

Cybernetic Theory-The Self, Team, Community :
An Essay on Freshman Required Oral/Aural
English

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Cybernetic Theory-The Self, Team, Community: An Essay on Freshman Required Oral/Aural English

“I must Create my System or be enslaved by another Man’s;
I will not Reason & Compare: my business is to Create.
William Blake. *Jerusalem* lns. 21-22.

ウィルキンソン ヴァレリー

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Abstract: The teacher facilitates learning by structuring required English for freshmen using ideas borrowed from Cybernetics. Students are framed as individuals, symbolized by Da Vinci’s Vitruvian Man. Engaged activity is done in teams. The news, symbolized by Planet Earth, provides a source of topics. The electromagnetic spectrum provides a metaphor of total university offerings to model choices for academic and professional development. Balance, or equilibrium, is never static, but a constant process of readjustment.

keywords: cybernetics, General System Theory (GST), Game Theory (GT), creativity, emergence, self-realization, holistic cognition, Ashby’s requisite variety.

1. Introduction

Freshmen come from all over Japan, and the world, to the university which offers a four year “coming of age” program in a structured environment for professional licensing and personal development. I am an English teacher. My job as a teacher and a professor replicates the mission of the university. Students come to my classroom on the first day of class to “study” oral English, as a foreign language, with other strangers. This is not their first English or university class. It is, however, their first with me. This essay proposes a theory of teaching oral English to Freshmen from the standpoint of Cybernetic Theory.

“The attainment of equilibrium requires a disequilibrium process.”

Kenneth Arrow (1986)

I say, “We are together in this room. I don’t know who you are or where you came from, you don’t know who I am or where I came from, but we are together to set you on your path towards your life as a citizen and member of society.”

2. General Systems Theory, Cybernetics, and Game Theory.

2.1 General Systems Theory

GST describes nested organismic life and natural whole systems. At school, GST sees Individuals, Teams, and Communities as autonomous structures. Life structures and processes emerge in the communications and connections among entities and the environment. The boundaries are permeable. GST begins with THIS CLASS, THESE PEOPLE

in this real time.

See Figure: GST and Autonomy in a Team and English Class

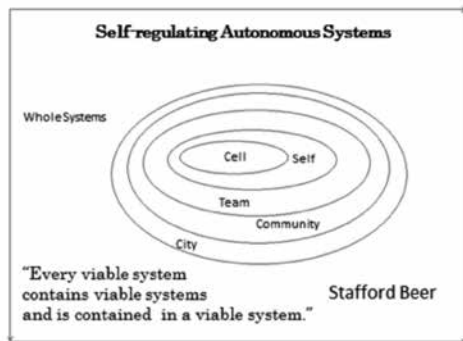


Figure 1: GST & Autonomy in a Team and English Class.

The figure images the interconnectedness of all organismic life. The diagram presents the relational concept visually so that we do not have to discuss each point in minute detail. It is a mapping. Beer's citation is included in the mapping, confirming with words. Self-regulation is not independent of the environment which supports it.

2.2 Cybernetics within GST

Cybernetics is a legitimate family member within the constellated disciplines of General Systems Theory (GST). In the academic world, fields and disciplines are necessary. GST says these are systems with structures, layers, levels, and processes in common. Cybernetics owes much of its development in the postwar decades of the 20th century to the combined efforts of foundational sciences in communication (Shannon), information (Shannon), and GST (Bertalanffy).

The general nature of this essay can only provide a brief survey of major developments in these fields,

¹ For brief profile of Stafford Beer, best known for Operational Research and Management Cybernetics, see Wikipedia.

which are so relevant to us today. As a language teacher teaching English to freshmen in Informatics at the university in Japan, my mission is identical with the University's, to propose framing and keywords so students create their own cognitive map of the terrain of their education.

See Figure: Some Fields within the GST Umbrella

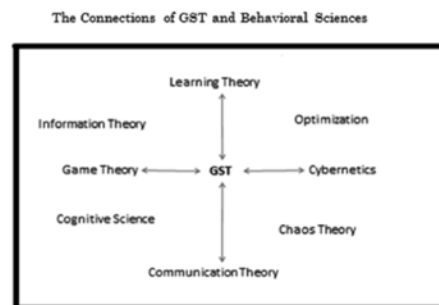


Figure 2: Some Fields within GST Umbrella

Cybernetics within GST is about control, guidance, and governance of a system. There is a long history of the term cybernetics, but the science of cybernetics is generally agreed in modern times to have originated with Norbert Wiener in *Cybernetics: or Control and Communication in the Animal and the Machine* (1948). GST is general and has general applicability, while cybernetics is practical and applied. It is the active side of GST. Cybernetics has two sides: applied management and iterative, recursive mapping. There is cybernetics of the self, the team, and the community.

2.3 What is the difference between Cybernetics and Game Theory?

Game Theory (GT) is concerned with proposed strategy, about how to make the best decisions to achieve the desired outcome. GT lends itself to linear representation and pure abstraction. From its "inception" with Von Neumann's *Theory of Games and Economic Behavior* (1944) GT has mostly been

concerned with mathematics, probability, statistics and prediction. It is, as the title of the book clearly states, a theoretical field, which may have predictive value. In contrast, Cybernetics is applied and practical.

In the English language classroom for freshmen, teaching Cybernetics is about helping students understand their own autonomy, grasp the idea of personal mastery, and lay the plans for their own unique personal development. In their group work and team work, they would learn and practice the cybernetics of teams, and in their community development, they would learn to understand Ashby's Law, The First Law of Cybernetics: Requisite Variety.

Applying GT specifically to my freshman class would mean to apply theories and teach the students to see their own activities strategically. To see and grasp the organization of the university and their own activities as individuals, as teams, and members of communities, is part of their education. The university, the class, and extracurricular activities are the laboratory for the practice of being educated members and global citizens. The structure of the learning environment is a cybernetic venture which imparts strategic thinking, encourages creativity, and promotes emergent properties, in the individual, the team, and the community.

Game Theory (GT) occupies cybernetic and strategic aspects of a constellated group of theoretical disciplines. Applications of "the theory of games" show many contexts, and much vocabulary, in common with GST, but they are quite distinct. GST concerns defining processes, boundaries, and mapping the elements and relations of levels and parts that all systems have in common. Game Theory is about strategy, probability, risk, and

stakeholders, negotiation and decisions, as well as outcomes, in interactions among living and natural systems. For the purpose of this essay, GT involves THIS group. THESE students are PLAYERS.

Cybernetics, GST and GT also share much vocabulary in describing the behavior of living and natural systems. Natural systems display patterns, whether they have consciousness or are moved by unconscious forces. The problem of ambiguous and redundant language will inevitably clog us down, unless we can set up the conceptual tool of a meta-frame and propose a few cognitive tools, like "black box" and "keyword."

3. GST, Cybernetics, and GT CONVERGE in seeking Balance! (equilibrium)

Gregory Bateson who wrote *Mind and Nature: A Necessary Unity* (1979/2002) distinguished physical steady-state processes from the balancing processes of living systems. He called the descriptions of the physical sciences the *pleroma*, where forces and impacts provide a sufficient basis of explanation for observed phenomena (MN 7). Following C.G. Jung, Bateson calls the other world *creatura*, "the world when nothing can be understood until differences and distinctions are invoked" (MN *ibid*).

The physical description of steady-state is called homeostasis, whereby a system maintains and adjusts to maintain, balance. Living communities, of interacting entities have culture and environment to deal with, purposes and goals to develop, and must

² Black Box: a logical by-pass device in an argument to simplify unnecessary complexity. A black box can be opened and understood if you are a doctor of physics, but people who are not mathematicians just want to understand the function and significance. Working definition VW.

³ Keyword: A term which gives access to a whole theoretical development, a black box.

compete or cooperate with the environment and other living systems in the environment.

"In a social system, individuals' intentions are in equilibrium when no one wants to deviate from his intended behavior given the intentions of others."

(C. Peyton Young, *Strategic Learning and Its Limits* (2004)p.1)

4. The Self as Whole System Seeking Equilibrium.

Man is made of joy and woe;
And when this we rightly know,
Thro' the world we safely go.
Joy and woe are woven fine.
A clothing for the soul to bind.
William Blake. "Auguries of Innocence." (1803)

Blake's poem catches the grand pattern of life process in a nutshell. A person sometimes feels subjectively lonely and tired. One is not, therefore, a failure. That's how the system works. No need to be surprised about sorrow and woe. Emotions are part of the inner life, just as the seasons are part of the outer life.

Each of us is unique. My task is to facilitate an environment where individual persons can reveal and develop themselves in an atmosphere of trust and acceptance. This is more easily said than done. Of course, I hope these individuals also want to study English, and cooperate with the class. The structure of some rooms only favors the lecture model. Movable desks help!

My class is a university class, required or elective.

⁴ Another word, from a different rule set, is "equanimity," i.e. calmness and stability.

The trick for me is to invite and interest rather than threaten and intimidate within constraints established externally. Students have to make their own way, alone, with a friend or two, or going home to family every day. The process of developing autonomy is one of our goals. Autonomy includes a core competence of maintaining equilibrium.

The students in this classroom may not be aware of their own intentions yet. The disequilibrium process that brings this select group together places them in a disequilibrium environment in which they will seek equilibrium. The players' intentions, both conscious and unconscious, will take shape through the things they experience and how they reflect upon their experiences. They may also learn some English. For some matters, I choose to let what happens emerge through students' consensus and ideas.

Figure 2 (below) proposes the (hu)man as the model for ideal human development. One could say we aim to provide the developing person with cognitive tools to learn about her/himself and others. The job is to experience a range of experiences, balance subjective feelings and passion with objective distance, and practice a certain amount of introspection. Learning to balance these will develop the muscles of autonomy.



Figure 2: Vitruvian Man c. 1490 (with some major fields.)
Leonardo da Vinci

A new paradigm is invading the assumptions and practices of some students, suggesting that one owes it to oneself to cultivate one's core. Other students seem to have accepted the academic organization of their high school education without question. Some students have not begun to think. It does not matter. Students require dynamic curiosity to build competence in English.

"Creativity now is as important in education as literacy and we should treat it with the same status."

Sir Ken Robinson.

TED Talk Jan. 6, 2007

5. A Class viewed with GST eyes.

Given that each student brings a whole coordinated information system of an individual self to the group, in the first class session, I begin to organize the room filled with persons, who are uncertain and perhaps reluctant, by initiating connecting procedures. For example, I introduce myself and the course in English. I then assign a writing task to create a sample with which I can confirm the student's handwriting. While they are writing, I step "behind a curtain" to call each student for a brief personal chat to confirm for myself if the student can actually hear my English or not. This chat serves the double purpose of creating direct connection with me and putting a "finger on the pulse" of the hearing ability.

Any group of students has the potential of becoming a coherent interactive community, but this has not yet been realized. At present, they are individuals with voices and opinions, and so they will remain. It is not guaranteed that as a group they will achieve high-level group coherence. Nonetheless, intentional procedures are planned to engage "student members" in a governance process.

So far, the first class is familiar and expected. Other things are part of it, though invisible. Indeed, all members are members of other systems outside of this classroom. Dynamic equilibrium will emerge during the first three classes. We have 15 weeks to do something together.

6. Game Theory provides conceptual structure, practice, and convergence.

On the first day of class, I also explain the "Rules of The Game." In our case, it will be the Game of Hearts, a real card game that has been made into a program. Most students have never played it. If most of them have, I must find another game. The game is not too hard and not too simple. Part of three classes is spent learning the game. This exercise has multiple purposes, a) framing the class as a model, or simulation of a community, b) offering a game theoretic paradigm and c) breaking the ice. An English class is an ideal setting for learning and practicing the terminology and utilization of the conceptual framework of GT.

The whole university enterprise can be seen as a game field where people play credit games, GPA games, status building games, and career building games. The university is a player in a larger game, national and global, where it plays an intellectual and cultural role. One can see oneself as a player or a consumer.

7. Game Theory for Freshmen?

In 2005, Avinash Dixit published an article with the engaging title, "Restoring Fun to Game Theory," which provided the trigger, or inspiration, for my 2006 article "From Naïve Games to Applied Game Theory." Dixit claims an amazing range of applications:

“Game theory ... is applicable to numerous interesting and though-provoking aspects of decision-making in economics, business, politics, social interactions, and indeed, to much of everyday life.”

I can show the well-documented versatility, in range, scope, and scale, of applications of GT, but this does not solve the “black box” problem. Any natural system susceptible of analysis has potential for viable application of GT. Talk about it, however, inspires dead eyes and sleep. Students want to just do it.

8. World News and Equilibrium in Triple Bottom Lines (TBL).

I schedule one part of regular English language development for keeping up to date with current affairs. Every week, part of the class is connected to a few stories from the news. The planet Earth becomes the model global system. We will develop the spectrum of international news topics.

I plan to embed in this portion of the class a mention, perhaps a research project, to consider Corporate Social Responsibility (CSR) and Triple Bottom Line (TBL) or Three P's: Profit, People, and Planet. The world we live in is not just about money. Profit is balanced against the needs of people and the environment.

“Quantum theory taught me the four principles that have guided my work:

Everything is interconnected.
Everything is potential.
Everything is indeterminate.
There is no excluded middle.”

Vandana Shiva, PhD

September 1, 2014

Vandana Shiva came to my attention because of news that reported that a farmer commits suicide in India every 30 minutes. We must evaluate such a story and put it in context. In 2014, I have come to feel that the only bottom line is financial profit for corporate power. The money funds the research which excludes the communities and the environment. This talk of Triple Bottom Lines is beautiful rhetoric. How is it to be implemented? How evaluated?

9. The universal applicability of GT belongs with core university requirements.

In the same way that development of the autonomy of citizens at the individual level and “triple bottom lines” for public and corporate action can be built into the English syllabus for discussion, the total spectrum of applications of GST and GT can form the field for the engaged activity of the class. This is a primer, an introduction with “keywords,” which map-out potential research.

I am suggesting that somehow the students of English in the class can develop a capacity to discriminate wisely, exercise their cognitive faculties freely and judge matters in the clear light of empirical evidence. I believe a generative method of proceeding would be to develop the syllabus “on the fly” as a team in real time. After all, when have I known what was going to happen tomorrow? But we can see patterns.

Professor Dixit hopes that all university students are given access to the concepts of GT at once. If the definition of “game” includes stake-holders, or players, even a puddle with tadpoles can be framed as the field (puddle) in which the players (tadpoles) play the “Game of Life.” Viruses, both virtual and physical, countries, and populations can be studied

with GT. The idea is to give students a desire to study it later with fun now. Don't deaden minds with abstraction. Applied GT is engaging and useful now.

10. The Game of University Curriculum Design

The young candidates who choose to participate in the elaborate structured process of a university education little reckon what hoops they will have to jump through to earn their degree. Most of the students of around 18 years old have made this freewill choice with the support of their family. At the Entrance Ceremony, some dignified personage in an impeccable suit, may say a few words:

"The man who does not possess the concept of physics (not the science of physics proper, but the vital idea of the world which it has created), and the concept afforded by history and by biology, and the scheme of speculative philosophy, is not an educated man. Unless he should happen to be endowed with exceptional qualities, it is extremely unlikely that such a man will be, in the fullest sense, a good doctor, a good judge, or a good technical expert."

Ortega y Gasset

The philosopher Ortega y Gasset made this weighty pronouncement in his treatise *The Mission of the University* (1930). No doubt the words are of sufficient magnificence to be suitable for pomp and ceremony. Few students will want to remember the words or will care to discuss their significance. I would rather tell my freshmen:

"The journey of a thousand miles begins with a single step." (Lao Tzu)

Everyone is nervous on the first day of class. I'm

nervous, the students are uncertain. My application of Dixit's GT to my Freshman English class is clearly not an exact fit. The key ideas must be interpreted and adapted. But hey! Let's begin with an icebreaker!

A close look at Avinash Dixit's proposed course of GT for freshmen shows it to be ambitious, touching on life and literature, as well as strategy. No matter how I slice it, his semester or quarter class is too ambitious for a 15 session semester course of oral English. Nevertheless, aspects and applications of GST, with cybernetics, and GT can be used in developing classes and belong in the curriculum from the start.

To apply ideas from mathematics and technology to required freshman English is a tall order. Dixit's article clearly states the potential for convergence of GT for any university major, but the problem is how to present a 15 session English course structured on GT (and GST) principles to Japanese students studying oral English. Perhaps more difficult still is Dixit's higher intention of making Game Theory accessible to everyone, across discipline divides, from the hard sciences to the Behavioral Sciences and the Humanities.

The inter-referential fields of GST, Cybernetics and GT not only aid the structuring of the semester class, they also contribute substantially to the content of a course for developing communicative competence in English. The development of a variety of communicative competences is part of organizational behavior; organizational behavior is one of the behavioral sciences, as are Communication, Sociology, Anthropology, Psychology, Economics, Politics, Geography, and Education, i.e. the whole list of sciences which study living and natural systems.

The present essay argues for framing an English class with Cybernetics and GT. The university career is the start of a student's practical training in the navigation of their professional and social life. The language, and relevance, of cybernetic terms such as governance, direction, aim, goals, and adjustment is clear. So also are GT terms such as stake-holder, strategy, incentives, and pay-off. These students, with their peers at school, are the community with whom they will come of age and enter society. The work starts now. The people-skills and personal challenges each student faces are important now.

According to my version of GST, the group of students is a system, a group, and an organism. Living systems seek "stable-state." The game is: "Aim For Equilibrium!"

11. Curiosity, Mystery, Exploration OR Licensing: A Grand Dialectic

Obviously, the university serves both the idealists and the realists. That is the very meaning of requisite variety! The realists choose the right teacher, get a good recommendation for work, get their credential, and move on. Idealists, however, talk about "real" and "ideal." An idealist declared a major in Classics on the first day at university forty some years ago. If there is room for an idealist, how is she to earn her keep? Answer: Teaching English. And so I have done.

Students bring their lifetime of experience and culture to the new school. In another age, some were saying, "Seize the day." One might recognize the line from "The Dead Poets Society." A monstrously well-educated teacher might instantly recognize the "carpe diem trope," but no one wants to hear the ancient lineage. Don't waste time! So what do students want to do; think and develop or

get the degree and move on?

A few years back, freshmen were saying, "TPO." Not that I speak of all freshmen, by the way, but some have a precious handful of aphorisms to get them started on the new life away from home, like "Time, Place, Opportunity," I respect the urgency. When I myself was eighteen and graduated from high school, I too tried to grab a few words to reorient myself to life in the present mode of existence. When I was eighteen, I had no idea what was in front of me. At the other end of my career, I know students are not here to download the file of all my learning. They want to get on with it. Don't waste time!

12. "The Seed" and Ionian Enchantment:

"The Seed" by Martin Pavelek (age 20)

"This happened in my university lab back in Czech Republic; I'd been eating an apple and at one point, one of the seeds somehow got out.

I spent at least 10 minutes just looking at it in wonder, how could the molecules of this tiny little and harmless piece of matter "ordered" and assembled in a way, that allows it to "deny" all the growing entropy around it, and so become a complex and giant tree. It is so small and has such a limited amount of "orderliness" available, yet it can go even beyond that and create new seeds with the ability to do the same again and again..

This sort of thing was always a great inspiration for me; it's so unbelievable, that there are times, when I feel almost desperate and over-excited at the same time; seeing how something works so perfectly, but being aware of the fact, that it's not possible for the human brain to gain the complete knowledge

about everything in its lifetime..

So as you were saying, the only possibility is life-long learning; not only for the sake of employment, but for some of us it is also probably the only chance to approach the unreachable goal - to know everything about the world we live in.

Martin was a young Czech exchange student who joined an English discussion class. The letter he wrote (above) on January 11, 2011, recapitulates Edward O. Wilson's strikingly similar discovery:

"I remember very well the time I was captured by the dream of unified learning. It was in the early fall of 1947, when at eighteen I came up from Mobile to Tuscaloosa to enter my sophomore year at the University of Alabama."

E.O. Wilson recounted his experience of reading *Systematics and the Origin of Species* (1942):

"By giving a theoretical structure to natural history, it vastly expanded the Linnaean enterprise. A tumbler fell somewhere in my mind, and a door opened to a new world. I was enthralled, couldn't stop thinking about the implications evolution has for classification and for the rest of biology. And for philosophy. And just about everything else. *Static pattern slid into fluid process.*" (italics mine) (*Consilience* 2 1998)

As he describes it, he had experienced "The Ionian Enchantment," a belief in the unity of the sciences – a conviction, far deeper than a mere working proposition, that the world is orderly and can be explained by a small number of natural laws. Some such conviction guided Ludwig von Bertalanffy

when he began his publishing career in 1928, age 27, detailing his global perception that there are laws which guide the development of creatures. In his 1968 book *General Systems Theory*, he sums it up, saying, "It seems legitimate to ask for a theory, not of systems of a more or less special kind, but of universal principles applying to systems in general" (GST 32).

The young people coming to the university hope to discover, explore, invent. They also want to enter society at a certain level. The concept of the university also includes the major, professional training, plus introductions to a variety of disciplines, and languages. Most important for some, the university experience is a protected space where students can forge a world view and cultivate themselves and define their own path. They have to balance the requirements of discipline and freedom by themselves.

13. Zero/One Binaries and Dialectics

Thomas Hueble, an Austrian philosopher, who does not appear in Wikipedia, teaches two major competences: the competence of stillness and the competence of movement.

0. The competence of stillness contains presence, awareness, consciousness, and transcendence.
1. The competence of movement contains intelligence, flow, learning, participation, creation, exploration and immanence.

These form a classic dichotomy. A binary opposition that initiates the I Ching's 64 hexagrams is a different take on stillness and movement – active vs. passive:

- i. The Creative

o. The Receptive

The binaries that create the bits and bytes of information can be encoded with the “0” (Zero) and “1” (One) of digital programming. Binaries provide a basic exercise in dialogic thinking with simple binaries like “up and down” , “day and night,” “sleeping and waking.” We’ll get back to these dialectic polarities when we discuss the spectrum.

The “off” and “on” of electrical current demands our attention. The interplay of intellectual activity brings us from George Boole (1815-1865) and his logic and algebra to Claude Shannon (fl. 1940s) who compactly applied it to electronics, computing and the digital age. Of course, I have greatly oversimplified these steps. Shannon was the mathematician who recognized the importance of Boole.

14. From Paradox to Uncertainty to Fuzzy Logic.

“Zeno’s Paradoxes” could now take their place in this story, were it not for the problem of the zero in the history of mathematics. We could start with paradox to found a discussion on Zeno’s principle arguments of motion: the arrow will never hit the tree and Achilles will never beat the tortoise because he gives him a head-start and can never overtake him. Common sense tells one that the arrow flight from bow to tree is the equation: “ velocity X distance = time,” and that Achilles will catch up with the tortoise in minutes, but that is not the purpose of the paradox at all.

The purpose of Zeno’s paradox is to comment on Parmenides’ view of the truth of existence, as timeless, necessary, and unchanging. At any moment, the arrow occupies a static now. We have now glanced at modern “Western” dialectic, ancient

Chinese binaries, and a Greek monist paradox. Why do this for a discussion of the framework of a beginning class for freshmen? Beginners just get hints and keywords. Let them choose to study “uncertainty” and the “paradoxes of light” when they choose.

15. A Brief General History of the Cognitive Sciences

I am neither a mathematician nor an exact scientist, so I can only point to the important names like Max Plank, Albert Einstein, and Werner Heisenberg, John von Neumann, Claude Shannon, Kurt Gödel, and Norbert Wiener. I can articulate the import of their discoveries, chart them, and maybe even provide context and daily life illustrations. That is the level of understanding that university students might have general familiarity with through their General Arts and Sciences Core requirement.

15.1. Beginning and Ending with Cybernetics

Norbert Wiener changed the conversation when he wrote *Cybernetics: Or Control and Communication in The Animal and the Machine* (1948). The work was fast and furious. We had come through a great world war. We were talking about preventing war, stable government systems, and the partnerships of industry, government, and university. Princeton and MIT and many, many scientists were involved in learning about and designing protocols for development. Cybernetics, a word with the same Greek root as Governance, required transdisciplinarity. Science and mathematics were talking to behavioral sciences, sociologists, anthropologists, and politicians.

15.2. Not the history of everything.

This brief summary has wandered through historical threads of development until the present. I began my personal journey with Gregory Bateson, who

was in love with Cybernetics. Cybernetics, GST, and Cognitive Science all emerged at around the same time. Bateson leads to Wiener leads to Bertalanffy, leads to Ashby. Bateson worked with biology, psychology, anthropology, learning and communication. He was my ideal generalist.

Be warned:

“It is an empirical fact that scientific achievements are put just as much, or even more, to destructive as to constructive use. The sciences of human behavior and society are no exception.”

Bertalanffy, GST. 52.

Some crucial dialectics have emerged in this history of development. Is everything to be mechanistic or can it be holistic? Does all science have to be reductionist? Or can it be integrative? Polarization in debate can be fierce, but with a whole spectrum to work with, perhaps some adjustments and be found. Balance or dynamic equilibrium can be found in any whole integrated system.

16. For Explorers – the Art of Discovery: Rigor and Imagination

I have presented the human body as the model for the self. Each student may use themselves as the index for personal learning and development. We have planet earth as the model for the world. We will utilize individual reports of current events to expand our knowledge of the global systems in which we live.

17. The Spectrum of University Study.

Game Theory has dominated the Nobel Prize for Economics, but we have shown that it has wide

applications. Game theoretic analysis has been in use since the Dutch historian Johan Huizinga wrote *Homo Ludens* (1938). The French Roger Caillois is a transdisciplinary intellectual who wrote *Les Jeux et Les Hommes* (1958), combining literary criticism, anthropology and sociology with philosophy. The “field” does not belong only to the economic mathematicians!

It took John Maynard Smith to firmly plant theoretical game theory in biology and evolution. His “Hawk-Dove Game” is his most influential contribution to the game theory field. In the brief *Preface to Evolution and the Theory of Games* (1982), Smith hopes that “... the book will also be of some interest to game theorists. ... Paradoxically, it has turned out that game theory is more readily applied to biology than to the field of economic behavior.” (vii)

There are two reasons for this:

- a. The theory requires that the values of different outcomes (for example, financial rewards, the risks of death and the pleasures of a clear conscience) be measured on a single scale. In human applications, this measure is provided by ‘utility’ – a somewhat artificial and uncomfortable concept: in biology, Darwinian fitness provides a natural and genuinely one-dimensional scale.
- b. Secondly, and more importantly, in seeking the solution of a game, the concept of human rationality is replaced by that of evolutionary stability. The advantage here is that there are good theoretical reasons to expect populations to evolve to stable states, whereas there are grounds for doubting whether human beings always behave rationally.

17.1 The Metaphor of the Electro-magnetic Spectrum for University study.

Here I propose a multiple use scale as a metaphor for some of the issues and dialectics I have covered in this essay. See Figure 3 below. Using the electromagnetic spectrum, we can find two scales to put in this chart, i.e. wavelength and frequency. The point is this:

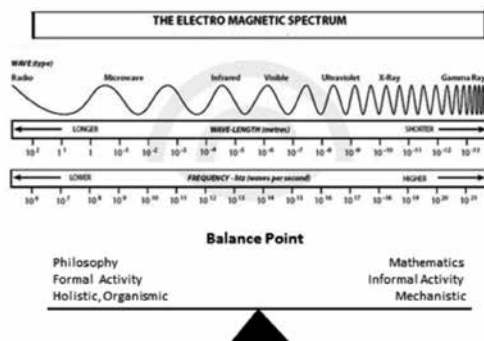


Figure 3: Three polarities imaged on the image of the spectrum.

The electromagnetic spectrum is a METAPHOR and ANALOG to show an equilibrium or balance point for three polarities: Math and Philosophy, Formal and Informal Activity, and Mechanistic vs. Holistic, Organismic Thinking.

One of the topics that arose in this discussion is that there is NO excluded middle. Philosophic questions of ethics, true history accessible to persons at the appropriate age, legal questions which touch on politics, gender, race, and class will emerge. A million potential trans-disciplinary issues concerning training, empowerment, social engineering, can and do emerge, now and actually at this university, and theoretically and in policy at the international level. Think of journalism and the media in the control of power – either gagged or lying. What kind of citizens are we nurturing in the university?

18. Conclusion

The English Conversation class for freshmen will emphasize the development of the person, awareness of current issues in the news, and a glance at the spectrum of learning in the academic world. Three symbols carry the meanings: the human body is the individual, the earth is the world, and the electromagnetic spectrum is the symbol of the scope of academic learning.

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⁵ Aporia. In logic and philosophy, a difficulty in establishing the theoretical truth of a proposition. (Online dictionary.com)