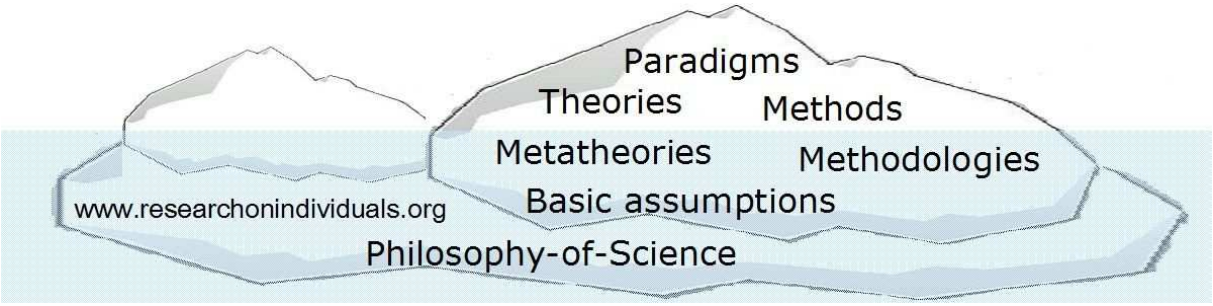
What is philosophy-of-science? And why is this needed?

In every research discipline, there are various schools of thought that rely on different basic assumptions and different theories and methods—thus, on different paradigms. But the basic assumptions underlying a given paradigm are not always made explicit. This complicates collaborations between scientists from different traditions and disciplines. In her new research trilogy, Jana Uher explored the "theories behind the theories and methods"—the metatheories and methodologies—that are used to study individuals in various fields. This abstract level of exploration is referred to as philosophy-of-science. She demands that scientists make explicit their most basic assumptions and critically reflect on possible biases that they themselves may have introduced into their research. In research on individuals, this is particularly important because scientists are always individuals themselves; therefore, scientists studying individuals are not independent from their objects of research. This profound problem is often not well considered.



The times during which each scientific discipline built its own ivory tower are long over—but these towers still cast their shadows. Exploring the complex phenomena that are still not well understood and finding answers to the real-world problems that we face today requires the joint expertise of multiple disciplines. But putting multi-disciplinary collaborations into practice has turned out to be quite difficult. Theories and methods often cannot be easily combined across disciplines, and findings often cannot be directly compared across different fields.

Research on individuals is one example. Experts from many different sciences, such as psychologists, biologists, physicians, social scientists, economists and political scientists, to name just a few, contribute to our knowledge about individuals. But they have all developed their own theories and methods. Moreover, a Babel of scientific languages has evolved in the city of ivory towers, making communication between the disciplines quite difficult at times (see the Science Blog "When biologists and psychologists talk at cross-purposes").

Therefore, Jana Uher explored the "theories behind the theories and methods"—the meta-theories and methodologies—that researchers in different disciplines have developed about individuals (see the Science Blog "A new scientific paradigm for research on individuals"). This abstract level of consideration is referred to as theory and philosophy of science. Philosophy-of-science explores the most basic assumptions that researchers make about what they consider an object of research and how they can gain knowledge about it.

The majority of scientists are primarily concerned with creating knowledge in their particular field and with finding answers to specific research questions. To achieve this, they rely on research paradigms that are established in their fields. Paradigms are frameworks that comprise interrelated sets of hypotheses, models and theories and the sets of methods needed for their exploration. Every paradigm is built on particular world views, basic assumptions and ways of doing science. But these most basic ideas need not be expressed directly. Rather, they are built into the theories and methods used in a given research tradition.

Now, in any given discipline, there is never just one single paradigm. Instead, different groups of scientist use different paradigms and thus different theories and methods—even within the same field of research. In psychology, for example, various paradigms have been

established for studying human individuals. Each of these paradigms builds on very different ideas of human nature. For example, some groups of psychologists see humans as driven by subconscious inner urges and conflicts. Others consider individuals to be influenced by their genes and environmental conditions. Still other groups of psychologists understand humans as actively striving for knowledge, personal growth and self-fulfilment. These different basic assumptions result in very different ways in which individuals are studied in each paradigm.

Thus, within any given discipline, different groups of scientists already make different basic assumptions about individuals. Across disciplines, even more diverse assumptions are made, such as in the paradigms of biology, medicine, the social sciences and economics. Consequently, very different theories and methods are used to explore particular aspects of individuals' lives from particular viewpoints. But putting the big picture together is often difficult because competing paradigms can be contradictory and are sometimes even irreconcilable with one another because they are based on different basic assumptions.

This is the point at which philosophers-of-science can make meaningful contributions because they are concerned with scientists' basic assumptions and the ways in which scientists make science. This special field of science is a part of philosophy—as its name already reveals. But the issues explored in philosophy-of-science are often discussed on levels of consideration that are too remote from the actual research problems with which most scientists are concerned. Therefore, scientists and philosophers-of-science often work quite independently of one another. "That's a great pity", as Jana Uher finds, "because every science depends on a sound philosophy-of-science and, vice versa, the purpose of philosophy-of-science is to advance science. Each cannot be without the other."

Therefore, she argues for strengthening the connections between these fields and demands: "Scientists should think more often about the most basic assumptions on which their theories and methods are built because these are the tools that they use for making science". This also applies to research tools that have been used for some time already, she emphasises. "In our everyday lives, we also renew our tools such as household devices and we update our mobile devices from time to time. New developments are always possible." Philosophers-of-science, in turn, should consider actual and even applied research problems more strongly in their work. "This is where their expertise is most urgently needed", she says.

Jana Uher explains: "It is a bit like connecting the expert who studies the grammar of foreign languages with the tradesperson who is active in a multi-lingual business world". It is clear how these two areas of expertise are connected, but why intensify this connection? Their different aims and different ways of thinking and talking about foreign languages could make an exchange of ideas quite difficult. And yet, it is also clear that our knowledge of foreign languages can be best advanced if the two kinds of experts combine their knowledge.

Such collaborations are of utmost importance in science because it explores phenomena and problems that are highly complex and that cannot be easily understood and solved. Mastering this complexity requires the joint expertise of many fields. Moreover, scientific knowledge is targeted toward enhancing the well-being of individuals and societies all around the globe. Improving and testing the ways in which scientific knowledge is created is therefore of particular importance.

In her new research trilogy, published in the international journal *Integrative Psychological and Behavioral Science*, Jana Uher, shows how the connections between philosophy-of-science and the specific sciences can be strengthened. "Sometimes, scientists seem to avoid the philosophy-of-science perspective because it puts their own thinking and their own beliefs under the microscope". In research on individuals, it seems to be particularly difficult for scientists to become aware of the ways in which their own personal ideas also influence their scientific ideas and ways of thinking about their objects of research.

Jana Uher explains why: "Scientists exploring individuals are always individuals themselves with their own personal viewpoints and ideas about the world. Therefore, they can never be independent from their objects of research – unlike physicists and chemists, for example".

She emphasises: “We can never fully avoid this problem. Ultimately, we are all human beings. But an awareness of this problem can help us put our own theories and methods into perspective and to critically reconsider them from time to time to identify possible biases.”

In her research trilogy, Jana Uher explored the most basic assumptions underlying the different paradigms that are used to study individuals in various fields and identified commonalities and differences. On the basis of this and of established philosophy-of-science concepts, she developed research frameworks and novel concepts that are applicable to all sciences and that are integrated in her Transdisciplinary Philosophy-of-Science Paradigm. This paradigm provides tools that researchers can use to make explicit their most basic assumptions, to critically analyse their established theories and methods and to develop novel ones (see the Science Blog “A new scientific paradigm for research on individuals”).

Jana Uher showed how this novel paradigm can be applied by the example of “personality” research. First, she explored the basic assumptions underlying the different definitions of “personality” that are used in psychology and identified why there are so many different definitions and the consequences this has for the “personality” theories that researchers develop (see the Science Blog “What is ‘personality’?”).

Then she critically analysed the theories and methods that are used to develop models of human “personality”. The philosophy-of-science analyses revealed serious biases in the ways in which some of the most widely used “personality” models, such as the Big Five Model and the Five Factor Model, were developed and in how they are interpreted (see the Science Blog “How were the Big Five Model and the Five Factor Model actually developed?”).

Jana Uher highlighted that these models were developed on the basis of everyday language and people’s assessments of themselves and of others. Therefore, these models capture people’s everyday knowledge about individuals. But contrary to frequent assumptions, these models cannot reflect how individuals actually behave, feel and think. This fallacy is derived from our everyday thinking because we often believe that our words are directly related to the things that they denote. But this is possible only for concrete things that we can directly perceive; it is not possible for abstract ideas such as those about “personality”.

The Transdisciplinary Philosophy-of-Science Paradigm provides tools that scientists can use to critically analyse their basic assumptions, theories and methods and to identify possible biases and fallacies. It also provides tools that enable scientists to select methods that are appropriately matched with their particular objects of research and to develop new ones.

Scientific publications:

Uher, J. (2015a). Conceiving "personality": Psychologists’ challenges and basic fundamentals of the Transdisciplinary Philosophy-of-Science Paradigm for Research on Individuals. *Integrative Psychological and Behavioral Science, 49,* 398-458. [Download] Online

Uher, J. (2015b). Developing "personality" taxonomies: Metatheoretical and methodological rationales underlying selection approaches, methods of data generation and reduction principles. *Integrative Psychological and Behavioral Science, 49 (4)*. [Download] Online

Uher, J. (2015c). Interpreting "personality" taxonomies: Why previous models cannot capture individual-specific experiencing, behaviour, functioning and development. Major taxonomic tasks still lay ahead. *Integrative Psychological and Behavioral Science, 49 (4)*. [Download] Online

Uher, J. (2013). Personality psychology: Lexical approaches, assessment methods, and trait concepts reveal only half of the story—Why it is time for a paradigm shift. *Integrative Psychological and Behavioral Science, 47,* 1-55. [Download] Online

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