

Medical Science is a Self Organizing Social Environment

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Science, like the market, is an archetypal Self Organizing System. The essence of these systems revolves around Freedom of individuals, as opposed to executive subordination or other forms of supervision. “Free flow of information” is a central, primary fundamental. Indeed as Science in Medicine has matured, the breadth and scope of the communication channels have extended to include a plethora of verbal, written, abstracted, peer reviewed and observational publications and compendial syntheses in the form of review articles and books. The immediacy of presentation of informed hypotheses and “preliminary” observations verbally is encouraged by scientific urgency for early “priority” publication. Where previously information flow awaited “print form” publication, the current volume and complexity of new knowledge requires electronic access with “search engine” similarities to more widely known systems such as Google. Indeed modern journals are now available as searchable knowledge sources. If they were not, they would disappear as obsolete artifacts of a now forgotten, recent past.

The other fundamentals for Science as a Self Organizing System are related to more personal freedoms. While the central, primary fundamental is a generic societal freedom of information flow, the personal fundamentals are:

- Selection of information relevant to self
- Freedom of decision
- Freedom of action

Personal attribution of meaning to information is critical to the second fundamental of Self Organizing Systems – “Freedom to select information relevant to self” for it is the individual scientist that accesses information for personal relevance. Thus thousands of assessment initiatives termed “data mining” or “bioinformatics” are applied to the analysis of scientific relevance, validity, and authenticity of information, in the form of review by scientists.

This is the essence of the “Scientific method” - that is, the continuous testing of information in search of validity through assessment of disprovability. This process encourages refinement (corrections) to nondisprovable information and the parallel capability to discard obsolete information.

The capacity to activate the remaining two major fundamentals – “Freedom of Decision” and “Freedom of Action” are affected by the organization in which each scientist works. If the organization in question is heavily focused on “information as a source of power” or as marketable “intellectual property” then the individual scientist may be afforded less freedom by the organization’s managers or may respond personally to the organization’s culture by focusing enquiry to be coherent with agency goals. If the agency is more focused on creation of new knowledge as are most universities, then a more open system will exist. Additionally as scientific query is costly, substantial resources are required for its prosecution and the extent of investigative freedom may also be affected by limiting the topics that can be studied. If the organization’s source of funding is a “profit-oriented” corporation, deliverables and accountability will more likely be prescribed than in more open systems. Fortunately, in Medical Science there are numerous open organizations including Public Universities and Federal granting agencies in both the USA and Canada that, despite substantial bureaucratic pressures still encourage and fund original research and permit a degree of discretion to the investigative scientist. In each setting grant requests are carefully scrutinized and are typically reviewed by peer adjudicators and grants panels. This is not to suggest that at each level scientific bias is not exercised, it is. However, had there not been broad latitude afforded original research by these agencies over the past six decades, the huge strides of modern Medical Science would not have occurred.

After World War 2 in the USA, the National Institutes of Health initiated research programs with a fundamental speculative bias. Similar systems were implemented in Canada and the UK. In colloquial terms the programs operated as follows. If an investigator could demonstrate a track record (published reports of scientific research), then proposed an investigation that to several reviewers seemed plausible, he was given research funding to pursue the ideas. If at the conclusion of the project the researcher had made discoveries and also come up with another plausible proposal, additional funding would be forthcoming. This speculative grants architecture stimulated an outpouring of innovative concepts unparalleled in human history. This system also has had its critics and during the presidency of Ronald Regan it reached a nadir. The US Federal National laboratory system in the mid 1980’s was felt to be an unaccountable system costing large amounts of money and

not held to account for deliverables through adequate “funding management” procedures (Crease 1991). Consequently scientists at these agencies were required to write contracts for funding with specified deliverables for research initiatives. To guarantee that research targets were met, research about the “unknown” could not be pursued with any certainty of meeting these delineated deliverables. As a consequence of this improvident and illogical, politically determined and enforced system, the number of new ideas generated dropped. Creativity cannot be commanded as a bureaucratic requirement.

The “systemic resource” of science is the “validated non-disprovable observation”. It is essential that authentication of existing as well as new knowledge occur and further that it be tested against evolving knowledge and with the latest technology. Regarding the latter, human ingenuity has led to technological innovations determining productivity increments of about 1.5% per annum, compound over the past 2 ½ centuries (Taylor 2001). This is in excess of 350% percent per century and shows no sign of abating. Given this propensity for technological innovativeness – propelled by market (efficiency) with scientific motivation and curiosity, old scientific hypotheses, concepts, beliefs and eternal verities come under recurrent and constant screening. It is through this phenomenon, in part, that scientific frauds are uncovered. Additionally numerous scientists have a built in tendency to be skeptical and take some delight in “putting paid” to overblown findings. This general propensity also leads to discovery of careless science such as the HeLa Cell contamination scandal (Stern 2004). To suggest that all scientific research is carried on with a pure monastic type of focus on the unknown would be disingenuous. Scientists have needs beyond satisfying their own curiosity or exposing errors of others or scientific fraud. This exposes a fundamental difference in original research in an open system vs. adaptional or translational research in a corporate or industrial agency. In executive systems whether political, theocratic, industrial or corporate – information is sequestered and aggregated at the broadest bureaucratic level, “information is power” and thus not shared, also at the industrial and corporate level, information is an intellectual property and may be sequestered through copyright or patents or just plain hidden for local use only! This description is precisely the opposite of an open system by permitting only limited “flow of information.” From the perspective of an individual scientist in an open system such as the typical public university this is problematic as academic promotion requires researchers to distribute knowledge widely to gain national and international recognition. Thus in an open system there is tension between organization pressure to sequester and protect knowledge, and personal pressure to distribute knowledge promptly. It is this balance that fosters continuing innovation in Science. Today some major Corporations, such as eBay have

recognized the value of broad conceptual input into processes and have moved to “open source” research. Linux operating system is another example of this acknowledgement.

It is also acknowledged that corporate motivation to protect and restrict knowledge flow is a coercive imperative that may affect the clarity of reporting of scientific findings. After several high profile cases of corporate attempts to conceal negative results and some scientists not acknowledging conflicts of interests such as owning shares or being on the payroll of corporations about whose products they were reporting, glowingly, now all reputable Medical journals require written (and published) disclaimers as do all reputable Medical academic organizations where preliminary data and assessments are presented verbally (Accreditation Council for Medical Education).

One aspect of Medical Science has been especially challenging. This relates to a knowledge driven aspects of Medical practice. Where 50 years ago the largest component of Medical care costs was professional fees (not counting institutional/hospital costs) today the balance is shifting towards pharmaceutical costs as being the dominant component. This has drawn huge industrial agencies – pharmaceutical corporations into vastly expanded action. Each corporate agency acts to maximize its profits. This clashes with “Free flow of information” in a crucial way. When a new drug is proposed, it must be tested through a “Clinical Trial” where the drug is tested by physicians on willing patients. The original design was crafted to provide a “final answer” as to suitability, without a structure to follow up on late occurring negative outcomes, purposely. This conclusive single clinical trial structure is required by the pharmaceutical companies so they can earn back the huge cost of creating the drug, and also to earn a profit. This is best achieved through a subsequent ten to twenty year run of sales, until the patent period has expired, without unwelcome disclosure of negative outcomes. Recent examples of this process without adequate patient follow-up to ascertain whether there were long term consequences i.e., acting as if the clinical trial were immutable proof that required no further study has lead to serious (some lethal) outcomes, such as Fen-Fen and other cardiac drugs. This has stimulated major discussions in the U.S. and Canada proposing definitive follow-up studies that render the initial clinical trial open to iterative analysis – a fundamental of the Scientific Method (Blumenthal 2003).

This above is a classic example of an organization of the ‘Market’ Domain acting in such a way as to distort the functioning of the ‘Science’ Domain. The actions of the pharmaceutical corporations are correct and proper for a well managed agency acting properly in the best interests of shareholders in the market. Unfortunately, these Agency interests are in conflict with Science Domain fundamentals noted above. What eventually acts to create

a rectifying incident is the fact that Medical Science journals and academic organizations are designed to provide a free flow of information, and that combined with the Internet open source structures outcomes whether good or bad are widely publicized.

Medical Science is far from immune to distorting influences by organizations within Science itself as well as within the other Self Organizing Systems. Numerous high profile examples exist and include political agencies attempting to restrict stem cell research through legislation, religious organizations attempting to limit stem cell research through threats. Corporate attempts to preempt open access to intellectual properties (Celera) eg. DNA genome sequencing where open systems (NIH, etc) attempt to maintain open access. Science of course has numerous agencies operating within its domain that attempt to skew political decisions regarding allocation of resources or areas of study focused recently on the above cited corporate examples.

Additionally, granting agencies, government ministries and hospital administrators have discovered “Return on Investment” and are now forcefully requiring extensive business case analyses of “ROI” from researchers. This preoccupation with “ROI” has flooded the public research system with a ‘deliverables’ perspective encouraging translational research as it is the perspective of many managers that previous research has built up a huge bank of ideas and information begging to be applied to today’s problems. Thus the argument goes that if so much knowledge is already in the ‘databank’ there is little return on investment “ROI” in creating more!

As a balance to the above, Medical science is rapidly iterative in that new ideas on interest-based systems rapidly render existing knowledge truly ephemeral and readily replaced with better understandings based on novel findings that show earlier ones to be incomplete and relegate them to a historical repository of former beliefs. This is not to imply that all Medical Science is ephemeral. Broad generalities are clearly more lasting, such as the concept of contagion or the implications of genomics in cancer. Important details as to how these phenomena occur are however certainly subject to rapidly evolving scenarios.

The processes of Knowledge development and its evolution in Medical Science are characteristically those of an Emergent or Self-organizing system with free flow of Knowledge and Information taking place at innumerable Medical Science meetings world wide where investigators, physicians, students, postgrads and others present their works. To be sure, there is a degree of scrutiny of these offerings but there is later unfettered critique of tens of thousands of presentations. This counters managed or biased efforts to regularize the offerings.

Presentations are nowadays typically posted on websites¹ for consideration by a wider audience. It may be feasible for a small focus group to limit discussion transiently but given the volume of work and disparate presentation sites it is virtually impossible to suppress knowledge except for short periods in our interconnected world.

Thus the second fundamental of Emergent systems – ‘Selection of information relevant to self’ is facilitated in Pathology the “Natural Science” of Medicine through presentation of thousands of papers and hundreds of new academic courses each year at meetings, then on the World Wide Web (Hardwick 2007) free for anyone to view

Pathologists world wide and also basic medical science researchers generate an avalanche of new knowledge available for countless others to explore, act upon, and then repeat the cycle. Application of the conceptual basis of Emergent system logic in the “International Academy of Pathology”⁷ a century old global academic organization fosters both the concept and also the success of this organization. The basis of the organization’s global mission is to foster and maintain an unfettered free flow of Pathology/Medical knowledge to Pathologists and others world wide. To be sure there is structured review of the proffered knowledge after accessioning. The organization has 29 divisions worldwide with 25,000 members who respond to annual solicitation of ideas that are then assessed by hundreds of volunteer reviewers to eliminate unsubstantiated material as well as any nonsense and fraudulent presentations. We believe that the scope of this (thousands of papers, hundreds of reviewers, dozens of global Divisions) renders censorship and institutional bias over time to be extremely unlikely. Given the Hayekian logic in Emergent systems of persons acting ‘knowledgeably’ in their own best interest, elimination of spurious and ignorant input seems consistent (Hayek 1982).

Within public Universities there is now constant pressure to protect “intellectual property” fostered by ‘corporate agency’ imperatives and also individual scientist’s mixed personal motives that, may include monetary interests. Countering this is the above noted personal imperative to publish results widely and promptly for acknowledgement and recognition (promotion) a right typically fostered through protection of Academic Freedom by a University Senate with attribution of tenure to the scientist as a way of ensuring freedom of inquiry and of open public presentation. This latter is often misinterpreted by both professionals and the general public as a sinecure. Thus Science as a self organizing domain in Society shares with the Market and Liberal Democracy the confounding influences of internal and external Instrumental Agencies. Discussions of the basis of this, including individual persons self interests, is beyond the scope of this analysis. However, a search of the literature over the past 2 ½ millennia suggest that this tension which

appears to have always existed will continue. An example of this Tsun Tzu (1965), a Confucian disciple of 2500 years ago wrote “on Kingly Government.” Tsun Tzu building on the philosophy of Confucius and an earlier disciple Mencius pointed out that as peoples likes and dislikes will be the same there will be strife, riot and poverty. Francis Bacon (Howe 1908) in an Essay on Friends and Followers notes “There is little Friendship in the World and least between equals”.

Our capability to balance these apparently natural tendencies was dramatically altered by the European and Scottish Enlightenments. These two coherent but different social processes have resulted in the Freedoms that we, as derivatives of these events, now enjoy. It is the Freedoms afforded those who encourage acknowledged distinction of personal roles and accepted divisions in society such as Division of Labor (Smith 1937). As we acknowledge these distinctions, so we empower each of his or her freedoms – to operate as citizens in a Society with Self Organizing systems as an overarching operational architecture.

Pathology as the natural Science of Medicine has progressed over the past 1½ centuries from gross tissue “answers” and basic microscopic “answers” through special stains, electron microscopy and immunological tissue stain answers (Hardwick 2005). Current answers to the questions of clinical and scientific medicine focus on genomic and proteomic microarray analysis with targeted answers related to personalized phenotypic analysis. What has been a constant has been the role of Pathology as the integrative repository of knowledge providing “meaningful” answers about the science and clinical aspects of Medicine. What is also constant is the iterative aspects of Pathology where with each new analytical innovation, the “accepted” knowledge of the day is retested, again and again. This represents application of the “Scientific Method” to matters of human disease which moves pathologic understanding continually forward towards scientific truth, again defined as the most current non-disprovable hypotheses and diagnostic scheme. Thus Pathology (Cushing 1925) provides an integrated, knowledgeable, and meaningful support for iterative understanding of the causes and mechanisms of disease to provide knowledgeable advice to physicians and surgeons.

Notes

¹ See, for instance, United States and Canadian Academy of Pathology – Educational Materials 2002-2007, <http://www.uscap.org/>.

Appendix 1 - Research Prospects

Aspects of Science/Medicine as a Self-organizing system are fruitful areas for exploration related to the volume of knowledge currently available for translation into effective actions and the intent of organizations to impact these actions. With more or less constant increase in productivity through the application of new knowledge to effect continuous improvement in efficiency, Government and Market related agencies now posit that there exists a vast amount of knowledge available in Medical Science that requires translation (adaptive implementation) into efficiencies, and since there is so much knowledge already available, there is little reason to continue to create new knowledge as there would clearly be little, if any return on investment.

The first issue, the existence of vast amounts of existing data/information/knowledge, has led to Research Funding agencies such as the US National Institute of Health to hold sessions to educate scientists about this, and explore ways of utilizing available data bank “mining” and “bio-informatics” tools to access existing knowledge. The actual consequences of this on the creation of new knowledge has not yet been explored, although it is anecdotally expected that with existing knowledge, “translation” efficiencies, (ROI) will improve.

New knowledge in Medical Science must be tested repeatedly given the prospect for iterative updates with ongoing research. This need is currently blunted by market pressures and is a fertile field for study. I cite recent papers in the New England Journal of Medicine (Smith 2007; Heinig 2007) – a highly prestigious medical journal delineating the obvious agency bias of the US Federal Government in blunting medical science agency attempts to ensure follow-up on approved pharmaceuticals to ascertain long-term safety. The government agency, The Food and Drug Administration has consistently limited formal proposals by The Institute of Medicine (IOM) to conduct surveillance measures on approved pharmaceuticals that might impact sales of drugs by the pharmaceutical industry. With the vast Medical Science knowledge base available for translation into action, one can anticipate increased Market agency actions to impact Political and Science domain programs.

Another aspect of Emergent systems related to the above is the impact of knowledge transmission volumes and rates on creating an “extremely” rich information environment. Given the rapid wireless and fibre optic systems now becoming available, and the volume and searchability of knowledge banks, appropriate systematic documentation and analyses of these effects ought to be pursued vigorously.

Appendix 2 - Some Thoughts on Interdependent Relationships

There is a tendency to think in terms of a binary when considering self-organizing systems as compared to agencies or other social groupings. Whereas the social domains that are self-organizing fulfill Hayekian Emergent order criteria, those and other organization structures not only do not, but display a number of interdependent relationships. The most cited and obvious example is the coordinated executive structure of hierarchic agencies or organizations. This concatenate structure is familiar to all who work in corporate structures, belong to theocratic organizations or wander about in society getting food in stores, gasoline at gas stations, money from banks, or being treated in hospitals. We tend to generalize that systems are either ordered as a hierarchy or are open systems. This oversimplifies the complex interdependencies that exist in personal and institutional situations described by numerous authors from Confucius (Sacred Books of Confucius 1965) and his disciples Mencius and Tzun Tsu 2,500 years ago, to the nuanced writing of Jane Jacobs (1992). Examples of this complexity abound with Francis Bacon (Howe 1908) commenting on the Interdependent 'Friend' relationship noting that although friendship does exist, it is a rare phenomenon, often succumbing to the ubiquitous superior-inferior relationship. Thus 'Friend' can be considered an additional interdependent relationship that relates to neither the Emergent spontaneous order concept, nor to the ordered hierarchic executive system.

If one reads "Systems of Survival" by Jane Jacobs, one component is the consideration of hierarchic systems, where she is explicit in describing "Guardian" behaviour noted in executive orders. She also describes a "Commercial" behavioural structure that relates to Hayekian open systems, but also notes that it relates to 'Professional' behaviours wherein the professional person is subordinated to his or her discipline's expectations but not to an immediate superior or boss. This latter relationship is discussed extensively by Eliot Friedsen (1986) in his book on "Professional Powers"⁴.

Confucian authors also indicate that 'Family' is a separate order with numerous interdependencies including husband and wife, father and eldest son, eldest son and second son, and many others. These relationships are fostered or confounded by many nuanced behaviours including love, hate, devotion, trust, sex, and others too numerous to mention. To be sure there is, and always has been, the requirement to care for or 'socialize' children but reducing this relationship to a single foundational 'economic' relationship, as in "providing for", is inappropriate. Also, this speaks to an ingrained academic preoccupation with market, corporate or economic idioms.

What is apparent is that the Emergent order structure is foundationally based on the interdependence of independent equals – a relationship explicitly rejected by the Tzun Tsu (Sacred Books of Confucius 1965) as unworkable and implicitly rejected by executive and theocratic systems. Indeed we can thank the

writers and thinkers of the European and Scottish Enlightenment, spreading their ideas around the North Sea littoral for the freedom to experience Spontaneous Orders!

Appendix 3 - Independent Equal Status, Central to operation of Spontaneous Orders, Anathema in the operation of Instrumental Organizations; Cosmos and Taxis revisited.

Spontaneous Orders (Hayek 1982) from Market and Science to Liberal Democracy (diZerega 2002) all have one fundamental in common and that is Freedom. Freedom of information flow and access, freedom to select information of relevance to each individual, freedom of individual decision and freedom of action constrained only by the need to respect the freedom and rights of others represent this constellation's operational rules. This construct empowers individual's freedom as equals in society. Confounding this ideal and requiring a means of regulating individual behaviors is the reality that the interdependence of independent equals is the most problematic of all interdependent states.

Thus for Society to function, this interdependent state must be accommodated. Whether a society is organized or "ordered" as "class and caste", division of labour or as theocracy / dictatorships or management in a hierarchy the independent equal relationship lurks beneath the surface as a constant destabilizing influence. When one searches the literature for mention of the relationship of equals or discussions of equality, one finds myriad sources from eminent thinkers over the past two and a half millennia of recorded thought. Hsün Tzu (1965) and another Confucian disciple, Mencius (1965: 93) both commented on this state. Unlike Hsün Tzu who saw the need for punitive measures to correct natural and imperfect tendencies of errant humans, Mencius felt that social structures such as Confucian Learning and Morals should be followed to foster perfection of people who were born good and needed perfecting, a view similar to that of Confucius (1979) himself. In more recent literature the position of Hsün Tzu is somewhat parallel to Thomas Hobbes (1991) whose social theorizing led him to conclude that a powerful central state with coercive powers was necessary to maintain order in a society of self interested individuals. Perhaps the position espoused in Karl Marx's (1944) early writings more closely resembled that of Mencius. Marx posited that changing the social order to ensure communally held property and resources would lead to an order that would be self perpetuating as individuals began to respect the norms and wishes of others. We know where that ultimately leads with the playing out of personally aggregative tendencies by

those with access to the treasure of their choosing and the capacity to disenfranchise and subordinate others in a society without entrenched moral imperatives of a “Confucian” order.

Additional literature on this subject includes for example, Francis Bacon’s (1908: 153) Essay “Followers and Friends” where he explores these relationships. In the penultimate sentence, he states “There is little friendship in the World, and least between equals, which was wont to be magnified,” and then concludes “That, that is is between superior and inferior, whose fortunes may comprehend the one the other.”

Daniel Bell (1972) engaged in an extensive discussion on Meritocracy and Equality and concluded with a reasoned analysis of “The redefinition of Equality.” This turns out to revolve around “whose ox is being gored.” The redefinition is from equality defined as equality of opportunity to the Lockean concept of equality of result. Bell observes “contemporary populism in its desire for wholesale egalitarianism, insists in the end on complete leveling.” It is not for fairness, but against elitism, its impulse is not justice but “ressentiment” the latter a term used in similar mode by Nietzsche. The prospects for a successful “leveling” would appear to be about as likely as for the Leveler’s movement in England in the 1640s (Manning 1978: 340) which collapsed in dissonance. de Tocqueville (2000) in “Democracy in America” recognized this prospect in our society, “democratic institutions awake and flatter the passion for equality without ever being able to satisfy it entirely.”

As one explores the concept of equality or the obverse, inequality, through amoral familism the depth of the dilemma manifests itself. (Banfield 1958). Finally, the conclusion that the inter-relationship of the independent equals is tentative, precarious, animated by subjective interpretation and then re-interpretation suggests improbability of stability and indicates a need for formalized mechanisms to maintain social order.

As Social Order is modified by individuals within the “order” it is subject to the behaviors of individuals, emotional or rational, features that, too, will vary over time with social occurrences resulting in individual’s interpretations and responses, in aggregate. Thus as analyzed by Pitirim Sorokin (1937) and recently studied by Peter Van der Molen (1989), social order appears to be cyclic. This betrays a pathophysiological bias in observing cyclic phenomenology in the hormonal, structural and neural origins of virtually all human systems, suggesting a similar societal existence. Social Order is also a state that is interpreted and modified by the inhabitants of the society within bounds acceptable to themselves for various reasons relating to money, power or prestige. Empathy also appeared to play an important role according to Smith (1976).

Understanding that “order” is the consequence of a sequence of occurrences is important. This dynamic is related to aggregate actions of individual’s initiating or responding to a preexisting “order”, itself the consequence of aggregate actions of individuals responding to previous ordered states.

Two different “Social Order” structures animate the governance of a majority of humankind, globally. Both are founded on the requirement for division among with distinction between different individuals and institutions as a fundamental for Social Order. One, governing Chinese society a hierarchic or executive society is the division of class and is of Confucian origin with the clearest exposition of the philosophy contained in the writings of Hsün Tzu (1965) in the second century B.C.E. In his discussion of social order Hsün Tzu emphasized the need for division in society. The Confucian social order is a division of class and explicitly eschews the prospect of interdependent equal:

“When division is equal, there is no distinction; when power is equal, there is no unity; when the multitude is equal, there is no order. When heaven and earth exist, there is distinction between the high and the low. When the enlightened king arises, the state is governed by different institutions. For two superiors cannot serve each other, two inferiors cannot order each other; this is the law of heaven. When people’s power and position are equal, so their likes and dislikes are the same, things will not be sufficient to satisfy them, and hence, strife will invariably result. When there is strife, there must be riot; when there is riot, there must be poverty.”

Social order is thus maintained from the Emperor, Prince or Leader down through social classes, based on each understanding his place in society. This fundamental maintains social division and thus social order. However, it needs an animating basis--the prospect of reward and penalty meted out in strict regimen.

Western society is animated by a social structure that is also based on division and distinction. This social construct was codified in the writings of the Scottish Enlightenment of the 1700s. Adam Smith (1937) in his book “The Wealth of Nations” develops as his dominant thesis the “Division of Labor.” The book’s first sentences are the summary statement:

“The greatest improvement in the productive powers of labor, and the greater part of the skill, dexterity and judgment with which it is any where directed, or applied, seems to have been the effects of the division of labor.

The effect of the division of labor, in the general business of society will be more easily understood, by considering in what manner it operates in some particular manufactures.”

Distinction resulting from the division of labor allocates to individuals discreet tasks clearly defined which they then perform. Individuals function in an intricate series of steps or activities with each individual assigned a clearly defined remit operating in an interdependent process animated by the prospect of reward through cooperation. Smith however recognized that the independent equal relationships might be feasible at the level of individuals but was confounded by sovereign situations such as exists among, corporations, institutions and Nation States.

“As they give us their custom, it is pretended we should give them ours. The sneaking arts of underling tradesmen are thus erected into political maxims for the conduct of a great empire; for it is the most underling tradesmen only who make it a rule to employ chiefly their own customers.

By such maxims as these, however, nations have been taught that their interest consisted in beggaring all their neighbors. Each nation has been made to look with an invidious eye upon the prosperity of all the nations with which it trades; and to consider their gain as its own loss.”

There is a fundamental coherence between these two apparently different social/ cultural systems and that is the need for precisely defined social distinctions for the maintenance of social order. These distinctions whether as in the case outlined by Adam Smith into defined “division of labor” animated by substantial reward through productivity improvement and gain or in the case of Hsün Tzu, divided into social classes animated by acquiescence and when necessary penalty, are but mirror images of each other with compliance and cooperation induced by a “carrot and stick”. Of course the structures of the two social systems are different operationally yet “order” is maintained.

The lesson here for two or more “independent equal” social institutions engaged in a cooperative venture is that their “division of labor” must be designed as precise remits with distinct domains and degree as in the Mikado (Gilbert 1941), “let the punishment fit the crime.” Compliance and cooperation should be accommodated by a suitable benefit recognizing meritorious behavior by the partners. Numerous proposals for regulating these behaviors exist amongst which that of Hegel with a civil service motivated to maintain a civil society ranks amongst the most highly developed and precisely described. (Hegel 1995).

The interdependence of independent institutions governed by individuals subject to all the vagaries of these relationships suggests impermanence. Thus we return to the wisdom of Adam Smith and Hsün Tzu and a clear definition of the behaviors required of spontaneous orders and guardian organization (Jacobs 1992).

1. Clear Definition of each Instrumental Agency, institution, department, division, Authority, etc. as to its defined remit.
2. Surveillance of effecting the remit.
3. Full and continuing education of all the relevant organizational bureaucracy. (Mencius 1965: 93).
4. A full disclosure of the rewards and punishment (Fehr 2002) related to compliance with cooperation. (Axelrod 1984).
5. May the best system leading to cooperative collaboration win! The concept of checks and balances for both spontaneous orders and instrumental organizations seems most likely to suffice.

References

- Axelrod, Robert. 1984. *The Evolution of Cooperation*. New York: Basic Books.
- Bacon, Francis. 1908. *The Essays Civil and Moral*, edited by F.A. Howe, Boston: D.C. Heath and Co. Publishers
- Banfield, Edward C. 1958. *The Moral Basis of a Backward Society*. Florence, MA: The Free Press
- Bell, Daniel. 1972. "Meritocracy and Equality," *The Public Interest*, 29:29-68, 1972.
- Blumenthal, D. 2003. "Academic-Industrial relationships in the Life Sciences," *N.E. J Med*, 349:2452-2459, 2003.
- Crease, R.P. and N.P. Samios. 1991. "Managing the unmanageable," *The Atlantic Monthly*, January 1991, 80-88.
- Confucius. 1979. *The Analects*, New York: Penguin Books.
- Cushing, H. 1925. *The Life of Sir William Osler*, Clarendon Press: Oxford.
- de Tocqueville, Alexis. 2000. *Democracy in America*, edited and translated by H.C. Mansfield and D. Winthrop, University of Chicago Press.
- diZerega, G. 2002. *Persuasion, Power and Polity*, Cresskill, New Jersey: Hampton Press.
- Fehr, E. and Gächter, S. 2002. "Altruistic Punishment in Humans", *Nature*, 415:137-40, 2002.

- Friedsen, E. 1986. *Professional Powers: A study of the institutionalization of Formal Knowledge*, University of Chicago Press.
- Gilbert, WS and Sullivan, AS. 1941. "My Object Sublime," *The Mikado* (in) *A Treasury of Gilbert and Sullivan*, New York: Simon and Schuster.
- Hardwick, David F. 2005. "Pathology and Society: Providing Meaningful Answers to the Questions of Clinical and Scientific Medicine," *Medimond S.r.l*, F823, R9013, 2005.
- Hardwick, D.F. 2007. "THE KNOWLEDGE HUB FOR PATHOLOGY©," *Human Pathology*, 2007.
- Hayek, F.A. 1982. *Cosmos and Taxis (in) Law Legislation and Liberty, Vol.1*, London: Routledge.
- Hegel, GWF. 1995. *Lecturers on Natural Right and Political Science*, ranslated by JM Steward and P.G. Hodgson, Berkeley: University of California Press.
- Heinig, S.J., J.Y. Krakower, H.B. Dicker and D. Korn. 2007. "Sustaining the Engine of U.S. Biomedical Discovery", *N. Engl. J. Med.* 357(10):1042-1047, 2007.
- Hobbes, Thomas. 1991. *Leviathan*, edited by Richard Tack, London: Cambridge University Press.
- Howe, Edith, A.. 1908. *The Essays or Counsels, Civil and Moral of Francis Bacon*, New York: Heath & Company.
- Hsün Tzu. 1965. "On Kingly Government," VII, Chapter 9, Page 278 in *Sacred Books of Confucius*, edited and translated by Chai'u and Chai, New York: University Books.
- Jacobs, Jane. 1992. *Systems of Survival: A dialogue on the Moral Foundations of Commerce and Politics*, Toronto: Random House.
- Marx, Karl. 1944. *Early Political writings*, edited and translated by J.O. Malley and R.A. Davis, London: Cambridge University Press.
- Manning, Brian. 1978. *The English People and the English Revolution*, London: Penguin.

Mencius. 1965. Ed. Chai and Chai, New York: University Books.

Sacred Books of Confucius. 1965. Edited and translated by Chai and Chai, New York: University Books.

Smith, Adam. 1937. *The Wealth of Nations "The Cannan Edition,"* New York: The Maclean Library.

Smith, Adam. 1976. *The Theory of Moral Sentiments*, ed. D.D. Raphael and A.L. Macfie, Oxford: Clarendon Press.

Smith, S.W. 2007. "Sideline Safety – The FDA's inadequate response to the IOM," N. Engl. J. Med 357(10):960-933, 2007.

Sorokin, Pitirim A. 1937. *Social and Cultural Dynamics, Vol.3*, New York: American Books.

Stern, Scott. 2004. *Biological Resource Centers*, Washington: Brookings Institution.

Taylor, Timothy. 2001. "Thinking about a 'New Economy,'" *The Public Interest*; 143: 3-19, 2001.

United States and Canadian Academy of Pathology – Educational Materials 2002-2007
<http://www.uscap.org/>

Van der Molen, Peter P. 1989. "Adaptation—Innovation and Changes in Social Structures: On the Anatomy of Catastrophe," Chapter 7 (in) *Adaptors and Innovators*, Michael Kirton (Ed), London: Routledge.