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The Classical Notion of Knowledge and Interdisciplinarity of Science

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The Classical Notion of Knowledge and Interdisciplinarity of Science

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Abstract

The main concern of this paper is situated between analytical epistemology (theory of knowledge) and philosophy of science. The main question concerns the notion of knowledge that might be useful when discussing the interdisciplinarity of knowledge, and especially scientific knowledge. Other issues addressed in the paper include the following: does the classical notion of knowledge, used in analytical epistemology, suffice to address the problem of the interdisciplinarity of (scientific) knowledge? What aspects of knowledge are relevant in this context and should they be reflected in the notion of knowledge? How to transform the classical notion of knowledge so that it can serve as a conceptual tool to discuss the interdisciplinarity of scientific knowledge?

Interdisciplinarity has recently become a crucial category in the philosophy of science. However, it is not used in the context of analytical epistemology (theory of knowledge). While nobody denies that science is today the most prominent domain of knowledge, the analysis of knowledge in analytical epistemology, generated by the classical notion of knowledge, passes over the issue of the interdisciplinarity of knowledge. Since the most fundamental way of understanding science in its epistemological dimension is science as a kind of knowledge, epistemology should provide an analysis of knowledge in terms that can be useful when describing and interpreting important aspects of contemporary science such as interdisciplinarity. In the paper it is argued that the classical, epistemological notion of knowledge as justified, true belief is not sufficient to discuss the interdisciplinarity of (scientific) knowledge because it ignores some important aspects of knowledge such as its selectiveness, inadequacy/incompleteness and its systemic, linguistic, and social character. My thesis is that expanding the notion of knowledge to take into consideration these aspects will enable analysis and discussion of the interdisciplinarity of scientific knowledge.

Keywords: Knowledge, Science, Scientific Knowledge, Interdisciplinarity, Interdisciplinary Knowledge, Interdisciplinarity of Scientific Knowledge

The Notion of Interdisciplinarity of Science*

The notion of interdisciplinarity has recently become, as noted above, a crucial category in the philosophy of science. Many attempts to define it have been made. It is opposed to "disciplinarity", while some see it as a kind of multidisciplinarity, with disciplinarity being a kind of monodisciplinarity[1]. It is sometimes a collective name describing movement through many disciplines that transcends one discipline. It appears in science in different versions and is variously called *transdisciplinarity*, *pluridisciplinarity*, *syndisciplinarity*, *crossdisciplinarity*, etc. These are often distinguished and characterized in different ways. Different ways to project their meaning (meaning postulates) are proposed and there is no consensus in understanding them. In this paper, I partially accept the broad use of the term interdisciplinarity with, however, a somewhat different arrangement of the terminology. In the title "interdisciplinarity" is used in the broad sense, as the collective name for various kinds of multidisciplinarity, because it is often used in such a way. However, I prefer to see interdisciplinarity as a kind of multidisciplinarity and to use the latter term as the broadest category, denoting all situations in science where scientists transcend one discipline or cross the boundaries of particular disciplines to integrate their perspectives or insights[2].

Interdisciplinarity is a noun formed from the adjective *interdisciplinary*; the feature denoted by this adjective is ontologically secondary to the object to which it is attributed. Hence, interdisciplinarity is a feature of science (or some its elements) as scientific activity (actions), i.e. in the first place research and in the second place the result of research; that is, knowledge. Interdisciplinarity can be treated as a feature of science in the sense of a form of cognition or knowledge, i.e. a method (as a form for research actions), a language (as a form for knowledge) or an institutional form for doing science (as a form for science as an area of culture)[3]. The adjective *interdisciplinary* (*multidisciplinary*) occurs before nouns like *studies*, *research*, *knowledge*, *problem*, *concept*, *education*, *approach*, etc.[4]

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*I use in the paper some ideas presented in my articles and book in Polish: Walczak, M. 2015. Interdyscyplinarny charakter kulturoznawczego pojęcia kultury, *Człowiek i Społeczeństwo*. In printing; Walczak, M. 2015. Natura wiedzy. Charakterystyka z odniesieniem do epistemologii anglosaskiej. In *Epistemologia*, S. Janeczek Ed., Wydawnictwo KUL. Lublin. In printing; Walczak, M. 2006. *Racjonalność nauki. Problemy, koncepcje, argumenty*. TN KUL. Lublin.

[1]Chettiparamb, A. 2007. *Interdisciplinarity: a Literature Review*. The Interdisciplinary Teaching and Learning Group, Subject Centre for Languages, Linguistics and Area Studies, School of Humanities. University of Southampton. https://www.llas.ac.uk/resources/3219. (January 2ed, 2015).

[2]Different metaphors are used here: bridge building, boundary crossing, bilingualism, and the smoothie; see: https://sites.google.com/a/ualberta.ca/rick-szostak/research/about-interdisciplinarity/definitions/defining-instrumental-interdisciplinarity (December 27th, 2014).

[3]Kamiński, S. 1992. O typach desygnatów terminu nauka. In *Nauka i metoda. Pojęcie nauki i klasyfikacja nauk*. S. Kamiński. TN KUL. Lublin, 1-19.

[4]Repko, A.F. 2008. *Interdisciplinary Research: Process and Theory*, Sage Publications Inc. Los Angeles.

The prefix *inter-* comes from Latin and means between, among, in the midst. *Disciplinary* means here of or relating to particular field of study or specialization. Thus *interdisciplinary* means between fields of study (a spatial metaphor); on common ground not covered by one discipline alone; and creating a common field of study for two or more disciplines[5].

Allen F. Repko's definition of interdisciplinary research specified important meaning moments (connotations) for *interdisciplinarity*:

> Interdisciplinary studies is a process of answering a question, solving a problem, or addressing a topic that is too broad or complex to be dealt with adequately by a single discipline and draws on disciplinary perspectives and integrates their insights to produce a more comprehensive understanding or cognitive advancement[6].

Accordingly, there are several constitutive moments of interdisciplinary studies: 1) research is processual[7]; 2) the disciplinary perspective (the type of approach to the problem) represented by particular disciplines or specialized fields of studies is a condition for interdisciplinarity; 3) the results/insights of particular disciplines are integrated; 4) the aim of interdisciplinary research is a more comprehensive understanding or cognitive advancement. I omit a more detailed characterization of these moments to concentrate on the notion of the interdisciplinary of (scientific) knowledge and interdisciplinary knowledge.

The Interdisciplinarity of Scientific Knowledge and Interdisciplinary Knowledge

Production of knowledge of a particular kind is usually the aim of interdisciplinary research[8]. It is a natural presumption that interdisciplinary research produces interdisciplinary knowledge, although it is not a fixed principle that properties of the research process are inherited by its results. The term *interdisciplinary knowledge* is not as common in discussions of interdisciplinarity as one might think[9]. Finding a systematic description of interdisciplinary knowledge is hard but its properties can be reconstructed on the basis of literature that uses the term *interdisciplinary knowledge*.

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[5] *Ibidem*, 5-6.
[6] *Ibidem*, 12.
[7] "Process" is preferred to "method" because Repko believes "process allows for greater methodological flexibility particularly when working in the humanities" (Repko 2008, 12). He does not take into account changes in the contemporary notion of method where a *method* means usually what scientists and scholars do rather than fixed, algorithmic patterns or rules of doing science; see: Bronk, A. 2006. Metoda naukowa. *Nauka* nr 1 (2006), 47-64.
[8] Østreng, W. 2010. *Science without Boundaries. Interdisciplinarity in Research, Society, and Politics*. University press of America, ® Inc. Lanham, 28, 33.
[9] In *The Oxford Handbook of Interdisciplinarity*. 2010. R. Frodeman, J. Thompson Klein and C. Mitcham, Eds. OUP. Oxford, the term *interdisciplinary knowledge* can be found only a few times.

Firstly, interdisciplinary knowledge is intended "to produce (scientific) syntheses between two or more disciplines for the sake of scientific progress"[10]; *ergo* it is synthesized knowledge. Synthesis and integration are the keys to understanding interdisciplinary knowledge, however described. Synthesis rests on the creation of a whole (totality) employing different elements. Since these elements are provided by particular disciplines, interdisciplinarity depends on and presupposes disciplinarity. Interdisciplinary knowledge involves familiarity with components of two or more disciplines[11] using expert, disciplinary knowledge. Interdisciplinarians "spur us to see the various components of human knowledge for what they are: pieces in a panoramic jigsaw puzzle"[12]. Creating the totality from elements means understanding "system" as a whole compounded of many elements and relations. These components are pieces of disciplinary knowledge, or new items created by the synthesis. Because interdisciplinary synthesis is a system or complex, the natural background against which to describe it is the systemic approach and systems theory[13]. Systems of knowledge in science take the form of (scientific) theories that are structures (organizations) that can or should be similar or identical to axiomatic-deductive systems. Theories vary in their generality and can be disciplinary or interdisciplinary. Detailed acquaintance with particular aspects of research objects and disciplinary objects gives greater general interdisciplinary knowledge than universal knowledge without a such an inductive basis[14].

What are the other properties of interdisciplinary knowledge as a synthesised general theory? Interdisciplinary knowledge is more balanced than disciplinary knowledge, overcoming compartmentalization, capturing contextual complexity. It is broader, more complex, comprehensive, multifaceted, and holistic than narrow disciplinary knowledge[15].

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[10]Østreng 2010, 33.

[11]Nissanni, M. 1997. Ten cheers for interdisciplinarity: the case for interdisciplinary knowledge and research. *The Social Science Journal* 34 (1997), 210-216; 203.

[12]Nissanni 1997, 210.

[13]See: Agazzi, E. 2002. What is Complexity?, In *Complexity and Emergence: Proceedings of the Annual Meeting of the International Academy of the Philosophy of Science*. (Bergamo, Italy, 9-13 May 2001), E. Agazzi and L. Montecucco, Eds. World Scientific Publishing Company. River Edge, New Jersey, 1-25; Agazzi, E. 2008. Epistemology and the Social: A Feedback Loop. *Poznań Studies in the Philosophy of the Sciences and the Humanities*. 96 (44), E. Agazzi, J. Echeverria and A. Gómez Rodriguez, Eds. Rodopi. Amsterdam-New York, 19-33, and Broszkiewicz, P. 2014. *Systemowa koncepcja nauki na przykładzie poglądów Evandra Agazziego i Javiera Echeverrii*, Doctoral Thesis. The Catholic University of Lublin.

[14]Østreng 2010, 27.

[15]"The objective of academic interdisciplinarity – which can be broken down into different modes of crossdisciplinarity (see Chapter 3) – is to integrate the specialized contributions of two or more disciplines to deal with a complex problem. The craft of this type of interdisciplinarity is to create wholeness out of pieces, to see how the individual contributions of disciplines affect, connect, relate, integrate and interact in composite reality. The quest is to find unity in diversity, to explain how order can emerge from a mass of evolving agents, whether they are, atoms, cells or organisms. In so doing, the uni-dimensionality of individual disciplines is pitted against the multi-dimensionality of multiple disciplines, that is, the mono-faceted compared with multifaceted, the specialist view compared with the generalist view, the

Such knowledge is called "'a science of new connections', 'a science of synthesis,' 'a science of consilience', 'big science', 'bold science', 'holistic science', 'complex science,' 'symbiotic science', 'interdisciplinary science', etc."[16]. These names reveal also its features.

The comprehensive complex contextual and holistic character of interdisciplinary knowledge comes from bringing together insights and methodologies from a variety of disciplines to achieve the widest view and see things as an organic whole[17]. Interdisciplinary knowledge gives a holistic understanding of a given topic, challenge or problem, breaking the "walls" separating communities of knowledge[18]. As a result, specialists can see their field in a wider context[19], their connections to different parts of the context, and the context as a whole.

Scientists look for relationships among clusters of interdependent variables with the aim of addressing their intersections and areas of overlap to reveal insights that in individual disciplines cannot provide separately and in isolation from each other[20].

These properties mean the natural background against which to describe interdisciplinary knowledge is holism, understood as a kind of doctrine that a belief content (or the meaning of a sentence that expresses it) is determined by its place in the web (system) of beliefs or sentences comprising a whole theory or group of theories[21].

Interdisciplinarity and interdisciplinary knowledge presupposes cooperation between specialists of many disciplines, so it has an important social aspect. The ultimate aim of interdisciplinary knowledge is to become public knowledge[22]. To become public knowledge, the results of (disciplinary or interdisciplinary) research have to be generally accepted by the scientific community as the truth about a specific matter.

Scientific knowledge, which starts with experience, does not become public knowledge until its facts and theories have survived a period of critical study and testing by other competent and distinguished researchers and have, as a consequence, become accepted by the consensus of rational opinion over the widest possible field[23].

Cooperation and critical discussion presupposes the possibility of communication and the use of language to communicate one's own insights

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specialized answer compared with the compound answer, narrowness against broadness, depth against wholeness" (Østreng 2010, 26).

[16]Østreng 2010, 13-14.

[17]Nissanni 1997, 210.

[18]Østreng 2010, 26.

[19]Nissanni 1997, 209-10.

[20]Østreng 2010, 13-14.

[21]Block, N. 1998. Holism: Mental and Semantic. In *Routledge Encyclopedia of Philosophy*. vol. 4. Routledge, Taylor & Francis Group. London, 488-493; see also: Jackman, H. 2014. Meaning Holism. In *Stanford Encyclopedia of Philosophy*. http://plato.stanford.edu/entries/meaning-holism/ (April 7th, 2015).

[22]Østreng 2010, 33-34.

[23]Østreng 2010, 15-16.

and understanding[24]. The above mentioned aspects of interdisciplinarity and interdisciplinary knowledge are discussed in terms of intersubjectivity, especially intersubjective communicability and the intersubjective control (testability) of knowledge[25]. In the context of interdisciplinarity and intersubjectivity, the problem of translation between languages and the incommensurability of the languages of different disciplines and disciplinary perspectives arises.

The Classical Notion of Knowledge

To analyze the notions of the interdisciplinarity of knowledge and interdisciplinary knowledge, we need to analyze the notion of knowledge. The theory of knowledge (epistemology) provides the most general notion of knowledge that is or should be the basis for particular notions of knowledge used by different disciplines, for example philosophy of science. Hence, there is an expectation that the general notion of knowledge analyzed by the theory of knowledge will be useful in discussing problems of particular kinds of knowledge: here, the problem of the interdisciplinarity of (scientific) knowledge[26].

The theory of knowledge gives different definitions of knowledge. The mainstream or classical notion is that of propositional knowledge[27], according to which – the most widely accepted definition – knowledge is justified true belief. This tripartite definition is also called "the standard analysis" of knowledge. An enormous amount of contemporary discussions of knowledge in analytical theory of knowledge is generated by this analysis, which is ascribed to Plato and his dialogue *Theaetetus*. However, what modern-day philosophers call knowledge is not knowledge in the sense used by Plato, who distinguished between *epistéme* and *doxa*, where the former corresponds to *a priori* knowledge, not with propositional knowledge, and the latter corresponds

[24]Østreng 2010, 16.

[25]These properties of scientific knowledge are stressed especially by philosophers and methodologists of the Lvov-Warsaw School, for example: Ajdukiewicz, K.1973. *Problems and Theories of Philosophy*. Cambridge University Press. Cambridge; in Polish: Ajdukiewicz, K. (1949) 1983. *Zagadnienia i kierunki filozofii. Teoria poznania, metafizyka*. Czytelnik. Warszawa, 71-72. See also: Woleński, J. 2013. Lvov-Warsaw School. In *Stanford Encyclopedia of Philosophy*. http://plato.stanford.edu/entries/lvov-warsaw/. (April 7th, 2015).

[26]Under the name of *transdisciplinarity* (transdisciplinary knowledge) is subsumed knowledge that unites not only the perspectives or insights of different disciplines belonging to science but also perspectives or insights of different domains, like science and society, science and art, science and religion, etc. See: Repko 2008, 15; Østreng 2010, 29-33.

[27]See for example: Moser, P.K. 1995. Epistemology. In *The Cambridge Dictionary of Philosophy*, R. Audi, Ed. Cambridge University Press. Cambridge; Moser, P. K., Mulder, D. H., Trout, J. D. 1998. *The Theory of Knowledge. A Thematic Introduction*. Oxford University Press. New York, Oxford; Quinton, A. 2005. Knowledge and Belief. In *The Encyclopedia of Philosophy*. vol. 5, P. Edwards, Ed. Thomson Gale. New York-London, 91-100; *The Routledge Companion to Epistemology*. 2011, S. Bernecker and D. Pritchard, Eds. Routledge, Taylor & Francis Group. London and New York.

to (common) belief, opinion. *Epistéme* represents the ideal of general and necessary knowledge. Plato assumed that *epistéme* is received dialectically, with the aid of pure thinking, i.e. by comparing *a priori* concepts and theses from the point of view of their logical relations (*apriorism*). The subject matter of knowledge can be only the general and the necessary, i.e. what exists in an ideal world. A point of reference for his notion of *epistéme* is mathematics, which Plato considers the supreme form of knowledge. Nevertheless, Plato addresses the key epistemological problems: what results of cognitive activity can we accept as knowledge, and what are attributes (properties) of knowledge? In distinguishing between *epistéme* and *doxa* he searches for the necessary and sufficient conditions for knowledge and so is acknowledged as the precursor of the classical notion of knowledge.

The classical notion of propositional knowledge can be clarified by attending to each of its three conditions: belief, truth and justification. The belief condition requires that anyone who knows that p, where "p" stands for any proposition or statement, believe that p. So, if the knower does not believe that the Earth is a planet, then she does not know that the Earth is a planet. A knower must be psychologically related somehow to a proposition that is an object of knowledge for her/him. The relation is called a propositional attitude, and it takes the form of acceptance (assertion) of a proposition that is a belief content. Proponents of the standard analysis of knowledge hold that only beliefs can provide the knower with the necessary psychological relation to the proposition. Philosophers do not share a uniform account of belief[28]. Beliefs can be understood as actions of assenting to a proposition or as dispositions (dispositional psychological states) that can exist even when not manifested.

The second condition for knowledge is truth. Belief is not sufficient for knowledge. Many beliefs clearly do not qualify as knowledge because they are false. On the standard analysis of knowledge, it is necessary that if you know that p, then it is true that p. Hence, if it is false that the Earth is flat, then you do not know that the Earth is flat. That is why it is also misleading to say that astronomers before Copernicus knew that the earth was at the center of the solar system; at best, they justifiably believed that they knew this[29]. So knowledge requires not only belief, but also true belief[30].

The third condition for knowledge in the tripartite analysis is justification. Knowledge is not simply true belief because some true beliefs are supported only by lucky guesswork and hence do not qualify as knowledge. Moreover, one may draw a true conclusion by invalid means, from false premises: one may believe a truth on the strength of a dream or the misremembered testimony of a notorious liar. For a true belief to be knowledge, it must meet the condition called justification, warrant or evidence. So, a knower must have adequate indication (reason) that a known proposition is true.

[28]Moser 1995, 233-238; 234.
[29]Moser 1995, 234-235.
[30]Moser, Mulder, Trout 1998, 15.

Questions about justification attract the lion's share of attention in contemporary epistemology. Controversy focuses on the meaning of "justification" as well as on the substantive conditions for a belief's being justified in a way appropriate to knowledge[31].

There are many objections to all three parts of the definition of knowledge as justified true belief, especially objections called Gettier problems[32]. However, I will not present them here, focusing only on such criticism of the standard analysis of knowledge that is a part of a discussion on the interdisciplinarity of (scientific) knowledge and interdisciplinary knowledge.

Criticism of the Classical Notion of Knowledge and Its Transformation

The classical, epistemological notion of knowledge as justified, true belief, and the standard analysis of knowledge thus generated, omit some important aspects of knowledge that are necessary in a discussion of the problems of interdisciplinary knowledge and the interdisciplinarity of science. As I have tried to show, interdisciplinary knowledge is systemic, general, comprehensive, multifaceted, social, intersubjective and linguistic in character. The classical notion of knowledge considers only three aspects of knowledge: belief, truth and justification. Even disregarding the discussions generated by the Gettier problems with these conditions (properties) of knowledge, the standard analysis is too scanty to be useful for a discussion of the interdisciplinarity of (scientific) knowledge and interdisciplinary knowledge. It does not provide conceptual and theoretical tools to analyze these problems. I will try to show this by successively analyzing the properties of interdisciplinary knowledge in the context of the classical notion of knowledge as justified true belief.

Because the constitutive properties of the interdisciplinarity of knowledge (interdisciplinary knowledge) are integration and synthesis, knowledge must be seen as a whole, a complex, a system. Therefore the systemic aspect of knowledge, absent from the classical notion of knowledge, should be respected in any notion of knowledge useful for the analysis of the interdisciplinarity of science. In the classical notion of knowledge its systemic aspect appears especially in the debate on the nature of justification between foundationalism and coherentism[33], and between atomism and holism[34]. However, since the condition of justification admits of different interpretations – foundationalists and coherentist, atomistic and holistic – the systemic aspect of knowledge does not seem to be a constitutive element of the notion of knowledge. The most

[31]Moser 1995, 235.
[32]Gettier, E. L.1963. Is Justified True Belief Knowledge?. *Analysis* 23(6), 121-123.
[33]DePaul, M. 2011. Foundationalism. In: *The Routledge Companion to Epistemology*, S. Bernecker and D. Pritchard, Eds. Routledge, Taylor & Francis Group. London and New York, 235-244; BonJour, L. 1998. Knowledge and Justification, Coherence Theory of. In *Routledge Encyclopedia of Philosophy*. vol. 5. Routledge, Taylor & Francis Group. London, 253-259; Olsson, E.J. 2011. Coherentism. In *The Routledge Companion to Epistemology*, S. Bernecker and D. Pritchard, Eds. Routledge, Taylor & Francis Group. London and New York, 257-267.
[34]Block 1998; Jackman 2014.

basic elements of knowledge are beliefs (propositions accepted by a subject), but knowledge is also constituted by such elements as concepts and problems, so they should be essential for knowledge as system. Conceiving knowledge as a system has many advantages for the analysis of interdisciplinary knowledge: it provides tools to discuss not only elements and relations intrinsic to the system of interdisciplinary knowledge as a synthesis of different disciplines, but it also gives a framework to discuss extrinsic relationships of the scientific knowledge system to different social systems such as technology, or axiology. The systemic conception of knowledge allows us to reconstruct the structure and organization of interdisciplinary knowledge too.

Synthesis and integration of the insights, viewpoints, and perspectives of more then one science in interdisciplinary knowledge is necessary because all human knowledge, especially scientific knowledge, is specialized, aspective, incomplete, partial, limited and selective. The classical notion of knowledge does not allow for these properties of human knowledge, i.e. that it arises as a result of abstraction, omitting some aspects of the object and concentrating its attention on other ones. Nor does it allow for the facts that human knowledge always takes its object from a specific viewpoint; is never complete; that it sometimes achieves truth but never completeness and adequacy. Integration and synthesis of different viewpoints and research perspectives is therefore necessary for attaining a more complete and adequate picture of a research object or research problem, and ultimately the world.

The classical notion of knowledge presupposes the perspective of an individual subject who accepts particular propositions independently of the social context where she achieves knowledge. But knowledge, especially scientific knowledge, arises from cooperation between scientists. As Thomas Kuhn[35] pointed out, science is pursued by communities that cultivate some paradigms (patterns, standards) of science. A paradigm consists of some theories, methodologies and aims of science shared by members of a particular community. A belief can be included in the body of science only if the community admits it from the viewpoint of an accepted standard of science. The knower, or scientist, is not only an individual, but ultimately also a social subject. The social aspect of knowledge is evident in interdisciplinary knowledge, which arises from – and only from – the cooperation of scientists of different disciplines. The social aspect of knowledge is manifested in the fact that cooperation between knowers (scientists) requires that the belief content (proposition) be intersubjective (also called intersubjective communicability). Also required is intersubjectivity of control (justification), also called intersubjective testability.

Belief contents (propositions) need a linguistic expression, not only because of the intersubjectivity requirement, but also because human thinking needs linguistic structures and tools: concepts, statements, questions, etc[36].

[35]Kuhn, T.S. 1962. *The Structure of Scientific Revolutions*. University of Chicago Press. Chicago.

[36]The problem of the relationship between human thought and language is today addressed by many disciplines such as philosophy of the mind, epistemology, cognitive psychology,

Therefore, one of the most important factors and tools in the process of cognition, including the process of knowledge integration (synthesis), is language. Synthesis, understood as the set of propositions in the form of a system or theory composed of linguistic expressions, is a standard result of integration where interdisciplinary knowledge arises. For these reasons, the classical notion of knowledge, which does not consider the linguistic aspect of knowledge should be supplemented in this area. Clearly, the thesis that knowledge is language-laden exposes problems in the relationships between different pieces of knowledge, especially pieces of knowledge obtained in different disciplines. Because different disciplines or research perspectives (traditions) use different conceptual tools (languages) the problem of combining them arises. How can we compare and translate the languages of different disciplines from one to another? What kind of language is useful to synthesize the perspectives of different disciplines and traditions? The languages of some general or universal disciplines can be useful here. For example, good conceptual tools are given by the languages of philosophy, ontology (metaphysics) and epistemology, as well as formal types of knowledge like logic, methodology, theory of systems, etc.[37]

This discussion shows that the classical notion of knowledge ignores the process of its generation and acquisition. This is a mistake because knowledge inherits some important properties from these processes. For example, the selectiveness and partiality of cognition is inherited by the resulting knowledge, which is also selective and partial. If we ignore these properties, the picture of knowledge is incomplete, even mistaken. This is especially visible in interdisciplinary knowledge. Another general remark on the discussion is that the standard analysis of knowledge does not consider non-propositional types of knowledge such as knowledge-how, tacit knowledge, and knowledge by acquaintance. These types are also involved in and produced by interdisciplinary research but the problem of their presence in interdisciplinarity is a problem for another paper.

In conclusion, for the classical notion of knowledge to be useful in a discussion of the interdisciplinarity of (scientific) knowledge and interdisciplinary knowledge it should be supplemented by the following ideas:

1) Individual (atomic) belief is part of a belief system, and/or can constitute belief systems;
2) Belief on a research object is generated in the process of abstraction and the selection of aspects (levels, dimensions) of the object;
3) Belief is generated by an individual subject who submits it to the community; the community admits it from the point of view of the

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linguistics and cognitive science; see for example: Aydede, M. 2010. The Language of Thought Hypothesis. In *Stanford Encyclopedia of Philosophy*. http://plato.stanford.edu/entries/language-thought/. (April 13th, 2015).

[37]Kamiński, S. 1992. *Nauka i metoda. Pojęcie nauki i klasyfikacja nauk*. TN KUL. Lublin, 278, 280.

accepted paradigm of knowledge (science) by virtue of its intersubjective communicability and its intersubjective control (criticism);
4) The condition of intersubjectivity of knowledge is language.