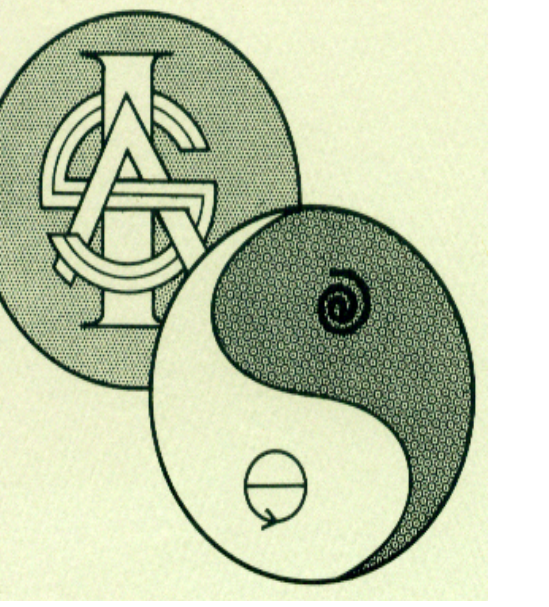




Systems Processes Theory (SPT) and Sustainability: VII. Applications of Hierarchies to Sustainable Development



Introduction

One of the frustrating challenges meeting those interested in conserving and protecting the earth's natural ecosystems is how to go about instilling a sense of ecological responsibility among individuals. One way, however, is through sustainable development. Rising energy prices, emerging economies, and water scarcity are a few issues stressing the need for sustainable development. However, a strictly reductionist or holist approach to sustainable development is often emphasized. This leads to inconsistency and disagreement between advocates of sustainable development. Neither holism nor reductionism alone will reach the desired outcomes of sustainable development. In order to abate this imminent impedance I suggest that ecology is a set of nested and interpedently hierarchies and on the personal ecological level the use of Maslow's Hierarchy of Needs is a prerequisite for sustainable development.

Systems Science & Sustainability

- Systems science is useful to sustainability studies for several reasons:
 - Allows for linkages and connections between constituents to be examined and more fully understood
 - Creates awareness of sustainable systems processes, which otherwise would be overlooked
 - Creates and adjacent knowledgebase

•Hierarchies can be found nested in any place, at any level. A systems science approach can therefore serve many applications and functions.

•Articles totals containing both hierarch* and sustainability are radically reduced compared to articles containing only hierarch

•Over the past ten years article totals containing sustainability have increased

•Although the percentage of article totals containing sustainability are relatively steady

•Could have used sustain* instead of sustainability to get better indication of sustainability and systems science

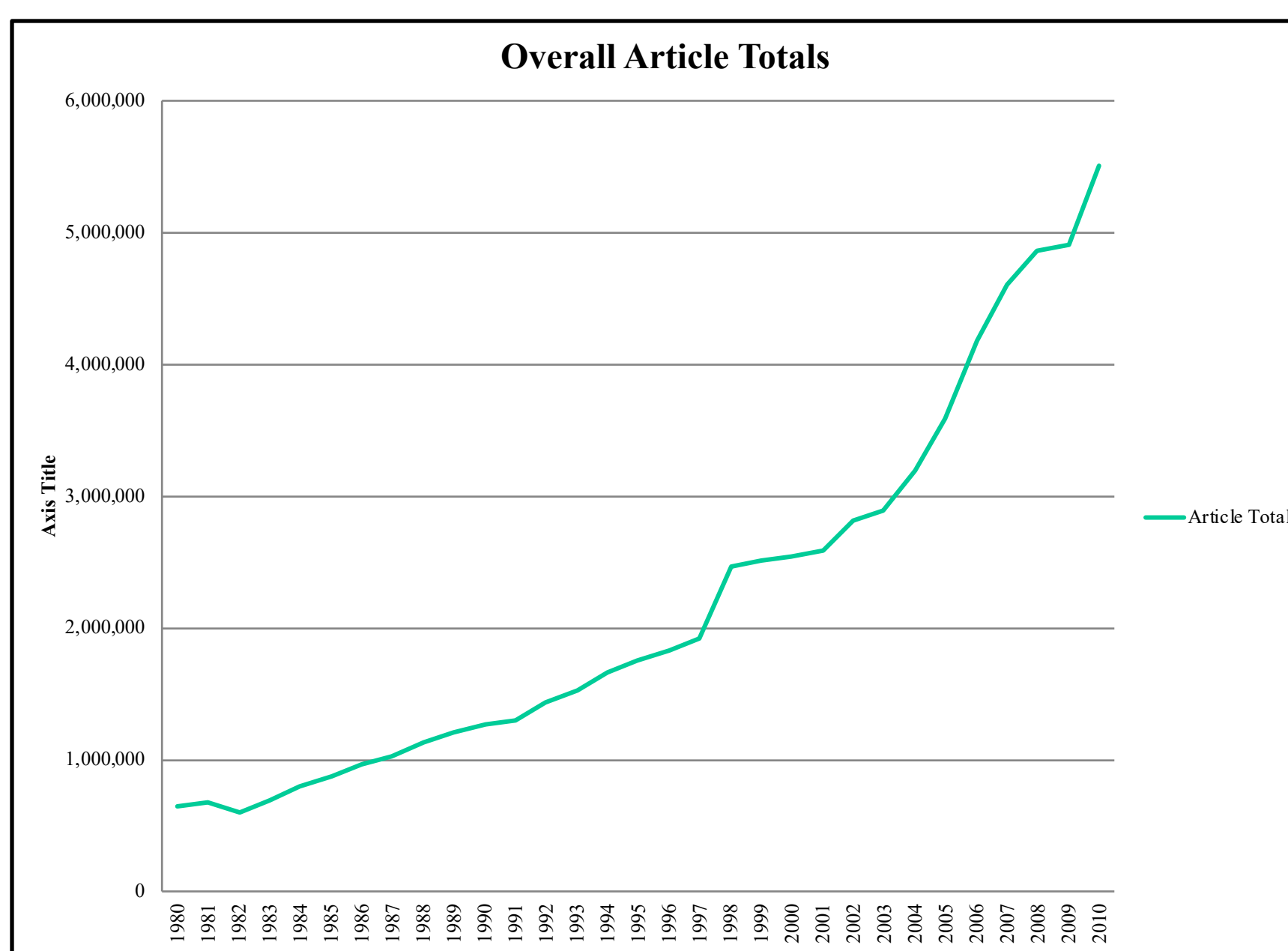
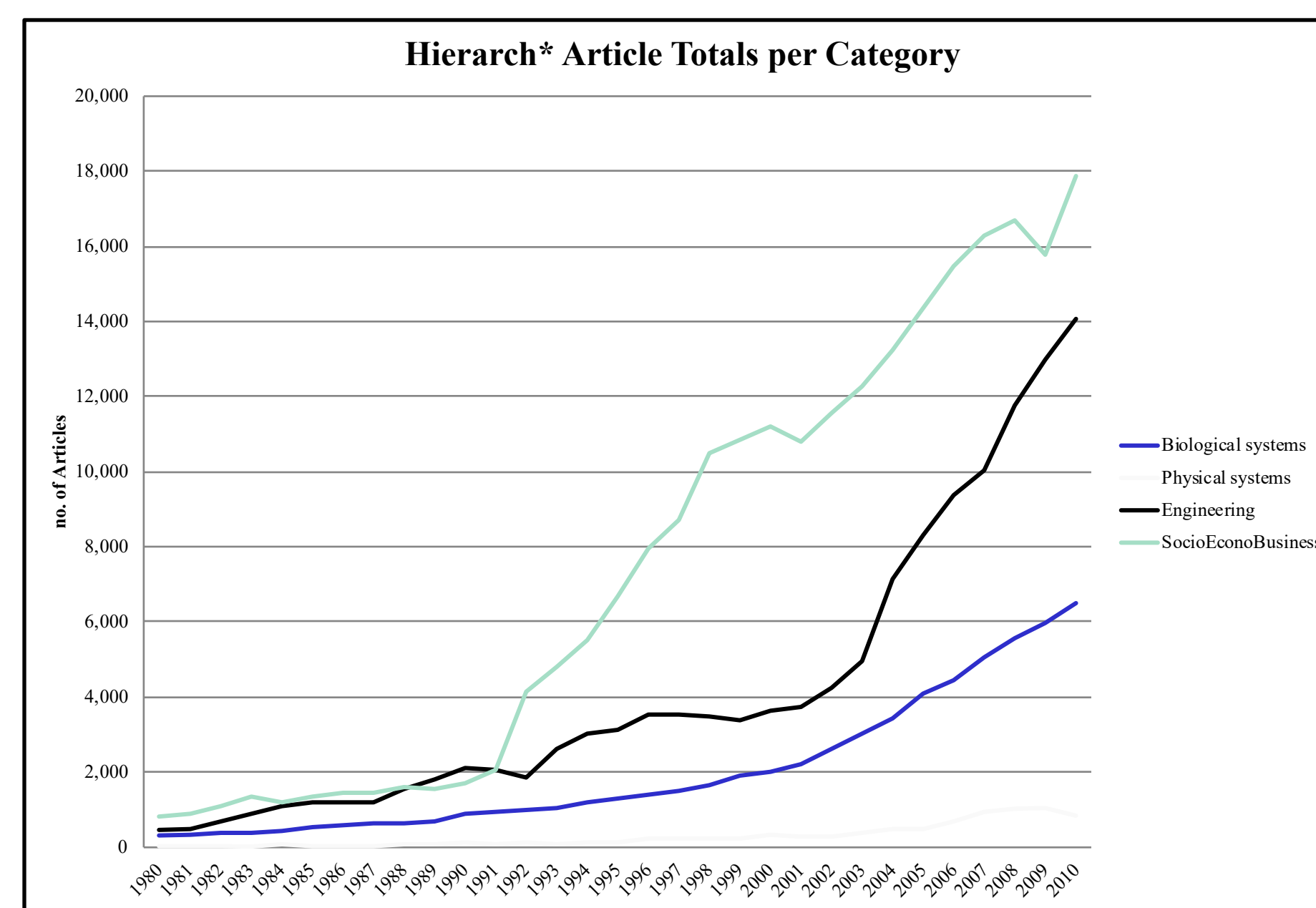
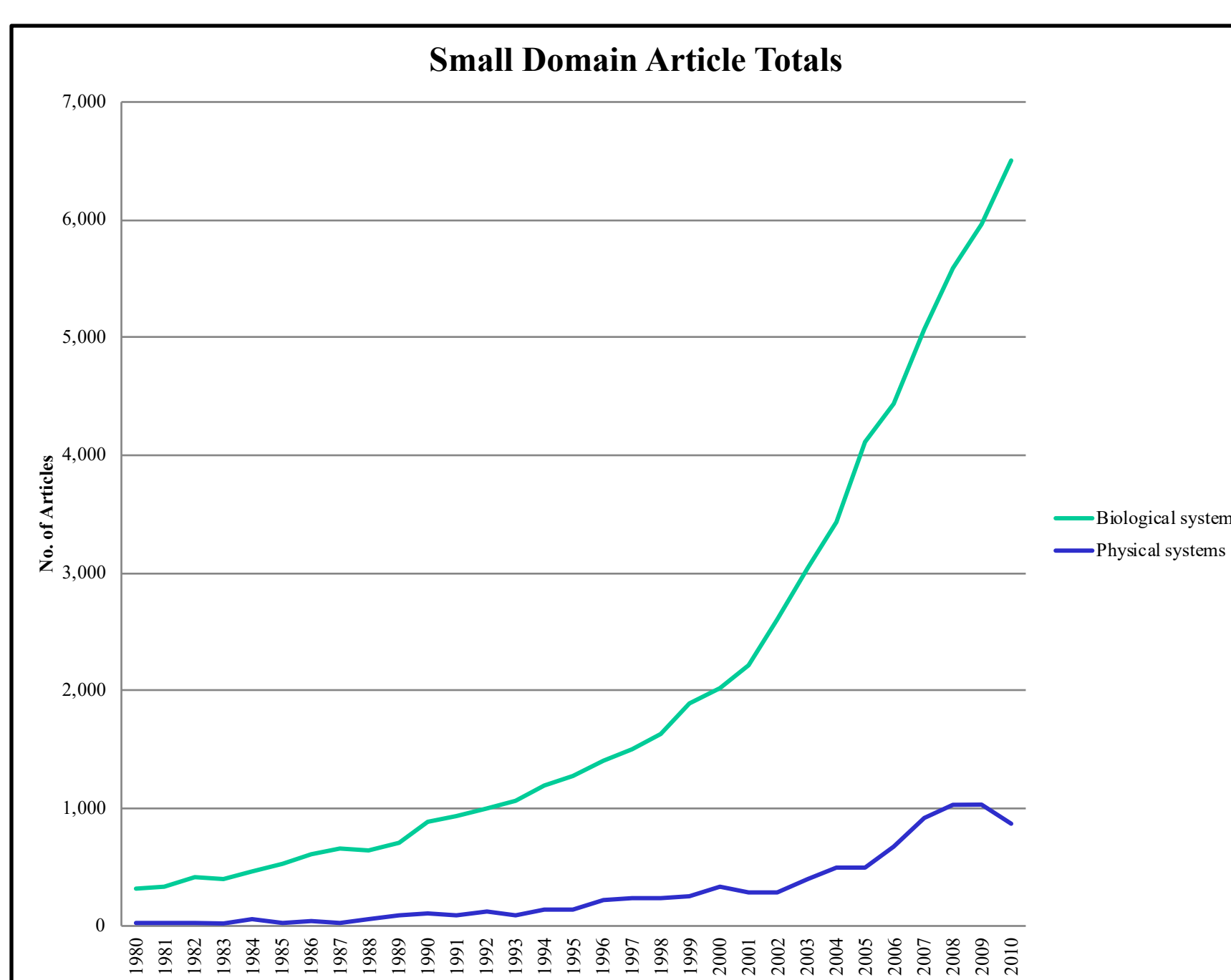
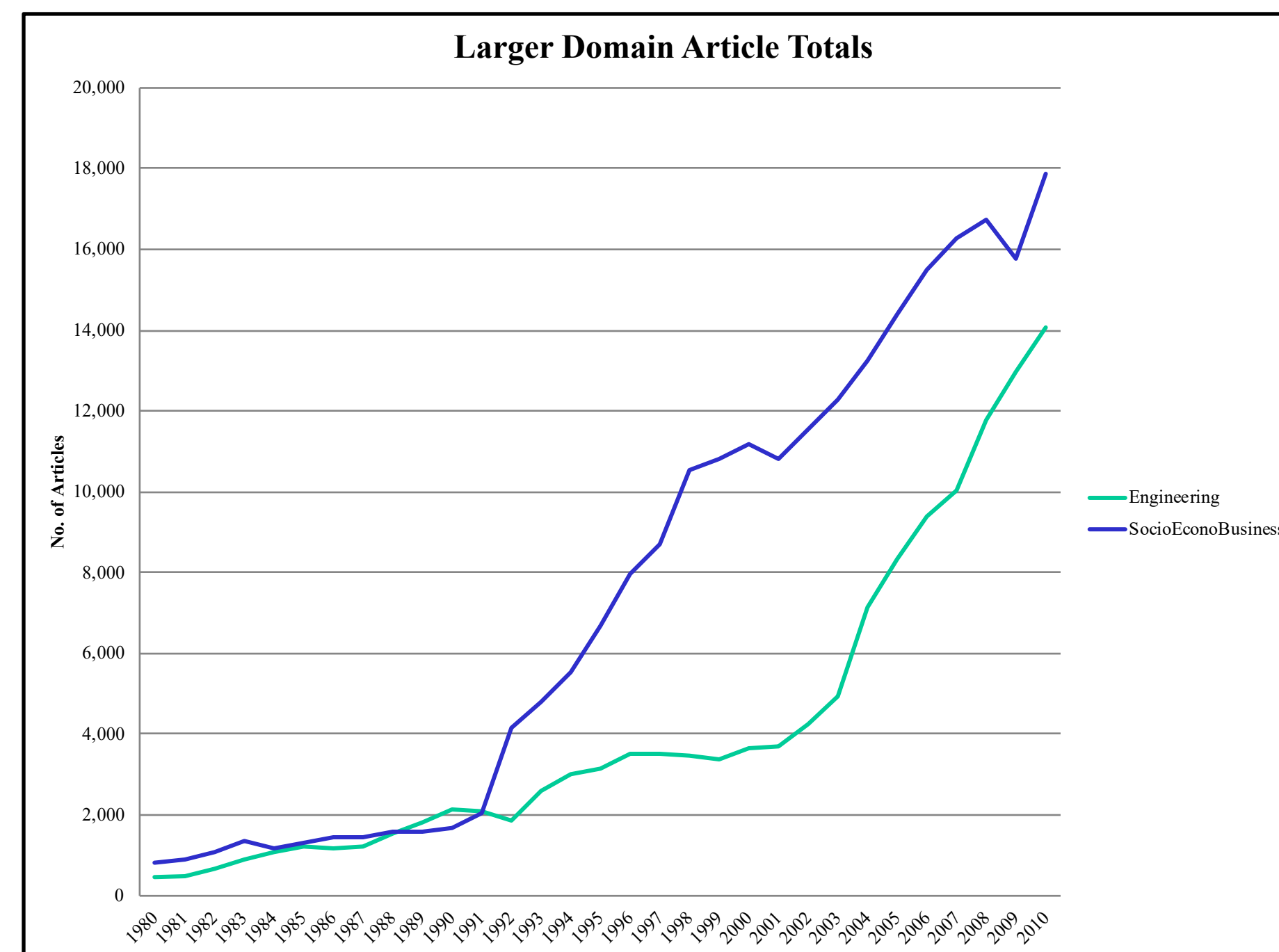
Comparisons Between Articles Containing Hierarch* and Hierarch* w/ Sustainability		
Years 2000-2010	Total Articles Containing Hierarch*	Total Articles containg Hierarch* and Sustainability
2010	39,966	1,521
2009	36,404	1,368
2008	35,691	1,230
2007	32,935	1,121
2006	30,590	910
2005	27,910	670
2004	24,795	591
2003	21,132	489
2002	19,043	417
2001	17,417	316
2000	17,551	376
Grand Total	303,434	9,009
Percentage Total		2.97%

Hierarchy

- An ordered set or an acyclic directed graph
- A hierarchy can link entities either directly or indirectly, and either vertically or horizontally
- The only direct links in a hierarchy are to one's immediate superior or to one of one's subordinates, although a system that is largely hierarchical can also incorporate nested hierarchies
- Levels constrained by lower and higher sub-units and super-units
- Leaps in size among scales
- Largest and most fundamental at the bottom
- Herbert Simon defines hierarchy as "a system that is composed if interrelated sub-systems, each of the latter being in turn hierarchic in structure until we reach some lowest level of elementary subsystem."
- Ludwig von Bertalanffy says that hierarchical structure "is characteristic of reality as a whole"

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Trends In Literature

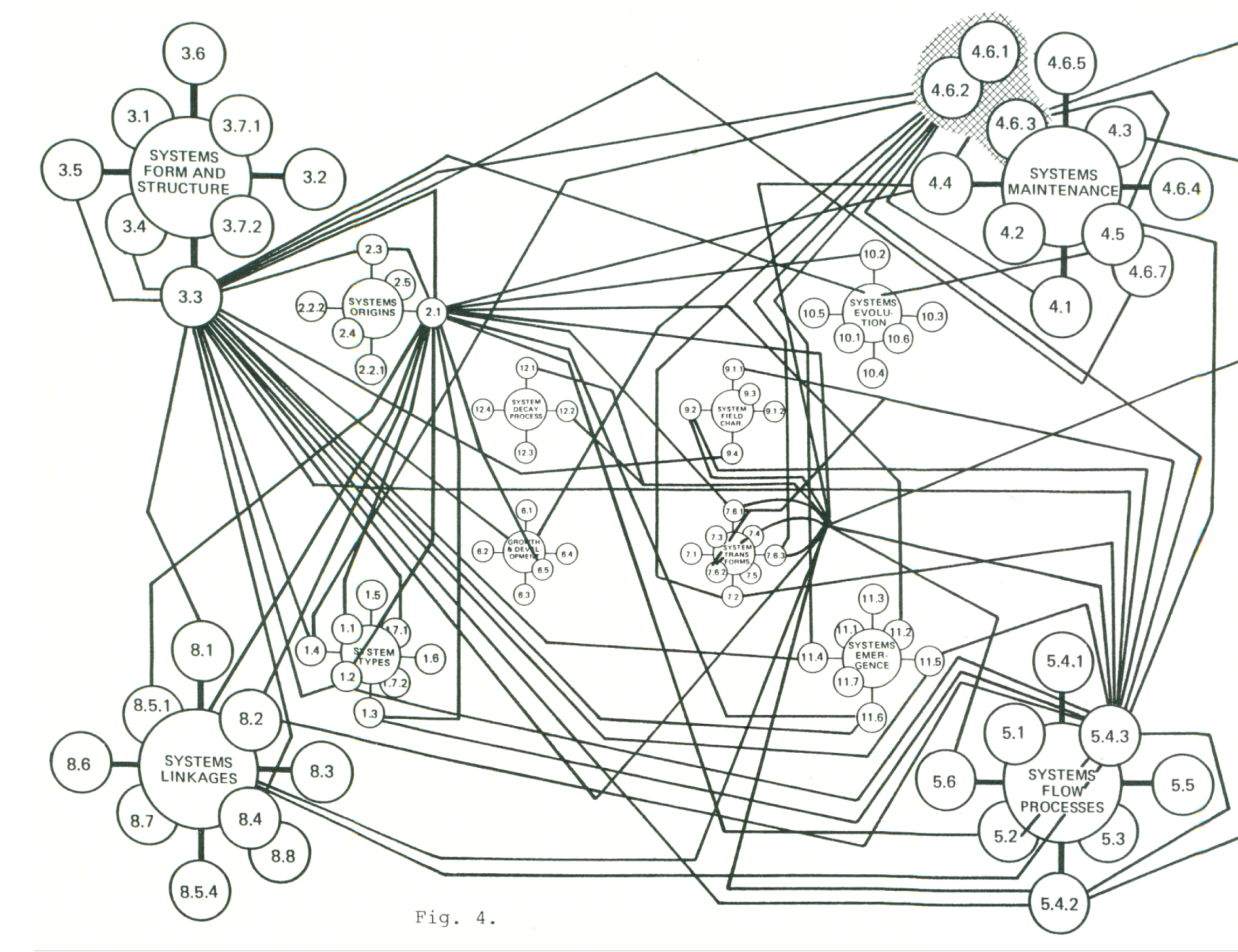
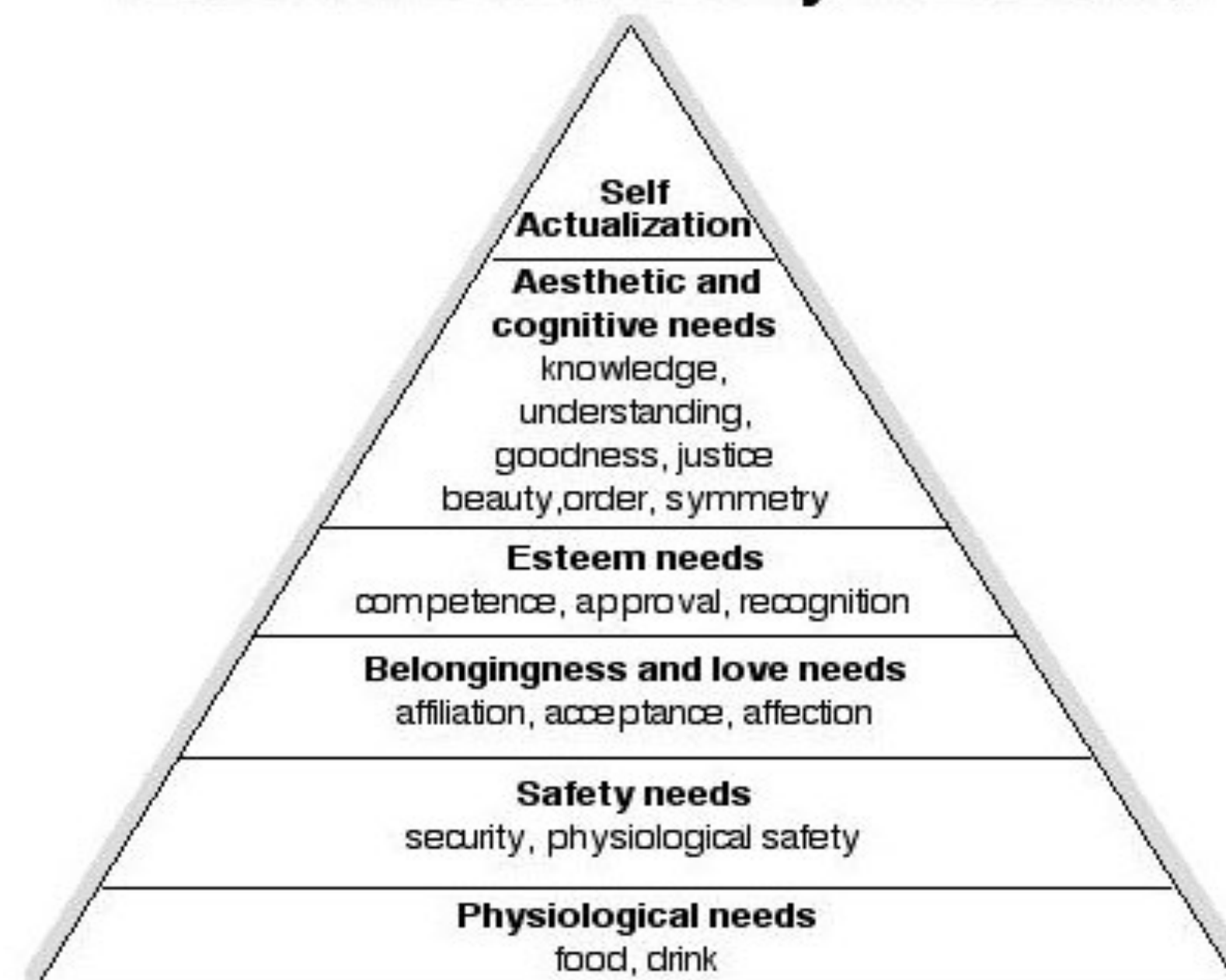


- Article searches were conducted across 11 databases
 - Pubmed, Bio Abstracts, SciFinder, GeoRef, Scitation, Compendex, IEEE Xplore, Socio Abstracts, ABI/inform, PsychInfo, EconLit
- Domains include Biological, Physical, Engineering and SocioEconoBusiness
- Y-axis indicates article totals
- X-axis indicates year
- Article totals linearly increase over the past thirty years

- Hierarch* article totals also linearly increase over the past thirty years
- This means that articles on hierarchies have remained relatively the same
- When searching the databases I use the term hierarch* to include all uses of the term
- Article totals do not include 3 data bases
- It was nearly impossible to access SciFinder
- Both engineering databases did not allow for searches regarding overall yearly totals
- Top two graphs are limited to smallest and largest domains to better show discrepancies

Systems Diagram and Linkage Propositions

Maslow's Hierarchy of Needs



Taken from Troncale (1986). The circles represent isomorphic systems mechanisms, which are clustered by type. Lines represent linkage propositions. The red lines are linkage propositions found while doing the review

Application

- Applying Malsow's hierarchy to sustainable development helps create awareness
 - Specifically an awareness of shortcomings within sustainability
 - Needs not being met
- The first tier of the hierarchy, physiological needs, account for the basic mechanisms of a sustainably ecology
 - Once these are met a perspective of safety can begin to emerge
 - All to often the first tier is overlooked when trying to accomplish goals of sustainable development
- The second tier of Maslow's hierarchy, safety, applies directly to sustainability
 - By creating a perspective of global safety the lens is then widened to its greatest aperture, sustainability can then be appreciated
 - And the third tier emerges
- The sustainability movement is firmly rooted in the fourth tier of the hierarchy, esteem
 - Sustainable development hopes to change social norms so that esteem can be based on what people can do to minimize their environmental impact
 - i.e. recycling
- Once esteem is satisfied, the fifth tier begins to emerge
 - An aesthetic is developed of sustainable development and cognitive needs are satisfied
- After this occurs self-actualization can occur
 - Self realization and place are now firmly cemented within sustainable development
- Nested ecology
 - An integrated whole progressively based upon personal, social, environmental and cosmic ecologies
 - Serves a practical and pragmatic worldview that allows everyone to think for themselves, their lives, their relationships, community, nation and ultimately the world as interdependent

ISSS/INCOSE

•The International Council on Systems Engineering and the International Society for the Systems Science have formally arranged a cooperation in exploring and developing systems science as a knowledge base for both fields. Delegates from both organizations have met in Canada, Arizona, and England to plan these joint efforts.

•The Systems Science Working Group (SSWG) has branded four or five official projects. Two of these focus on Systems Process Theory and Systems Pathology, which are also SIGs of the ISSS.

- This poster is an example of one of these strategies of the joint SPT projects to enable several graduate students and one undergraduate in systems science, systems engineering, or related new fields to share their extensive literature survey on the large number of systems processes
- By assisting on search and analysis of the diverse literature and by integrating, preserving, and making available our individual products, all thesis writers benefit as does the practicing fields of systems engineering.

Conclusion

-By applying Maslow's hierarchy to sustainable development we can begin to see a more unified pragmatic approach

-Identifying the features of the hierarchy allows us to formulate perspectives of sustainable development

-Creating a global perspective increases the chances of sustainable development to be successful

-Literature database searches show that hierarchy and sustainability is relatively un-researched are of systems science

-Through this we can see the need to systems science to be applied to sustainability in order to identify its successes and failures

References

Wimberly, Edward, *Nested Ecology: The Place of Humans in the Ecological Hierarchy*, 2009.