

Fourth International Conference on the Foundation of Information Science
Toward a New Science of Information Beijing China, August 2010

Challenges for Those Constructing a Science of Information as an
Evolving Unique Discipline

The purpose of this paper is more of a challenge to the active practitioners and participants in the field of information foundational and application studies rather than a standard academic treatise. The observations and suggestions presented here are my own and do not necessarily represent any organization. My duty here is to present to those actively involved in developing a new science of information some candid observations and suggestions.

1. Proposed Perspective:

I suggest that all of you here attending this conference, members of Foundations of Information Science (FIS), Science of Information Institute (SciI), and other distinguished professional organizations from our host country, China, and other countries, consider evolving our focus and activities from the traditional information science, semiotics, etc. into a broader meta-discipline and professional domain to be called a "Science of Information." We should continue to recognize, respect, and even support those traditional disciplines that helped originate this evolved discipline, but now focus our main attention on establishing this newer macro field, and assist on leading it into history.

At the third FIS conference on Foundations of Information Science in Paris, 2005, a science of information was proposed. We added an additional day to the conference to discuss this topic and the establishment of an institute to further develop and promote this revised concept. Out of this meeting we initiated the Science of Information Institute. In November of 2005, at the 2nd UNESCO Conference on The Information Society in Tunis, Tunisia, I distributed a paper entitled "Information as a Unique and Scholarly Field" in which a Science of Information concept was presented. In both papers it was suggested we have evolved beyond the traditional study of Information Science and should consider a new term "Science of Information" in order to broaden the scope and include the theories and perspectives of the physical sciences together with arts and humanities. In addition, I proposed that the developments in the field are at a stage of where "Science of Information" should be considered more a "meta-science" that is contributive to – and complementary with – every other science and academic discipline rather than just a solitary traditional discipline, which is distinguished by a singular, unique area of scientific perspective and which focuses on its establishing its own

internal boundaries and theories. Historical studies of Information Science that have included the fields of library and computer, science, semiotics, psychology and many Social Sciences, plus management and engineering-oriented approaches, have been oriented toward the descriptive and manipulative aspects of information. The concepts presented by physicists John Wheeler, Anton Zeilinger, Hans Christian von Baeyer, and Luciano Floridi shows how information in physical science includes a "prescriptive" element. In a similar manner, the science of information must also now have a strong inclusion of a physical science approaches in addition to the more traditional descriptive and manipulative perspectives.

2. The Current Structure of Academia and Science Disciplines

If we consider the Science of Information as an evolving viable field of study and development, a question for those interested in this field is how to place or categorize information as a unique field of study, within the current academic and science disciplines.

Although Wikipedia is not the most authoritative reference on the subject, it is somewhat indicative of a contemporary broad perspective. Following is a summation of the current Wikipedia list of science and academic disciplines:

A. Science Specializations:

1. Natural/Physical Sciences (some cultures refer to this as material sciences)
 - 1.1 Chemistry
 - 1.2 Physics
 - 1.3 Astronomy
 - 1.4 Earth Sciences
 - 1.5 Environmental Science
2. Natural Life Sciences
 - 2.1 Biology
 - 2.2 Anatomy
 - 2.3 Botany
 - 2.4 Ecology
 - 2.5 Evolution
 - 2.6 Genetics
 - 2.7 Physiology
 - 2.8 Zoology
3. Formal Sciences
 - 3.1 Informatics
 - 3.2 Computer Science
 - 3.3 Statistics
 - 3.4 System Sciences
 - 3.5 Logic
4. Cognitive Sciences
 - 4.1 Communication
 - 4.2 Computer Science

- 4.3 Philosophy
- 4.4 Linguistics
- 4.5 Neuroscience
- 4.6 Psychology
- 4.7 Information Science
- 5. Social Science
 - 5.1 Anthropology
 - 5.2 Economics
 - 5.3 Psychology
 - 5.4 Political Science
 - 5.5 Sociology
- 6. Applied Science
 - 6.1 Agriculture
 - 6.2 Architecture
 - 6.3 Education
 - 6.4 Engineering
 - 6.5 Management
- B. Their list of academic disciplines added two more categories:
 - 7. Humanities
 - 7.1 History
 - 7.2 Linguistics and language
 - 7.3 Literature
 - 7.4 Philosophy
 - 8. Arts
 - 8.1 Dance
 - 8.2 New media (Video-computer art)
 - 8.3 Music
 - 8.4 Painting
 - 8.5 Sculpture
 - 8.6 Drama, and acting and movies

These are the academic disciplines that are normally designated by western higher education. Most of these disciplines were revised, created and/or formalized in the 19th and 20th centuries. There is no overall consensus on how academic disciplines should be classified; every educational institution is free to adapt them to their own unique conditions.

In establishing the new evolved information discipline, there should be some initial awareness that information is a part of all elements, systems, conditions and is therefore also an integral part of the other individual disciplines and sciences. In studying information phenomena, it is essential to look beyond the limitations of how human use and perceive information, or even how living organisms' uses information. It is proposed that information is a continuous evolving process that exists in some simple to complex form in every stage of development across all science and academia domains as well as being a significant part of

everything that exists. Information is a trigger mechanism, emphasis and nutrient for not only information activities but also all physical biological elements, systems and activities. This is a functional perspective, not a statement of cosmology or philosophy.

I suggest those actively engaged in the field discuss with their associates how we can integrate this evolving discipline into a new science/academic categorization. It is suggested that new science of information category either be designated as a number 9 on the prior list or as a part of a new category called multi discipline specialties. Moreover, we as colleagues should suggest how this new field could be actively included in the science and academic community.

3. Antecedents of This Approach

It may be helpful to understand how this particular concept of Information as a Science has evolved in my 50 years of work experience with the industrial, governmental and academic world since it is somewhat parallel to the development of this evolved concept. In 1955, I was appointed to a team of system engineers, scientists and developers who were tasked by the U.S. Government Advanced Research Projects Agency (ARPA) to look at newer ways to conceive, develop and use operational information. A few of the recommendations of that research team have continued to influence information research and development in the U.S. Federal government, and include: (1) focusing of funding on digital rather than analog compilers, (2) the development of integrated display systems, (3) the handling and processing of information should evolve from existing batch processing to a more interactive real time process (4) more members of using organizations should be involved in information related activities rather than primarily relying on outside assistance and (5) we must move beyond traditional science and engineering specializations and use a multidisciplinary conceptual and planning approach for all systems and application developments.

In 1962, at University of California in Los Angeles (UCLA) a group of fellow lecturers and I prepared the second graduate seminar on Information Display Systems. We suggested to the Dean of Engineering that we approach information from a multi-discipline and user point of view rather than the traditional mechanical, electrical and optical points of view of engineering, and include human factors and fine art perspectives, skills and techniques. Additionally, the field of information processing and display were in essence part of a larger interdisciplinary study and practice of information. The dean agreed, and we adopted this new approach.

In 1970, Klaus Otten at National Cash Register Company, in Dayton, Ohio and Anthony Debons at Information Science Department, University of Dayton, who I later worked with, published a paper in the Journal of American Society for Information Science entitled "Towards a Metascience of Information," (Journal of the American Society for Information Science — January-February 1970, Page 89), in which they summarized contemporary developments in the field. This had considerable influence on development of the then emerging field of information science. In many ways much of this paper is still relevant at the beginning of the 21st century.

Further expansion of this concept of a unified study of information was presented during the first and second international conferences of the FIS (Foundations of Information Science), which took place in Madrid in 1994, and Vienna in 1996. Wolfgang Hofkirchner summarized and expanded the concepts in his 1999 book "A Quest for a Unified Theory of Information."

In 1989, the American Physicists John Wheeler delivered a famous lecture entitled "it from bit" which stated in part "all things physical are information – theoretic in origin – and that this is a participatory universe." Hans Christian von Baeyer in his 2003 book "Information As the New Language of Science" and later Luciano Floridi, an information philosopher, in his 2010 book "Information: A Very Short Introduction" indicated that the study of information should include the conceptual addition of physical science' contributions to traditional Information Science studies.

These are the key developments that led to my suggesting an evolved science of information.

4. The Challenge

In 2010, there is enough research, discussion, and concern to begin formalizing Science of Information into a formal discipline and academic specialty.

The Science of Information, by combining the work from multiple disciplines on information as a science, should assist in opening up expanded perspectives and opportunities. It should continue to recognize, honor and assist the traditional disciplines that have contributed to its beginning and will continue to expand and deepen their own contributions to knowledge. It is not the purpose to replace these traditional disciplines, but rather to create a new Meta science to stand alongside of them. It is important to enhance what they contribute by comparisons and consolidations, adding new perspectives, resources, and developments.

All living species and systems need to go through adaptation and transition periods in order to meet new and changing conditions, challenges and developments. So should the new study of information. We need to step out of where we have been into a newer evolved macro challenge. The development of the field of "Life Science" has shown that a development of a new field and categorization can be done. It is important in forming the science of information, we be wary of the influence of historical, cultural, political, economic and academic self interests that may drain off focus and resources or diminish the open, unified cooperative participation that will be needed to form this new field.

What we need most is personal commitment and action by you, the participants of this 2010 conference in Beijing. It is now up to you the activists to assist in moving this subject into a viable field of scientific academic research, and study. It is just possible that all our combined efforts can help not only establish a new field but also reduce misunderstanding of information principles, misuse of information perspectives, to achieve other, yet currently unknown benefits for humanity.