

An Introduction to Jerzy A. Wojciechowski's Theory of the Ecology of Knowledge¹

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Introduction

Jerzy A. Wojciechowski, Professor Emeritus, University of Ottawa, is an engineer by training and a philosopher by vocation. The latter function, in his view, involves a responsibility to teach, to reach beyond the circle of disciplinary adepts, and bring the fruit of philosophic thinking to the sovereign of democratic societies, the citizen. He has taught Philosophy of Science at the University of Ottawa and at major universities throughout the world, focusing for the past 30 years on what he calls his theory of the Ecology of Knowledge (EoK). A systematic exposition of his thoughts on the subject in one place was published in 2001 by The Council for Research in Values and Philosophy.² As a lecturer, Wojciechowski developed a set of pictographs to bring his audiences quickly to an appreciation of the context which calls for the ecological principle in understanding what he terms "the existential system of man[kind]."³ Because they consume space, these pictographs do not appear in the book or in his published papers. One of our principal objectives is therefore to make them widely available through this space-friendly medium. With those, and this minimal descriptive comment, we hope to spark further debate on the truth content and moral applicability of ideas that have coloured much of our own thought and activity over recent decades.

Wojciechowski's recent book, *Ecology of Knowledge*, seems to us to be a canonical work in, at least, three ways:

1. First, the book brings together, in a single volume, 30 years of thought and deliberation. It represents the complete thought of Wojciechowski on EoK.
2. Having been trained in both Western science and philosophy, Wojciechowski routinely seeks understanding in reduction. Throughout the book he elucidates "laws" that arise from his deliberations. The laws of EoK are reproduced below.
3. Wojciechowski's journey into the ecology of knowledge is presented in the book as a fugue-like progression, where the ideas are similar to melodies. The ideas join like melodies in a fugue and are advanced, enhanced, and then fall back upon themselves.

We introduce the major idea of knowledge constructs as used by Wojciechowski, list the 25 laws of EoK, and present a set of charts that Wojciechowski uses as an introductory lecture on his subject. They illustrate his point that progress of knowledge creates problems that merit serious study as a general dilemma and consideration in every important public policy context. It is not our intent to fully explore the ramifications of EoK for ecological philosophies or deep ecology. We wish to introduce readers to the conceptual space of EoK and allow them to create their own canons. As with all philosophical works, what the reader brings is as important as what the author purports.

Wojciechowski's first published paper bearing the *ecology of knowledge* label appeared in 1976, after the baby-boom generation expressed discontent with the "affluent but effluent" society and after warnings from the prestigious Club of Rome that unconstrained technological power had inspired a growing concern that humankind was destroying its home. Enthusiasm for controls on "progress" prompted Wojciechowski to take a broader look at the activities and motivations that foster technology. He saw that the problem is deeper than the unbridled clumsiness of the sorcerer's apprentice. In fact, it reinforces the creation myth, that to taste the forbidden fruit of knowledge is a temptation of the Devil and entails expulsion from Paradise. Not only is the engineer reckless, therefore, but the philosopher is unwisely impious in his love of knowledge. EoK is an exploration and an instruction in the meaning of this ancient fear.

EoK is *not*, therefore, a theory about how knowledge is acquired, the act of knowing, the psychology or neurology of cognition, the verification of speculative ideas—the methodology of science. Rather, it is about the consequences of these activities. These include not only the body of knowledge (the knowledge construct) that has accumulated through countless billions of individual acts of knowing, but also its effects on both the extra-human world and, reflexively, on the human species. Knowledge as an objective phenomenon exists apart from thinkers and knowers. Nonetheless, it requires human interaction to assure that it retains intelligibility to successive generations. Humans create knowledge by acts of rational effort; we use this knowledge to affect the world around us. In turn, the world acts back on us, motivating renewed acts of knowing. These actions employ and modify the body of knowledge, producing new impacts on the ambient world and consequently on the knower and her neighbours and progeny. Thus, humankind as knowers and thinkers, the ambient world and the body of knowledge are in an ecological relationship. In contrast to the relations among biological organisms, however, knowledge is not a product of non-human nature. We know that other organisms have sensations, many very similar to our own, and some animals may even think. But even the most intelligent of non-human organisms do not produce knowledge.

Knowledge is the product of human intellection, in combination with sensation and in the social context made possible by language and collective memory. It grows and changes under a different set of dynamic, ecological principles than does biological evolution and the intelligence of individual members of other species. The most important of these differences is speed, an idea that has only become apparent since the recognition, in modern, Western culture, that knowledge is power. That realization, which epitomizes the transition to modern times, encouraged the design of deliberate methods and institutions for fostering the growth of knowledge, and especially for its productive applications as technology. The set of pictographs that follows this introductory text is intended to convey the implications of Wojciechowski's observation that knowledge has been increasing exponentially since humans began living together in social groups.

The chronological axis in these charts illustrates the point that transition to modernity was playing with fire, the breaching of ancient warnings illustrated in myths and legends like letting genies out of bottles and the Midas touch. These reflect nervousness about overstepping the bounds of human capacity to cope with the consequences of knowledge power. Early modern philosophers were impious in transgressing a taboo based

in ancient wisdom. For once ejected from Paradise, humanity was on its own, the consequence of which is encapsulated in Gordon Childe's generalization that *Man Makes Himself*.⁴ Our species is being transformed by knowledge, and not in simply cultural ways. Our very physical, biological nature is undergoing ever more deliberate transformation. And in keeping with the ecological principle, it is not just ourselves and our environments that are transformed; the body of knowledge itself is in flux. It cannot remain constant because it must be transmitted through human minds whose interpretations are necessarily influenced by changes in the ambient world and the state of our species.

As part of his vocation for reaching non-specialists, Wojciechowski has provided explanations about philosophy as a special field of inquiry, including distinctions among major approaches to the subject of knowledge and its sources. Important for this purpose are two appendices in the book about the role of sensation, which complement an emphasis in the main text on the primary role played by intellection in the modern era (after Descartes). He observes there, that each of these methods, in isolation, has its champions among philosophers, and that the middle way or combination of both is usually described as *moderate realism*, the approach taken by Aristotle. Although Wojciechowski appears in the book to avoid taking a position along the continuum between pure idealism and radical empiricism, the implications of his treatment seem to be quite firmly supportive of moderate realism. In his lectures and in conversations with colleagues, he frequently invokes Francis Bacon, the father of deliberate scientific effort, as the real pioneer of the modern way of thinking. Fundamental similarities between Bacon's approach and Karl Popper's hypothetico-deductive method seem to us to justify making a parallel with Popper in describing Wojciechowski's thought, although he has himself never noted or acknowledged such an affinity.

The Knowledge Construct and the Existential System of Man

Wojciechowski argues that each culture creates a base of knowledge that is shared by the members of that culture. He calls this a "knowledge construct" (KC). As long as a culture is isolated, its KC develops slowly and within the ecological constraints of the culture. To the extent that cultures begin to overlap as they spread, they then share Knowledge Constructs, beginning perhaps with language. The KC that a culture develops or shares exists in Wojciechowski's theory separate from the individuals that create it. The KC is passed on within and

between generations as a part of the culture, much as artefacts and other physical objects.

A KC exists in a defined relationship with its creators and this relationship is recursively complementary as described by Caley and Sawada.⁵ Wojciechowski is correct to describe this relationship as ecological, for the components of ecosystems exist in complementary relationships.

Ecosystems have abiotic and biotic components, each necessary for the continuous maintenance of the system. These relationships are referred to as *structural coupling* by Maturana and Varela.⁶ Removal or addition of sub-components causes the whole system to shift energy and matter flow to accommodate such changes. This is the basis of evolution. However, it seems to be impossible for biotic components to exist without the abiotic components and other biotic components.

Only self-aware components of ecosystems can imagine the possibility of being external to the systems. However, this is an imaginary exercise, since no biotic component can exist external to its ecosystem. Ask an astronaut or submariner what happens if they try to “go outside.”

Self-aware components can create the concept of the KC as an external part of their ecosystems, as Wojciechowski has done. However, even he is aware that this is a fiction, perhaps a necessary fiction, in order to help others understand his conceptual space. The creators and the KC are inexorably intertwined in recursively complementary relations. As the creators change, so does the KC; but also, as the KC changes, so do the creators (structural coupling). Thus while we try to maintain the “fiction of the KC as out there,” we must be conscious that we are embedded in it even as we become aware of it. This concept is encapsulated by Wojciechowski as the Existential System of Man (ESM).

The analogy in ecology is the concept that “the ecology is out there” somewhere separate from the humans who live in it. Thus the phrases “ecology or jobs” or “economic growth or ecology,” as if in some strange manner humans can be extracted from their ecosystems. This “rational thought” has led to the environmental disasters we now face (deforestation, desertification, pollution, fisheries collapse, catastrophic fires, climate shift, etc). Only by perceiving humans to be external to their environment can we exploit ecosystems as though they are inexhaustible resources.

In 1931, the Czech-born mathematician Kurt Gödel demonstrated that within any given branch of mathematics, there would always be some propositions that couldn't be proven either true or false using the rules and axioms . . . of that mathematical branch itself. You might be able to prove every conceivable statement about numbers within a system by going *Toutside* the system in order to come up with new rules and axioms, but by doing so you'll only create a larger system with its own unprovable statements. The implication is that *all* logical systems of any complexity are, by definition, incomplete; each of them contains, at any given time, more true statements than it can possibly prove according to its own defining set of rules.⁷

It seems to us that EoK and Gödel's theorem are mutually supporting. Such thinking is, however, now a component of the EoK. Thus, EoK appears to be a "formal system" as described by Gödel in his Incompleteness Theorem. As such, it can and does create problems for which it cannot develop solutions. It seems to us that this may be, in the end, the most difficult problem for the KC to comprehend. Gödel's theorem demonstrates that the only way a formal system can solve the incommensurable problems that it inevitably creates is to develop a more complex system. How can the global KC, that includes all human knowledge, create a system of greater complexity that includes itself in a more complex system?

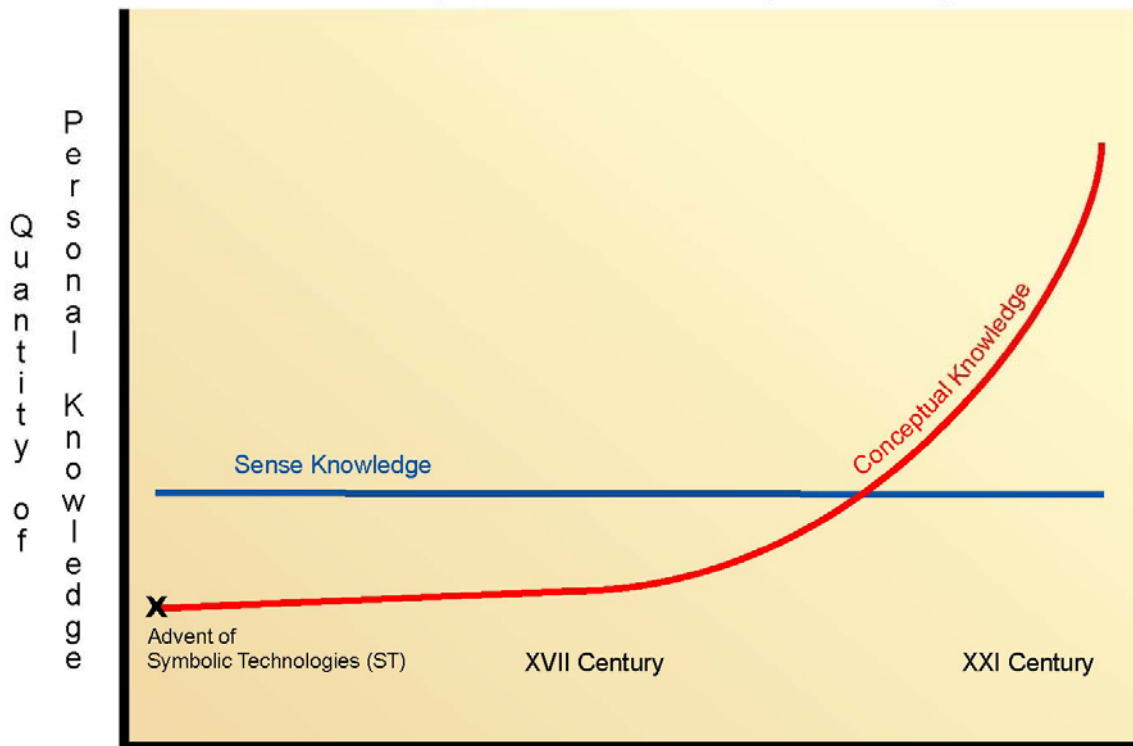
Is EoK a philosophical system? We think not, though it relies heavily on the precepts of Western philosophy and science. It seems that EoK is an extremely powerful statement of human development of all kinds in an ecological context. This does not diminish EoK. The EoK concept is robust and able to take its place with other grand systems (General Semantics, A Theory of General Systems, Chaos Theory, Chan, Zen, Deep Ecology, Sociobiology, General and Special Relativity, Quantum Dynamics, etc.).

A Pictorial Introduction to the Problem Context

Wojciechowski developed a set of Cartesian coordinate charts illustrating various knowledge relationships as a compact means of explaining the context of his theory in a single lecture. We reproduce them here from notes, since the slides have not been incorporated in his book.⁸ The book does contain an insert sheet on which the author has reduced the entire idea into a single diagrammatic exposition. Readers will want to spend some time digesting it. We offer the following as a rapid, albeit space-consuming, primer.

In all eleven charts, the abscissa represents the passage of time. A presumption in all of them is that there is a progressive accumulation of knowledge over time. That presumption requires some explanation because some readers' concept of knowledge may lead them to doubt its acceptability as a premise. The diagrams are designed in part to overcome that objection. The first of them addresses it directly.

1. Conceptual versus Sensory Knowledge

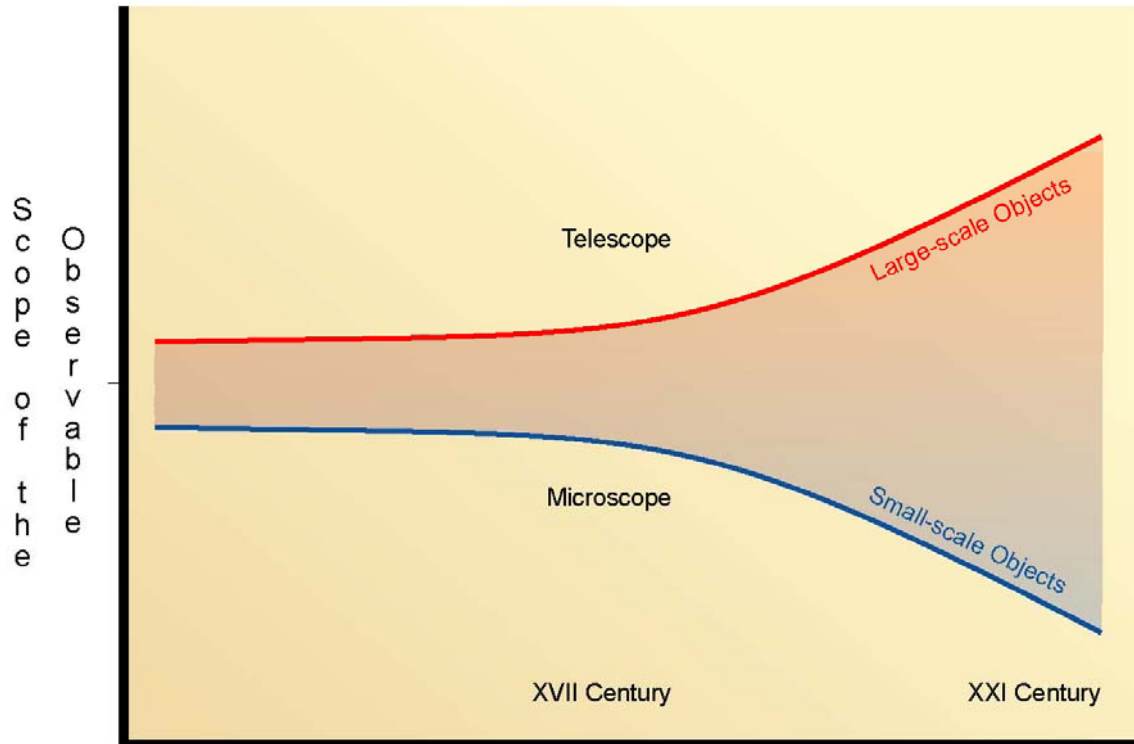


Interpersonal Transmission Increases Over Time

The ordinate here is *quantity* of knowledge. The meaning of knowledge is explained by distinguishing between two sources. One is the kind of knowledge that a sensate being can acquire and use through its genetic endowments and is limited by the sensory equipment of the individual. It is represented as a constant through time. Conceptual knowledge, on the other hand, is an inter-being (mostly human) phenomenon that became possible only with the advent of symbolic technologies. This event is not further specified but obviously embraces the development of language and then writing. It is vaguely represented as far back in time but importantly as inferior over most of human existence to knowledge that an individual could acquire directly through his senses.

The point at which conceptual becomes a larger factor than sensory is subject to speculation, but the general idea resonates with personal experience.

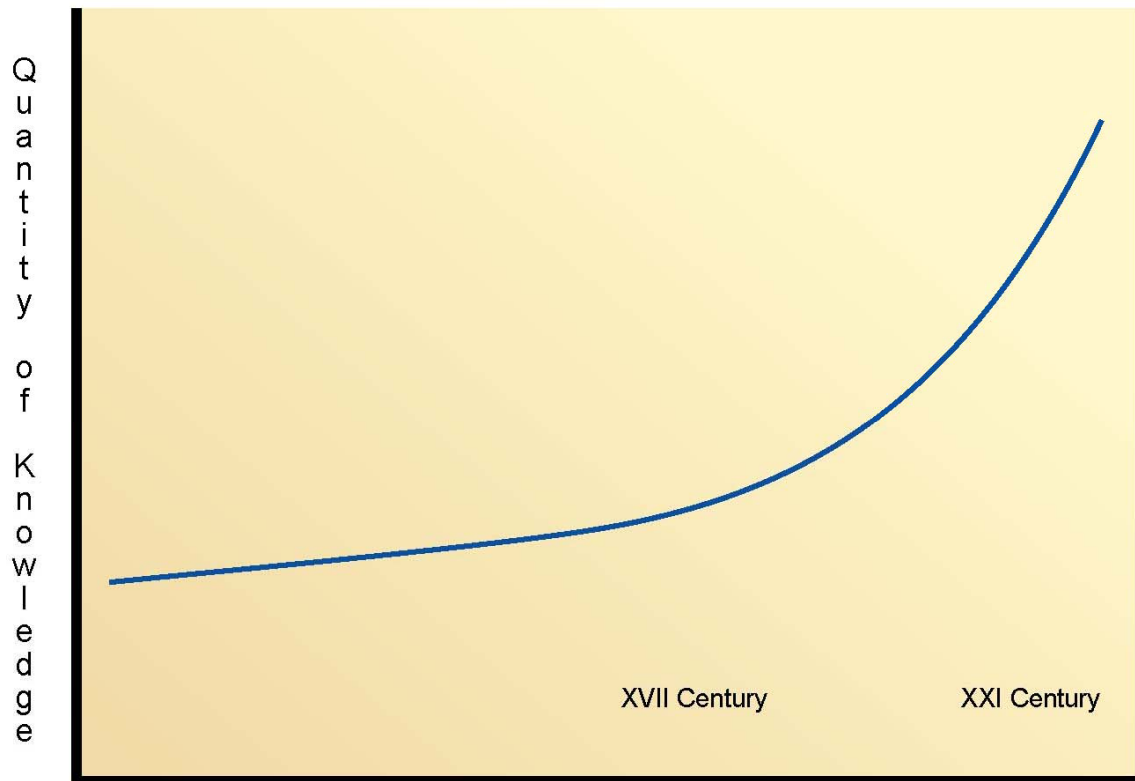
2. Expansion of Sensory Capacity



Progress of Observational Techniques

Technological progress expands the power of the senses in acquiring personal knowledge. The example of the telescope and microscope is appropriately supplemented by growing capacity of early humans to transport themselves and their supplies, to navigate and in general to overcome obstacles encountered in nature. This brought them into contact with other peoples and environments and increased their knowledge. It suggests that sensory knowledge should not therefore be represented as a constant, but it is nonetheless undeniable that growth in sensory capacity was a consequence of development through transmission of conceptual knowledge.

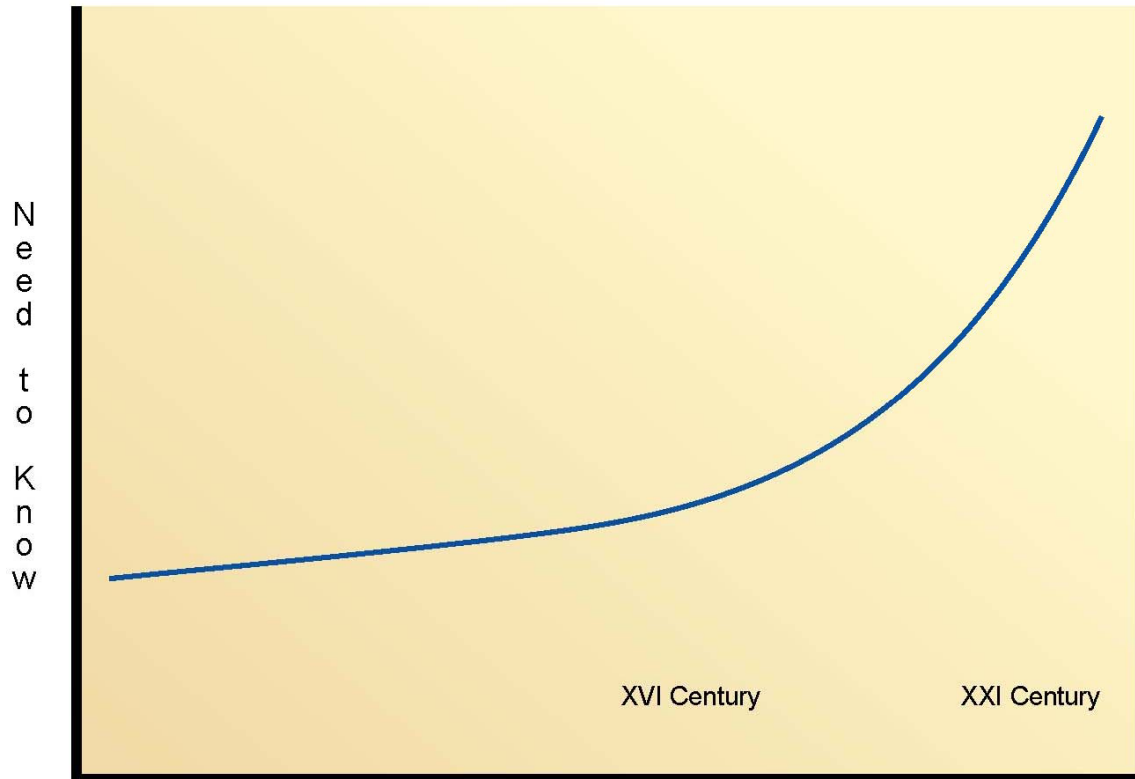
3. Growing Capacity to Know



Continual Combining of Sensory and Conceptual for Mutual Enhancement

This relation summarizes the two previous and underscores Wojciechowski's *quantitative* focus on knowledge. He is *not* addressing truth tests, efficacy, or value issues.

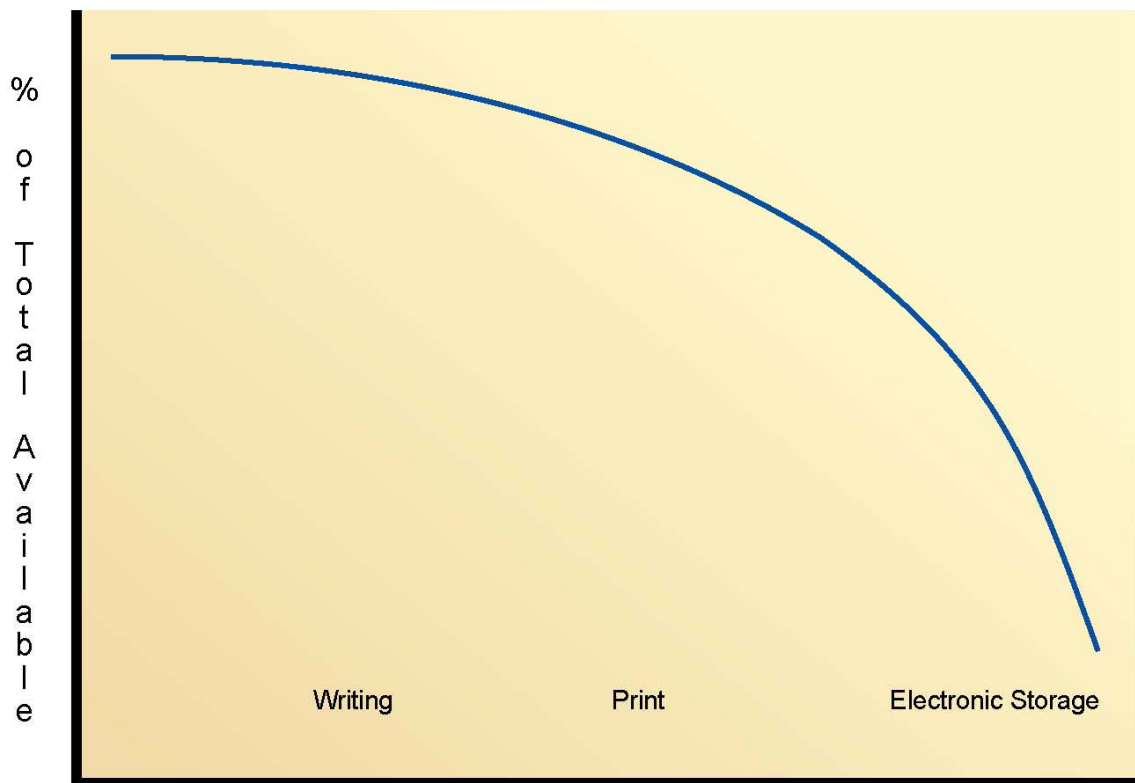
4. The Imperative of Knowledge Use



Progressive Accumulation of Knowledge

Knowledge is desired for its value in overcoming natural obstacles and human adversaries. As it is exploited by innovators, others are forced to adopt as well, in self-defence. This interplay encourages ever more rapid development of knowledge.

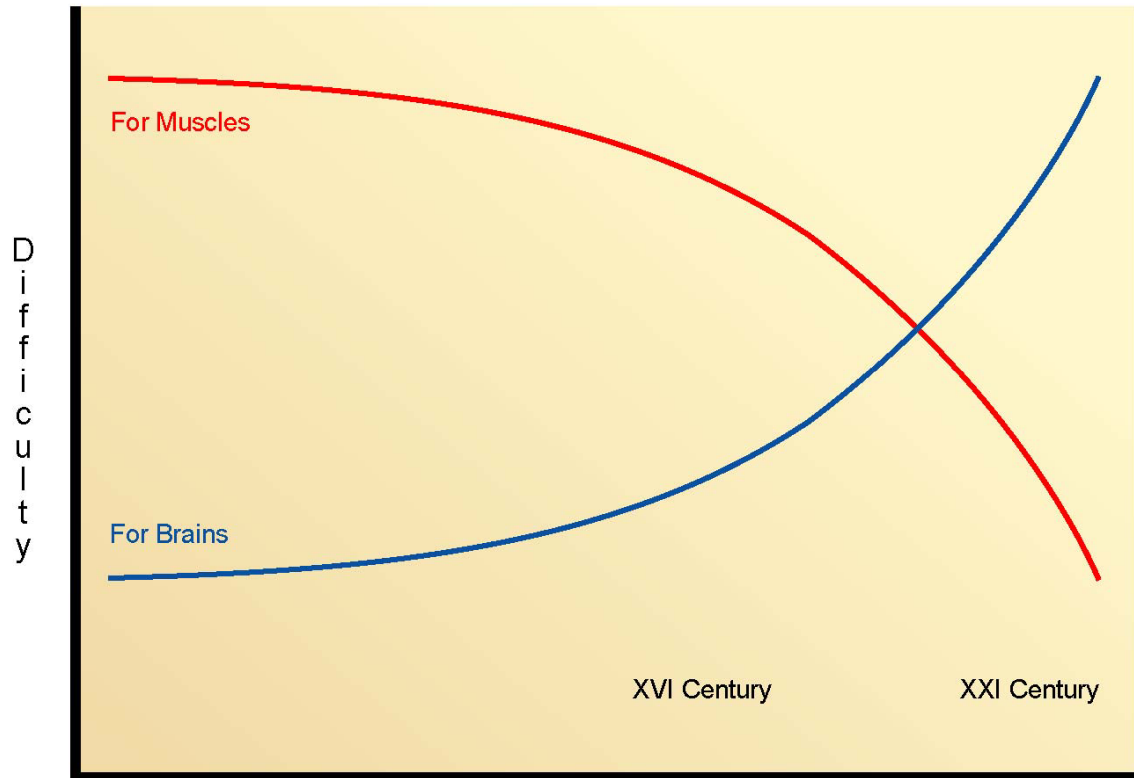
5. Knowledge Mastery by Individuals



Progressive Increase of Conceptual Knowledge

This represents the declining capacity of individuals to master the existing body of knowledge as it grows ever more rapidly. It should be kept in mind always that this dilemma is independent of the truthfulness, efficacy, or moral and aesthetic value of knowledge.

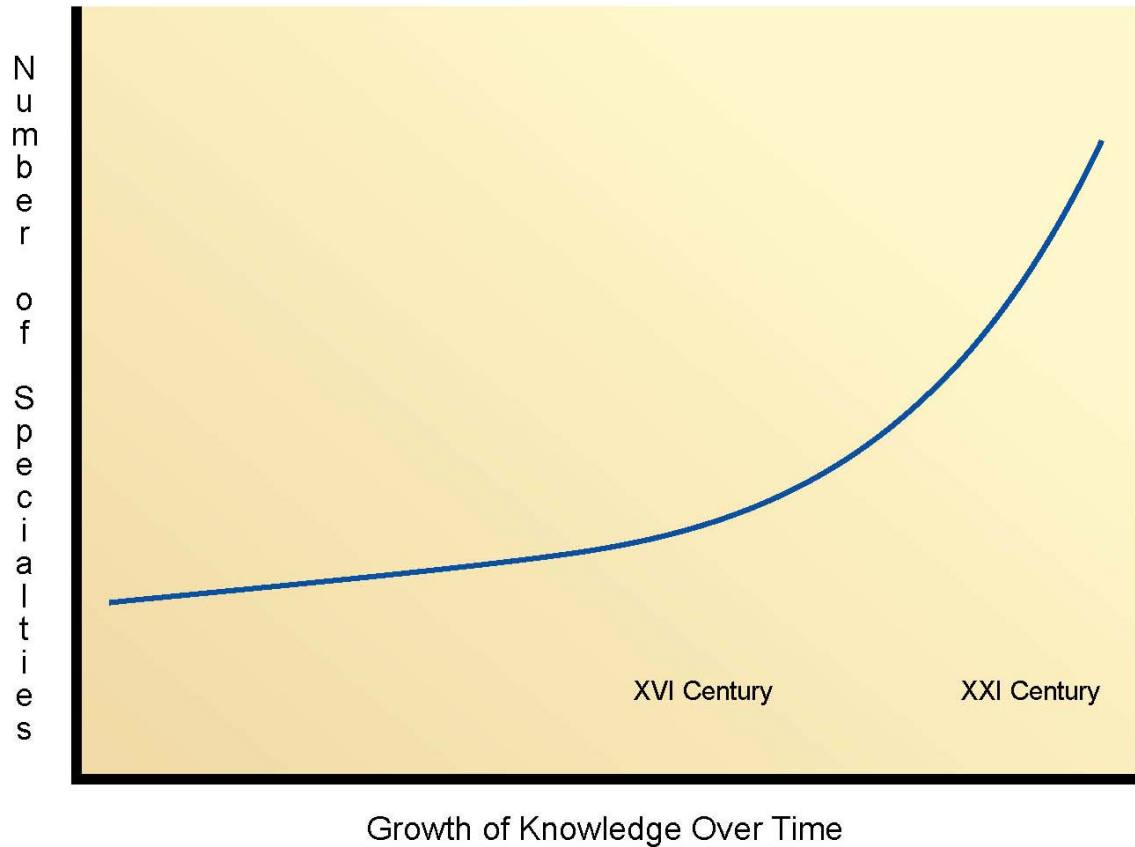
6. Physiological Implications of Knowledge Growth



Growth of the Knowledge Construct (KC)

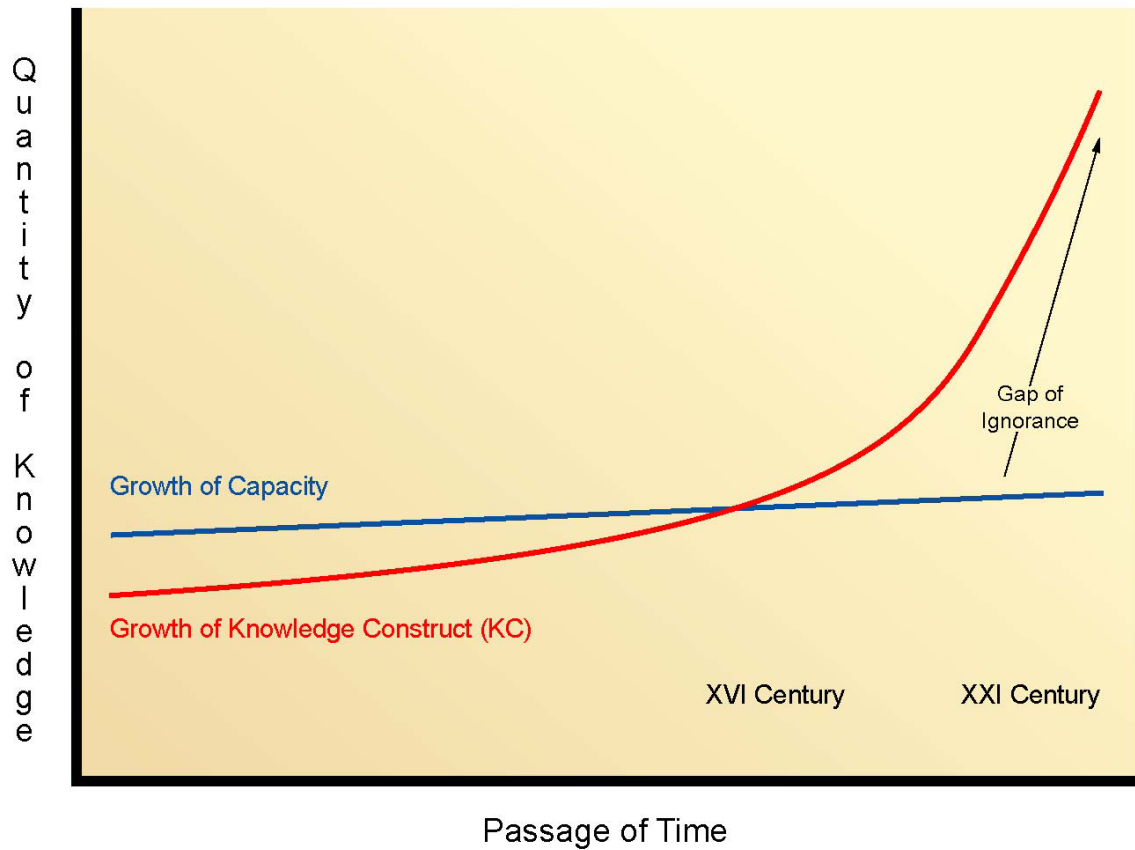
This implication of knowledge growth follows from the imperative of using knowledge and our declining capacity as individuals to master all of it that is relevant to our personal context. Moving stuff around is now pretty effortless; deciding where to put it and what to do with it is something else.

7. Specialization: A Consequence of Limited Personal Capacity to Master Knowledge



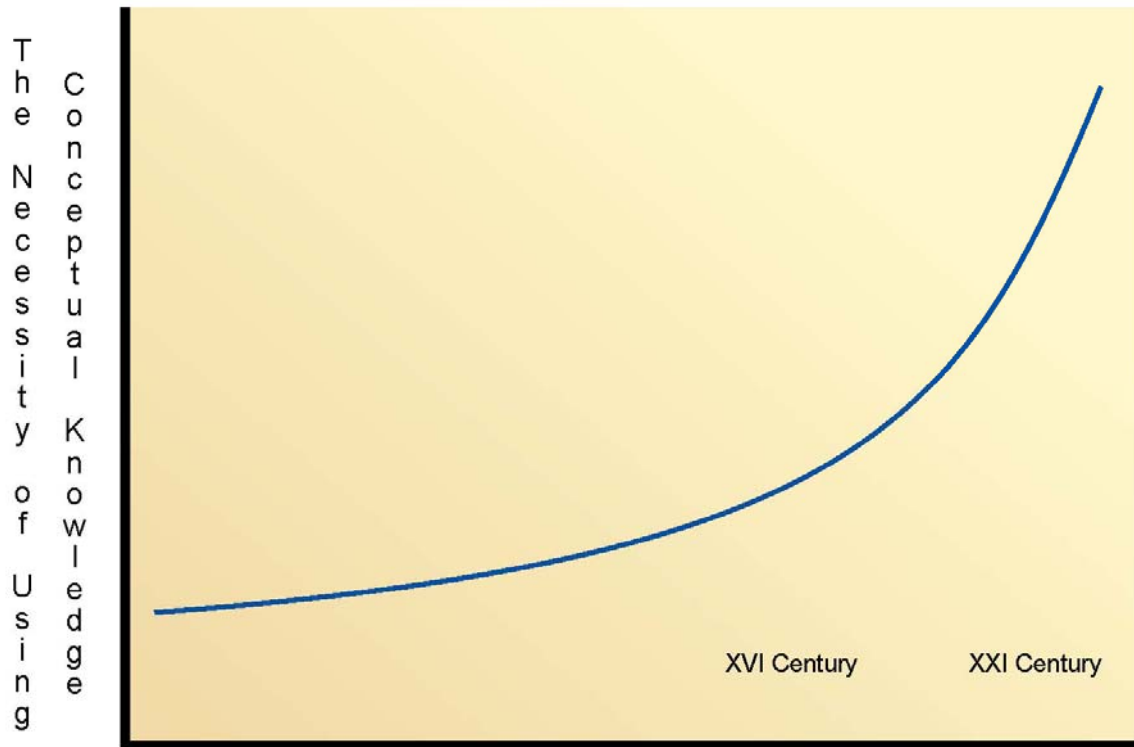
This phenomenon is well-known and requires no further explanation.

8. The Challenge of Rampant Ignorance



The concomitant of rapid knowledge growth is an unbridled mushrooming of ignorance. The uncomfortable implications of this underside of knowledge are explored in the relations charted on the remaining slides.

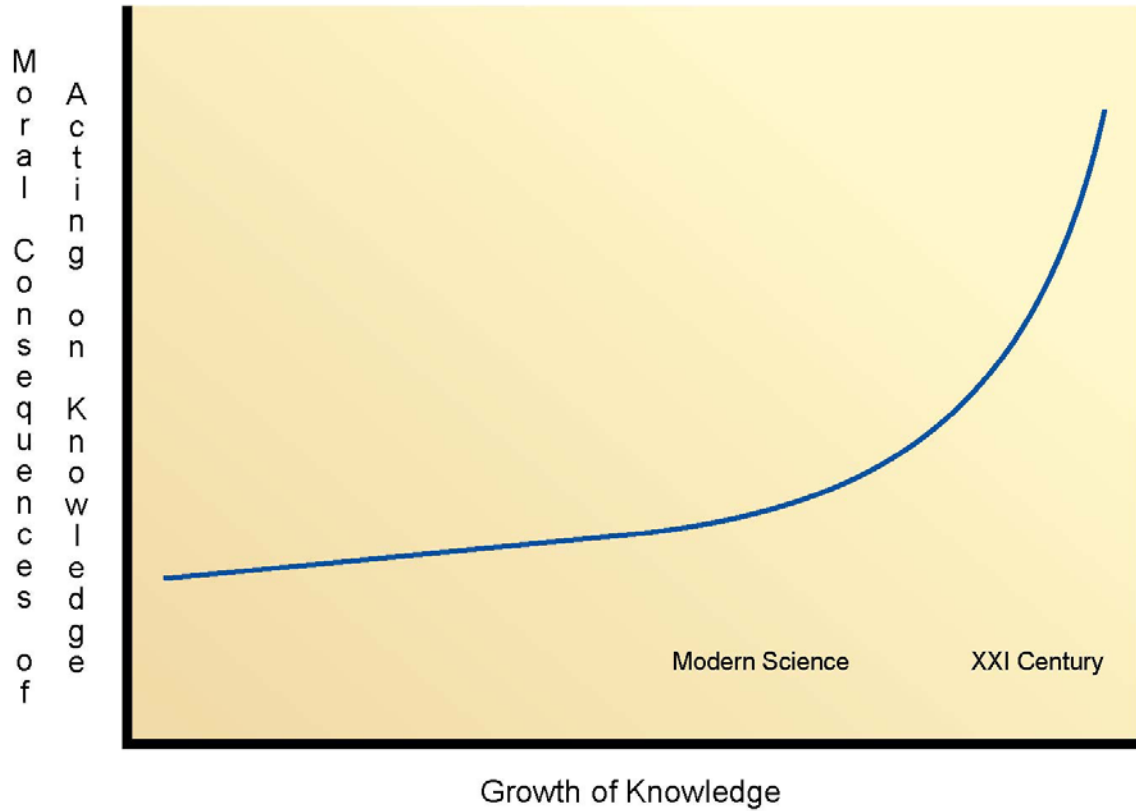
9. Importance of Knowledge for Society



Growth of Knowledge Construct Entails More Social Problems

The message here is a repeat of pictograph number 4, but this time for societies. As individual members acquire knowledge power they affect others and some collective response is demanded so that societies can be held together. This requires a knowledge response from society, meaning that collective consciousness must be raised in some way. The difficulty of responding to this challenge may be feeding the popularity of laissez-faire economic policies at the turn of the twenty-first century, for example.

10. Impetus of Knowledge Growth to Ethical Reflection



One of the reactions imposed by growing social problems is the necessity of expanding the domain of ethical responses to embrace new situations and altered perspectives on older ones.

11. Implications for Governance



Growing Power of Individual and Group Action

The growing ability of individuals and groups to take effective actions calls forth a demand for governments to control them. This is resisted powerfully in reaction. Governments need and hire knowledge specialists to help them, but these are resented and reviled if their analyses point to a restraint on the actions of influential interest groups. The impetus to laissez-faire in our time entails a denial that growing use of knowledge creates problems as big as the ones it solves.

The 25 Laws of EoK

In our opinion, Wojciechowski's "laws" are simply statements of fundamental aspects arising from his EoK, *not* fundamental laws of the universe.

1. The number and the variety of causes of stress are proportional to the amount of knowledge.

2. The perception of complexity of the consequences of knowledge is proportional to the development of knowledge.
3. The knowledge of knowledge is a function of a general development of knowledge.
4. The size and complexity of the problematic of knowledge is proportional to the general level of knowledge.
5. Thought induces change.
6. Humans' ability to determine the development of humanity is proportional to their knowledge.
7. All other things being equal, the complexity of involvement of the individual with external reality is proportional to the amount of knowledge he or she possesses.
8. Physical mastery of nature is proportional to the active, intellectual subordination of it.
9. There exists interdependence between the size of the human group, the amount of communications within the group, the spread of intersubjectivity of the knowledge construct and the progress of knowledge.
10. The need for communication is proportional to the size of the society, the number of groups within the society and the amount of knowledge available.
11. The need of humans to understand themselves is proportional to the level of their knowledge and their demiurgic capacities.
12. Rational activity is proportional to knowledge. And its corollary.
13. The efficiency of rational activity is proportional to knowledge.
14. The need to understand the Existential system of man is proportional to the level of knowledge.
15. The size and complexity of the existential system of man are proportional to the level of rational activity.
16. The impact of the existential system of man on humans is proportional to its nature-size and complexity.
17. The level and complexity of human life and problems are proportional to the existential system of man.
18. The satisfaction with the existential system of man is inversely proportional to the capacity to change it.

19. The development of a society is proportional to its storage and use of information.
20. The potential for the development of knowledge is proportional to the existing knowledge.
21. An intellectual construct always retains a noetic role.
22. The level of the material support system for knowledge has to be proportional to the level of knowledge.
23. The number of peoples in need of help is proportional to the level of knowledge and the ability to act.
24. The moral problematic is proportional to the knowledge construct and to the power to act.
25. The capacity to do good or evil is proportional to knowledge.

Some Questions Arising from EoK

1. Does knowledge exist only in brains or does knowledge exist in other parts of the body?
2. Does information stored outside of human brains constitute knowledge?
3. Is there such a thing as “sufficient knowledge” as in “you can never be too thin or too rich!”
4. Is “rational knowledge” the only meaningful type of knowledge?
5. How does rational knowledge interact with other forms of knowledge (i.e., intuitive knowledge, muscle knowledge, cellular knowledge, etc.)?
6. Is rational knowledge the “highest” form of knowledge, for example, the Sherlock Holmes phenomena?
7. How do we make decisions given various forms of knowledge?

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Endnotes

¹ The Introduction to this article contains excerpts adapted from a review of Jerzy A. Wojciechowski's 2001 *Ecology of Knowledge* reviewed by Keith Wilde in the *Proceedings* of the Canadian Association for the Club of Rome, Series 2, Number 4, June, 2002. See the review at <http://www.cacor.ca/projun02.pdf>.

² Jerzy A. Wojciechowski. 2001. *Ecology of Knowledge*. Washington: The Council for Research in Values and Philosophy. *Ecology of Knowledge* is available online: <http://www.crvp.org/book/Series01/I-23/contents.htm>. The Council for Research in Values and Philosophy may be contacted at P.O. Box 261 Cardinal Station, Washington, D.C. Telephone and Fax 202-319-6089; e-mail: cua-rv@cua.edu; website: <http://www.crvp.org>.

³ Chapter title, Wojciechowski 2001.

⁴ V. Gordon Childe. 1963. *Man Makes Himself*. New York: Mentor Books.

⁵ Caley and Sawada 1986; Sawada and Caley 1986.

⁶ Maturana and Varela 1992.

⁷ Judy Jones and William Wilson. 1995. *An Incomplete Education*. Rev. ed. New York: Ballantine Books.

⁸ We gratefully acknowledge the technical assistance of Bergen Wilde, who produced these pictographs from sketches.