The Rigor of "Interdisciplinary"

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Abstract

This special edition of The Journal on Systemics, Cybernetics, and Informatics (JSCI)*, subtitled "Rigor and Inter-Disciplinary Communication¨ contains my arguing "rigor" assumes different meanings, each variety interacting with the others inside the framework "interdisciplinary", also causing problems, beginning with Descartes saying you know something by subdividing a whole. How do we re-assemble this Humpty-Dumpty to restore the 17th century natural philosophy tradition? We need know what "interdisciplinary" means to know the context of "rigor",* after definitions, etymology, and historical backdrop. "Rigor" ostensibly is the quality, strength, and intensity of exploring ourselves and the environment. However, upon closer inspection, we see it remarkably resembling the "dropdown" word "disciplinary" inside the general "interdisciplinary", forcing the question, "what is the distinction; why is it important?". While many higher education institutions (HEI) tout their "interdisciplinary" programmes, graduate students learn very quickly upon entering graduate school their mandate: narrow your focus. Closer inspection reveals "rigor" describing discipline's force, explicitly, the granularity of a field and the academician's response, i.e., generating quality knowledge. Not to be excluded is the the disciplinarian's ethos, her/his reflecting on core values driving the academic quest. Rigor can operate at odds with interdisciplinary; students in specialized areas can compromise learning further about a larger world. Perforce, humans realizing the Universal process internalize interdisciplinary, i.e., living it, "rigor" signifying honesty. Somewhat a sidebar illustrating rigor's corruption is the peer review process, demanding others "be rigorous" (publish or perish), and the dramatic and disconcerting rise of fake and predatory journals. "Rigorous" peer review can exclude knowledge development and corrupt knowledge quality. When we dig deeper into the shaded meanings of "interdisciplinary", discovering multitudinous problems with its subset "discipline" apparently overlapping "rigor", it becomes increasingly apparent these fit inside a philosophical system. How are a discipline's boundaries determined? How is "rigor" intended? If "rigor" means specificity, how specific is specific? A flaccid use of the term – itself non-rigorous – is a double-edged, granularity dissolving into oblivion, generality disappearing into the ether. Well, then, if "interdisciplinary" exists, what is its ontological status? Here, again, is required a philosophical system. However, we have a paradox, not unlike Russell's set encompassing all sets, "rigorous" describing "rigor". Perhaps you can understand why I usually quote the word. Now, the reader might be somewhat befuddled; I intend shaking out the "why" in a future paper and book on the philosophy underpinning all the above.*
* I avoid using the American punctuation style because it is illogical.

1. Why this article?

"Simply, IIIS invited this article for its special issue of the *Journal of Systemics, Cybernetics and Informatics* 'Rigor and Interdisciplinary Communication' and my seeing an opportunity to present a much-needed different perspective" is the simple answer. A more complicated one concerns my experiences, I a good example of being too rigorous (logician) and slack (not following academic conventions, exemplified by "nonstandard" usage, writing conversationally, and rejecting the US quotation-punctuation style. But, I really do appreciate a gud editer and prufreeder because I am blind as a bat.) A third, perhaps the most important, the following is a gateway to my book articulating a seriously-needed embracing philosophy for these trouble-filled divisive times.

At first, I viewed the invitation - yet another paper - an ordinary academic exercise. All my life, I have been "interdisciplinary", eschewing specialty areas, never knowing my ultimate professional destination. I still don't. "I yam what I am", said Popeye; he has a point. I self-ejected from my first Ph.D. political science programme, bitterly observing professors not asking the "why" of social arrangements, concluding political science was only number-crunching survey research results. Outside these conventional university departments lay the "real world", my confronting it by doing "bread and butter" technical documentation, taking me from fiber optics through identifying flawed year 2000 FORTRAN IV code, credit card practices, military target control systems, and numerous communications systems jobs. My world never has been one-track or conventional, so I have wondered why all the hubbub over "interdisciplinary". Isn't this the way the world is naturally without paying special attention to the word? You will later learn my worry over a world more cluttered by *arcana,* the obsessive-compulsion about style, appearance, and form over substance yet increasingly alienating. Alienation, I maintain, causes most suffering and conflict, "interdisciplinary" having broken down on a social scale. Shining the "interdisciplinary" light, thinking uniquely, and broadening horizons counters partitioning with its subsequent alienation.

How inclusive are such Earth-shattering dissertations as:

- "A comparison of jump performances of the dog flea, *Ctenocephalides canis*, and the cat flea, *Ctenocephalides felis felis*,"
- "On human odor, malaria mosquitoes, and Limburger cheese,"
- "Pigeons' discrimination of paintings by Monet and Picasso"? [Academic arcana, 2020]

What motivates these people; is it just braggadocio? Narcissism? Sometimes I think "rigor mortis" accurately describes academicians' not appreciating interdependence and integration or the way their work is actualized. Their world appears dead or frozen, surely isolated. No person is an island; a "rugged individualist" courts becoming a mortician 's fodder by persistently researching only one domain, presenting findings incomprehensible to a generalist scholar.

As a 1970s graduate student, I wrote a paper "Reason on the brink", setting me up as a philosophy department pariah. "Reason " was repeatedly subdividing an academic area, reaching a granularity rivaling Planck scale. The Dean, I was told, was sleepless for several nights. I argued the typical journal article was so narrow, just so much detritus, rigid, cold, mechanical, and alienating, saying, "ours is a special club; you're not invited.". I was a rogue, undisciplined, and not narrowly focused enough to "contribute to the body of knowledge".

Through Professor Nagib Callaos' systems theory work (Callaos, 1988), IIIS has presented arguably the most in-depth explication and analysis of "interdisciplinary". Now, let us animate the word, allowing it to walk through a philosophical forest coming along life, hence expressing its essence. Fortunately, the IIIS has planned its JSCI journal:

- Special Issue on Rigor and Inter-Disciplinary Communication
- *Special Issue on Cybernetics and Philosophy.*

I can not write exclusively on "Inter-Disciplinary Communication" without explicating the second; the four words, "rigor", "inter-disciplinary Communication", "cybernetics', and "philosophy" all depend on each other for their meaning.

Like Nagib [Metaphor, 2020], I see metaphors and analogies buttressing our communicative ability, taking umbrage at those staid English teachers recommending against stringing them together. Be careful, though. Across the street from my college dormitory was Vic Remy's general store, a place I frequented almost daily. My freshmen classmates asked if I could obtain an article at a discount. Well, I knew Remy like he knew his wife. Even today's "woke" culture, I would not be so foolish, although I do like my allegories and analogies. Comparison works hand-in-glove alongside interdependence.

In language web, each word is defined by others, those so defined within the same web. Ultimately, the original word will reappear. We build new words from existing ones. This and the web rely upon analogy and metaphor – comparisons. Note here the web's interdisciplinary character or process – integration and interdependence. University entrance examinees,

you surely must remember the Miller Analogies Test, assessing "analytical thinking ability" [MAT, 2020]. I suspect most our communications is metaphorical, especially when we encounter the unfamiliar only described by the modified familiar (adjective or adverb). So, here goes another metaphor. Before embarking on our journey, let's build the boat. Because "rigorous" and "discipline" are multidimensional, perhaps "interdisciplinary" too.

2. The environment – "interdisciplinary"

Immediately, you will see my frequently quoting words "interdisciplinary", "discipline", "rigor", and their derivatives, because people write about their existence, including the meanings with little philosophy but much application.

I start with a dictionary definition of "interdisciplinary", following with its etymology providing a historical and linguistic context. Important are "integration", "interdependence", "cybernetics","recursion", and their dynamics. However, understanding the dynamics requires the "why", like observing the effects of superposition - either a particle or wave - our not knowing the essence of superposition, itself. Essence stems from a philosophical system. Yet, think "limitations" – metaphysics, boundaries, space-time and number, randomness, and dimension. Regardless how we shape and compensate for these seemingly irresolvable problems, "interdisciplinary" will be affected. The current article describes "interdisciplinary" overall, humanity a social organism (metaphorical or perhaps actual) whose *raison d'etre* is "why".

Behind "interdisciplinary" (system) is epistemology-supported ontology, epistemology needing rationalism working together with empiricism, indescribable metaphysics enveloping the ensemble, the foregoing leaving everyone perplexed, not unlike asking what supports the tortoise holding up the Earth, the ultimate metaphor, all the foregoing one word.

2.1 "Interdisciplinary" – the word and its background

"Interdisciplinary" is a complex word, the overall meaning assuming a quality its components do not possess. Such makes it complex. Let's look at the "boilerplate".

Oxford says, "Relating to more than one branch of knowledge (Interdisciplinary – Oxford, 2020)".

UNESCO's International Bureau of Education (IBE) says "interdisciplinary" is:

> An approach to curriculum integration that generates an understanding of themes and ideas that cut across disciplines and of

the connections between different disciplines and their relationship to the real world. It normally emphasizes process and meaning rather than product and content by combining contents, theories, methodologies and perspectives from two or more disciplines. [Interdisciplinary – UNESCO, 2020]

The U.S. National Science Foundation (NSF) says:
> Interdisciplinary research is a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice.
> *Committee on Facilitating Interdisciplinary Research, Committee on Science, Engineering, and Public Policy (2004). *Facilitating interdisciplinary research*. National Academies. Washington: National Academy Press, p. 2. [Interdisciplinary – NSF, 2020]

Other dictionaries follow the same Oxford-style definition:

- involving two or more different subjects or areas of knowledge: [Interdisciplinary- Cambridge, 2020]
- involving more than one academic subject. [Interdisciplinary – Collins, 2020]

Pay attention to "rigor", "inter-disciplinary", "disciplinary", and "communication", reflecting on their juxtaposition, topics detailed below. From "interdisciplinary" are derivatives like "inter-disciplinary", "intra-disciplinary", and "cross-disciplinary", each carrying the meaning of their hyphenated prefixes.
A word's meaning needs historical context, i.e., etymology and history. Let's say etymology describes a word meaning a becoming, where the present incorporates previous development. Says science, the future resembles the past
.

2.2 Etymology

First, we have the whole word:
> *interdisciplinary (adj.)*
> drawing from or characterized by participation of two or more fields of study; [Interdisciplinary – etymology, 2020]
> **inter**
> "Inter", from the Latin:
> *between, among*
> > *1. during*
> > *2. (inter se => to each other, mutually) [Inter, 2020]*

Then,

> word-forming element used freely in English, "between, among, during," from Latin inter (prep., adv.) "among, between, betwixt, in the midst of" (also used extensively as a prefix), from PIE *enter "between, among" (source also of Sanskrit antar, Old Persian antar "among, between," Greek entera (plural) "intestines," Old Irish eter, Old Welsh ithr "among, between," Gothic undar, Old English under "under"), a comparative of root *en "in."

[Inter – etymology, 2020]

Now, we observe an axial word.

> **discipline (n.)**
> c.   1200, "penitential chastisement; punishment for the sake of correction," from Old French descepline "discipline, physical punishment; teaching; suffering; martyrdom" (11c., Modern French discipline) and directly from Latin disciplina "instruction given, teaching, learning, knowledge," also "object of instruction, knowledge, science, military discipline," from discipulus "pupil, student, follower" (see disciple (n.)).
> The Latin word is glossed in Old English by þeodscipe. The meaning "treatment that corrects or punishes" is from the notion of "order necessary for instruction."

[Discipline – etymology, 2020]

Oxford says,

> noun: **discipline**
>> *the practice of training people to obey rules or a code of behavior, using punishment to correct disobedience.*
>> *"a lack of proper parental and school discipline"*
> *a branch of knowledge, typically one studied in higher education.*
> *"sociology is a fairly new discipline"*
> [Discipline   –   Oxford,   2020 https://www.google.com/search?channel=fs&client=ubuntu&q=discipline]

Observe the two-headed definition – the academic subject with the pedagogy. Heed also instruction's function – correct or redirect by punishment, teaching, or suffering from something deemed not right. We'll return latterly when studying "rigor".

We now have some surficial details about "interdisciplinary", though wanting its foundations and implications. How is "interdisciplinary" situated?

2.3 The academic setting

Scholars into the 19th century thought the "smallest of the smallest" was Leibniz's monads, pretty much confirming Democritus' view two thousand years earlier identifying the "atom". Like a crystal ball, however, it deserved further gazing, and such led us into the very strange Planck space populated by entities we really are ignorant. Really, do you have any common sense idea what $1.616255(18) \times 10^{-35}$ m looks like? Scholars similarly have defined "interdisciplinary", using the word – like the scientists did "atom", not probing much further into the philosophy underscoring the word.

"Interdisciplinary" very much influences university and college liberal arts students course curriculum planning. Years ago when academic standards were not so loose, "core curriculum" students all took language, science (the traditional biology, chemistry, and physics), mathematics, history, foreign language, psychology, and social science. Spottily, the learned institutions housed philosophy, the "queen of sciences", nowadays often just like an old New York Bowery whore kicked aside by big business tycoons but available for cheap popularization. Each subject supplemented the others, recounting a more holistic world. Such followed the ancient Greek (*artes liberales, septem artes liberales*, *studia liberalia* (seven liberal arts).

Now comes the "educational" system. Minimally, "system" means a goal-directed collection of interoperating elements, accepting inputs from each other and its environment and producing outputs. The system is homeostatic (maintaining itself), adaptive (survives and changes), or dies.

Recall the rigid secondary schools compartmentalization, students wandering among rooms, silo after silo, all disconnected - geography, biology, history, mathematics - how often does a student interrelate the two unless the teacher does? The content is so confined by those tall columns no information exchange could take place due to the specialization. Project-based learning here remains much more efficacious than total single course immersion [project-based learning, 2020].

Higher education institution (HEI) proclaims rigor from a curriculum standpoint. Students enter college often not knowing their professional desires, although seeking scientific/math/technology or otherwise. During the first two years, they usually undergo a required baseline program - native language (e.g.: freshman English grammar and composition), world history, a science course, psychology, mathematics, etc., but no philosophy.

They select a major – social sciences, arts and humanities, sciences, etc. The HEI (universities), itself is partitioned into schools and departments

reflecting the specialty areas. Overall, the HEI is a large funnel, collecting non-specified matter, filtering it, draining out a well-defined product. Indeed, the words "education industry" belie HEI's intent, administrators, and the socioeconomic milieu. Much "education" really is training [Horne – philosophy, 2014] ultimately directed by the large corporations that bankroll research. Students enter a factory with empty heads to be filled with knowledge, exiting the assembly line consumer-ready products.

From post-undergraduate studies, the student emerges degreed with a major, familiar generally with subjects and their methods. A biology major may comprehend the journal *Cell* or *Nature* better than the *Journal of Symbolic Logic*, let's say. Yet, they must learn the specific way their field is further carved up into specialties, each often requiring a vocabulary, research methodology, or particular knowledge base.

Hence, the student selects her/his appropriate graduate department. At the master's level, s/he learns those field competencies. In essence, the student, rather than being an encyclopedia, concentrates on an entry. Not to be forgotten is research methodology.

"Rigor" applies where the Ph. D. student makes her/his appearance ostensibly amplifying the knowledge realm. Now, s/he is exhaustively knows the field through the specialized courses, the platform supporting the dissertation literature search. The ever-expanding literature pool – specialized areas, for sure – demands more rigorous searches. "Rigor" is strength, firmness, determination, persistence, and related words characterizing a student's journey.

While the training system thrives, the educational system is dying.

2.4 The historical context of "interdisciplinary"

Merriam, outrageously not giving any references says:
> First Known Use of *"interdisciplinary"*
> 1926, in the meaning defined above
> [Interdisciplinary – Merriam, 2020]

Some research has been done Merriam contradicting Merriam, itself, saying:
> Later that year, in December 1937, a notice of the availability of Council fellowships reprinted in the Journal of Educational Sociology referred to "training of an interdisciplinary nature" (page 251). This is currently the earliest published use of the word "interdisciplinary" in the files of Merriam-Webster.[8] [Sills, 2016]

The reference "8" is to "Telephone conversation with Frederick C. Mish, editorial director, Merriam-Webster, March 11, 1986." Aside from my little editorial, surely, the idea has been around a lot longer than a century.

Disciplines go back millennia. Western hemispherians, at least, saw Plato's (428-348 BCE) Academy giving music, poetry, physical training, military training, mathematical science, dialectic training, and political training. Also, Aristotle's *Categories* represented "disciplines"; people did not learn amorphously. The Roman "how" of the Greek "why of the what" crumbled when Aleric came into still standing Rome, finding snacks, some whores, and gold, scant else. Italian Rome subsisted until1453, conquered by the Ottoman Empire, ultimately becoming the "sick man of Europe", the sickness being the "how" not coupling with the "why".

The Medieval period really was not the typical "dark ages". All the same, many literati lived in their heads, science advancing very slowly, surely not like the following Renaissance, Greece's re-birth. Too bad it was the library at Alexandria, Egypt was repeatedly sacked; think how far along we'd be now. Storal of the mory: don't release narrow-minded leaders and drunk soldiers from their quarters. Monty Python's *In Search of the Holy Grail* had the king standing out just because "he is the only one not covered in shit" – literally and physically - rather accurate. However, plagues (like 1347 – "Black Death"), witch burnings, and non-mechanized warfare were common. Read the *Malleus Maleficarum* (1486) - certainly no "interdisciplinary here! Latter 15th-century Europeans saw the other hemisphere (Vikings and probably the Chinese), signifying horizons much greater than the narrow Catholic Church ideology. Martin Luther literally nailed on Wittenberg Chapel's door that point home the night before All Hallows' Day, 31 October 1517, scaring the Hell out of the Catholic Church with his *Disputation on the Power of Indulgences* (Ninety-Five Theses). Maybe COVID-19 will prompt the much-needed true "interdisciplinary".

The Enlightenment period focused primarily, well, enlightenment, shining reason's light on superstition and mythology from days yore, providing a cradle birthing "interdisciplinary". Plato lived on. Make no mistake, the stake was very much a barbecue spit, women the main course, but by 1800, such for the most part was tossed into the 15th-18th century dustbin. Patriarchy found more sophisticated ways to oppress women [Griffin, 1978], thus raising the alienation temperature.

Serfs became liberated from feudalism, acquiring their own domains as petty merchants or just workers, crying, "protect my acquisitions". Adam Smith and John Locke, for sure, are the founding philosophers of liberalism; governments only guarded property, not interfering with individuals. Lest we forget, besides people acquiring physical property through their physical

labor, they also were acquiring knowledge (also property) through their intellect.

"Interdisciplinary" flourished from the Medieval period through the Renaissance on through the Enlightenment with the natural philosophers. "Renaissance" was re-birth, but what kind? Descartes (1637/1912) - *Meditations on first philosophy* - fragmented the natural philosophers' world, i.e., "...to divide each of the difficulties under examination into as many parts as possible, and as might be necessary for its adequate solution. (Ibid., p. 15)… by showing we cannot conceive body unless as divisible" (Ibid., p. 76)", leaving the question still unresolved, "to what extent can knowledge be miniaturized?" This is the most significant philosophical development since Christ, as I will show momentarily.

Starting around the time when the Industrial Revolution was really getting off the ground (1780), low-paid workers got shoved into substandard working conditions, having only their labor power to sell. Already, Descartes, the subdividing king charged ahead proclaiming non-human animal inhabitants machines, i.e., no "souls". Isn't his the perfect rationale for reducing people to "human capital", a favorite expression parroted by modern capitalists? How better to alienate everyone [Weber, 1930/2001]. Many who were just downright revolutionaries like Karl Marx, stirred up the masses, social philosophers, like Jean Jacques Rousseau (*Du Contrat Social)* writing on the major signpost gracing the 19th century entryway about common good. Not only were specialty areas linked back together ("interdisciplinary") forming a knowledge whole - just like the natural philosophers a century earlier - collectively, human interrelationships were alive.

Physics, medicine, and astronomy (among others) saw discoveries at a faster pace, creating small territories beyond average comprehension. Keep fractionating a fact; you shortly will have gazillions. Think "2^2".

So compartmentalized the knowledge landscape was in the early 1800s philosophers started sorting all these field and connecting them. Representing the dozens of 19th-century thinkers Auguste Comte exclaimed "halt".

Coordination of parts can be accomplished only within an integrated whole. His *Cours de philosophie positive (Course in Positive Philosophy)* outlines a programme of study integrating the various disciplines, a taxonomy founded on order of precision from deductive to inductive. Comte sewed disparate fields together he called "Positive Philosophy".

> En résultat de cette discussion, la philosophie positive se trouve donc naturellement partagée en cinq sciences fondamentales, dont la succession est déterminée par une subordination nécessaire et

invariable, fondée, indépendamment de toute opinion hypothétique, sur la simple comparaison approfondie des phénomènes correspondans: ce sont l'astronomie, la physique, la chimie, la physiologie, et enfin la physique sociale (Cours ...Vol. I p. 30) ... cette classification présente la propriété très-remarquable de marquer exactement la perfection relative des différentes sciences, laquelle consiste essentiellement dans le degré de précision des connaissances, et dans leur coordination plus ou moins intime. (Comte, 1830, p. 31)

[As a result of this discussion [survey of fields of study], positive philosophy is thus naturally divided into five fundamental sciences, the succession of which is determined by a necessary and invariable subordination, founded, independently of any hypothetical opinion, on the mere comparison of the corresponding phenomena: these are Astronomy, physics, chemistry, physiology, and finally social physics. This classification presents the most remarkable property of marking exactly the relative perfection of the different sciences, which consists essentially in the degree of precision of knowledge, and in their more or less intimate co-ordination] (Loose translation by Horne)

To now "interdisciplinary" has been an object. Everything is interrelated organically. Humanity? "Interdisciplinary" accurately describes our world, social integration and interdependence many 19th-century thinkers regarded "organic", more specifically organized society the State. Research the following under the phrase, "___'s ideas on the State" or related phrases:

- Georg Wilhelm Friedrich Hegel (27 August 1770 – 14 November 1831)
- Johann Caspar (also Kaspar) Bluntschli (7 March 1808 – 21 October 1881)
- Auguste Comte 19 January 1798 – 5 September 1857)
- Henri Saint-Simon (17 October 1760 – 19 May 1825)
- Herbert Spencer (27 April 1820 – 8 December 1903)
- Emile Durkheim (15 April 1858 – 15 November 1917)
- Oswald Spengler (29 May 1880 – 8 May 1936)

Most developed are Hegel (*The Philosophy of Right*) and Durkheim, the latter with "collective consciousness" (*The Division of Labor in Society)*. We now have an integrated and interdependent humanity "interdisciplinarily" exploring the integrated and interdependent world, truth the goal.

Reflect on Descartes, the explosive scientific discoveries, and absoluteness, particularly Newton's absolute space. Our increasing predictive ability saw

a corresponding rising confidence in science, thinking humans could control their own destiny. Greek automatons (Hero's engine) foreshadowed the sophisticated mid-1700s automaton clocks signifying increasingly mechanized factories. These - don't forget the Babbage machine - represented the technology freeing us from mundane chores. Keep going similarly; could it be someday we would create ourselves? Beyond is the seemingly infinite knowledge field expanse humans fancy exploring and controlling. Nietzsche's "God is dead. God remains dead. And we have killed him." [Nietzsche, 1887/2001, §125, p. 120] meant not so much a deity perishing than our no longer "requiring" any supernatural being managing our affairs.

The 19th century portended Heisenberg's hard wake-up call and Uncertainty Principle yelling WE determine reality. My students never thought pondering their image in a mirror and reflecting on it (figuratively and literally) was easy. We know ourselves through ourselves (recursion), the amplified Greek maxim, "Know thyself". Einstein said space was no longer absolute; it now is the dual of space-time, the second half physicists still arguing over. If space-time is not "disciplinary", then, what is? "Interdisciplinary" at its simplest level is the dual (something existing because of what it is not, the unity of difference making something what it is).

Progressively, humanity thought it was gaining greater control over its own destiny, scientific advances, extrapolating from the past and accurately projecting to the future, thereby supposedly controlling it. The "organic period" marking the 19th century questioned the other "half" of physical. Soon we may replicate ourselves, some truly frightened by the prospect (and perhaps rightly so), others denying it.

If we could replicate humans' physical motions, such as dancing around a clock centerpiece, why not their thinking?. Comes Norbert Weiner (*Cybernetics)*, who IIIS now sees integral to understanding "interdisciplinary". After all, we *homo sapiens sapiens* should live the word.

Now, let's get back into our metaphorical vessel discipline carrying rigor.

3. The vessel – discipline

No, I do not mean a kid's derrière *on fire* –

Figure 1: "A Spanking Good Time" – 1883, Boston Public Library [Discipline, 2020]

Inside "interdisciplinary" resides "discipline", focus, and rigor. Instructors correct or redirect by punishment, teach, relieving suffering from something deemed not right.

> **correct (v.)**
>
> mid-14c., "to set (someone) right by punishing for a fault or error, to discipline;" late 14c., of texts, "to bring into accordance with a standard or original," from Latin correctus, past participle of corrigere "to put straight, attempt to make (a crooked thing) straight, reduce to order, set right;" in transferred use, "to reform, amend," especially of speech or writing, from assimilated form of com-, here probably an intensive prefix (see com-), + regere "to lead straight, rule" (from PIE root *reg- "move in a straight line," with derivatives meaning "to direct in a straight line," thus "to lead, rule"). [Correct – etymology, 2020]

"Correct?" We see the root "rect", or "straight".

"Discipline" has widely diverse meanings:

Figure 2: Thesaurus synonyms - "discipline"

For example, "education" does not mean "restraint", the latter more concerning indoctrination. Observe the *Thesaurus* does not include directly specialized knowledge nor directly "correct".

Discipline incorporates "straight" ("ordered") and the ordered object of instruction. How straight? How much tolerance? What is absolute straightness? The less straightness, the more included are areas, depicted here:
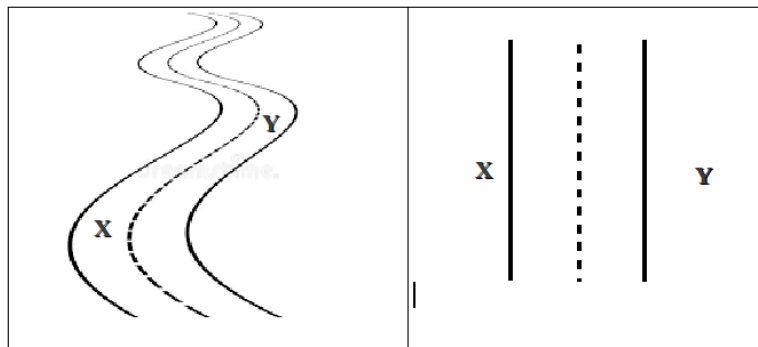

Figure 3: Disciplinary boundary problems

A discipline's curved road (left panel) can include the biology of X and the physics of Y (biophysics), but chemistry's straight road (right panel), also a science, excludes these. A road's linearity determines a subject's "interdisciplinary" character, the curvier the road, the more "interdisciplinary", conversely for a narrowly-defined field. Somewhat paradoxical, "interdisciplinary" can be disciplinary. Lack of discipline means looseness, carelessness, inattentiveness regarding rules and standards, a social extreme anarchy, no structure, purpose, content, nihilism, or destruction. I'll include the ubiquitous incompetent. We will see later discipline corrupting knowledge quality and peer review.
Opposite "disciplines" are anarchy producing social entropy and "interdisciplinary". The first started manifesting itself in the 1960s-era US schools. The second is deconstructing the Tower of Babel - confused speech with now-siloed work. So, a contradiction emerges. We want rigor information quality rigor, plus intercommunication and cross-fertilization.

4. The contents - rigor

What really is "rigor"? "Rigor" contradicts itself; it's meaning all over the map, the following a snapshot explaining why:
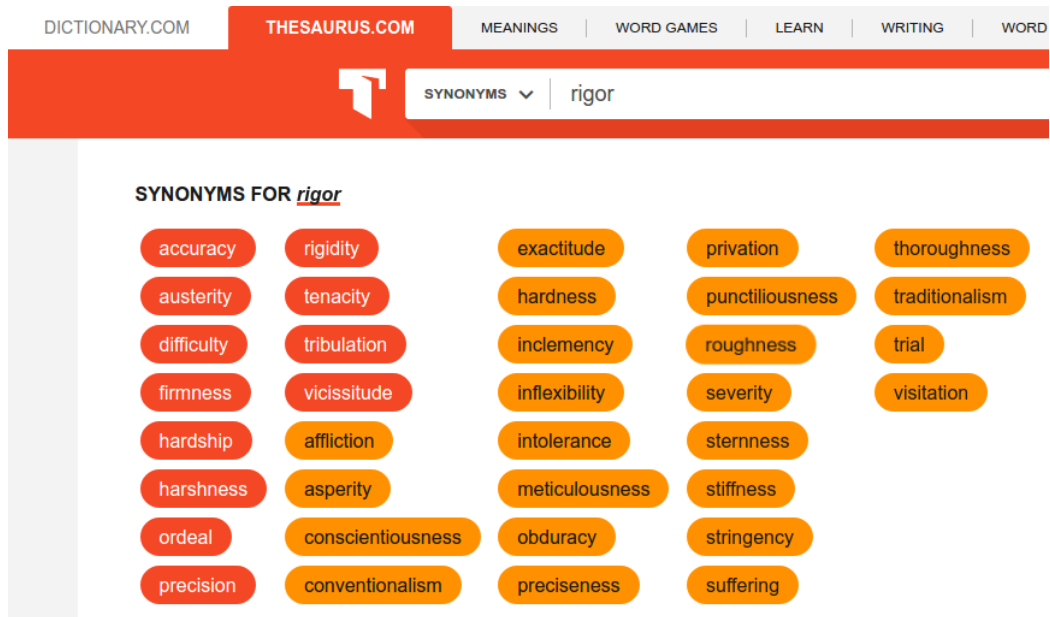
Figure 4: Thesaurus synonyms - "rigor"

Contrast "rigor" with ideology (single-minded rigidly-held ideas). Two "rigors" can clash, the ideologue holding pseudoscientific views confronting her/his beloved science. Eric Hoffer's *The True Believer* dissects fanaticism, something academicians might consider when defending "rigor". I also am mindful, though not entirely on board, of Paul Feyerabend's *Against Method* cautioning us against scientism, agreeing there is no "the" scientific method or any method.

Compare the two *Thesaurus* "discipline" and "rigor" synonyms, and the equivalence should be clear. "Rigor" complements "discipline" and vice versa. Then, I am "rigorously interdisciplinary".

5. "Discipline" and "rigor" merge

It should be clear context shapes word use. Such I suspect is a topic academicians seeking tenure could expound on indefinitely. Important are the implications. Here are a few not necessarily organized examples.

"Discipline" with its dark sides show "discipline" by ideologues (oppressive regimes or social systems) their carving up knowledge space enabling control – keeping others out by special vocabulary and method(s). We see manipulation on two fronts. First, academicians encounter the gatekeepers for conferences, journals, and books, editors ostensibly following "rigorous" peer-reviewing standards, and higher educations institutions imposing "publish or perish" culling their "surplus" faculty.

"Knowledge is power", and the more arcane a discipline, the greater the ability its club door gatekeepers can set the figurative entrance fee. How forcibly they impose entrance requirements reflects their "rigor". If an academician ventures outside her/his area with a presentation violating those rules, the research possibly revealing profound results, may never see the sun. Academic exclusion is a microcosm of general social conflicts manifesting a range from personal narcissism through ideologies (including sectarian religion), personality cult dictatorships, bureaucratic empire-building, and ultimately nationalism. Otherwise stated, question the motivation underpinning establishing a "discipline".

Let's review the technical writers' two-part standard. First, say what you do and do what you say. Second, any person should read only the document, replicating faithfully the creation, patent applications excellent examples. If the patent examiner cannot "reduce to practice" the document's contents, the applicant will fail patenting. The first rigor is preciseness describing the creation, not advertising the "should", "ought", or other "want-to-be".

If "rigor" means "strict adherence to", can the shadows that are our knowledge ever mirror the reality? Without doubt knowledge quality for the social brain requires the confluence of "interdisciplinary", "discipline", and "rigor".

Post-graduate "rigor" means peer-review when an academician's future depends upon publishing. Ostensibly throughout her/his school courses, s/he was peer-reviewed internally by the professors. Aside, general standards can bar publication, like presentation venue – journal, conference, etc. Don't discount a reviewer's or editor's prejudice.
Predatory and fake journals break apart all standards and "rigor", academicians not organizationally stepping up to the plate with a meaningful action programme [Kennedy and Horne, 2018]. Such a sidebar discussion includes changing the whole publish-or-perish environment driving these fake and low-quality publications and conferences.

6. Bringing it all together

Dynamic integration and interdependence define "interdisciplinary" describing life's essence, organicity, movement *qua* movement, a purposeful independent entity within the overall philosophical system. Organicity with the content and method emerge from the academics, perforce interdependent and integrated collectively within a social organism. The academicians ultimately must internalize "interdisciplinary", i.e., live it.
What is the most "interdisciplinary" entity you can imagine on Earth, besides Earth, itself? "Bringing it all together" expresses the conclusion, collecting all the disparate entities into a single system, a system containing

its subsystems.   Systems are abstractions, with little agreement about collections like a swarm, lion pride, or committee. Systems have to be dynamic (weather systems) - accept input and deliver outputs. However, "interdisciplinary" characterizes organic, or living systems. My defending "it is organic" you'll see later, albeit I will say societies act organically, again, the above section so indicating.   An interdisciplinary society disciplines itself (recursion) with rigor. Let's recall Durkheim and Hegel.

Different entities can operate collectively as one, the one dependent upon the differences, the living essence of "interdisciplinary, each entity needing rigor itself, the rigor extending to the organism's very essence, the whole maintaining its integrity. It is worthwhile quoting Durkheim at length.

Society, equivalent to an individual, has a consciousness, more explicitly, a "collective consciousness".   Government, is the "'brain' of society" (Durkheim, p. 42, p. 171) but, "...it is not the brain that creates the unity of the organism, but it expresses it, setting its seal upon it." (Ibid., p. 297). However,

> ...wherever an authority with power to govern is established its first and foremost function is to ensure respect for beliefs, traditions and collective practices - namely, to defend the common consciousness from all its enemies, from within as well as without. It thus becomes the symbol of that consciousness, in everybody's eyes its living expression. [Durkheim, 1893/1984, p. 42,]
> ...
> The solidarity that derives from similarities is at its maximum when the collective consciousness completely envelops our total consciousness, coinciding with it at every point. At that moment our individuality is zero. … at the very moment when this solidarity exerts its effect, our personality, it may be said by definition, disappears, for we are no longer ourselves, but a collective being. … The bond that thus unites the individual with society is completely analogous to that which links the thing to the person. (Ibid., p. 84)

The "interdisciplinary" of the individual "parts" culminates in unity, the whole, the whole relying upon the individuals, the impetus interdisciplinary. More generally, the "unity of difference" law governs, something existing because of what it is not. Here, I omit the quotes, because you now have the word's full meaning.

From individual subject areas through societies - integrated and interdependent beings, we arrive at both the object and process, just before the "why". Ostensibly, being "rigorous" improves the knowledge quest. Reflect on Durkheim's "social brain". We dig deeper, though, persistently asking "why", and though I will not venture a more complete answer, let's say here it is seeking truth.

If people coalesce into a society, and the society emerges as the State owning a collective consciousness, what does its social brain do? Surely, *homo sapiens sapiens*, the full anthropological human subspecies name, transcends simply existing, the second "*sapiens*" bespeaking the intelligent species, more important, the wise one.

Hegel (1899) said, "The State is the Divine Idea as it exists on Earth" (Ibid., p. 39.). "Spirit is self-contained existence" (Ibid., p. 17). "Society and the State are the very conditions in which Freedom is realized" (Ibid., p. 41).

> The universal is the concern of every particular person. Everything depends on the law of reason being thoroughly incorporated with the law of particular freedom. My particular end, thus becomes identical with the universal. [(§ 265, p. 135)]

Now, we see the interdisciplinary's large context and the deeper meanings of "discipline" and "rigor", all shaping an integrated and interdependent humanity sharing "collective consciousness" in its social brain, where truth and knowledge quality supporting it is its social purpose. Such is where we will venture in an upcoming article, "The ontology of 'interdisciplinary' " and my book, *Zero is Greater Than One*. I'll see you there.

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Paper Title (Less than 80 characters)

[1]Author[1] Author[2] and Author[3]

[1]Affiliation
[2]Affiliation
[3]Affiliation

[1]Email, [2]Email, [3]Email (Emails are optional)

Abstract[2]

*The abstract is to be in fully-justified italicized text as it is here, below the author information. Use the word "Abstract" as the title, in 13-point Times New Roman, boldface type, centered relative to the column, initially capitalized. The number of words used in the abstract should be in the range of 150-250, and it should briefly describe (at least and right at it beginning): 1) **What** the article is about 2) **Why** it is intellectually important and/or is, may be, or has been pragmatically useful, and 3) **How** the results were achieved (naming or briefly describing the method or methodology used in the research or study). More details regarding these three important structural points should be provided in the introduction section of the article and/or in any following sections. The abstract is to be in 12-point, single-spaced type, and may be up to 3 in. (18 picas or 7.62 cm) long. Leave two blank lines after the abstract, and then begin the main text. All manuscripts must be in English. **Referencing should be done via APA Style. We are referring to the APA referencing style, not the APA format style. The format described in these Guidelines for Authors should be the ones to be followed***

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[1] This footnote would be used in the case of making explicit the contact authors.

[2] This footnote is to acknowledge the name of who made the peer-editing or the final proofreading of the article

1. Introduction

The introduction should include, at least, the background, the context and a brief summary of previous related works. Any of these three features may be expanded or detailed, in the context of any following sections. If this is the case, please reference in the this introductory section the title of the section(s) when more details will provided. Please follow the steps outlined below when submitting your final draft, or camera ready version of your article to the related publication of the International Institute of Informatics and Systemics or to the publisher (IIIS or TIDC). These guidelines include complete descriptions of the fonts, spacing, and related information for producing your manuscript. Please, follow them and if you have any questions, direct them to the editor of your special issue or to iiicsec@iiic.com

2. Formatting your Paper

All printed material, including text, illustrations, and charts, must be kept within the parameters of the 8 15/16-inch (53.75 picas, 22.75 cm.) column length and 5 15/16-inch (36 picas, 15.24 cm.) column width. Please do not write or print outside of the column parameters. Margins are 3.3cm on the left side, 3.65cm on the right, 2.03 cm. At the top, and 3.05cm at the bottom. Paper orientation in all pages should be in portrait style.

3. Main Title

The main title (on the first page) should 1) have no more than 80 characters, 2) begin 1 3/16 inches (7 picas, 2.96 cm.) from the top edge of the page, 3) centered, and 4) in Times New Roman 14-point, boldface type. Capitalize the first letter of verbs, nouns, adjectives, pronouns, and adverbs; do not capitalize articles, prepositions, or coordinate conjunctions, (unless, of course, the title begins with such a word) (*e.g.* **A Case Study of a Systemic Merhodology for Information systems Development**).

4. Author Name(s) and Affiliation(s)

Author names and affiliations are to be centered beneath the title and printed in Times New Roman 13-point, non-boldface type. (See example below), Beneath the title, type. The author's name should have first

name, middle initial(s), and last name. ***Do not use titles (Dr.) or degrees (PhD).***

For example:

<div align="center">

Author[1], Author[2] and Author[3]

[1]Affiliation
[2]Affiliation
[3]Affiliation
[1]Email, [2]Email, [3]Email

</div>

The corresponding author should have an asterisk sign (*) if possible, after the corresponding author's name. The Corresponding author label (should appear at the footnote section of the first page of the paper (or besides the affiliation of the author) Times New Roman in style and 10 in font size. Emails below the affiliations might be included or not. We encourage the inclusion of, at least, the email of the corresponding author. Authors' names should not have titles and not be written in capital letters, but, of course the first letter of each name.. The affiliations should be written in italics.

5. Second and Following Pages

The second and following pages should begin 1.0 inch (2.54 cm) from the top edge. On all pages, the bottom margin should be 1-3/16 inches (2.86 cm) from the bottom edge of the page for 8.5 x 11-inch paper; for A4 paper, approximately 1-5/8 inches (4.13 cm) from the bottom edge of the page.

6. Type-style and Fonts

Wherever Times New Roman is specified, Times New Roman may be used. If not available in your word processor, please use a font closest to Times New Roman that you have access to. Please, do not use bit-mapped fonts.

7. Main Text

Type your main text in 13-point Times New Roman, line-space of 1.15. Do not use double-spacing. Use one blank line between paragraphs.
Be sure your text is fully justified, flush left and flush right. Please do not place any additional blank lines between paragraphs.

7.1. Tables

Place tables as close as possible to the text they refer to and aligned center. A table is labeled *Table* and given a number (*e.g.*, **Table 1. Production per Year**) it should be numbered consecutively. Table the label and caption or title appear 8pt space above the table, 13pt space after the text or paragraph if any; it should be uniform fonts and font size, and use 13pt font size and Times New Roman style, capitalized similar to paper title, aligned center and bold face. Sources and notes appear below the table, aligned left. All tables must be in portrait orientation.

For Example:

Table 1. Production per year

7.2. Figures

Place figures as close as possible to the text they refer to and aligned them to the center. Photos, graphs, charts or diagram should be labeled **Figure** (do not abbreviate) and appear 13pt space below the figure, 13pt space before the next text or paragraph, and assigned a number consecutively. The label and title should be in line with the figure number (*e.g.*, **Figure 1.** Location Error Rate of Three Schemes), it should be uniform fonts and font size; use 13 pt font size and Times New Roman style, capitalized similar to paper title, aligned center and bold face. You may provide a very short description of what is shown in the figure. Source (if any) appears underneath, in 6pt font size and Times New Roman style Figures should be at good enough quality. Minimum image dimensions are 6 cm (2.3622 in) wide by 6 cm (2.3622 in) high.
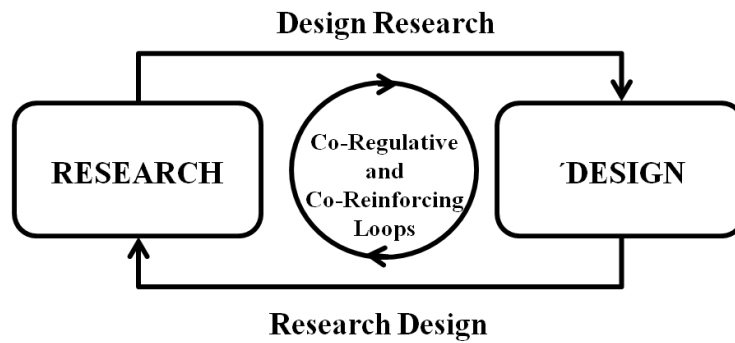
For Example:

Figure 1: Relationships between the of Research and Design. Research and Design have implicit or explicit cybernetic relationships.

7.3. Equations

Including symbols and equations in the text, the variable name and style must be consistent with those in the equations. Equations should be indented at the left margin and numbered in the right margin, equation number is enclosed with open and close parenthesis () Time New Roman in style and 12pt font size. Define all symbols the first time they are used. All equations symbols must be defined in a clear and understandable way.

For Example:

$$N_{\sigma1,\sigma2} + N_{\sigma1,\sigma3} + \ldots + N_{\sigma1,\sigma m} + N_{\sigma2,\sigma3} + N_{\sigma2,\sigma4} + \ldots + N_{\sigma2,\sigma m} + N_{\sigma m-1,\sigma m} \qquad (1)$$

$$Z^* \geq \sum_{j=2}^{m} N_{\sigma1,\sigma j} + \sum_{j=3}^{m} N_{\sigma2,\sigma j} + \ldots + \sum_{j=t=1}^{m} N_{\sigma t,\sigma j} + N_{\sigma t,\sigma t-1} + \sum_{j=t}^{m} N_{\sigma t-1,\sigma j} - N_{\sigma t-1,\sigma t}$$

$$+ \sum_{j=t+2}^{m} N_{\sigma t+1,\sigma j} + \ldots + \sum_{j=m}^{m} N_{\sigma m-1,\sigma j} \qquad (10)$$

8. First-order Headings

For example, "**1. Introduction**", should be Times New Roman 13-point boldface, initially capitalized, flush left, with two blank lines before, and one blank line after. First order heading should not be left at the end of a page with no text of, at least one line, below it in the same page.

8.1. Second-order Headings (Sub-heading)

As in this heading, they should be Times New Roman 13-point boldface, initially capitalized, flush left, with one blank line before, and one after.

Second order heading should not be left at the end of a page with no text of, at least one line, below it in the same page.

8.1.1. Third-order Headings: Third-order headings, as in this paragraph, are discouraged. However, if you must use them, use 13-point Times New Roman, boldface, initially capitalized, flush left, and proceeded by one blank line, followed by a colon and your text on the same line.

9. Conclusions

All articles should have a last section titled "Conlusion", in which results are briefly presented, reflections are made on these solutions, suggestions are presented with regards to 1) their potential applications and/or 2) additional research that might be done, as a consequence of the information, knowledge and-or reflections shared by the article

9. Footnotes

Use footnotes for short texts and place them at the bottom of the page on which they are referenced to. Use Times New Roman 10-point type, single-spaced. To help your readers, please, avoid using large texts in the footnotes. For larger texts you can use the end-notes or appendixes. The author should make a tradeoff between being precise in his/her writing (or providing helpful additional information) with cluttering the reader with potentially unnecessary details or precisions. This depends on the audience targeted by the author as well as on her/his writing stage. This is one of the reasons we are avoiding formatting styles that might constraints the writing style. Having said so we suggest 1) to avoid many not short footnotes, 2) use appendixes or end-notes for larger texts. *The intention of this guideline is to maximize the flexibility that the author may have in order to adequately adapt to his/her writing style while minimizing the differences that the reader might find among the format of different writers. It is a matter of trade off between the authors and the readers, both of whom should be taken care of, in the editorial process.*

10. Notes and Appnendixes

Notes, if needed, should appear before the possible acknowledgments, and ordered by numbers.

Appendixes, if needed, should appear after the possible acknowledgments, and ordered with capital Letters, as for example Appenxis A, Appendix B, etc., always after the acknowledgments.

11. Acknowledgments

1. Remember that authors are responsible for copy-editing the final version of their paper. Since no author can make the final proofreading and editing of her/his own article, then s/he needs a peer-editor. Consequently, the author(s) of the paper should acknowledge, via an initial footnote in the first page of the article, the peer-editor who proofread and edited the final version of your paper. More details and the reasoning, that support this requirement, have been included in the appendix of the "Quality Assurance" document posted at http://www.iiisci.org/journal/sci/Quality-Assurance.pdf.

2. Because of our dual methodology of peer reviewing that combines traditional double-blind reviewing and non-blind reviewing, please include in the acknowledgments you make at the end of your paper, under the title of "Acknowledgements" the names of the reviewers you recommended as non-anonymous reviewers of your papers, who validated, verified and approved by us and who reviewed your paper and recommended its acceptance. This acknowledgement section should be brief and placed at the end of the text or after the notes, if these are needed and used.

References

List and number all references that using 10-point Times New Roman, fully justified, single-spaced, at the end of your paper, and according the APA style of referencing, This is a *must* condition. All references included under the title "References" should be referenced in the main text of the article (abstract, introduction, any of the following sections, notes and appendixes.

As we emphasized above in the abstract, "referencing should done via APA Style. We are referring to the APA referencing style, not the APA format style. The format described in this Guideline for Authors should be the one to be followed.

Word has an excellent support for enforcing APA referencing while not enforcing APA formatting. While it might seem, at least initially, time consuming, this support showed to be not a time waste, but a time investment for those references used in the article and used again in future articles, because it saves the references made in previous articles in order to be moved to future articles in seconds. We cannot emphasize more about our recommendation to use Word support for APA referencing, even if it might initially be perceived as less efficient. Please use the format provided by APA style for listing the references. *Remember that all listed references should have been cited at least once in the article.* Articles and books not

cited in the written article may be listed after the references, as Additional Recommended Bibliography.

The following is an example of the spacing and the fonts (Times New Roman) and size (10), required for listing the references in alphabetic order, as it is the APA style. If you want to list not-referenced related bibliography, you can do it in the same way, but entitling it as **Additional Bibliography.**

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