ABSTRUCT

The concept of power is a fundamental notion in the human vocabulary. Yet, as old and venerable as it is, common sense and expert opinion alike have great difficulty in coming to grips with its nature or essence. It seems that power is a many splendored thing, depending on the point of view of the beholder.

This problem of conceptualization is particularly acute between the natural and social sciences. Although the former has a clear position and rigorous definition of the term, the latter is still fuzzy on the concept and moot in its exact meaning; a situation that creates great difficulties and constant misunderstandings, especially in interdisciplinary discourse.

The present study attempts to resolve these semantic issues, thus increasing human comprehension of this phenomenon and improving our ability to deal with it. That is done by extending General Systems Theory into a Sociophysics paradigm. This most recent exploration into scientific integration begins with a metaphoric transposition and ends with a symmetric composition leading towards that distant Grand Unified Theory at the end of the enlightenment tunnel.

As a small step towards a general theory of power, this study focuses on power politics as a quintessential example of a natural-cultural metaphor. Consequently the central thesis here is that a rigorous definition of power can be similarly, easily and usefully applied to all three realms of reality: intrapersonal, interpersonal and extrapersonal. As a result of a more exact denotation and more widely shared connotation of the term, one should be in a better position to understand its manifold manifestations and control its multiple applications.

This paper will therefore proceed deductively: first by inscribing the nominal definition of general concepts, then describing their actual manifestation in reality, and finally concluding by prescribing some ideal solution to their problems.

POWER POLITICS

THE SOCIOPHYSICS OF HUMAN INTERACTION

INTERDISCIPLINARY METAPHORS OF
ENERGY-ENTROPY-EQUITY IN PHYSICS-LOGICS-POLITICS

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Introduction

This paper addresses three important problems of interdisciplinary studies and therefore has a threefold purpose. The first and foremost is terminological and looks into the use or abuse of basic concepts of the social sciences. In this area, we chose power politics, as a particular example of misunderstanding and malcommunication which we try to correct it by generalizing definitions and clarifying their meaning. In attempting to resolve semantic issues, we increase human comprehension and improve our ability to deal with their corresponding reality.

The next and central one is physiological and concerns the fragmentation of science into hyper-specialized natural and social compartments. We deal with this problem by applying General Systems Theory into a Sociophysics Model. This most recent exploration into scientific integration begins with metaphoric transpositions and ends with symmetric compositions leading towards that ultimate aspiration of a Grand Unified Theory at the end of merging scientific tunnels.

The last but not least is sociological and regards the ideological agendas of human studies which mistake or misrepresent crucial correlations in their factor analysis of controversial variables, such as energy, equity, or tyranny. By analyzing the social meaning of these concepts, this part utilizes the terminology and methodology of the first two, to draw some general conclusions about the nature of power and the culture of politics.

The basic premise here is that a rigorous definition of these and other related terms could be similarly and usefully applied to all realms of reality: macro-physical interacting, meso-social influencing, and micro-logical thinking. As a result of more general denotations and acceptable connotations of terms, we should be in a better position to

appreciate their manifold manifestations, as well as regulate their multiple applications.

What we will do here is support this contention by modeling definitions of our concepts, manifesting their reality, and proposing policies to handle their social impacts. Consequently, we should be able to combine the ideal models of many disciplines within the pragmatic modes of a single reality.

From this argument, based on the premise that common definitions of these concepts improve our understanding, we draw the conclusion that the increased ability of humanity to manipulate high energy and bring to bear great power upon its social system and natural environment, also increases the necessity of greater concern, care and control for these fatal forces.

The conceptual framework used here intersects two parameters. The first is structural: involving the concentric realms from the innermost mental content to the outermost natural context, mediated by the central social system, as illustrated in the spherical diagram of next page. The second is functional: proceeding by a deductive methodology which inscribes fundamental premises, describes intervening variables, and prescribes policy conclusions as shown in the classification tree of next page.

This paper then begins by determining the terminology (concepts, contexts, contents) underlying this study. Next, it continues by analyzing the physiology (force, energy, power) of our concerns. Finally, it closes by discussing the sociology (economy, society, polity) within which these concepts are applied.

Terminological problems involve different meanings and usages assigned to concepts by people in different fields. This situation is particularly acute between the natural and social sciences. Although the former has clear positions and rigorous definitions of its terms, the latter is still fuzzy

on its concepts and moot in their meaning; a situation that creates great difficulties and constant misunderstandings, especially in interdisciplinary discourse.

Our approach to this problem begins by trying to define and clarify the most basic notions of our scientific vocabulary, such as space and time. This task is necessary as a background and foundation upon which we can build more complex concepts, such as power and politics. To that end, we have constructed the taxonomic trichotomy presented in the Introduction.

As shown in the previous page, this scheme represents our universe of discourse which is centered in the SET distinction of space-existence-time as the primordial parameters of our reality. From this conceptual distinction emanates a dual extension. On the right side, opens the MEF content of matter-energy-form; and on the left side, its ESE context of eco- socio- and ego-spheres. We shall presently take each of these three central columns of the framework and elucidate their dimensions.

1.1 SET Concept

The space-existence-time premise provides the central concept of our framework. Although SET implicitly underlines all discussions, it is explicitly emphasized here, as the fundamental assumption of our paradigm.

Space (s) envelopes our physical existence and delimits its extent by determining location, scale and distance. More specifically, topology and geography provide important aspects of space and significant variables of position and motion. This is especially so in geopolitics, where power is directly correlated to territorial imperatives and strategic configurations.

Along with space, time (t) forms our fourth dimension. As space measures distance between

points, time measures duration between events. So as geography compares on concurrent positions, history follows succeeding periods. The main difference, of course, is that unlike three-dimensional space, time is unidimensional and its arrow always flies from the past through the present into the future.

Combining space and time, we note the notion of motion. When some distance is covered in a certain time, we speak of displacement between two points. Utilizing a mathematical notation as the best shorthand and manipulative tool, we define the rate of motion as velocity: v=s/t, representing the ratio of distance divided by time. From Democritos and Heraclitos to Hobbes and Newton, natural philosophers thought that the essence of science was the study of bodies in motion. Accordingly, the idea of movement is the fundamental factor in our study.

This compound concept gives rise to the necessity of existence (e), because we need something to move through space and time. In order to fill the space-time continuum, we infuse it with a substantive existence. In this dichotomy, we distinguish between being and void and assume that there is something rather than nothing in space and time. For our purposes here, we forego any further discussion of space or time per se, and focus on existence as the relevant content to be elaborated below.

1.2 MEF Content

As shown on the right side of our framework, we postulate the significant aspect of existence to be matter-energy- form. This MEF content of reality is closely inter-related and interacting within its SET context. It should thus be briefly explained here.

The substance of matter is mass (m). Having volume or displacement, it occupies exclusively a place and fills a space for a time. Matter provides the concrete basis of our reality and the stability

of our existence. Within the space-time field, material objects are of a certain size (micro-macro) and last for some time (ephemeral-epochal).

Space is partly filled with matter which forms distinct objects. The quantity of material or number of bodies filling a given space is determined by the notion of density: d=m/s. The number of people living in a certain territory, for example, is of a particular density depending on the size of the population divided by a land area.

Pure materialism, however, only explains one aspect of reality. Energy (E), defined as the ability to move or act (A) in time: i.e. E=A/t, provides another. Accordingly, a body has energy if it is able to do something. This ability depends on whether it applies to position or motion. Masses in high places possess great potential energy, just as bodies is rapid motion acquire a lot of kinetic energy. Motion is thus a simple kind of action, as a result of which moving matter attains a certain momentum (q) which is equal to an objects mass and velocity: q=mv, which with a bit of simple mathematical transposition means that E=qv2.

Ever since Einstein's famous equation E=mc2, matter and energy have been intimately related. Since one can be converted into the other, they may be considered two sides of the same coin. Energy activates matter and makes things happen, thus complementing the static character of mass with a dynamic attribute. As we shall elucidate later on, since E=mv2 is matter-in-motion, energy becomes the source of work, force, and ultimately power.

Finally, the third aspect of being is form (f) or order. It is this aspect that gives matter its shape and energy its symbol, thus infusing cosmos into chaos. Order forms patterns and processes, data and codes, systems and structures, thus giving meaning to things and events. Although form is evanescent or immaterial, information is carried upon matter and energy, and thus coexists with them.

1.3 ESE Context

On the left side of SET, our conceptual framework distinguishes three realms of existence. Using the criteria outlined above, the best classification for our purposes is a concentric trichotomy which groups all things into eco- socio- and ego-spheres, or natural, social, and mental domains, as shown in the diagram.

In that scheme, nature provides the all-inclusive environment of our reality, represented by the outermost circle. It is the realm of hard facts and natural laws. As studied by physics, chemistry, biology and ecology, this contextual domain frames our universe and sets the outer limits of our knowledge. Any supernatural realm therefore has to be an externality beyond our concerns here.

At the other end of our spectrum, in the center of our concerns, is the human being with its internal world of thoughts and ideas. We are not here concerned with those human aspects reflected in the arts and humanities, but rather with the mental level of the human personality as studied by cognitive psychology. Any subconscious domain in the dark inner world of the psyche likewise lies beyond our purview.

In between the ecosphere and the egosphere lies the sociosphere where we now focus. Although society cuts through the realms of acts, facts and words; we are primarily concerned with interpersonal relations, and only marginally with extrapersonal and intrapersonal affairs. Whatever else societies may be, they are basically material systems, composed of human masses, their relations, creations and possessions. The mass of a social system at a particular place and time can therefore be shown as the sum of these three aggregates: i.e. ms=mh+mc+mp.

Beyond this quantitative aspect, of course, societies also have qualitative relationships which ultimately make them more complex than the sum of their

parts. This complexity emerges out of multiple interrelations of various simple components interacting according to basic rules. As open, dynamic and spontaneous self-organizing systems, organisms and societies alike require qualitative as well as quantitative descriptions. Thus in addition to exact indices of mass, size, and position, a complete description requires more intangible attributes or subtle impressionistic perceptions of ethic and esthetic traits. For our purposes however, power can be adequately described and simply explained without delving into these complications.

As studied by the social sciences, human culture is divided into three main functional sectors: society, economy, and polity, where love, gain, and fear interact. These sectors can be studied in either their chronological or topological perspective. Here we are primarily concerned with their comparative sociological aspect and leave the historical and geographical ones in the margins of this discussion.

Within these domains and their sectors there exist distinct systems, defined as sets of various elements. Systems are found everywhere from atomic clusters to astronomic galaxies, composed from elementary particles to Magellanic clouds, thus indicating matters tendency to agglutinate and organize itself in various structures from the simple diamond to the complex brain.

Based on General Systems Theory and Socio-physics, we contend that all the above contexts and their systemic contents share similar attributes; so metaphors, analogies and isonomies among them are not only possible and desirable, but also necessary in advancing scientific interdisciplinarity. As an example of this general equivalence, we have here chosen the relationship between power and politics, which are examined systemically and systematically in their proper content and context.

Physical systems, whether personal, social or natural, require their components to be ordered or related in some way. When this shape or form persists, a

system is stable or structured, thus permitting the preservation of its identity in space and time. This systemic stability is due to inertia, the tendency of all things to continue in the status quo, as reflected in the first of Newtonian Laws which recognizes that the more massive a system, the greater its inertia.

Newton's Laws of Conservation of energy, inertia, or momentum declare that these states tend to be preserved. Moreover, since the conservative tendency is proportional to mass, large or heavy bodies, mechanic, organic or politic, tend to maintain their states of rest or motion much easier than small or light ones.

As long as conditions remain the same, a system is in equilibrium, so there is no change of state. Consequently, every system has an equation of state which describes the condition of its equilibrium, as coordinates of certain spatial, temporal, and material factors. The number of variables required to fix the state of a system determine its degree of freedom. Social and biological systems have high degrees of freedom because they need large numbers of variables to describe their states. Their homeostatic parameters are so complex as to make it impossible to state them with any precision. Moreover, they are open and dynamic, interacting both internally and externally, therefore rarely approach equilibrium states, other than a temporary balance between the inputs and outputs of opposing forces.

With these general comments, we can now end this section by combining the two derivative levels of the SET concept: i.e. MEF and ECE. In so doing, we create the 3x3 matrix below, intersecting the content and context of our concerns.

CONTENT	Matter	Energy	Form
CONTEXT			
Ecosphere	Resources	Radiation	Symmetry
Sociosphere	Artifact	Synergy	Institution
Egosphere	Brain	Calorie	Mind

The nine cells resulting from the above cross-references are illustrated by a representative concept in each. Thus matter in ecology is illustrated by natural resources, while in society by artificial commodities. Similarly, natural energy is produced by radiation, while social energy is enhanced by synergy. Form in nature is reflected by perceived patterns and cosmic symmetry, whereas in society by its various structures and traditions. Finally the internal reality of each person is based on the massive capacity of physical brain, which given a sufficiently continuous supply of energy creates the uniquely human self-conscious mind. It is that emergent mental function of this extraordinary physical organ which is capable of transcending the constraints of SET and concocting ideal forms, mythical beliefs, and symbolic acts.

With this recognition of the self-referential ability of the human mind, we have now completed our tour d'horizon of the preliminary premises and fundamental factors necessary for a scientific understanding of such complex and controversial concepts as those of power and politics. This is done for power in the next chapter and for politics in the last one.

2. PHYSIOLOGY

On the basis of the above terminological discussion of elementary notions, we are now ready to tackle more advanced concepts and compounds. Our methodology here moves from classic mechanics to chaotic physics, thus combining mathematical rigor and fuzzy logic. The goal here is to conceptualize power, as a capability ratio involving an action at a distance over time. To do so however, we first need some preliminary knowledge of causality, which we discuss next.

2.1 DIR Causality

Central concepts (force-power) of scientific reasoning are based on focal percepts (cause-effect) of influence transmission which in turn rest upon fundamental phenomena (attraction-repulsion) of action at a distance. It is through these chains of reasoning that human minds admit that one entity or system affects or interacts with another

Cruising this conceptual stratosphere, we hereby recognize three types of causality. The first and simplest is a deterministic etiology whereby one thing or event inevitably leads to another. Scientific logic assumes a cosmic order that makes for stability and continuity. This order is made possible by the universal and eternal natural laws as reflected in classical physics and Newtonian mechanics. The behavior of deterministic systems, such as many natural phenomena and mechanical automata, follow strict rules making it possible to explain and predict their behavior absolutely, given their initial state.

At the opposite pole from these simple and well-ordered structures, lie complex and chaotic systems whose apparently random behavior baffle our attempts to decipher them. It seems that the functions of these non-linear processes are beyond the limited capacity of the human brain to explain. All that can be said now is that this chaos and complexity emerge out of order and simplicity by the application of general laws which we are just beginning to comprehend.

In such cases of dynamic instability and high sensitivity, the best one can do is search for probabilistic causes in various degrees of uncertainty. Quantum Mechanics and Chaos Theory are presently combining into a new Science of Complexity which tries to explain these auto-emerging phenomena and manipulate their self-organizing systems.

In between this cosmos-chaos continuum, where

things happen either necessarily or mysteriously, there is a narrow window of opportunity where events may be shaped intentionally. At the edges of the critical interface, where life and mind interact, it is possible to innovate complex systems and elaborate novel notions by combining variety and creativity. This phase transition from order to chaos and vice versa, thus creates most interesting human phenomena.

Societies, like organisms, emerge out of the particular organization of various material entities and behave either as particles or waves. Thus they possess both the rigidity of hardware structural and the fluidity of software functional properties. It is here that we can recognize another source of causality stemming from the decision-making capability of the human free will.

Absolute freedom, of course, may only be found in random motion, just as absolute serfdom exists only in deterministic predestination. Any other action has certain constraints of various degrees (more or less) and types (material or logical). This voluntaristic cause then relates the limited deterministic with the partly randomistic character of the humanity. Mankind's self-conscious motives and goal-oriented reasons have aspects of both logic and chaotic factors. Historical and personal explanations must therefore rely strongly on human intentionality.

The behavior of human beings emerges by the combination of all these causes in various degrees depending on its content and context. Naturally, natural functions are relatively more deterministic than cultural, since the latter are situated closer to the edges between cosmos and chaos where the margins of human freedom are widest. Consequently, we here utilize one and all of these factors depending on the context where they apply best. In trying to explain why something happened or a change occurred, our explanatory hypotheses must correlate

at least two variables, be they natural, mechanical, or human forces. It is to these forces that we now turn.

2.2 FEP Reality

On the basis of the above concepts and causes, we now proceed to describe the variable vectors of our study. Since the focus here is power, we are interested in how causality operates to assist or resist change in the status quo. We do so by deduction through three vectors: force, work and finally power, as they function in mental, natural and social systems.

The basic theorem here is that any change of state is only possible if and only if some strength or force is exerted upon it. This Newtonian law defines force (F) as whatever can give something an acceleration (a) or change its momentum (q): i.e. $F=ma=q/t$. In order to effect such change of momentum by overcoming its inertia, one must therefore provide some acceleration, defined as a ratio of velocity and time: $a=v/t=s/t2$.

Force correlates directly to pressure, defined as force per unit space: $p=F/s2$, exerted both macro and microscopically. In its latter form, it is manifested as heat: the kinetic energy produced by the collective random atomic or molecular thermodynamic motion. This aggregate measure of heat, translated as temperature, is proportional to both pressure (p) and volume (V), as shown succinctly by Boyle's Law: $T=pV$.

Where large number of agents interact, the larger and faster the interactions, and the smaller the space in which they occur, the heavier a systems pressure and the higher its overall temperature. As a result hot systems, tend to be expansive, if not explosive. Density (m/s) and velocity (s/t) are thus fundamental factors of the internal heat of a

system, whether it is a mechanical impact, chemical reaction, or social clash.

When things take place or events happen, it is said that some force is responsible. Since force is perceived by the senses directly in many ways, it was easily conceived long ago. Aristotle first discovered that force was proportional to speed, but Newton went a step better and replaced velocity with its derivative: acceleration. Finally, Einstein in his General Theory of Relativity showed that acceleration and gravity were equivalent forces with similar effects.

At this point, we should distinguish three fundamental forces which are mainly found at different spatial levels and at varying strengths. The nuclear (strong and weak) is the most powerful, but acts only in microscopic distances. On the other hand gravity is very weak, but reaches over macroscopic distances. In between, the electromagnetic force is of medium strength and functions at the human level.

These forces act at a distance to affect the behavior of all things. According to Newton’s famous Law of Universal Gravitation, two bodies attract each other in direct proportion to their masses and inverse proportion to the square of their distance: G=mm/s2. The bigger and closer two bodies are, the greater their attraction

The amount of force needed to change the status quo increases along with the size of the system and the magnitude of change. Since greater force is needed to affect massive change, heavy systems are harder to move than light ones and deep changes are more difficult to implement than shallow ones. For that reason, since revolutions are rapid and radical changes, they are difficult to mount, especially in large and stable societies, thus they do not take place very often.

According to the so-called power-law, the

average frequency of an event is inversely proportional to some power of its size, because the energy required to pull it off is that much greater and harder to come by. That is to say: the bigger the bang, the rarer it is. This law applies equally to avalanches and earthquakes, as it does to wars and revolutions.

Small events that take little energy are quite frequent and happen all the time, but historic explosions concentrate terrific forces and are therefore extraordinary occurrences. Catastrophe Theory reflects this law by recognizing that systems reach their critical point as energy accumulates until they collapse, some sooner and softer, others later and harder. Therefore, the longer an event takes, the bigger it gets.

We can extend the notion of force from classical physics to all systems. Whether it is to move a material object, mobilize a mass of people, or change someone's mind, force is the necessary, if not sufficient, ingredient. This force can either be a physical impact, a social incentive, or a psychological influence. Whatever the content of force and the context of its application, the general rule is always the same: force makes objects, bodies, or minds do what they would not otherwise have done.

Obviously, just as in moving a physical mass: the bigger the body to be moved, the greater the force needed. Changing the mind of one person or getting someone to do something takes less force than performing the same feat on many people. Demagogues who can move large masses by public speeches, therefore possess great force. Needless to say this accumulated force can be used for either constructive or destructive purposes.

With the exception of gravity, forces can be either positive or negative, because they can attract as well as repel. The general rule in this case is that opposites attract, and similars repel,

so that two bodies of similar charge repel each other, whereas opposite charges are mutually attractive.

Moreover, as Newton put it, every action produces an equal and opposite reaction. This means that a force vector in one sense creates another one in the opposite sense. All actions then tend to create counteractions, because of the inevitable resistance and opposition that they create. This general tendency of force-counterforce or action-reaction applies to all contexts of reality, from physic-dianomics, via politic-dialectics and psychic-dialogics.

As mentioned earlier, every action requires both time and energy (A=Et). It is this active ingredient of energy which leads to the concept of work as the application of some effort to perform a given task and thereby change a situation or convert a configuration. In order to overcome the innate resistance of all things, work demands the application of force in space: i.e. W=Fs. A system in equilibrium can neither work nor change, unless some effort is exerted to force it. The larger the system and the greater the change required, the more work has to be done.

Since, for any work to be performed, energy must be expended; we can redefine energy as the capacity or necessity for work. By a simple mathematical transformation, E=mv2=mas=Fs=W, we can even make the two concepts equivalent. In that sense, energy is indeed work, because one can be directly converted into the other. E and W are inversely proportional, because the more work is done, the less energy is left. Also, since whenever energy is converted to work and heat is diffused as a byproduct; work (Fs) and temperature (pV) coexist, hence physiomechanic force is equivalent to thermodynamic pressure.

According to the First Law of Thermodynamics, energy is always conserved, even when it is

converted. The process of conversion however is carried out by acting or working which always incurs a certain cost. Since every act dissipates heat, whenever it happens, the high quality and potentially useful energy is transformed into low quality random motion which is useless for any work.

This transformation is said to increase the entropy of the system in which it occurs and is stated in the famous Second Law of Thermodynamics, affirming that all processes tend to degrade energy and increase disorder. Left to themselves, unfortunately, all things eventually run-down in energy as well as break-down in structure, thus falling from order to chaos. Since order is less probable than chaos, it is less likely to create and more difficult to maintain. As working systems are rare, they must be kept up by a continuous infusion of new energy, otherwise they fall into lower and easier entropic or chaotic states.

Dynamic or organic systems try to fight this enervating tendency. Struggling against entropy is thus a constant battle of all life to postpone death. But even when successful, life’s victory is only local and temporary. The will to live can only postpone the inevitable and irreversible arrow of time towards universal entropy.

Like all living beings, social systems fight entropy by drawing energy from their environment, as order-building and structure-maintaining islands in a sea of spreading chaos. By exploiting the environment in their vicinity, societies thus hasten its overall degradation in the long run. Negentropic or ectropic processes therefore come at a heavy price which we all have to pay sooner or later.

Organic and social development depends on the various rates of energy flow through the system. In their growing stage, energy throughput are very high and matter conversion very large in order to build complex structures. In mature systems this accumulation ends and homeostasis is attained by

trying to balance inputs and outputs. Finally, in their decline, all systems diminish energy consumption and eventually die by implosion or explosion.

The repetition of life cycles through many generations produces both qualitative and quantitative changes through evolutionary selection and mutation which favor the survival of the fittest in a symbiotic environment. The evolutionary or syntropic process tends to improve the chances of a system's propagation by the emergence of complex organization and better adaptation to changing circumstances. Evolution, however, is not as powerful a social factor as revolution, because its rate of change is very slow.

With this indispensable background, we are now ready to broach the complexity of power. Of the many different dictionary meanings of this term, we can find a lowest common denominator which contains their essential and irreducible elements in our three domains: physics, politics and logics.

In the fist, power denotes the amount of work done in a given time. In this sense, it measures in Watts the rate of energy conversion or force application, thereby overcoming inertia and performing useful activity. Power is thus related to work, energy, action, force, and inertia.

In the second, it is the ability to act in general, or control the action of others in particular. In that sense, power makes it possible to impose one's will on others and get one's way in the world, thereby overcoming environmental obstacles and shaping events to one's own preference.

In the third, it is the capacity to think fast and perform rapid mental calculations. A powerful mind is able to act or react quickly by processing large amounts of information and drawing the logical conclusions. Recently, of course, artificial

intelligence has surpassed natural one in many respects, but still has a long way to go in others.

Even if these definitions do not resemble each other at first sight, they have more in common than meets the eye. This commonality obviously lies in their description of power as the capacity to overcome the resistance of inertia and effect some change. This notion can now allow us to define power formally is as the rate of energy flow, the ratio of work per unit time, or the velocity of force: i.e. $P=E/t=W/t=Fv$.

In this equation, power contains all our previous concepts, as the ultimate all-inclusive vector. Energy and force are the necessary, but not sufficient conditions for power. To make them so, we must add time. What has been said about force, energy or work, therefore applies to power as well with the supplement of speed.

Obviously, slow motion does not demand much power. Slowing down shows weakness and easing up indicates tiredness. Power speeds up the performance of work, the expenditure of energy and the application of force. Powerful systems, mental, social or mechanical are therefore quick paced and for that reason they burn up faster and do not last long.

Whereas physical power is the work needed to move an inert mass over a certain distance in a given time, mental power is the energy to effect metanoia quickly, and social power is the force to mobilize human masses fast. In order to move people or change minds rapidly, literally or metaphorically, some power is needed. The more people are to be moved, the farther and faster they have to go, the greater power must be utilized.

Social power is related to both physiological force and psychological influence. The former determines the behavior of people, whereas the latter influences their thoughts. Social power can

thus move people's minds as well as their bodies, making them change their opinions as well as their positions. Consequently, power is as much in the eyes of the beholder as it is on the resources of the holder. Perception and reputation are thus as good as possession and accession.

Whoever has power is able to utilize energy, apply force and change the (space-time configuration) of things. The power structure of a system is the set of relations through which the power holders can influence their environment, both natural and social. It is in this sense that not only raw materials, but science & technology are sources of power because they manipulate nature and make it do things it otherwise would not have done.

In discussing power, it is necessary to consider the content and context in which it is exercised: who (subject) is trying to get whom (object) to do what (scope), where (domain), when (timing), how (method), and why (purpose). Further questions involve wither (sources), whether (options), and how much (cost).

These variables of mass, space, and time, as well as agent, target and goal determine in various combinations of power necessary to do the job of getting others to do one's bidding. Obviously, this short study cannot go into all these aspects of power which require and have occupied many books to analyze in depth, as our bibliography indicates. So, we must contend ourselves with the above general remarks and move on to the most important qualifier of power.

2.3 CCC Control

Since power, force, and work or energy are essentially similar, we can discuss them together as the FEP complex. These factors are all carried by various modes or means: physical contact or magnetic

charge and most important symbolic conduct. Whether it involves action at a distance or contact, the first two types are simple mechanical, chemical or organic phenomena between two or more entities pushing or pulling, attracting or repelling each other by the exchange of blows, electrons, or hormones. Thus they serve adequately as vehicles carrying FEP in various contexts.

What we are particularly interested in this section, however, is conveying FEP without touching physically or interacting chemically as inanimate objects or even living bodies often do. This third mode is via symbolic manipulation which is the exclusive domain of the self-conscious human mind.

Cognitive systems, whether organic or mechanic, send and receive signals or data which inform them of things or events in their environment. This information is communicated and translated, forming part of their meaningful knowledge. The human brain, the most complex and sophisticated organ extant, interprets these messages and acts accordingly.

Complex systems, like humans, can be made to behave without physical contact, by action at a distance involving symbols embeded in electromagnetic waves. This linguistic communication replaces somatic transportation by moving minds rather than bodies. So, unlike physical force, social force gets people to do something by words. Government propaganda, like commercial advertising or peer pressure, all use verbal force, carried via mass media, to change human behavior, or maintain it against opposing forces.

In this respect, the latest mnemonic to impose itself upon us comprises the command-control-communication (C3) triad. This combination indicates the growing importance of information transfer in the social context. This recent recognition of communication as the necessary factor of action at a distance completes our explanation of power projection.

Since isolated entities cannot have any relationship, power can only be exercised within a system or between a system and its environment. For that reason communication is the sine qua non of power transmission. Apart from physical contact, the communication of information is the only means of exercising social forces. Effective use of social power presupposes some knowledge of what is to be done and who is to do it. Only then can one ask or command someone else to do something. Moving on to the central concept of control, defined as the second derivative of velocity or the rate of change of acceleration: C=a/t=v/t2, we can see how it relates to communication. Control means the regulation of change, and obviously in order to be effective, such regulation must be communicated somehow. Moreover, as change is brought about by the exertion of energy through force and power, control applies to all our factors.

Since the primary source of power is access to matter and energy, whoever controls the flow of natural resources and social commodities, can also influence human thought and action. In addition to controlling productive power, control of destructive force also confers power, because it impacts upon human values, either positively or negatively.

Nevertheless, we should not delude ourselves that social control is easy. In spite of the scientistic belief that prevoir est pouvoir, knowing something does not mean controlling it. Although humanity creates culture and effects social change, it does not necessarily either understand or control what it does. Perhaps, if demography and technology could be controlled, so could the rate of social development. But even then, such control could only be limited and chaotic at best.

Combining all the equalities we have presented so far, it is now possible to relate power, work, energy, force, momentum, motion and control in the

following equation: P=W/t=E/t=Fv=qa=msC. Power is thus related to both work and energy through its ability to apply force and control masses in space. So, as energy may be considered to be matter-in-motion, power is force-in-motion or matter-in-control.

Since knowledge is another source of power, control of information also confers social power. Since information is composed of symbolic patterns embedded in matter or energy, its flow moves energy-markers through space and time, thus making communication possible. Controlling these flows of matter, energy and data confers power and affects lives. Therefore, whether it is other or self-control, the regulation of change is most important in both public and private affairs.

We end this chapter here by summarizing the presentation so far in the table below which combines two relevant dimensions of the framework we have been using throughout: i.e. spheres and factors. By intersecting these two parameters, we get the 3x3 matrix which illustrates the nine combinations resulting from these cross-references between FEP and ESE.

REALM DOMAIN	FORCE	ENERGY	POWER
Ecosphere Strategic	Gravitation	Potential	Structural
Dianomic Dynamic	Magnetism	Kinetic	Mechanical
Impact Systemic	Radiation	Thermal	Chemical
Sociosphere Fiscal	Reward	Contributive	Economic
Dialectic Legal	Sanction	Distributive	Political
Conduct Moral	Fame	Creative	Cultural
Egosphere Scientific	Reason	Cognitive	Intellectual
Dialogic Artistic	Instinct	Sensitive	Emotional
Influence Mystic	Faith	Psychic	Spiritual
CONTEXT SECTOR	F=ma	E=mv2=Fs	P=E/t=Fv=msC

As shown above, the forces of nature translate into energy or work and power horizontally, while they transform into social behavior and mental influence vertically. Our discussion indicated that the same basic forces adapt into all domains of reality: inanimate and human, individual and collective.

The most interesting adaptation from our point of view is in the social domain, where, whether material or mental, power comes down to making people behave, something that they would not otherwise do on their own. Power allows leaders to command and be obeyed, as it permits them to ignore commands and refuse obedience. It makes people conform, prevents things from happening and affords one not to give in to pressure. The potent ability of effecting or preventing change in individual or collective pursuits, makes control of energy, force and power, a prime consideration of human concerns.

Recent interdisciplinary research has shown that FEP shape the structures and processes of social systems which provide the constants and variables of human life. The question is how and to what extent? How much and what kind of these variables combine and correlate with certain economies, cultures and polities. How should various ingredients be extracted, converted, mixed, stored, distributed and consumed in a proper way as to optimize social life within its natural environment? It is to these critical questions, particularly as they apply to the social domain, that we now turn.

3. SOCIOLOGY

Culminating our presentation, we are now ready to apply power to politics, and thus see how this phenomenon operates in the political agora. Since, it seems that power correlations apply to all systems, be they personal, natural or social, we can freely transfer our cumulative knowledge from the

realm of classic physics to that of chaotic politics. In this metaphor, power politics is simply the application of FEP in the social system.

Our hypothesis here is that the correlation among these factors is so strong that social life in general and political life in particular may be considered as a function of their qualitative and quantitative organization therein: i.e. S=(f,e,p). In this model, politics, economics, and other human activities depend on the type and amount of power exercised in society.

It should be kept in mind of course, that human society is a very complex, dynamic and self-referential system. As such, its behavior is nonlinear and highly sensitive to initial conditions: small causes or disturbances may produce big effects or catastrophes. It is thus necessary to take care in both our explanations and executions relating to power, because this might have considerable constructive and despicable destructive potential.

Since these matters involve the quantity and quality of MEF production, distribution and consumption, they affect economic, social and political positions. How people react to them depends on their perceived interests, considerate opinions, or desired intentions. Let us look into the three sectors of society to see the interplay of these variables on each.

3.1 Economy

As an open dynamic system, society needs a continuous flow of matter and energy to promote and prolong itself.

Successful social systems perform this function as converters of MEF which transform natural resource inputs from the environment into waste byproduct outputs to the environment. In between, by application of effort and work, social metabolism produces and consumes goods and

services as throughputs, providing people with a certain standard of living and quality of life.

The principal metabolic function of society is performed by the economy. Natural resources are the raw materials of the economy and eventually of all social action. Mechanical transformer-accumulators are intervening variables which transmit energy to its final appliances for consumption.

Economic issues with sociopolitical implications involve problems of extraction, conversion, and consumption of MEF. Primary in this category is the input-output ratio of energy transformation: i.e. the amount of gross energy required to produce a certain amount of net energy. A crucial aspect of social change throughout history has been the increasing amount of energy used by humanity.

Natural energy stems from animal-human labor, hydro-aeolic motion, and atmo-solar or coal-gas heat. But, these energy sources are usually intermittent and unreliable, dispersed and unexpected, explosive and destructive. Until couple centuries ago, all energy was animal, wind or water. With the invention of the steam engine, the Industrial Revolution was ushered in by explosive mechanical energy. Since then, modern technology and economy has striven and succeeded to increase the capacity and consistency, quality and quantity of energy usage in society.

Industrial efficiency and productivity represent the forces which drive modern economies. These forces derive from the increased information of applied science and driven by the profit motive. Economic drives thus increases the efficient use of human labor by improving people’s productivity. By this synergism, work adds value to matter and infuses it with form. This stored MEF is equivalent to capital accumulation, which along with the traditional land and labor, represents social wealth.

When to this force is combined with speed, we get economic power. A powerful economy is geared to fast production and quick turnover, thus moving along at a rapid pace. The rate of economic growth is therefore

directly related to increasing buying power, based on the accumulation of MEF resources. The ability of the economy to transform matter, convert energy and manipulate information correlates with its cultural level, structural complexity and technical sophistication. Thus, the higher its MEF flows, the more structured and dynamic an economy must be.

Hyperactive economies however, increase dangers as well as opportunities, because high tension currents create as well as solve many problems. It seems that as energy levels increase, so do infrastructural requirements and overhead costs. Additional increments above a certain point require larger and larger expenditures of energy. This rule of diminishing returns attains zero and finally negative returns when certain high quantities and qualities of energy are used (e.g. nuclear power and luxury goods). In these cases, it takes more energy to produce these commodities than the energy they provide.

Obviously when societies reach such wasteful practices, they must afford excessive amounts of energy. At these high levels, social systems become energy addicted and depend on increasing energy fixes to satisfy their craving, thus pushing tensions to even higher gradients. In order to maintain such expensive habit, societies must extract more and more energy either by depleting themselves or exploiting their environment. Debt and bankruptcy, as well as expansionism and imperialism are phenomena reflecting this pathological condition akin to parasitism or cancer.

Modern economies have now become complex hyperactive systems which extract large quantities of natural resources, transform them into consumable commodities and ultimately expel their byproducts as polluting wastes into the environment. The acceleration of these energy-intensive activities which harness and process huge amounts of raw materials raises crucial questions of how long they can be sustained before they exhaust nature’s finite reserves and inevitably come to an end.

It does not take much foresight to realize that such hypertrophic addiction cannot go on indefinitely. Exponential growth inevitably tapers off either of its own accord or after it empties the available energy supply upon which it feeds. As natural resources deplete, the struggle for them increases and conflicts among rivals become more severe. Competition is now spreading both within and between economies who fight to maintain the energy-intensive way of life to which they have become accustomed, as well as with those who want to rise to those high levels.

It is estimated that the human equivalent of global energy use today corresponds to ten times the present world population, of which a third would live in the most energy-intensive continent: North America. This means that the 250 million citizens of Canada and USA own the manpower equivalent of 80 slaves each. Certainly, dependence on so many working slaves makes life easier, but what does it do to human freedom, employment and security? As the slave owners of old, advanced economies are vulnerable to the risks of disruption in addition to those of revolution, resulting in greater protective insurance costs.

As energy accumulation leads to power concentration, how can humanity use this energy safely and benevolently? Such dilemmas have been faced ever since Prometheus brought fire to mankind, but the definitive solutions, if they exist at all, still elude us. One thing however seems clear by now: that the source of human problems stems from pushing too far and too fast in one direction by using too much FEP, thus falling into the sin of wretched excess. Going to extremes, upsets the delicate equilibrium of natural dynamics and opens up positive feedbacks that threaten to destroy our delicate systems and their environment.

In this perspective, economic sustainability lies in minimizing our capital depletion and living on current energy income. Given the discrepancy between our technical power and social wisdom, the search for

sustainable development could then only be found in a policy of humility and frugality, discretion and moderation as encapsulated by Aristotle's Golden Mean and Tao's Middle Road.

3.2 Society

Resting upon its economic infrastructure, social structure is the central sector of our concerns, as it performs the cultural functions of generation, information and communication. These functions are equivalent to the creative, formative, and sensitive operations of organic systems, thus permitting societies to develop and evolve. Just as organic genes do, cultural memes transmit information through generations and ensure social continuity through time.

Since societies are autocatalytic systems, they are thereby self-evolutionary. When they reach a certain stage of development they become complex adaptive systems, containing many active agents with dispersed controlling structures and multi-purposive behavior.

In social terms, force is the compelence of people to change the status quo. Conversely, social counterforce is the resistance to prevent any change deemed undesirable. Social energy drives collective action and influences cultural values. In this respect, social force correlates with physiological strength and psychological health. The higher the level of these qualities, the more dynamic a society is. Controlling social forces means balancing static traditions with dynamic innovations. Social force is the collective potential of people to maintain their identity, as they develop their creativity.

Obviously all these social variables are intimately related to economic and eventually to natural ones. Since man's relation to nature is similar to that of all organisms, it is a constant struggle to secure some control over the environment, so as to extract sufficient matter and energy to promote and perpetuate life.

By superior intelligence and technological acumen, however, humanity found ways and means to amass and transport large amounts of energy over large distances in short time, thus multiplying their available power manifold. It is in this unique ability to manipulate high energy potentials very fast that makes man such a extraordinarily powerful animal of greatly creative and dangerously destructive force.

The power of human society is superior to that of other species in that its rapid development has taken it above and beyond slow natural evolution or mere environmental adaptation. Since the Industrial Revolution, extensive technological innovations enabled humanity to reshape nature to a great extent, trying to fulfill increasing needs and rising expectations.

Power is valuable because it gives its possessor the capacity to enforce one's will against the resistance of others. This capacity depends on many things, as we have mentioned, but it also depends on perception. Thus a reputation for getting things done goes a long way in getting people to open themselves to one's influence.

The ability to get people to behave depends on the sense of community which ties people together and makes them act collectively. Strong social bonds and a shared community spirit make for powerful societies because they multiply human capacity to get things done smoothly. Social solidarity therefore empowers people to undertake great deeds which would be impossible to do individually. Lotka's Principle recognizes this collective advantage by correlating biological evolution with the steady increase of energy consumption in a system. Accordingly, the natural selection of evolution favors those societies which can utilize large quantities of energy, which presupposes a certain level of complexity and control. Thereby, social progress correlates with energy or economic growth. Great civilizations can only develop as a result of high energy potentials and large capital accumulations.

Yet, as we have warned, such developments, whether economic or cultural, have their down side. Complex and

dynamic societies depend on high potential energy gradients, so they tend to be stratified and hierarchic, therefore unequal. As a result, Ivan Illich proposed that beyond a certain level of development, energy and equity grow at the expense of each other. It may be that high quanta of energy concentrations degrade social relations as well as endanger natural functions.

But, if direct proportionality between equality and entropy does exist, then complex and dynamic societies must necessarily be unequal. Does that necessarily mean that they must also be iniquitous. If that is so, it would seem that mankind must pay a price for using and manipulating high energies. The social cost of economic development is then ultimately inequality and inequity.

If nature does not allow equal distributions outside entropic conditions, the choice is between simple low-energy weak and egalitarian communities and complex high-energy powerful hierarchical societies. Since the tradeoffs between social costs and energy benefits are subject to diminishing returns, each society must decide for itself at which point they are no longer worth the exchange.

It is well known that the distribution of values in the world is extremely unequal. The notorious North-South gap translates into energy consumption in the ratio of 250 to 1: i.e. the average North American uses 250 times as much energy as an African. Such orders of magnitude have raised insistent demands for a more equitable distribution of wealth and its corollary power.

The morals of most people instinctively lead them to concur that these gaps are excessive and should be closed. But this simple and easy solution is entropic and runs counter to natural evolution, if not social progress. So, how can this contradiction between forces and mores be resolved?

As a code of considerate conduct, ethics sets the criteria of acceptable social behavior. By demanding consideration of others, however, morals come into conflict with force which necessitates compulsion of

others. Yet, as antithetical as these two standards may seem, they form part of natural harmony and equilibrium.

Both in nature and culture, relentless conflict and competition coexist with toleration and accommodation. Even in the so-called of the jungle in which power is supposed to reign supreme, consideration and cooperation, egoism and altruism, play a balancing role in the overall scheme of things.

Only as human culture deviates far from nature, is this dynamic balance upset sometimes in some places. With logic supplementing instinct, humanity created the dilemmas between natural ethos and cultural ethics, from which we are now trying to escape. In spite of appearances however, the energetic and ethic antinomy may yet be accommodated.

Consideration of others makes for empathy and reciprocity, thus eventually strengthening community bonds and building mutual respect. Morals, like mores, are therefore important contributing factors of social empowerment, because the best way to get people to do something is by being considerate of others feelings. Consequently, moral behavior enhances power relations and social conviviality.

It is possible then for the power of morality to attenuate the conflict between equity and equality. As a catalyst that strengthens social solidarity, considerate conduct moderates the inequity of inequality. In this way, the social conflicts resulting from the inevitable clash of interests, opinions and volitions in a dynamic society may be minimized, without maximizing social poverty, entropy, or tyranny.

3.3 Polity

We finally come to consider the effects of FEP in the cybernetic superstructure of the social system, where social force and power present their starkest face. This is particularly so in the world arena where power politics or realpolitik sometime deteriorates into violence and war.

Nevertheless, even there, political force is only indirectly related to physical force through the rare but ever present threat of sanctions. Normally, it is rather based on legitimate acceptance by the community. It is most effective when used in moderation and when people or nations are convinced of its necessity. Force in politics is therefore mostly applied through the pressure of public opinion and purpose of public policy, than by fear or violence.

Since politics is a dialectic activity of social conflict-resolution, political effectiveness is measured by the ability to influence public policy and reach collective decisions. This ability derives from the political energy provided by the loyalty and support of the community given to those considered trustworthy and effective leaders.

Charismatic leadership, of course, springs eternal from a mysterious energy source which raises only a few to the heights of political power. The pinnacle of such power allows its holders to set the rules by which social systems operate and hence control the behavior of large masses of people.

Just as the source of economic power is the control of natural resources (matter and energy), and social power is the control of economic resources (work and capital), the source of political power is the control of social resources: people and information. As is well-known, popularity and knowledge, just as money and votes, can often be converted into political force and power, even if the conversion rate is non-linear.

Since the main function of politics is to regulate the distribution of social values, the differentials of such distribution are crucial both as inputs and outputs of this process. Political sub-systems provide a marketplace where influence is exchanged among the participating citizens. Of course, such exchange is asymmetric, because power is unevenly distributed in any but the most primitive or entropic systems.

Accordingly, power is the relative capacity to influence more than be influenced. One’s net power is

this differential between all the forces involved in this social transaction. The relativity of power distribution in society thus determines the form and content of public policy, which in turn channel the MEF flow throughout the system.

It is often said that politics involves who gets what, when and how. Obviously this is a standing question of value distribution in society which raise thorny problems of equity and morality. Relating this issue to what has been said so far, the question is whether political power gradients are as necessary to social life as physical energy differentials are to organic life. Since whenever energy is evenly distributed, it falls into a state of entropy and cannot do any work; if power spreads out too thinly among people, it loses its functional capacity and becomes impotent. Consequently, some concentration of power is both necessary and inevitable in all dynamic situations.

Since power can magnify as well as modify behavior, its exercise implies a discrepancy between different volitions, perceptions or opinions. Power comes into play when resources are used to cajole, convince or compel compliance. Since power is applied against some resistance, it raises the potential of conflict. As everyone values autonomy and freedom of action, forcing something against someone's will creates friction and tension which may result in violence. Thus the danger of playing with power and the need of increasing control as it accumulates becomes crucial.

In any case, the multifunction and intensification of social interactions requires a greater degree of organization and coordination, because increased energy flows demand more care and control in order to avoid chaos. Control seems to have a centripetal tendency because as systems rise to higher levels, power spirals towards the center, as if it is drawn there by a strange attractor. Thus the accumulation of energy and the concentration of power tend to evolve in parallel.

Power concentration provides an effective way of

harnessing, accumulating and releasing large amounts of energy, through which great feats of construction or destruction may be accomplished. This allows fewer and fewer people to control more and more energy, thus acquiring power over people who value energy. Such increased control in turn seeks more energy to bring under its domain, thus creating a vicious circle of power accumulation.

Political power depends on the ability to monitor and manipulate people. Until recently, such power was limited to a small number of people through personal contacts. With modern technology however, the communication time separating people has become more important than their transportation distance. So, effective political power over large numbers is now easier to exercise than ever before.

The thrust of this argument is that energy conversion is an independent variable in an equation where power, complexity and centrality are the dependent variables. Accordingly, the kind of government a society gets depends on the quantity and quality of energy conversion in the system. Low energy societies tend towards laissez-faire regimes and decentralized institutions, whereas high energy societies develop heavy structures and powerful states. Political evolution thus follows energy development.

Consequently, social systems concentrate decision-making by forming larger and higher structures. As Michel's Iron Law of Oligarchy recognizes, there is a clear tendency for the few (elites) to dominate the many (masses). With each incremental growth of structures and actions, new power bases are built. As power expands, the system must increase its complexity to contain the additional amount. As a result, increased control becomes imperative and individual freedom of action impossible.

As the historical record shows, even the best of men cannot easily handle too much power. Although power is normally an instrumental value, sometimes it becomes an end in itself, when controlling others gets to be emotionally satisfying. The Actonian adage power corrupts

aptly describes not only this human weakness but a general truth of the danger of high voltages. As power becomes more potent, whoever handles it risks burning himself as well as others. But having eaten from the tree of power, humanity has lost its innocence and cannot or will not abstain from it voluntarily.

Although it is true that the arrogance of power leads to corruption which ends in hubris; it is also true that the paradox of power reflects the impotence of power illustrated by the helpless giant. Obvious weakness may translate into great power, when accompanied by affection, as children figure out in their dealings with adults.

These power dilemmas can be resolved in the same way as ethics, by infusing politics into the social equation. Since politics resolves social conflicts dialectically, it is analogous to ethics which prevents such conflicts dialogically. In that sense, they complement each other's attempt to modulate or soften the effects of power.

Politics, like ethics, depends on dialogue between opposing positions, trying to convince rather than coerce. Like power, however, the end goal is the same: making people behave in a certain way. But, getting them to do so by consenting rather than compelling them makes all the difference between civilized and brutalized behavior.

This final synthesis between social ethics and power politics shows the way of civilizing force by the use of mutual consultation or negotiated consensus rather than unilateral dictation or peremptory command. In both cases force or power are being exercised to change one situation into another, but they do so in two significantly different ways: one is savage and primitive, while the other polite and humane.

Unlike the usual derogatory connotations associated with power politics, our analysis here sees power as a neutral instrument for good or evil purposes. What makes its use one or the other kind depends on the ethical component attached to it. Thus, there is no necessary contradiction between social ethics and power politics.

On the contrary, since politics is necessarily related to ethics, power makes both feasible. Although it is true that power without morality is harsh and brutal, politics without power is inoperative and ineffective. As we have shown, however, one does not have to choose between the undesirable and the impossible, since a judicious mixture of power politics could be the optimal or at least satisficing choice.

With this pragmatic combination, we conclude this anatomy of power. As a synopsis, we present the table below which cross-cuts the three variables with their domains, in a similar manner as in the previous sections by intersecting FEP and ESP.

	FORCE	ENERGY	POWER
ECONOMY	Industry	Capital	Ownership
	Profit	Money	Reward
	Production	Wealth	Acquisition
SOCIETY	Creativity	Action	Fellowship
	Influence	Education	Honor
	Innovation	Health	Repute
POLITY	Legitimacy	Loyalty	Leadership
	Sanction	Charisma	Control
	Pressure	Stealth	Policy

Our trichotomy of the social system distinguishes among its metabolic, informatic, and cybernetic functions; in each of which force, energy and power play a somewhat different role. Since these functions are all concerned with the influence of human thoughts and actions through which social change can be effected or prevented, they are canonical variations on a single theme.

Power manifests itself as ownership, fellowship, or leadership, depending on the arena it focuses; just as energy translates into wealth, health or strength, and

force into industry, creativity or legitimacy, as they affect different institutions in the economy, society and polity. Thus, we have outlined the salient elements of these social parameters in a simple, succinct manner.

Real force and power, of course, are much more brutal and complicated. Nevertheless, this does not mean that they cannot be understood and explained in a simple way as we have done here. Scientific methodology does precisely that by showing how a few simple rules can model an enormously complex reality.

The clear lesson we can draw from this cloudy reality is the necessity to correlate our control of FEP by a sense of economic sustainability, social adaptability and political responsibility. In order to avoid the dangers of playing with fire, as human power increases, so must its wisdom. Although the impotent may be allowed stupidity with impunity, because they cannot do much harm anyway, the powerful who can, do not have such luxury. So, since humanity has now reached such precarious stage, it could either heed this moral imperative or perish.

CONCLUSION

We close this brief study by a synopsis of our principal concepts and their interrelations. The upper schematic in the next page contains a dozen of these notions, from the most basic SET to the most complex FEP. The arrows, of course, indicate how only three simple concepts combine to generate all the others.

On this terminological foundation, we built some correlations between natural resources (MEF) and social sectors (ESP), using the methodical integration of socio-physics. Finally, we completed a sociological analysis of power applying to synergetic economics, syntropic ethics and cybernetic politics, shown in the lower schematic.

Power impacts into the three spheres of action to shape things and events. Focusing on the Sociosphere, we noted the problems of economic hyper-accumulation, social

maldistribution, and political unregulation, whose respective solutions of sustainability, adaptability, and responsibility lie in optimizing the capital/income, equity/equality, control/freedom ratios. Having said this of course does not mean that we could or should apply such solutions in practice.

What we have done here is point to some interesting relations and metaphors between thermo, psycho, and socio-dynamics which suggest a promising direction for further work. This study then is more seminal and heuristic than detailed and definitive.

Further comparative sociological, geographical and historical studies should tell us how different social systems cope to continuities or changes in MEF flows. In particular, it is important to know how various scientific concepts, such as energy and entropy, translate from physio-organic to socio-economic systems. With this knowledge, we can adjust politics to different situations, thus increasing our chances of survival and development, both as cultural entities and natural species.

If countering entropy means concentrating power potentials and increasing energy differentials, any such attempts augment social differences and inequalities, thus widening the gaps between rich and poor, or powerful and weak. The explosive significance of that analogy becomes readily apparent because it makes democratic and egalitarian societies or ideologies pro-entropic and hence anti-life: a conclusion that goes against our moral intuition.

But, is this intuition or simply the dominant paradigm of our civilization? Are traditional elitist philosophies more natural than modern egalitarian ideologies? If that is so, how far can one go in fighting entropy before the costs become intolerable? Premature entropy after all may not be the worst fate for humanity; only its ultimate end, if all else fails. As it is often said, the only way to avoid old age is to die young.

Perhaps the only way for mankind to fight the slow death of entropy is to live a short life heroically and

dynamically, even if it means promoting exploitation, injustice and conflict. But then, these stark and equally distasteful alternatives may not be out only options. Economic restraint, moral respect, and political responsibility can attenuate the dangers of extreme energy, fatal force and oppressive power.

It is possible that the human mind may find other counter intuitive ways out of this dilemma and thus localize, temporize and optimize the best of all practical worlds. For that however we have a long way to go and a lot of work to do. This study is a small contribution to this never ending endeavor.

BIBLIOGRAPHY.

P. J. Arnopoulos: Sociophysics. Nova Science, N. Y. 1993
Sociopolitics. Guernica, Toronto, 1995
B. Adams: The Law of Civilization & Decay.
Books for Libraries, Freeport, 1971
R. N. Adams: Energy & Structure. Texas U. P. Austin, 1975
K. T. Bailey: Social Entropy Theory. SUNY, Albany, 1990
B. Barry (ed): Power & Political Theory. Wiley, London, 1976
D. Bell: Power, Influence & Authority. Oxford, N. Y. 1975
W. Berkson: Fields of Force. Routledge Kegan Paul,London, 1974
J. Bhagwati & J. Ruggie (eds): Power, Passion, & Purpose. MIT, Cambridge, 1984
P. M. Blair: Energy & Power in Social Life. Wiley, N.Y. 1974
K. E. Boulding: Ecodynamics. Sage, B. H. 1978
R. Brym: From Culture to Power. Oxford, Toronto, 1989
T. Burns & W. Buckley: Power & Control. Sage, B. H. 1976
F. Capra: Social Implications of Modern Physics. Simon & Shuster, N. Y. 1982
W. Clarke & J. Page: Energy, Vulnerability & War. Norton, N. Y. 1981
R. S. Cline: World Power Assessment. Westview, Boulder, 1975
B. Commoner: The Poverty of Power. Knopf, N. Y. 1976
P. Corning: The Synergism Hypothesis. McGraw-Hill, N. Y. 1983
C. Crawford: Balance of Power. Microsoft Press, Redmond, 1986
P.C.W. Davies (ed): The New Physics. Cambridge U.P. 1989
G. Debnam: The Analysis of Power. Macmillan, London, 1984
K. W. Deutch (ed): Eco-Social Systems & Eco-Politics. Unesco, Paris, 1977
N. Elias: Power & Civility. Pantheon, N. Y. 1982 G. B. Feckes: The Hierarchy of Energy Systems. Sage, B. H. 1988
J. Foster etal: Energy for Development. Praeger, N.Y. 1981

B. R. Fuller: Synergetics. Macmillan, N. Y. 1975
J. K. Galbraith: The Anatomy of Power. Houghton Mifflin, Boston, 1983
N. Georgescu-Roegen: Energy & Economic Myths. Pergamon, London, 1976
P. Glansdorff: Thermodynamic Theory of Structure. Wiley, N. Y. 1971
K. Goldmann & G. Sjostedt (eds): Power, Capability, I4545————————————Ønterdependence. Sage, BH,1979
R. B. Graber: Scientific Model of Sociocultural Evolution. Jefferson UP, Kirksville, 1995
H. P. Green: Power & Evolution. South Carolina U. Columbia, 1986
H. Gunsteren: The Quest for Control. Wiley, London, 1976
H. Haken: Synergetics. Springer-Verlag, N. Y. 1977
P. Harman: Energy, Force, Matter. CUP, London, 1982
M. Hesse: Forces & Fields. Nelson, London, 1961
F. Hirsch: Social Limits to Growth. Harvard U. P. Cambridge, 1976
I. D. Illich: Energy & Equity. Harper & Row, N. Y. 1974
M. Jammer: Concepts of Force. Harvard, Cambridge, 1957
B. de Jouvenel: On Power. Beakon Press, Boston, 1969
M. Kaus: The End of Equality. Harper-Collins. N. Y. 1993
R. O. Keohane & J. S. Nye: Power & Interdependence. Scott, Foresman, Boston, 1989
S. A. Kauffman: Origins of Order. Oxford U. P., 1992
J. Kornai: Anti-Equilibrium. North-Holland, Amsterdam, 1971
K. Knorr: The Power of Nations. Basic Books, N. Y. 1975
S. Kreisberg: Transforming Power. SUNY, Albany, 1992
4545————————————dH. D. Lasswell & A. Kaplan: Power & Society. Yale U. P., N. H. 1950
E. Loebl: Humanomics. Random House, N. Y. 1976
S. Lukes: Power. Macmillan, London, 1974
R. May: Power & Innocence. Souvenir, London, 1974
W. McNeill: The Pursuit of Power. Chicago U. P. 1982
G. T. Miller: Energetics, Kinetics & Life. Wadsworth, Belmont, 1971
C. W. Mills: The Power Elite. Oxford, N. Y. 1956
P. Mirowski: More Heat than Light. Cambridge UP, N. Y.

1989
E. J. Mitchell: Energy & Ideology. A. E. I. P. R. Washington, 1977
G. T. Miller, Energetics, Kinetics & Life. Wadsworth, Belmont, 1971
L. von Misses: Human Action. Yale, N. H. 1959
E. Mortimer: Faith & Power. Vintage Books, N. Y. 1982
L. Mumford: The Pentagon of Power. Harcourt-Brace, N.Y. 1970
J. H. Nagel: The Descriptive Analysis of Power. Yale U. P., N. H. 1975
H. T. Odum: Energy Basis for Man & Nature. McGraw-Hill, N. Y. 1976
W. Ophuls: Ecology & Politics of Scarcity. Freeman, S.F. 1977
J. OÕTool: Energy & Social Change. MIT, Cambridge, 1976
M. Parenti: Power & the Powerless. St. Martins, N.Y. 1978
R. Parkman: The Cybernetic Society. Pergamon, N. Y. 1972
T. Parsons: The Structure of Social Action. Free Press, N.Y. 1968
M. Peckham: Explanation & Power. Seabury, N. Y. 1979
R. Perry: Hidden Power. Beaufort Books, N. Y. 1984
D. Pines (ed): The Emerging Synthesis in Science. Addison-Wesley, Redwood, 1986
A. Ranney: Channels of Power. Basic Books, N. Y. 1988
R. A. Rapparort: Energy & Power. Freeman, S. F. 1971
J. Rifkin: Entropy. Viking, N. Y. 1980
J. Rouse: Knowledge & Power. Cornel, Ithaca, 1987
J. M. Rothgeb: Defining Power. St. Martins, N. Y. 1993
B. Russell: Power. Unwin, London, 1983
R. G. H. Siu: The Craft of Power. John Wiley, N. Y. 1979
R. Stoll & M. Ward (eds): Power in World Politics. Rienner, Boulder, 1989
M. P. Sullivan: Power in Contemporary International Politics. South Carolina UP, 1990
T. L. Thorson: Biopolitics. Holt, Rinehart, Winston, N. Y. 1970
A. Toffler: Powershift. Bantam, N. Y. 1990
R. Thomas (ed): Kinetic Logic. Springer-Verlag, Berlin,

1979
N. Tosches: Power on Earth. Arbor House, N. Y. 1986
M. Waldrop: Complexity. Simon & Schuster, N. Y. 1992
D. M. White: The Concept of Power. General Learning, Morristown, 1976
M. Wight: Power Politics. Leicester U. P. 1995
M. Willrich: Energy & World Politics. Free Press, N. Y. 1975
R. L. Wing: The Tao of Power. Doubleday, N. Y. 1986
A. M. Young: The Geometry of Meaning. Robert Briggs, Mill Valey, 1976
D. H. Wrong: Power. Harper-Colophon, N. Y. 1979
W. H. Zurek (ed): Complexity, Entropy & Information. Addison-Wesley, Redwood, 1990