Proceeding Paper

On the Physics Paradigm of Communication Engineering and the Informatics Paradigm of Dissemination Science †

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Abstract: The authors of this article advocate the view that the transformation from a physics paradigm to an informatics paradigm is not a denial of the effectiveness and scope of application of the physics paradigm, but a criticism of the “arrogance” of the physics paradigm, which misleads research in the humanities and social sciences. Through the “disciplinary informatization” of the humanities and social sciences, their own disciplinary paradigms can be established. The research objects of “communication” and “dissemination”, respectively, are “material” and “information”, meaning that they should follow different scientific paradigms. After achieving the transformation into an informatics paradigm, we should strive to explore the “cooperation” between the two paradigms, allowing them to explain “nature” (such as biological gene DNA) and “society” (cultural gene MEME), especially human “thinking”. Obviously, the conditions for solving “physical and mental problems” since Plato and Descartes have already been met.

Keywords: communication; dissemination; physics paradigm; informatics paradigm; scientific paradigm change; mind–body problem

1. Introduction

In Shannon’s paper “Mathematical Theory of Communication”, “Communication” stands for “a transmitting” or “a giving or exchanging of information, messages, etc.”, and his paper title can be translated in Chinese. However, in the academic community, “Communication” can also mean “dissemination”, or even “dissemination studies”. For example, Wilbur Schramm’s work Men, Women, Messages, and Media: Understanding Human Communication could be translated in Chinese. In the view of Wilbur Schramm, i.e., the father of dissemination studies, Shannon’s information model “provides a new mathematical theory that can be used to study both electronic communication and human dissemination” [1]. His logic is as follows: Shannon’s information theory is a science, and so using the mathematical methods of probability statistics and calculus to quantitatively describe the objective laws of the dissemination process is a “scientific method”. This scientific method should have universal applicability and cannot be an exception in “dissemination studies”. Therefore, some scholars criticize the fact that “the mainstream dissemination school in the United States stubbornly adheres to the empiricism, positivism, and quantitative research approach” represented by Schramm. Some scholars challenge mainstream dissemination studies in the United States by proposing efforts to “correct the dominance of the empirical school” and “liberate dissemination studies from Schramm’s imperial system and study” [2].

In 2019, we collaborated with Professor Chen Shaohua of the School of Journalism and Professor Zhang Jianwei of the School of Foreign Languages at Huazhong University of Sci-
ence and Technology to publish a paper entitled “Mathematical Theory of communication and the Information Science of dissemination” (abbreviated as “communication and dissemination”) in the Advances in Social Science [3]. Upon re-reading it, we still feel that the facts, principles, and arguments therein are not inappropriate. During the preparation for our contribution to the 2023 Beijing Summit of the International Society for Information Studies, we discussed the theme of the Summit, “Paradigm Change in Information Discipline”. Both at home and abroad, everyone in the field of communication engineering agrees that the commonly used paradigm is that of physics. Conversely, in the field of communication, the commonly used paradigm is that of information science, with a “clear distinction” between the two. In this article, we supplement the discussion on “communication and dissemination” and call on scholars in the field of information science and philosophy to strive to answer new questions raised by information technology, products, engineering, and industry, and to provide “guidance” and “leadership” in the advancement of scientific theories and philosophical ideas.

2. The Mathematical Theory of Communication and the Information Science of Dissemination Are Distinct from Each Other

After restudying Shannon’s theory and current communication science, the authors of this article believe that Shannon’s “Mathematical Theory of Communication” paper used mathematical methods, such as probability statistics and calculus, to quantitatively describe the physical rules of the transmission process of “electrical signals” through “channels” [4]. This fully conforms to the paradigm of natural science and is highly regarded as a scientific template for “quantitatively” studying information. However, the “communication” discussed by Shannon is the transmission process of “electrical signals” on the “channel”, areas belonging to the field of physics. The author uses the mathematical methods of probability statistics and calculus to quantitatively describe the object, seeking to describe not “information”, but “message”. Shannon did not give a precise definition of “information”, and asserted that “information is a kind of message” [5]. The message, as the “carrier” of information, whether as a “signal” or a “symbol”, occurs in the “space-time” of physics and can be quantified. However, information is “content” or “meaning” that is based on “message” as the carrier. It occurs in the “space-time” of psychology and culturology, and therefore has no weight and does not occupy space. Further, it can be “time agnostic” or even display “spatiotemporal inversion”, and therefore cannot be measured spatiotemporally. We believe that news is the “carrier” of information. Information, as the “content” or “meaning” of a carrier, has an evolutionary process, but is not a function of “time”. Information is not a quantitative mathematical model and “formula” that can be described. Examples include Plato’s “Republic”, Rawls’ “Theory of Justice”, and the operating systems Windows and Android. In this sense, the so-called Shannon’s “Information Theory” is actually “Message Theory”.

“Messages”, of course, can be “measured” and must be “measured”. Otherwise, how do telegraph companies calculate the “number of messages” sent by customers and how do telephone companies charge for their services? The so-called Shannon formula for “information” measurement is actually a formula for “message” measurement. This has been authoritatively highlighted by experts of Shannon’s contemporaries, and Shannon has not refuted it. Therefore, Shannon never claimed to have proposed “information theory” and created a general theory of information. He merely said that he had established a “mathematical theory” of “communication”. Shannon is aware of the mathematical theory of message measurement, coding, and channels. If it is applied to the humanities and social sciences, its use may encounter difficulties. He clearly warns scholars to pay attention to its application. However, in the absence of any “alternative social public goods” that could be used at that time of publication, Shannon’s “reminders” have had little effect.

Obviously, Schramm misread Shannon’s mathematical theory of communication and misunderstood Shannon’s “message theory”. He did not fully understand “message theory” and its scope of use, and determined that Shannon’s mathematical theory of communica-
tion could be used to study both electronic communication and human communication. His starting point and basic thinking were wrong from the beginning. We believe that the research object of dissemination science does not belong to physics or biology, but belongs to psychology and cultural science. Apparently, dissemination science is not an “information theory” (i.e., dissemination theory) of “Newton’s space-time view” in the sense meant by Shannon. It does not belong to natural science, but belongs to information science. We cannot study the concepts, principles, and methods of “dissemination science” in accordance with Shannon’s paradigm of “mathematical and physical methods”. We advocate the view that when the space-time view and scientific paradigm of information science are both mature, people can observe and express dissemination science again.

Before Shannon’s thesis, human beings successfully constructed the information dissemination history of human society for thousands of years using “language” as the carrier. Starting with Wilbur Schramm, scholars of dissemination science have on the one hand solemnly declared that they should study the concepts, principles, and methods of “dissemination science” in accordance with Shannon’s paradigm of “mathematical and physical methods”. In practice, however, they have applied the space-time view and scientific paradigm of information science to re-observe and express dissemination science, which is different from the actions of communication engineering. Therefore, in fact, communication science is not a discipline of natural science or a discipline of science and engineering, but a discipline of social science that belongs to information science.

3. Dissemination Science Has Established Its Own Disciplinary Paradigm Which Is Different from That of Communication Engineering, but It Lacks Discipline Consciousness

Communication engineering is an undergraduate major in higher education that belongs to the category of electronic information. This major field is characterized by the integration of science and engineering, and is based on mathematics, physics, and information theory. It focuses on electronics, photons and related components, electronic systems, and information networks. The specialized basic knowledge of this discipline must cover the core content of knowledge fields such as circuit and electronic technology, computer systems and applications, signals and systems, electromagnetic fields and waves, including communication principles, digital signal processing, communication circuits and systems, information theory foundations, information networks, engineering cartography, etc.

For a college student majoring in communication engineering, the basic knowledge curriculum can include digital communication, the theoretical foundation of communication networks, modern switching technology, multimedia communication, wireless communication, broadband access and Internet communication, antenna and radio wave propagation, optical communication and optical networks, mobile Internet and terminals, radio frequency technology, satellite communication, mobile communication, etc. Specific designs can include the fundamentals of circuit analysis, analog electronic technology, communication electronic circuits, digital electronic technology, C++ high-level language programming, data structures, microprocessors and interface technology, signals and systems, random signal analysis, digital signal processing, communication principles, electromagnetic fields and waves, the theoretical foundations of communication networks, and modern communication technology.

Obviously, the above curriculum system conforms to the paradigm of “physical science”, which involves the relevant “material” elements in the entire “communication” process, including the system, technology, and engineering of matter, as well as the methods and methods of description using “quantitative” and “formulaic” methods. These have nothing to do with social information and its processing.

Conversely, the disciplinary “paradigm” of dissemination science is almost completely different from the aforementioned paradigm of physics. It studies communication activities by collecting various viewpoints and methodologies, studying the laws of the occurrence and development of all human dissemination behaviors and dissemination processes, as well as the relationship between dissemination, people and society. It is a science that stud-
cies social information systems and their operational laws. In short, dissemination science is a discipline that studies how humans use symbols to disseminate social information. It has the characteristics of intersection, marginality, and comprehensiveness. The focus and foothold of dissemination research is on how to use the role of dissemination to establish certain relationships among people. In the international context, disseminating studies are generally divided into two major schools: the empirical school (traditional school), which is centered in the United States, and the critical school, which is centered in Western Europe.

The main courses for dissemination majors include: History of Chinese and Foreign Journalism and Dissemination, Introduction to Dissemination, Introduction to Journalism, News Interview and Writing, Public Opinion, Literary and Art Aesthetics, Basic Photography, Introduction to Film and Television, Script Creation, TV Program Production, Photography Technology and Art, TV News and Documentary, Science and Education Film Editing and Creation, TV Program Editing, Media Animation and Production, Network Dissemination and Culture, Multimedia Application Technology, Network Media Design, Web Design and Production, General Theory of Advertising, Visual Design of Advertising, Media Organization, Dissemination Research Methods, etc.

Of course, we have noticed that there is a lack of awareness of the “physics paradigm” in the relevant teaching content of dissemination science, as well as a lack of autonomous thinking patterns, concepts, and theories of “information” in dissemination science. In the course of dissemination, the course under examination announced from the beginning that it recognized the universal role of the Shannon model, accepted Shannon’s information definitions, calculation formulas, and so on. Regarding information science, the teacher said that “Information science = information theory + cybernetics + systems science”. In its effort to develop into a theoretically self-contained scientific theory of logical self-sufficiency, dissemination science faces the difficulties of “inherent deficiency” that must be overcome.

4. The Guiding and Leading Role of Information Science and Information Philosophy

The term “information science” is commonplace, and writings on “information science” continue to emerge. However, according to the physics perspective, so far “there is only information technology, not information science.” After inviting Professor J. Bien, dean of the philosophy department at the University of Missouri-Columbia, to visit China, Li Zongrong had a heated debate with him on this idea. A “conclusion”, it was argued, comes from the “standard” used to evaluate whether a discipline is scientific or not. Professor Bien said that the standard of a science is the discipline’s methodology. This is argued because, except for the implementation of Shannon’s mathematical and physical methods in communication theory, all other information disciplines do not have such methods and cannot be considered scientific disciplines. The question remains: where does an “Information Science” come from?

After returning to China in 1995, Li Zongrong applied to his unit to establish a “Research Institute of Medical Information”. The group leader approved this request, and the official seal was carved. However, a physics doctor from the physics teaching and research section argued that while there could be an institute for “medical research”, there should not be an institute for “medical information”. It was argued that the object of medical research is the diseased human body, and that the “information” itself does not exist as an objective. The scholar requested a piece of information for examination, asserting that the argument in use here was the same as suggesting that speech is sound waves, that television is an electromagnetic wave, or that the CT image of the lung is the lung itself. To illustrate this, the question was posed: if there are no lungs, can lung CT be conducted?

Later, Li Zongrong attended relevant courses such as “Philosophy of Science” at Wuhan University and Huazhong University of Science and Technology. Here, the author learned that in order for information science to be a “science”, it requires a philosophical “ontological commitment” about its research object. The scientific evaluation of information science depends on the “philosophers of science” who study information. Establishing the scientific status of “information science” is the expectation of all information scientists.
However, the final say as to whether “information science” can be a “science” does not lie with the authors of this study.

In a further study, Li Zongrong learned that similar debates originally occurred between Plato and Aristotle more than 2000 years ago. These ended with a victory for Aristotle. Therefore, Aristotle’s “Physics” and “Meta-Physics” have been handed down to this day, and his “Four Causes Theory” has not seen a decline because his ideas are consistent with people’s “common sense” and “common convention”. Plato’s “idea” is yet to be illustrated fully. A famous philosopher of science in China wrote a book which stated that a theory that cannot be located in time and space can only be “pseudo-science” [6].

It was not until the last two years that Li Zongrong studied the English version of the course “Metaphysics” taught by a professor with a Ph.D. studying in the United States. Additionally, he took the course “Ancient Greek Philosophy”, which was taught in combination with ancient Greek and English by a professor with a Ph.D. studying in Germany. It was only then that Li Zongrong began to roughly understand the mystery of the problem. This is reflected in two articles we submitted to the “Forum on the Information Society”.

In theoretical informatics, Li Zongrong defined “information as the meaning of signals and symbols”. In terms of philosophical ontology, Plato is quoted as saying that “information” is “immaterial being”. Li Zongrong demonstrated the existence of such things, and pointed out that they are the direct opposite of the existence and movement of “material”, such as “non-conservation of information”, “non-consumption production”, “simultaneous sharing”, and so on. These phenomena cannot be explained by the laws of physics. Then, Li Zongrong pointed out that Aristotle’s “Physics” was scientific and correct, but that his philosophical thinking in “Metaphysics” led to the concept of “physicalism”, which was wrong because physicalism assumes that “the physical science can encompass everything in the world, and that ultimately everything in the world can be explained through physics”. Li Zongrong said that it is enough to “completely” refute physicalism and just cite a “counter example” to prove that not everything is purely physical. Moreover, all human and social phenomena cannot be fully explained by physics. Without the participation of information science, the process and mechanism of biological gene DNA as a natural phenomenon cannot be fully explained by the entire natural science. Along these lines, the following should be asked: does the “scientificalness” of physics and natural science need to be re-evaluated?

In China, there are such cases of injustice, falsehood, and error. These are exemplified in “the return of the dead”. A judge said that Zhang San killed Li Si and sentenced him to death, after which Zhang San was sentenced to death by the law. After that, Li Si returned home! Zhang San’s family petitioned to complain of judicial unfairness. In English speaking countries, “equity” is referred to as “fairness”. In the physical world, it is only “apples” that recognize the “particular” and “universal” of apples. Human beings “produce” the “fairness” that nature does not have, and thus have a particular and universal version of “fairness”. As for how to address and express the concept of “fairness”, different countries and ethnic groups can have their own choices. Obviously, the “ideal” products are primary, and their material carriers can be customized, selected, replaced, and translated.

Plato said that under the light of the “Sun”, we see what is “seen with the naked eye”, but that under the light of the idea of “Good”, we see what the “mind sees”, and thus distinguish between good and bad people. This enables us to punish bad people, encourage good people, and promote society to become better. “Good” is the highest idea, and the sun is its son. Plato’s informatics operates as a higher-level theory than Aristotle’s physics. This is the fundamental difference between “social science” and “natural science”. Physics itself was, is, and will be correct and applicable; but “physicalism” is wrong, one-sided, and misleading, and must be corrected.

5. Conclusions

The sponsor and organizer of this international summit chose “Paradigm Changes in Information Discipline” as the theme of the conference, which is very appropriate. We
believe that the concept, principles, and methods of “physics” are reasonable and correct, as they have been, are, and will continue to be. We criticize the one-sidedness of physicalism in order to clarify the scope and “boundaries” of the paradigm of physics, and also to point out that applying the paradigm of physics to the study of phenomena in the humanities and social sciences is inappropriate and misleading. Because the humanities and social sciences study information phenomena rather than material phenomena, the humanities and social sciences must establish their own disciplinary paradigms under the guidance of information science and information philosophy.

The way for the humanities and social sciences to establish their own disciplinary paradigm is through “discipline informatization”, which means using informatics paradigm to re-discuss the research objects, basic methods, theoretical assumptions, conceptual frameworks, knowledge systems, etc., of relevant disciplines. The “disciplinary paradigm” of theoretical informatics has been successfully applied to fields such as psychology, law, ethics, linguistics, communication, and dissemination studies. We hope that information science and information philosophy can better play guiding and leading roles and, after realizing the transformation of scientific paradigms, further promote the “mutual cooperation” between the two different disciplinary paradigms of physics and information science. Furthermore, they should be used to thoroughly explain various phenomena in nature, society, and thinking. We believe that Descartes’ dualistic problem of the “mind–body relationship”, concerning where and how the “extended thing” and “thinking thing” co-exist, as well as the forms and way in which the two interact [7], should be the focus of our upcoming research. The unsolved mind–body problem, which spans from Plato to Descartes, will be thoroughly explained in the transformation from the physics paradigm into the informatics paradigm, as well as in the “fusion” of the two scientific paradigms.

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References

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