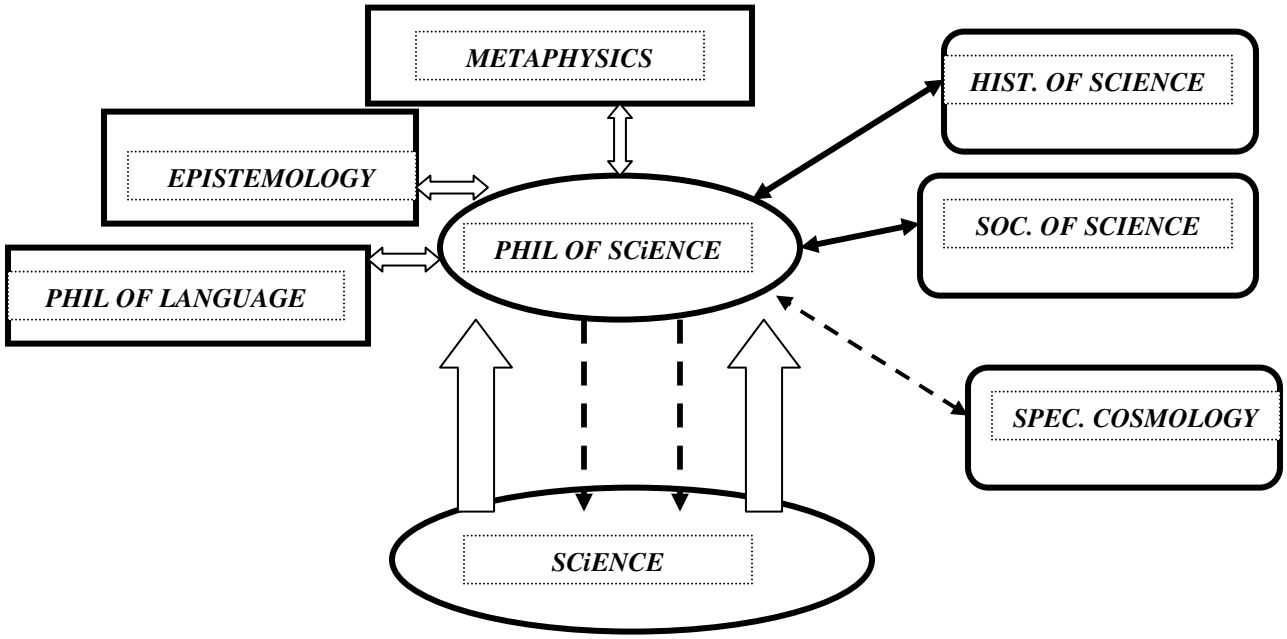
"In its broadest sense, the philosophy of science is **the investigation of philosophical questions that arise from reflecting on science**. What makes these questions philosophical is their **generality,** their **fundamental character,** and their **resistance to solution by empirical disciplines such as history, sociology, and psychology**."

(CC1998, xvii)

Central questions in philosophy of science aren't part of science, though they are about science. (ibid)

- **Internal to philosophy**, philosophy of science **often** draws on the resources of such areas like **epistemology** (the systematic philosophical investigation into the nature and limits of knowledge), **metaphysics** (the systematic philosophical investigation into the nature of fundamental or ultimate reality), and the **philosophy of language** (the systematic philosophical investigation into the nature of language). Philosophy of science can draw on the **methods** and **results** of such areas, while still remaining a **separate and autonomous discipline within philosophy.**

- **External to philosophy**, philosophy of science **can** draw on the resources of such areas like **history of science** (the systematic investigation of the evolution of science, treated as a concrete historical and cultural phenomenon), **sociology of science** (the systematic investigation into reciprocal impact science has on a broader cultural context, treated as a social phenomenon), and on some occasions the **philosophy of nature or speculative cosmology** (the attempt to formulate conceptions of the ultimate nature of the world, based on scientific results).



"We will not try to comprehend the history of science. We will not try to understand the scientific enterprise in terms of human or social needs. We will not present any grand cosmological speculation…It is one thing to present a psychological or sociological account of science…[But] [i]t is another thing to examine philosophically the relationship of science and culture and generally of science and values."[1]

Philosophy of Science's distinct aims and norms (some examples) :

- **EPISTEMOLOGICAL**

In science, generally speaking, concepts like:
-causality
-law
-explanation
-theory

…are often used. One can therefore ask:

-What is the **correct analysis** of a concept like **cause**?
-What is a **law**? **How is it related** to other laws? How is it accounted for by a theory?
-What is a **scientific explanation**? How is it related to prediction?

- **METAPHYSICAL**

In science, generally speaking, theories often refer to:
-unobservable entities

One can therefore ask:

-How are such entities logically justified?
-How do they reduce to or refer to actual or observable phenomena?

- **PHILOSOPHY OF LANGUAGE**

In science, generally speaking, new theories often introduce **new terms**

[1] E. D. Klemske, R Hollinger, D. W. Ridge. (KHR 1998) *Introductoy Readings in the Philosophy of Science* (Amherst NY: Prometheus Books, 1998), 20.

One can therefore ask:

-Do such new terms really represent new ideas, incapable of being accounted for by the pre-theoretic terms?

-Can such new terms in principle be entirely reduced to terms in ordinary language?

- **OTHER EXAMPLES OF TYPICAL PHILOSOPHY OF SCIENCE RESEARCH QUESTIONS:**

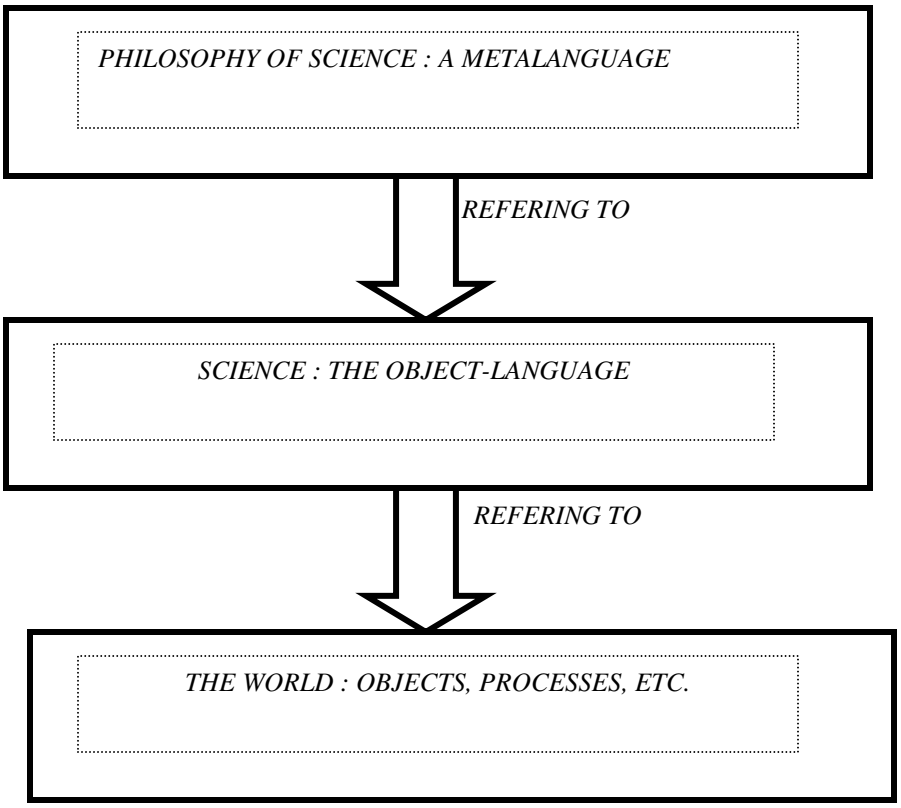
1. **Logic/Math:** How are truths in logic and mathematics known? In what sense are logic and mathematics "sciences?" What is their relation to empirical science?[2]
2. **Description**: What comprises an adequate scientific description, and the underlying logic of concept formation thereon?
3. **Explanation**: What is meant by stating that science explains? What is a scientific explanation and how is it related to other kinds of explanations?
4. **Prediction**: What is the relation of prediction to explanation? What is the relation of testing to prediction and explanation? What makes it possible for science *to* predict?
5. **Causality/Law**: What are scientific laws? What is their role in scientific explanation? What is the nature of explanatory laws (causal? Theory-dependence?)
6. **Theories/Models**: What *are* theories? What is the relation of theories to laws? How do they function in an explanation? What are models and what role do they play here?
7. **Determinism**: Lawfulness tends to slide into talk of determinism…What is meant by determinism in science? Do we have any reason for believing this thesis to be true?
8. **Philosophical Problems of the Special Sciences**: What novel notions do theories in the physical sciences (quantum theory, General and Special Relativity) convey concerning issues of subjectivity/objectivity and determinism? What novel notions do theories in the biological sciences convey concerning issues of reduction and emergence? Etc.
9. **Reduction/Unity in the Sceinces**: Is is possible to reduce on theory (or science) to another? Are all science reducible to one (like physics) or a few (physics, chemistry, biology)? Etc.
10. **Extensions of science**: To what extent do scientific theories express general truths about the world? (E.g., does the Second Law of Thermodynamics imply an eventual 'heat death' of the cosmos? Does biological evolution and complexity theory describe or account for general principles of cosmic self-organization?)

[2] Example: John P. Burgess "How Foundational Work in Mathematics Can Be Relevant to Philosophy of Science," *PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Assn,* 1992, Vol 2, pp. 433-441.

11. **Science/Values**: Is science truly value neutral? Does science inform ethics?
12. **Limits of Science**: Are there limits? What are they? By what criteria can they be established?

"Whereas science is largely empirical, synthetic, and experimental, philosophy of science is largely verbal, analytic, and reflective. To be sure, the words of some scientists—especially those in the more 'theoretical' sciences—verbal, analytic, and reflective features may be found. But the converse is not generally true…even in those cases where more 'philosophical' questions are found in science, they are usually not pursued with the same rigor or toward the same ends as they are by philosophers of science."

(KHR1998, 24)



Goals (re-capitulated)

- To understand method, foundations, and logical structure of science
- To examine relations and interfaces of science with other human concerns, institutions, quests via:
- A logical and methodological analysis of aims, methods, and criteria of science vis-à-vis those in other cultural phenomena in their relation to science.