism to the Christian exegesis. A parallel development also occurred in the Arab Islamic world - a development of mathematics, of its language and methods, that treats it as "a knowledge of all knowledge", a knowledge of the hidden reality of things and beings that complements the koranic knowledge. The rigor, at once formal and intellectual, that mathematics afforded, and its obvious application to solving practical problems of engineering, made it paradigmatic for what was then *a very different concept of science or certainty*: the *exactitude* of abstract formal mathematical processes, the *self-consistency* of an analytical logic based upon the number, the quantitative, created a concept of mathematics that defined it as an exact science. It had the certainty of an abstraction (not the certainty of a revelation). Natural science was never this exact, this certain, this coherent or logical. Precisely **Aquinas**' objection to natural science was that "a science that approaches singulars as is the case with applied sciences like medicine or chemistry" has a "lesser probability of certainty because of the multitude of items that must be considered".

As we shall shortly see, the real break of science with religion will only come about with the emancipation of natural science from "divine knowledge"; for this to occur, natural science will be forced to acquire a mathematical logic of the sensation and the perceptible that produced certainties analogous to those produced by "pure mathematical sciences". These are the simultaneous shifts that crystallize upon the constitution of natural science as a form of cognition separate from religion and distinct from deduction, because it has acquired a method at once analytical and experimental, formal and sensational or perceptual. The occurrence of this break, with all its ripples (including the formal severance of Official Science from State Religion), will then lead to two very different tendencies in thought and in science - to *dualism* and to *monism*. In a very real sense, both are rationalist tenden-

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cies, even if the meaning of 'rationalism' which became historically dominant is only an attribute of dualist, positivist thought.

The emergence of an independent natural science is intimately connected to the breakdown of the scholastic tradition, and once again constitutes a return to Greek thought, a re-examination of its natural philosophy, a rediscovery of the event of "a Greek natural science" that long antedated any Christian revelation. **Childe** saw justly when he considered that Greek science began after the schools of natural philosophy - **Thales of Miletus** (?625-540BC), **Anaximander** (?600-530BC) and **Heraclitus of Ephesus** (?550-475BC). For him the break came after 500BC, with the Atomists, **Leucippus** (of Miletus) and **Democritus** (of Abdera). But despite **Pythagoras**, **Anaxagoras** and **Archimedes** (see below, part II), "this superb effort of pure science did not find expression in technical inventions that not only enriched human life (...) but also provided instruments for fresh discoveries" [17], in marked contrast to what happened with the "comparable efflorescence of pure science" experienced after 1600AD, during the Renaissance. The rupture with the scholastic tradition caused by this efflorescence can be gauged, for instance, through the successive additions to *The Book of the Three Impostors*, or through the succession of cultural breaks made towards scholasticism and Aristotelianism by, for instance, the friars **Roger Bacon**, **Duns Scotus**, and **Wilhelm of Ockham**.

Roger Bacon (1214-1294), a contemporary opponent of **Aquinas**, was the first to emphasize the importance of testing notions or hypotheses by experiment (*experimentatio*), foreshadowing the method of scientific inquiry. In his "*Opus majus*" addressed to the then pope, he recognized science as having four enemies, the very four sources of ignorance: abiding by power and unworthy authority; fear of change as offensive to custom; the opinion of the incult and ignorant masses; and the worst one - a false knowledge (the appearance of knowledge, the bluff of knowledge) made up of untested and naive prejudices or beliefs disguised as knowledge. He also pointed out the danger incurred through disdain for the limitations or the incompleteness of knowledge.

All these negative traits characterized Royal Science and its dependency on religion and the institution of the Church, the religious arm of the State. But **Roger Bacon** was careful to denounce only the abuse of authority ('human frailty'), not the institution of the Church. His real contribution is to natural science, to sciences of the singular - as he held that a natural science that sought to escape these enemies or dangers would have to rely solely upon *experimentatio*. An ethics of knowledge ('it is possible and desirable to know, and to know well') could not be subject to a religious morality, to the morals and beliefs of an epoch.

The *invisible*, *incorporeal* or *imperceptible* can be *known* if it can be experimented with by employing the perceptible or the visible, their perceptible or visible effects - held **Scotus** (1270-1308) in his controversy with **Aquinas**. This was another small break with the scholastic tradition that begged the value of divine revelation. It questioned the definition of intellection as essence of a divine science, even if by an invocation of Platonism rather than Aristotelianism. **Scotus** also contended, against **Aquinas,** that the scholastic "principle of individuation" of a being could only signify that there are qualitative differences between distinct beings, and that these must be differences *in form and not in*

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content, since the content is the same for all beings - matter.

Ockham (1290/1300-1349/1350) wanted to separate philosophy of nature from theology and metaphysics - holding that science concerned itself with experimental concepts (functions) and logic with the abstract concepts that linked the former; and that 'a science of the singular' must take as the best explanation one which invokes the most limited number of 'beings' or variables : "beings must not be multiplied needlessly", a *principle* known as **Ockham**'s razor. **Ockham** is of particular interest because he argued that in order to become independent from metaphysics, from the science of the divine, natural science needed an abstract and formal tool (or structure). He considered logic to be this tool - to constitute an analytics of scientific propositions without which natural science could not grasp (understand, intellect) the 'intelligibility of things'. **Ockham**'s principle itself belongs to this analytical logic, a logic that should serve as the instrument of every scientific inquiry. However, we should underline that application of the principle can be falsified, since it should not be invoked in a summary manner. For instance, a phenomenon may have different immediate and efficient causes, or factors, or 'beings', and yet be the same exact phenomenon (eg a red cell precursor can hemoglobinize with erythropoietin, but it can also do so with insulin and insulin-like factors, or with a mixture of all and any of the above, not to mention synergism with other factors such as hemin and vitamins A and E!). The principle, then, can be seen to hinge upon the concrete embodiment of that "needlessly", of how one defines what is or is not a 'needless multiplication of factors' (it is this definition that in most science and philosophy is arbitrary and thus equivocated). And that is its crux indeed, but how does one know what is a required multiplication, which multiplication is needed and which is not, or under which conditions a multiplication of 'beings' becomes superfluous? The answer, we shall see, is the experimental determination of *inclusions* by the method of the *exclusion*, as the real razor of scientific research: *limits to the expression* of the phenomenon under study must be reached (condition for *exclusion* or separation, as *sine qua non* of analytical experimentation), so that a method for the *inclusion* of 'beings' or 'factors' permits one to reconstruct (or synthesize anew) the multiplicities, permits an exact gauge of the degree of "multiplication of beings that is necessary" in order to take into account a certain natural manifestation or expression (phenomenon). **Ockham**'s principle does *not* provide the methods to generate just 'the right multiplication of factors', just 'the right multiplicity of elements' that is necessary for scientific exploration (read experimentation) or effective intellection. **Ockham** was missing a method to ascertain the variables and their "natural numbers".

Emphasis on experimentation and observation, on the logical structure of science, its discourse, articulations and methodology, do not, by themselves, constitute a scientific method - a method of scientific investigation, at once formal and experimental. An ethical foundation for scientific knowledge, even as it belongs to a propositional logic that provides the tools for that scientific knowledge and permits its systematization, does not suffice to liberate natural science from religion, nor does it propel Official Science into a position of formal separation from Church and State. Furthermore, one must understand properly what such an emancipation of science from religion came to require: the invention of an exact method to ascertain the knowledge of things, beings, their processes and interactions. The break of science with religion or superstition will be seen to be an incomplete one, even

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to this day, for that emancipation has never really happened - only the formal institutional separation of powers has occurred. The essence of that separation, a separation between 'conniving partners', is to produce a religion that becomes less and less official and more and more officiating and ecumenical, and a science that becomes more and more official, unquestionable and indubitable: the couple of a *scientifist religion* and a *religiosified science*. The separation is not a real emancipation of science from religion - rather, a duplication, a duplication of official institutions and their abstract sign-machines; rather, a more subtle enslavement of science to religion, one that is splayed out over a dualistic doctrine of reality and has become nearly all-pervasive.

Here, at last, one comes to the political-psychic structure of modernity, of 'modern man'. Dualism is the condition for the transition of Official Science from its despotic age, under the authority of Religion and the power of the Church, to its civilized age, the age of capitalism. It preserves the mysticism of religion in the sovereign 'science of metaphysics', but now provides it with its natural complement: mechanistic models - gravitational and then caloric - that rule the lower world of matter and the body. It preserves the Christian dualism of body and soul, *relegating science to the mechanical*, and keeping the realm of the mind, the spirit, the soul for *metaphysics*. A new image of thought, a dualist image, at once mystical and mechanical, at once metaphysical and mechanistic, spans from **Aquinas** to **René Descartes** (1596-1650). And it carries the inevitability of the formal separation of Official Science from Religion. The domain of Official Science would be the physical world, the world of the body and sensations, while the domain of Religion would be the same as that of metaphysics - the world of the soul, the thinking substance given by revelation in Religion and as an apriori by thought and logic in metaphysics. In Cartesian dualism, there is a mechanistic **Descartes**, steeped in a uniform, mechanized physical world made up of bodies at rest or in motion, made up of mechanical causes and effects, and there is a mystical **Descartes** who believes in the incorporeal, immortal human mind, in the method of metaphysics that, as **Jean Wahl** points out in his "*Tableau de la Philosophie Française*", goes from the *Dubito*, the doubt about existence, about the body and its senses, to the *Cogito* as *alone having existence and reality*.

Certainly from an empirical perspective he was doubting the wrong object, his body and not his mind, or not doubting enough - both his body and his mind. The doubt is paranoiac and the Cartesian affair with thought entirely an oedipal story, as **Gilles Deleuze** once put it:

"The process of the *Cogito*, you recall, is: I can say "I think, therefore I am", but I can't say "I walk, therefore I am." Descartes explains this in his *Responses to Objections*, in Descartes' rare comic pages. Someone objected to him, "Why don't you say 'I walk' like 'I am'?" and he says, "I can't."

He cannot say so, because to say so he must first think 'walking', for which supposedly he would not need to be walking or even know walking... As **Deleuze** adds -

"That amounts to saying that "I walk" is a subject of the statement, whereas "I think" is the subject of enunciation. Then, perhaps I'm not walking, but there's one thing I'm sure of, and that is that I'm thinking of walking. In other words, the subject cannot produce a statement without being thereby split (*scindé*) by the statement into a subject of enunciation and a subject of the statement. This introduces the entire metaphysics of the subject (...). There is a dualism at the level of

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thought and the object being thought. There is a dualism at the level of soul and body, there are as many dualisms as you like. And if we ask: What is the source of all the Cartesian dualisms?—it lies in this scission internal to the subject, between the subjects of the statement, which allow no conclusion, and a subject of enunciation, which is subtracted from doubt: "I think." [18]

Already "*The Book of the Three Impostors*" (as per **Raoul Vaneigem**'s deviation), contains the same criticism of **Descartes** - "that there is no body; that despite this, I exist, though without body; that, accordingly, I can only be an uncorporeal substance that thinks". Not only is **Descartes** unable to prove that he is not a body which thinks, but there is no need for such proof in order to establish the soul as a substance which thinks - so says the same book. And indeed, subtraction of the body does not seize the soul other than as subject of the statement. It is within this Cartesian split between public and private, mechanistic and mystical, physical and metaphysical, body and soul, that the new Official Science will assume its position as the mechanical handmaiden of Religion. It is dualist thought that permits the transition of Official Science from being a religion of the State to becoming a religion of science, a properly speaking scientific State.

5. Separation of Science from Religion: the Scientific Method in the Renaissance

The detachment of science from Religion, at once separation as *an institution* and distinction as a specific form of knowledge or *a specific method of cognition*, could not occur until science found a self-sufficient, formal *and* empirical method for the production of scientific knowledge. With the syllogistic method, **Aristotle** had made a contribution to analytical logic and laid the formal foundation for deductive reasoning (*deductio*). Its premises were deemed to be sensible ones, borne by the world of the senses, their experience and observation. But the method was a logical one, not an experimental one, not an inductive-quantitative method, nor one that was implicitly critical of sense-perception or permitted the establishment of a distance towards sense-experience.

According to **Aristotle**, the first principle of science must be arrived at by induction, the generalization and association of sense-perception. **Francis Bacon** (1565-1626), author of the "*Novum Organum*" published in 1620, suggested that a new view of knowledge was necessary to lay the foundations of natural science - a view no longer bound or held back by Aristotelianism, Platonism and scholasticism. Natural science needed an autonomous method whose first principle was observation *by* experiment - a controlled production and collection of new facts, as exhaustively as possible. This principle had to have a logical articulation (which is a reiteration of **Ockham**'s view of the role of logic), and this imposed a systematic criterion upon the conduct of the experimentation, such that science had to be constituted also as a capacity to order the new facts or results into a systematic ensemble, a theory or an analytical articulation. **Francis Bacon** held that "science should serve practical life" [19], that it should yield a beneficial development of applied sciences and their machines to be put at the service or disposition of the living. He viewed machines, instruments like the microscope and the telescope, as extensions of our organs that enabled (made possible) finer perceptions, bringing the human mind ever closer to the actual nature of things. "To know is to may", or "knowledge is power" was his dictum, though he was not the first to think or utter it, let alone to practice it.

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Knowledge is power, but just *how* is it power and *what kind* of power or powers can it wield? For knowledge to become power, it requires a reliable method for its own generation. Yet, if all the power that it is to become is nothing other than the *Potestas* of a State, than a separate political power, then 'knowledge' does not need any reliable method to generate itself, only more of the same religious certainty, more arbitrary revelation. **Francis Bacon** had defined the fundamental traits of the scientific method, while emphasizing the fact that science is forced to form an open system. Yet **Francis Bacon** had little impact on the 'new science' that emerged with the Renaissance. He had remained unable to provide the quantitative bases for that new inductive method. He could well postulate that from the "closer league of the two faculties, rational and experimental" much was to be "hoped", but save for not wanting natural science to be subordinate to mathematics ("mathematics cannot give birth to science"), Bacon had no notion of the formal mathematical methods needed to establish 'scientific induction', to test the axioms of experience, to formalize and analyze them.

Galileo Galilei (1564-1642) is undoubtedly the first to formalize the scientific method by precisely synthesizing both the theoretical and experimental activities. He does not begin his formulation with observation and sense-perception; rather, his formulation in *Two New Sciences* begins with a Postulate, a theory or hypothesis. And it continues on to the *testing* of this hypothesis by the design of experiments pertinent to the object of the hypothesis, and the collection of observations, or *new* sense-perceptions (data), obtained from those experiments. The results *modify the hypothesis*, permitting its successive approximation of a scientific truth, an empirical and predictive truth that becomes ever more exact and exacting. The self-correcting power of the scientific method lay on this capacity for modification, actual knowledge becoming exact through the cumulative effect of successive modifications, or their elaboration.

The greatness of **Galileo** lies precisely in having demonstrated that with the scientific method -

hypothesis->selective experimentation->observation->corrected hypothesis

- science could actually come to measure and address the occult, the imperceptible, precisely because science could never really take sense-perception, the given, the phenomenal, as being equal to the real. Moreover, by **Galileo**'s process, science would no longer make the mistake of replacing the given or perceptible by the imaginary - for it had now found a verifiable method to confirm its findings and extend them, and thus determine which perceptions were valid (right) and how, and which were invalid (objectively falsified) or wrong. Within ever-growing limits, science was now in a position to call off any cognitive bluff.

The separation of science from Religion was inseparable from an ongoing struggle within science itself - between naive Aristotelianism (the Official Science of the Church) and the Copernican revolution. **Leon Brunschvicg** commented on how, with **Copernicus** and **Galileo**, the sensible universe - the world accessible to the senses, to their perception and immediate observation - is demonstrated to be a "falsely concrete world" made up of illusions and mistaken appearances, "inconsistent ghosts" or

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phantoms [20]. These can only be dissipated by science, by its method and its free development - only science allows human thought to reach and contact a world that alone deserves the qualification of *concrete*. The Sun may appear to turn around the Earth, but by any meaning of the concept of turning around or rotation, it is the Earth that turns around the Sun. It is only through the abstract, through thought of a theory or an hypothesis, through its testing in *well-designed* experiments and by observation of new sense-data, that the *real concrete* can be seized, grasped, apprehended, known and learned: "It is only through the abstract that the concrete becomes possible", says **Brunschvicg**. The 'concrete' of sense-perception must itself be doubted, validated or not by experiment and observation; common sense is merely a depositary of beliefs, opinions and fantasies, mostly imaginary, or based on a naive adherence to sense-perception. But this Galilean *Dubito* is *not* **Descartes**' *Dubito* - for it doubts not the existence of the body or the positivity of the senses or their perceptions; it doubts the belief in these perceptions and sensations just as it doubts the belief in deductive Reason alone - since reason is just another sense, nothing more. It doubts, in sum, the belief that either the senses or reason can *apriori* present us with the real motions of beings or the real nature of existence. It doubts what common sense and naive observation of sense-perception have construed as being the knowledge of the world. It doubts therefore Official Science, first and foremost. And, indeed, it was Official Science that claimed it was the Sun which turned around the Earth.

This Galilean *Dubito* is the moment of protoscience, the condition necessary for a real scientific method to be sought. We have already encountered this in animistic shamanism. There, too, the first truth is to become aware of ordinary perception, of its apparent solidity, while realizing that it is objectively false, that its truth is relative, that it can give way - through method - to knowledge and even to a finer perception (a world of fluids and fluid-beings), be it a non-ordinary perception ('silent knowledge') or a scientific intellection ('scientific knowledge'). This is an element of a nomad science (see next chapter); not the result of a dialectic of being and becoming, but the result of seizing nature as a world of beings that perpetually move and change, a world of fluid-beings engaged in becomings, a world of a perpetual coming-to-be. To perceive motion differently, one must relativize the truths of the senses generated by cultural modes of conscious perception; then another perception, other modes of perception become possible:

"the first truth is that the world is as it looks and yet it isn't. It's not as solid and real as our perception has been led to believe, but it isn't a mirage either. The world is not an illusion, as it has been said to be; it's real on the one hand, and unreal on the other. Pay close attention to this, for it must be understood, not just accepted. We perceive. But what we perceive is not a fact of the same kind, because we learn to perceive" [21].

Every organ 'sees' or seizes the world from its own viewpoint - is a learning how to perceive in terms of electric, photonic, acoustic, etc, modes of sensation. Our senses are so many *biased* perceptions in relations of correspondence and synchronicity. **Nietzsche** was perhaps the first natural philosopher to recognize the biased and partial nature of unconscious drives: "There is no will: there are only punctuations of will" [22], shifting federations or alliances of organic drives, multiplicities of distinct wills or "willings". Their functional unity (the world of experience) is worked on, fashioned, coded, molded by culture, to permit *human* sense-experience, a consciousness of this experience, the thought (consciousness in words) of this experience and its knowledge (perceptual *and* intellectual). The

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thought, that consciousness, its knowledge, become our way to perceive, to staticize perception. They can also become a way to nomadize it, to reach for the movement and the becomings of things, beings, bodies, organs.

Galileo's first epistemological break is not the founding of the scientific method, but consists in repeating the same rupture which **Heraclitus, Anaxagoras, Archimedes** (see below) and others had laid as a mobile foundation for a *nomad* or *eccentric* science: the observation that what *is*, is *only in flux*, is only *a becoming*, is the *being of becoming*. What is, is change. If what is, is change, and change can be intelligible if its language and functions are discovered, and thus known and understood, then at last one encounters **Galileo**'s next problem: how to create a science or mathematical physics *of motion or change* that seeks the conditions of its general validity and deploys a rigorous mathematical language. The error of ordinary perceptions and their unity, is an objectively real error. Science does not begin until it is questioned, until the error is properly understood as falsifiable truth, until its objective existence is adequately explained, which is *the problem of method*. It is in this sense that **Galileo** is often presented as having come in the footsteps of **Archimedes**. The latter would have opened up the mathematical physics of statics, whereas **Galileo** introduced a kinematics of the motion of bodies.

But **Galileo**'s approach is also *eccentric* for another reason - because his vision of the scientific method is that of a process of ongoing learning, or teasing lessons from the experimentation with nature, and is not a bureaucratic procedure - neither divination nor dictation, nor pointless iteration. This places the epistemological break effected by his proposed methodology as belonging to *another kind of science* than Official Science - to a science capable of self-regulation and self-correction because it 'has method to its knowledge', and its knowledge *can* become exact.

Thus, the very separation of Official Science from Religion owes its internal impetus to a development that affected a kind of science very different from Official Science - a science, in fact, that goes back to **Anaxagoras** and the pre-Socratic Greek thought. It is a kind of science that is unable to lend itself to the staticism and rigidity of Official Science, one that cannot serve the State, be 'official', or secrete an officialdom; one that had found at last its *autonomous foundation* in an empirical method of cognition which, *honestly* employed, permitted self-correction. Now, too, we can clearly discern the two epistemological foundations of scientific knowledge, as they are an integral part of **Galileo**'s practice of the method of scientific investigation: the autonomous foundation constitutes an *aesthetic principle*, the principle of experimental determination; and the honest employment, the very condition for intelligibility of the datum, constitutes the *ethical principle*. Here was an autonomous process for the production of accurate knowledge of nature, capable of generating new facts and scrutinizing all of these. Implicit in the concept of the scientific method and its aesthetics, was this ethical vision of science as an *honest*, *self-corrective* process of open inquiry. At last, a reason or a process of reasoning had been found that was not dependent upon superstition, or upon the passivity of feelings or the passive and apriori notions of common sense; rather, a reason that could affect nature, that had discovered its method as a path to action, action upon nature and upon itself; a reason that could be put at the service of life. Scientists should not be afraid to err, not unless they

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are unable to correct their errors; for legitimate error is part of science, part of a flawed or insufficient hypothesis to be tested and corrected, and part of the difficulty in adequately relating all the dispar or diverse hypotheses (ie the enunciation or discovery of general laws).

From this point on, science will be obliged to enter an era of perpetual conflict with itself. It is obliged to search for limits and place them somewhere. But these limits become at once the source of error and the slippery slope that does not permit congealment of any science for long. Prejudice creeps into science precisely to the extent that the limits are constantly placed where they are not to be found; but this assures that changes, improvement and breakthroughs are always watered down, always made to crawl, inch by inch. In turn, this deepens the crevasse between eccentric science and Royal Science. It is a properly speaking scientific prejudice. It stems from a potential error that could be ingrained in the discourse of science, in its analytical tools themselves, in their relationship of externality toward the natural object of inquiry. It is the limitation of the system of axioms itself, of the axiomatics - and it occurs whenever the jump is made from an operational tool to the establishment of a dogma that becomes part of Royal Science. No scientific genius escapes it - as most keep one foot in eccentric science and the other in Royal Science. The old non-scientific prejudice can thus return, but this time as a *scientific* error; and it, too, can lead to a new superstition and a new religion - the religion of science. The very rule that requires that only the minimum be changed with each new breakthrough, becomes the resort that preserves most of the old and prevents any inrush of the new. As much as possible, shifts in knowledge are kept to a single paradigm or a subfield of one, even when they obviously affect or can affect a variety of paradigms.

Galileo is a case in point. His own errors creep in as a limitation of the axiomatics he employed - according to which only slight changes (**Ockham**'s razor) were to be made to the logic of the previous scientific hypothesis. The new limits are placed where thought or scientific inquiry have ceased questioning an axiom - where a form is taken for granted, a limit unquestioned. In the new mathematical physics that he created, **Galileo** also made assumptions that he took as being self-evident and did not question - assumptions which subsequent scientific investigations came to demonstrate were not correct or adequate. For example, his view of heliocentered orbitals sticks to the ancient myth that the motions of the planets had to be perfectly circular; he believes that there is agreement between the mathematical theorems of **Euclid**'s geometry and physical reality - that the motion of all bodies occurs in Euclidean space, that the path of light is a straight line. These are the new limitations, and one easily recognizes in them the lines of the new architecture of an Official Science, one that will in turn try to uniformalize, rectify, circularize, flatten, reduce, all the heterogeneity, the becoming, the movement, the particularizing variabilities of general functions. The search for universal truths, for universal scientific laws had to come about as the rebirth of Official Science, the birth of a New Official Science separate from religion; just as the impetus for this came from a break of eccentric science with the Old Official Science that complemented religion. Hence, the dual character of the impact of the Copernican-Galilean revolution *within* the Catholic Church - as the Copernican method of computation was permitted and used in astronomical computations, just *not allowed to represent physical reality*. Likewise, **Galileo**'s recantation may well have been just another way of smearing the difference between the two sciences, of bridging the old geocentric view and the

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new heliocentric view, inch by inch, in forward motions and step-backs.

Finally, we should mention that **Galileo**'s intuition led him beyond the creation of the inductive-quantitative method - better named the 'analytical-experimental method of science' - and beyond even the notion of science's ability to self-correct as an open process. He rejoined **Pythagoras**, when he declared that nature was written with numbers, or that it thought in numbers. Science could not be science if it did not become *mathesis*, if it did not develop a language that either approximated that of nature, or was found to be that of nature (a radical eccentricity); a language that permitted science to think like nature does. The task of science was to find the language of nature. This idea, of course, caused much confusion in **Galileo**'s spirit, just as it had amongst Pythagoreans. **Rupert Hall** quotes **Galileo**'s text - where this language is explicitly described as a geometrical language, made up of triangles, circles and other geometric figures. **Hall** correctly calls it a metaphysical principle, and sees it as the neo-platonism inherent to the new figure of science [23]. To this extent, **Galileo** remains a Pythagorean, and the correspondence between mathematical theorems and physical reality remains a mysterious given, axiomatic at best (thus an error such as upholding the axiom of perfection leads **Galileo** to assume that orbitals are perfect circles; yet, of necessity, this results in an eccentric Sun). As long as we make the choice of geometry as being Euclidean, the theorem that carries **Pythagoras**' name cannot be falsified, hence it remains as an apriori not susceptible of proof. But it can be demonstrated to be in immediate error if no surface can be said to be flat, or no line straight. Geometry cannot dictate physical nature, only approach it under conditions that already reduce it, and permit such reduction. If the approximation is operationally permissible, elementary geometrical optics can be employed to treat light as if it followed straight lines; but when the problem posed can no longer escape the physical reality that light (or its stimulus) is not transmitted in straight lines, elementary geometrization fails; the axiomatic breaks down, and a new paradigm must emerge.

But, as **Hall** perceptibly remarks, **Pythagoras** was on to something else - also an eccentricity - when he discovered "the relations between the length of strings and the notes they struck". It was an effort to uncover the intrinsic difference in degree within the quality 'sound', the difference that permitted it to vary in tonality or frequency - and thus an effort to uncover the inner algebra of sound as a wave-process. This is a different kind of mathematization than geometrization; it is a different kind of measure that is provided, a different kind of mathematical language - and also a different kind of approximation. This kind of mathematization may well be shown not to require any metaphysical basis; it may well be what actually permits geometry to have its 'approximative truths'; and at the same time be that which never lets the circle be perfect, the ellipse be one, obliging us to think all motion as always vortical, as a kind of spiral, a helix, a vortex, a flux tube.

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3. Reich, W (1950) "Ether, God and Devil", Farrar, Straus & Giroux, NY, p. 88.

4. If **Guy Debord** had searched for the origin of Spectacle outside of Capital, he would have found that the "primitives" of his so-called "cold-societies" first produced and projected the image as residual (veil of the imaginary), which the priestly inventors of the archaic State subsequently turned into a Spectacle called religion, or a social system of signifying representation by the image and the symbol (a projection onto the skies through the screen of a collective imaginary). This happens long before the concept of Spectacle reduces to "bread and circus" in warfare States. **Gabriel Tarde** had already made this connection: qua spectacle, the media constitutes the modern spiritual power, but the "need for spectacle" finds its source in organized religion (the archaic spiritual power) and the desire to obey. **Tarde** stated: "Ruinous or disastrous, it matters little because, as long as a government holds the breadth of its spectators, or is of keen interest to them, it can be sure of applause for the meagrest of successes", in **Tarde, G (1899) "Les transformations du pouvoir", Empêcheurs de penser en rond, Paris, 2003, pp. 94-95, our translation.**

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10. At the end of the XIXth century, it seemed that the cult of dead ancestors dated only to the post-Paleolithic period, when tombs first appeared. This was, for instance, **Tarde**'s estimate in **Tarde (1899) op. cit., p. 72.** A century later, it became evident that cave burials dated back to the Middle Paleolithic - see, for example, **"Past Worlds - The Time Atlas of Archeology", Hammond, NY, 1988, pp. 64-65.**

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15. Idem, p. 134.

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