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A Theory of Public Knowledge

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ABSTRACT
A theory of public knowledge is offered for the purposes of defining more clearly its role in information systems and classification schemas. Public knowledge is knowledge intended to be available for use in a public system. It is knowledge accessible to the public or knowledge in the public arena as opposed to the other seemingly multitudinous ways to describe knowledge. Furthermore, there are many different public arenas or small worlds. Public knowledge, irrespective of these different arenas, has four important overlying characteristics: It is consensual, it does not imply complete truth or certainty, it is autonomous, and it has a constant renewal of old knowledge with new knowledge. Each of these attributes has been culled from a study of the works of Patrick Wilson, Karl Popper, and John Ziman.

Keywords: public knowledge, information systems, classification, theory, small worlds

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1. INTRODUCTION

The idea of public knowledge remains a general idea, not something easily seen through to something real and tangible. It is a convenient idea that rings true—that is, people do organize themselves into groups, or disciplines…which can be described as small worlds of people with shared social values and norms who produce knowledge. Disciplines, in particular, are important components of public knowledge. It is a convenient idea in the sense that speaking of knowledge as a *universe of knowledge* is a convenient idea. It is difficult to prove the existence of a universe of knowledge, but the idea that knowledge is somehow interrelated as a single whole is eminently sensible. Another similarly convenient idea is that of saying that groups of people know things. An individual person can know things. However, in what sense does a group of people know anything? There is no group brain, in the same sense that individual brains are the bases of individual knowing. There are only individual brains, in fact. Nevertheless, it is commonly accepted that people together in a group know things; that there exists knowledge of the public arena. Car drivers commonly know that red traffic lights mean *stop* and green lights mean *go*, bakers know that most bread requires flour of some type, and everyone who has ever been in an ocean knows the water is salty. Alternatively, from a point of view of a discipline, archaeologists have specific knowledge about ancient cultures gained through the study of found artifacts from those cultures, generating theories about how their societies were organized or traded with other societies, how they spread out over territories, and so on. How does such a phenomenon take place?

Social or collective knowledge can be spoken of as group knowledge based on an analogy from individual knowing. In short, groups of people know in the same sense that an individual knows something, but that statement is analogical—and in the end only a convenient way of speaking. What is the mechanism by which a group of people—a small world—knows anything? Is it simply accepted as a reality because is it sensible to believe that many different groups of people do in fact find common knowledge within their group?

However, the question becomes more complex—a complex knot of individual threads. If public knowledge is assumed to be comprised of knowledge coming from hundreds and hundreds, perhaps millions, of these small worlds then how is a particular 'sphere of knowledge' identified? What would be its characteristics? Outward evidence? How is it measured? What are its operational definitions such that it could confidently be said that it is legitimate? It is one thing to posit their existence, and quite another to say positively they have been 'seen.'

On a more practical note, however, it seems logical to say that an understanding of public knowledge is vital to library and information science, especially as it pertains to access and retrieval of the information resources produced by individuals and groups of people that constitute a large part of the universe of knowledge. Swanson (1986) explored the role and importance of information retrieval 'facilitating' discoveries of scientific knowledge, focusing specifically on knowledge that goes 'undiscovered.' Similarly, the construction and modification of the classification schema (e.g., Dewey Decimal Classification [DDC], Universal Decimal Classification, etc.) should also recognize the distinctive characteristics of public knowledge. A model or theory of public knowledge might be a good first step in defining its role in information systems and classification schema.

This is a purely theoretical paper intended to examine what is meant by 'public knowledge' or 'knowledge accessible to the public,' or 'knowledge in the public arena' as opposed to other seemingly multitudinous ways to describe 'knowledge.' What is this special type of knowledge and why is there is a need to distinguish it from other types of knowledge? Moreover, having defined public knowledge, what is its role in information retrieval systems or knowledge classification schemas? If an information system (a broad term here) is created to organize and collocate public knowledge, then defining that knowledge and recognizing that the knowledge may be unique to a specific group of users is necessary.

2. DEFINING PUBLIC KNOWLEDGE

Public knowledge is knowledge intended to be available for potential use in a public system which is any system that is available to a group of people. It could also be called social knowledge or collective intelligence but with the caveat that there is not one collective intelligence or one type of social knowledge. Public knowledge is not *subjective or personal* knowledge, which, by definition, falls outside the realm of public knowledge. Therefore, this special kind of knowledge will be offered here as a set of concepts and proposition statements that describe the characteristics of this type of knowledge. The concepts are numerous but a refined set of the more prominent ones can be assembled such as knower, knowledge, consensus, truth, autonomy, ownership, and those concepts that hint at the cyclical nature of public knowledge such as interaction, new knowledge, and old knowledge. Propositional statements follow:

- Public knowledge is consensual knowledge.
- Public knowledge does not imply truth.

- Public knowledge is autonomous in the sense that it may or may not require a knower. It does not belong to any one person and it may be undiscovered.
- New public knowledge is produced to replace the old knowledge that no longer explains phenomena.

One last clarification is needed before discussing more deeply these four propositional statements. The phrase 'knowledge of the public arena' is not intended to mean the public at large, or all publics. Rather, it is the *small worlds* that individuals may inhabit together. Chatman (1999) defined small worlds as

> …a society in which mutual opinions and concerns are reflected by its members, a world in which language and customs bind its participants to a worldview. Resources (both intellectual and material) are known and easily accessible. It is a world in which there is a collective awareness about who is important and who is not; which ideas are relevant and which are trivial; whom to trust and who to avoid. In its truest form, a small world is a community of like-minded individuals who share co-ownership of social reality (p. 213).

Chatman's definition is used here instead of, for example, Jaeger and Burnett's (2010) broader definition of an 'information world.' One person may inhabit many small worlds, worlds that have definite boundaries from others. Differences in academic disciplines is a good example—the arena of a humanities scholar is different in many ways from the mathematical arena but at the same time they both function in the larger small world of a university or academia overall. In today's U.S. political climate, the stark differences in beliefs about the direction of the country's future can be keenly felt, as is evidenced by debates on globalization, climate change, immigration, gender fluidity, and socio-economic differences. The U.S. is one country, but with an infinite number of small worlds. In a way, this is an exploration of public knowledge when seen in the context of a small world. These characteristics of public knowledge have been culled from an examination of a number of published works. In particular, Patrick Wilson's *Public knowledge, private ignorance*, John Ziman's *Reliable knowledge*, and Karl Popper's *Objective knowledge* were examined. Wilson was a professor of library and information science who wrote on bibliographic organization, Ziman a theoretical physicist who wrote extensively on the matter of the social nature of science and scientific knowledge, and Popper was a critical thinker and philosopher of science, well-known for his work on objective knowledge. There are many others that could be examined, perhaps most notably would be Swanson's (1986) work on undiscovered public knowledge and Polanyi's (1962) work on personal knowledge. Swanson's (1986) idea of 'undiscovered public knowledge' was influenced by Karl Popper's Third World—the world of objective knowledge, or recorded knowledge. He wrote that "the world of published knowledge certainly contains more than any of person can know and indeed contains more than the aggregate of what all persons know" (p. 107).

Wilson (1977) addressed what is needed for an effective library and information policy and in doing so concluded that an effective policy "should be based on an understanding of the way in which what is known is represented in, and recoverable from, the documents that constitute the library's chief, though not sole, stock" (p. vii). Ziman (1978) addressed the reliability of scientific knowledge by showing that it is "a product of a collective human enterprise to which scientists make individual contributions which are purified and extended by mutual criticism and intellectual cooperation" (p. 3). Lastly, Popper (1979) raised interesting questions on the nature of objective knowledge which has had a lasting influence on several thinkers within the library and information sciences, among other disciplines.

Popper's Third World, or the world of objective knowledge, is the realm of the "objective contents of thought, especially of scientific and poetic thoughts and of works of art" (Popper, 1979, p. 106). Scientific thought includes theoretical systems, critical arguments, problems, and problem situations. Poetic and artistic works, while having originated in the subjective mind, become objective when presented publicly. They may be reinterpreted at various times, but the essence of the work remains unchanged. This Third World includes all the contents of all the libraries (p. 107). Most importantly, Popper insisted that this world exists independently of the human mind; in other words, it is totally independent of anyone's claim to know and it is autonomous in the sense that it can be acted upon by us, but it cannot be mastered by us (p. 112). The idea of public knowledge existing independently of the mind is challenging; public knowledge once recorded may separate itself from its creators, but it needs users to exist and to grow. It does not hover or float above us literally, although today people often put their information in 'the cloud' (i.e., server farms) figuratively.

Ziman's (1978) notion of scientific knowledge is somewhat different from Popper's Third World. He described scientific knowledge as being *intersubjective*; in other words, it can only be validated and translated into action by the intervention of human minds. In contrast to Popper's insistence that the Third World exists independently of human minds, Ziman wrote "that it does not contain any independent source of objective knowledge" (p. 8). Scientists unavoidably interject their world

view into their work and it is impossible to be unbiased in their scientific observations because of this world view. He also wrote that scientific knowledge is consensual because "individual contributions are purified and extended by mutual criticism and intellectual cooperation" (p. 3). This process of criticism and cooperation is the "scientific paradigm" and constitutes how the objective knowledge of the scientific realm comes into being (p. 7).

Ziman and Popper both explore the arenas of the physical, the subjective, and the objective. Popper calls them simply World One, World Two, and World Three whereas Ziman refers to them as simply the material domain, the mental domain, and the noetic domain, or the world of the objective: a world that is "collectively created and maintained as a social institution" (Ziman, 1978, p. 106). Ziman in turn took this idea of the noetic from Polanyi (1962), who wrote of "superior knowledge" as that which is "coherently believed to be right and excellent by men within their culture" (p. 375).

Wilson (1977) does not specifically use the term 'objective' nor does he focus particularly on scientific knowledge. Rather, he is addressing these concepts through the study of what he calls 'public knowledge.' In this sense he sees it as something that is decided on by the public itself. Public knowledge is the "best constructed view of the world at any given time, judged by our own best procedures for criticism and evaluation" (p. 5). It is not only created and accepted as a special type of knowledge, but at the same time people evaluate it and judge it to the best presently available story (for lack of a better term). This type of knowledge includes much that is not known. It can include, but is not limited to, scientific knowledge. In that sense, Wilson does imply that public knowledge is objective and scientific.

3. THE UNIVERSE OF KNOWLEDGE AND PUBLIC KNOWLEDGE

Earlier it was postulated that speaking of knowledge as a *universe of knowledge* is a convenient idea and that while it is difficult to 'prove' the existence of a universe of knowledge, the idea that knowledge is somehow interrelated as a single whole is eminently sensible. The intent of this paper is to provide a theory of public knowledge which can be seen as a part of the larger universe of knowledge. The idea of a universe of knowledge is discussed further on in this paper but suffice it to say that it may help to clarify the purpose of this paper by making clear the relationship between the universe of knowledge and public knowledge. One way is to describe it is as a whole-to-part relationship. Public knowledge (whole) is objective knowledge that can consist of various individual knowledge (subjective knowledge) parts. And, the universe of knowledge (the larger whole) consists of various public knowledge (parts).

4. ATTRIBUTES OF PUBLIC KNOWLEDGE

4.1. Consensual Knowledge

Knowledge in any small world is knowledge that is agreed upon; it comes from the general agreement of the majority of the population of the small world. What is known at the moment is called upon to fulfill information needs until what is known changes or is replaced because it does not satisfy the information need. This process takes place in both scientific and non-scientific small worlds. Ziman and Wilson both explicitly state that knowledge formation is a consensual process. In science, the goal "is to achieve the maximum degree of consensuality" (Ziman, 1978, p. 6). Wilson sees it as the public agreeing on what is, or what is not, a relevant or acceptable part of the consensus. In other words, people have control over the decision of what is or what is not to be public knowledge. Ziman and Wilson share the view that not only does society create and accept public knowledge, but it also decides upon the criteria for evaluation and judgment. In this sense, knowledge formation is an ongoing process of negotiation. Similarly, Swanson (1986) sees the necessity of public criticism by scientists; published arguments create the published products that make up public knowledge. More recently, Ma (2015) has argued that although group consensus alone does not make knowledge, "the construction of public knowledge is inarguably social and discursive" (p. 535).

Popper (1979) implies human consensus but he posits that once knowledge is proposed it is 'out there' and becomes part of something that humans no longer have much control over. He writes that "all work in science is work directed towards the growth of objective knowledge" and that this growth takes place by the "formulation of problems, the emergence of new problem situations, competing theories, mutual criticism by way of argument: all these are the indispensable means of scientific growth" (pp. 121-122). Yet, he writes that contributions by man to this objective knowledge are "vanishingly small" and that no one can master any one part of it (p. 161). The formation of knowledge is a process with an end goal—growth—and while negotiation, or consensus, is part of the process is more a super-consensual process.

4.2. Truth

The second characteristic of public knowledge is that it does not imply truth. In other words, while much of what is accepted as public knowledge will be believed and used by the public as

foundations for creating new knowledge or discrediting old knowledge, everything is subject to change as beliefs themselves change or because not all the knowledge is known; as Swanson (1986) would say, some public knowledge is *undiscovered*.

The aim of science is to find "*satisfactory explanations* of whatever strikes us as being in need of explanation" and these explanations are "more or less well known to be true, or assumed to be so known" (Popper, 1979, p. 191). However, Popper dismisses *ultimate explanations* which he defines "an explanation which is neither capable of any further explanation, nor in need of it" (p. 194). Instead, he contends that every explanation may be "further explained by a theory or conjecture of a higher degree of universality" (p. 195). Put another way, for every explanation given more explanations are generated, and therefore the essential nature of something, the *ultimate essence*, can never be fully described (p. 196).

Ziman (1978), speaking from within the same scientific realm as Popper (1979), approaches this idea of truth from a different angle. He does not believe there are absolute truths because the scientific paradigm "does not contain any independent source of objective knowledge" (p. 8). There is no truly objective knowledge because a scientist, despite a rigorous training process when studying to become an expert in any given field, cannot contradict his own world view with "statements that are obviously at variance with what he has learnt and come to love" (p. 8). Scientists cannot truly divorce their status as human beings from the unbiased observer that is the ideal scientist. Ziman also questions whether the scientific paradigm is any more believable as a unique world picture than any other world view such as that held by a non-scientific group. While both Popper and Ziman agree that public knowledge in a scientific community does not implicitly hold truth, they come to their conclusions from different avenues. Popper obviously believes scientists are truly unbiased. Ziman contends they can never be so because they are human.

Wilson (1977) does not limit his discussion of public knowledge to the scientific realm and he uses another approach. He stresses that his explanation of public knowledge is not to be taken as an explanation of all knowledge; public knowledge is simply the public stock of knowledge at any given time and can include things that are not known to anyone. But, when looking at the standard concept of knowledge he writes, it is "at the very least true belief, and without this belief there would be no knowledge (p. 6). *True belief* is not the same as *truth*, however. It simply signifies the complete acceptance of a piece of knowledge until, at some future time, that belief in the truth is shifted to another piece of knowledge. Said another way, knowledge, according to Wilson, implies belief and truth in something that is known and since public knowledge may include things that are not known, it cannot be truly *believed* and so cannot be true. "Certainty", he writes, "has no dominant role in the theory of public knowledge public knowledge no more implies certainty then it implies truth" (p. 6). This could be seen also as a consequence of there never being a complete world view. It may contain "vague and indefinite views" or be altogether blank in some areas (p. 5).

Public knowledge is defined as knowledge held by a specific group of people who, by consensus, agree what the knowledge will be, and also understand that this special knowledge will not inspire complete certainty or complete belief in its truth due to the fact that is it constantly changing or may contain knowledge that is not known. This leads in turn to the third and fourth features of public knowledge.

4.3. Known Versus Not Known

Wilson's (1977) use of 'known' versus 'what is not known' reveals the third characteristic of public knowledge: that it is potentially autonomous. Knowledge may or may not require a knower. Wilson asserts that public knowledge includes much that is not known to anyone; that some knowledge may be unknown for years until it is rediscovered. Some knowledge may not be adequately captured in published documents, and some may only be passed on verbally, but even then it may not be completely understood (p. 9). The technological expertise needed to discover the knowledge may even be lacking—whether intelligent life exists off-world or the cure for diseases such as HIV or Alzheimer's. Either way, making knowledge public does not guarantee that someone will acquire it or understand it, in other words that they acquire knowledge (p. 9). It may 'float' on the public arena of the small world but when it is accessed or abstracted by someone it becomes subjective at that particular instance.

Ziman and Popper both contend that public knowledge, or objective knowledge, does not need a knower to be knowledge. Popper (1979) writes

> Knowledge in this objective sense is totally independent of anybody's claim to know; it is also independent of anybody's belief, or disposition to assent; or to assert, or to act. Knowledge in the objective sense is *knowledge without a knower*: it is *knowledge without a knowing subject* (p. 109).

His declaration here relies strongly on his belief that objective knowledge, what he calls the Third World, is autonomous; it exists independently of the human mind. Popper asserts that a book is still a book even if it is never read. Everything contained

within the book is objective knowledge, as if no more than extant messages. Whether anyone reads it or not, whether it is true or false, whether anyone really understands it, does not change its status as objective knowledge. Furthermore, it is the *potentiality* of someone understanding, or even misunderstanding, the message that makes everything contained in the book objective knowledge (p. 116). However, Popper does concede that "a book should—in principle, or virtually—be capable of being grasped (or deciphered, or understood, or 'known') by somebody. But I do not admit more" (p. 116).

Ziman, too, holds this view. In fact, he directly quotes Popper when discussing objective knowledge (Ziman, 1978, p. 107). His understanding relies on the fact that scientific knowledge does not come from any one individual but is the result of the cooperation of many individuals. The final product, he says, belongs "to humanity" (p. 108). He writes that this is true of non-scientific knowledge as well – be it artistic knowledge, social knowledge, etc. Beyond quoting Popper, Ziman does not have as strong an argument that knowledge does not require a knower to be considered knowledge. He offers the explanation that our belief in scientific knowledge comes mainly from our accepting it because "eventually it gives its own semblance to our picture of the world" (p. 108). People come to accept the objectivity of knowledge not necessarily by knowing it personally, but by simply accepting it because it was accepted as knowledge by a consensus of the public.

Whether or not knowledge needs a knower to be knowledge is debatable when considering the views of these three writers. On the one hand, knowledge may not exist unless someone understands it, or it may exist even if it is never discovered, or even if it is misunderstood.

4.4. New Knowledge Replaces Old Knowledge

Public knowledge has so far been described as a consensual, not necessarily true, autonomous entity that may or may not require a knower. Ziman, Popper, and Wilson all agree that new knowledge is constantly being produced to replace the old knowledge that no longer adequately explains phenomena. Ziman (1978) writes that "much of the research literature of science is intended *rhetorically* – to persuade other scientists of the validity of a new hypothesis or to shatter received opinions" (p. 7). This is necessary in a scientific community in order to ensure the maximum amount of consensus and it is accomplished by "mutual criticism and intellectual cooperation" (p. 3).

Popper (1979), holding to the view of an autonomous, objective world of knowledge, sees the growth of new knowledge resulting from the "feed-back effect" that objective knowledge has on those who would use it (p. 161). Referring back to his non-belief in absolute truths, every explanation of a phenomena creates more questions and more explanations. This is a necessary condition for the growth of knowledge and as a result there will always be "an infinity of problems" that will remain undiscovered (p. 161). Similarly, Wilson asserts that public knowledge has to be *constructed*. He writes that "we have again and again to survey the state of knowledge, or the state of the different areas" and that this is the "job of construction" (Wilson, 1977, p. 10). There is a constant cycle of criticism and evaluation to ensure that pubic knowledge is the best view of the world at any given time (p. 5).

In short, public knowledge develops from the consensus of a group of people with similar interests or goals; it may or may not be certain or true, and it may not be known to all; and it seems to be in a constant state of change or adjustment.

5. PUBLIC KNOWLEDGE AND INFORMATION SYSTEMS

In library and information science public knowledge is addressed at the level of controlling the information resources. This is commonly called 'bibliographic' control but it involves more than just books, so it is appropriate to use the phrase 'information resources' or 'information-bearing entities', as coined by F. Miksa. People strive to provide organization of, and access to, the information that is produced through information retrieval systems with the idea of providing a means of communication between the users of the systems and the information resources in the system, or even the system itself. And, just as there are many types of knowledge there are also many types of information systems employed in the task of providing access to and retrieving ordered knowledge. The next logical step is to identify the defining characteristics of the system that would make public knowledge accessible and retrievable. And, looking further, how should public knowledge be organized within this information system?

How can one define the essential components of a public knowledge information system? This will not be a technical review of the electronic innards or the programming complexities of such a system. Rather, it is about the conceptual elements with which the system should be composed. Once again, this will be culled from the work of three individuals: Michael Buckland's *Information and information systems*, Daniel Bell's *The coming of the post-industrial society*, and Wilson's *Two kinds of power: An essay on bibliographic control*. Buckland (1991) focuses exclusively on the "nature

of information systems" and not on the technical aspects. Wilson (1977) discusses the specifications of 'bibliographical instruments' from which we hope to extrapolate to an information system that uses all types of information resources. Bell (1973) offers some notions of technology that may serve to fine-tune the overall definition being sought.

Starting with Bell (1973), it is possible to take a step back and examine the idea of an information system from a broader view. Bell discusses the notion of intellectual technologies and writes that one of the major problems with the post-industrial society will be the management of large-scale systems, with large numbers of interacting variables, which have to be coordinated to achieve specific goals" (p. 29). This is easily found daily in the online interactions with search engines and information systems, as well as social media, online shopping, the 24-hour news cycle, and wearable devices with applications that send data constantly to 'the cloud.' Bell defines an intellectual technology as the substitution of algorithms (problem solving rules) for intuitive judgments" (p. 29). Algorithms are used because it is the nature of complex systems to be counter-intuitive; in other words, there are too many variables interacting for our minds to hold and process successfully. The cause and effect relationships in a complex system may be too "deeply hidden or remote in time, or may lie in the very structure (i.e., pattern) of the system itself" (p. 32). Naturally, computers are used to run these algorithms. However, putting aside an exploration of algorithms, it is more important to explore what sort of conceptual framework the algorithms should be employed in so as to provide order over a constantly changing arena of knowledge.

Buckland (1991) views information systems as depending on information processing—"deriving new forms and representations of existing information" (p. 28). They are open systems, not isolated from social and technological contexts. The system is likely to be large and complex in terms of its elements and the relationships involved, such as social, economic, political, and cognitive activities. It will also respond to changes and will adapt itself to environments in order to survive.

These complex, open, adaptable systems are also contingent upon responses—responses that "constitute the means of change and adaption by internal alteration, by changing relationships, or by influencing the external environment" (Buckland, 1991, p. 28). Buckland names five responses: inquiry, perception, becoming informed, demand, and provision. Information must be perceived to be communicated, observed, or retrieved. Inquiry arising from perception is a motivation to know something and this motivation will shape the use of the information system. Demand for information arises from the perception of information, as does inquiry. The provision of information is motivated by the "goals, preferences, and perceptions by those who have resources that can be allocated for that purpose" (p. 29). As individuals become informed by the information received, or perceived, they can then inquire about and receive even more information. These responses can be viewed as a continuous cycle and perhaps as a finer way of stating what Bell (1973) called the cause-and-effect relationships in complex systems.

Buckland (1991) distinguishes between information systems that communicate or observe and those that are retrieval-based which involve "the additional complexity of selecting, collecting, retrieving, and searching information (p. 30). The role and mission of the retrieval-based system is to facilitate access to information and to support the mission of whoever finds the information—those individuals who are members of many small worlds. This can be related back to the public arenas of knowledge discussed earlier. The role and mission of each of these arenas will certainly vary and as such demand a unique information retrieval system.

By information Buckland (1991) writes of *information-as-thing*—the physical artifacts, the data, and the documents that people see as information resources or information-bearing entities. An information system deals directly with this type of information. Now, having discussed public knowledge and its characteristics—some of which are not tangible—it is not possible to create a retrieval system based only on tangibles. And, by that what is meant is something beyond born-digital information resources—something recorded and created as a 'document,' for all intents and purposes. The knowledge that is 'out there' is not tangible, but it is known in some capacity. In the next section on classification schemas Buckland's notion of *information-as-knowledge* and its relationship to these schemas as they are used within information systems will be discussed, but for now the focus is on systems dealing with tangibles.

There are other factors to consider when making these systems. Wilson (1968) describes five elements in the specification of what he calls 'bibliographic instruments' which can be related to information systems. Wilson defines bibliographical instruments as that which "consists entirely or primarily of descriptions of works, texts, and copies" (p. 57). The five specifications are the rules for the construction of the instrument:

- domains of the instrument—the set of items of which the system will consist, including those items that may be considered for inclusion
- principles according to which the items represented have been drawn—what claims can be made about the domain

- determinations of what is to count as a unit for listing and description—knowing by what rules an item has been determined as 'listable'
- what information can be expected to be found about an item when it is listed as a unit
- the complex system of arrangement or organization—where an item of a given sort will be found and what it means to find an item in a given place (pp. 59-62)

Wilson writes that these specifications alone do not ensure the success of an instrument. It must be known how well they have been followed by the designers of the instrument. By specifying the domain of items, the designers guarantee the items will meet the requirements for inclusion as well as the principles used to decide the requirements. If these principles are not discoverable then no claims can be made about the domain. If the user does not understand the "often quite complicated rules by which it is determined what is a 'listable unit,' one is likely to make the grossest of errors in using the instrument" (p. 61). Also, to include representations of the items, as surely must happen because it is not always possible to include the actual artifact, the user must be made aware of what information he or she will find as well as what information is not found. Lastly, knowing how the organization or arrangement of the items is implemented in the system allows the user to immediately and directly identify "items that fit some description without the necessity of scanning all the descriptions of the items listed" (p. 62).

Information systems have been described as being complex intellectual technologies that are not wholly separated from the small worlds they are serving. These systems not only house information but process it as well. This processing is contingent upon the responses of the system user. Lastly, the user must be able to understand the specifications by which items have been collected, represented, and organized within the system.

6. PUBLIC KNOWLEDGE AND CLASSIFICATION SCHEMA

This raises the question of how to build a classification system based on the public knowledge of a small world. Is it a viable option to make ultra-specialized classification schemas? Should we? We have attempted to describe public knowledge not as a universal public knowledge but public knowledge that is a natural outcome of a small world in which individuals "share co-ownership of the reality of that world" (Chatman, 1999, p. 213). Library classification schema used in most academic libraries attempt to organize what is considered 'all' of knowledge (i.e., arts and humanities, physical sciences, social sciences, etc.) and as such may not be as specific as is needed to meet information needs. There have been studies throughout the library and information science (LIS) field, especially in its formative years of the mid-twentieth century, looking at the different needs of scholars in different fields of research, and some have concluded that these differing information needs call for information systems that take these differences into account.

Library classifications have largely centered around the concept of the *universe of knowledge* which in found in the early writings of H. E. Bliss, E. C. Richardson, W. C. Berwick Sayers, and S. R. Ranganathan, and those who studied under them. The undertaking of library classification invariably demands an understanding of all that can potentially be housed in a library setting—that being, at the highest level, all of humankind's knowledge. Many in LIS refer to this as the *universe of knowledge: Universe* because it includes everything and *knowledge* because people see that product of human minds as one of the most valuable possessions besides, perhaps, life itself. As such, it rightfully belongs in a library. The *universe of knowledge* is essentially a limitless area of all our knowings, and because people are in constant need of this knowledge they devise ways of finding and retrieving the 'containers' of knowledge, the information resources and all they contain, or in some systems the knowledge itself. This notion is a direct product of the beginnings of the modern library, starting in the nineteenth century. A good public library collection should strive to have the 'best'—the best books by the best authors, representing all the main divisions of humankind's recorded knowledge.

There was also the belief that organization of knowledge should be based on the organization of the sciences. Bliss, Richardson, Berwick Sayers, and Ranganathan all held that the organization of the sciences was the cornerstone of what is considered *knowledge*. This can be seen most strongly in the work of Richardson and Bliss. In Richardson's *Classification: Theoretical and practical* he devotes his first lecture to the order of the 'sciences,' rather than saying the order of 'knowledge.' His whole argument is based on the premise that "the order of things is the order of the sciences" (Richardson, 1930, p. 10). Things, from his viewpoint, are anything that have separate existence: anything that is, in other words (pp. 1-2).

Bliss (1929) writes that the unification of knowledge is "one of the highest purposes of science and philosophy" (p. 166). He distinguishes science from other types of knowledge because he believes our classifications should be scientific in their orientation as science is reflective of the order of nature. Science, he writes, "is verified and organized knowledge, experiential,

rational, methodic, proceeding from generalizations, theories, and conceptual systems" (p. 190). The universe is made up of, and relies on, the interweaving of relationships between things, concepts, and classes and relations themselves and science, with philosophy, is dedicated to revealing these relationships (p. 165). Thus, the ordering of things that comes from the sciences reveals a true order, or a natural order. Richardson and Bliss greatly rely on what they term Nature. Nature, to Bliss, is the "system of real things and relations external to human minds and underlying the works of humanity" (Bliss, 1929, p. 173). Nature, to Richardson (1930), is that which is outside of man and that which is already classified (p. 2). In their natural order there is a natural order in the universe and as science inherently seeks to reveal this natural order, so it must be the purveyor, the champion so to speak, of the arrangement of the universe of knowledge.

Berwick Sayers (1938) seems to assume, without too much introspection, what these two men are saying as he cites them often in his own work. He takes his stance by expounding specifically on book classification and how it should be accomplished. He asks if there is an order in nature and, if so, should classification follow it? He gives no definite answer but rather turns to the 'logical machinery' that should drive a classification scheme (p. 10). Further on he makes the simply statement that classification of books is more the classification of the statements contained within their pages (p. 16). He might say that most books deal with something of a scientific nature; therefore a practical classification, recognizing the nature of books, is more scientifically-based. In his introduction he says as much when he writes:

> My classification theory is quite simple. The order which philosophers, scientists, or valid systematic thinkers have discovered in things is the basis of book classification (Berwick Sayers, 1938, p. xix).

Ranganathan takes a different approach to the situation, owing in large part to his work having come in the later years following Richardson, Bliss, and Berwick Sayers, as well as due to his differences in his education compared to the education of these three men.[1] He never completely or directly states that classification should follow the scientific order. Interestingly, he was first and foremost a mathematician before he ever set foot in the realm of LIS. His idea of faceted classification is heavily influenced by his prior mathematical training, and it should be noted that he developed his colon classification prior to actually developing his theory of library classification (Miksa, 1998, p. 1). When Ranganathan talks of applying his classification scheme his examples tend toward products of the scientific realm. For example, at the time he wrote, he believed classification had the most to offer in this realm. Certainly, in the present time, there is even more information being produced and more and more scientific specializations being practiced. At one point he likened the influx of articles written and published to a swarm of locusts (Ranganathan, 1967, p. 206). In his view, the realm of subjects was multi-dimensional and could be seen in the scientific world as it was developing before his very eyes in the mid-twentieth century.

How does this idea of the organization of knowledge being based on the organization of science impact the theory of public knowledge as expressed so far? Scientific disciplines, as small *worlds*, share some of the four characteristics discussed in the first half of this paper. In fact, "we see Science... as public knowledge at its most manifest" (Ziman, 1968, p. 53). However, not every arena of public knowledge is scientifically-based and not all information resources housed in libraries and classified with current classification schema are derived in purely scientific ways. For examples, books on witchcraft are certainly not considered scientific but in the DDC they are split between the 100s (Philosophy and Psychology), the 200s (Religion), the 700s (Arts), and the 800s (Literature and Rhetoric). Melvil Dewey built his classification on the principle that knowledge could be divided into ten main divisions, while at the same time intending it to be an "open and expanding system" (Miksa, 1987, p. 7). The DDC system has since developed into a very elaborate knowledge organization system (currently in its 23rd edition), but it still relies on the same ten main divisions. The Library of Congress Classification was built upon the idea of literary warrant and the categories created varied according to the "goal of arranging the subjects of each area of knowledge in a unique and tailored manner" (Miksa, 1984, p. 29). This certainly holds true to the idea of new knowledge replacing old knowledge, but it still tries to encompass a *universe of knowledge* and so has become quite a cumbersome system.

This is not to quibble that classification schema should not be ordered as science. However, instead of molding public knowledge to conform to what may be a limited view would it not be better to let the nature of public knowledge guide its own organization?[2] Beghtol (2003) described a cyclical relationship

[1] See, for example, F. Miksa's The *DDC, the universe of knowledge, and the postmodern library* (1998), and his 1997 paper on the influence of mathematics on Ranganathan's work.

[2] While a discussion of folksonomy and crowdsourcing of information does have some bearing on this topic, our perception is that folksonomies have become rather passé in the LIS literature and crowdsourcing of information projects such as Wikipedia have had to rely more and more on strict editing and verification of information; all of which is food for thought for another paper.

between naïve classification schemas (new classification schema invented for purposes of knowledge discovery) and classification schema traditionally used in information retrieval systems. The primary difference between these two types is that naïve schemas are generated when discovering unrecorded knowledge (i.e., scholarly activity and research) which is then disseminated through publications, which in turn are classified as documents so as to be made discoverable by users searching information retrieval systems. Beghtol also points out the relationship between 'literary warrant' and 'consensus' in scholarly activity—as publications of new research are disseminated among scholars, literary warrant becomes extensive and thus consensus develops among scholars (p. 70). In that sense, new knowledge is constantly being generated and replaces old knowledge.

Of course, it is possible to just dismiss the whole idea as being too general by pointing out that different groups of people or different disciplines still have different modes of operations and different ways of seeing relationships and connections, and so on. That, in fact, attempting to chart public knowledge is an enormous task, perhaps impossible, for more than one reason and that it is not adequate for information retrieval or classification schema due mainly to its generality and constantly shifting nature. But, would that not then be a good reason to use one classification schema so as to *relate* and connect all the different spheres together?

7. CONCLUSION

This discussion started by suggesting that an understanding of public knowledge is vital to library and information science, especially as it pertains to access and retrieval of the information resources produced by individuals and groups of people (who may belong to many small worlds) and that constitute a large part of the *universe of knowledge*. Similarly, the construction and modification of the classification schema that would seek to provide order over this type of knowledge should recognize the distinctive characteristics of public knowledge. This would increase the chances of not only meeting the information needs of users but also of creating more cohesive specialized knowledge systems for future use.

We have offered a theory of public knowledge such that:

- Public knowledge is consensual knowledge.
- Public knowledge does not imply truth.
- Public knowledge is autonomous in the sense that it may or may not require a knower. It does not belong to any one person and it may be undiscovered.
- New public knowledge is produced to replace the old knowledge that no longer explains phenomena.

Public knowledge is created by groups of individuals in a process that is never ending—much like Otlet's (1990) notion of a universal book of knowledge that "will never be completed but will grow unceasingly" (p. 84). There is constant interaction between individuals and public knowledge, just as in user-centric information systems there is constant interaction between the system and individuals. As noted earlier, Richardson believed that the order of things in nature should be mirrored in the order of the sciences; classifications are still, in many ways, our (human) interpretation of that order in nature. We are trying to show our understanding of nature/world with a collection of public knowledge created by various groups of individuals. Public knowledge (whole) is objective knowledge that consists of various individual knowledge (subjective knowledge) parts. And the universe of knowledge (larger whole) consists of various public knowledge (parts). Within each whole-part relationship, there is constant interaction between the whole and the parts, just as there is also constant interaction between the universe of knowledge and individuals.

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