S.SEIFULLIN KAZAKH AGRO TECHNICAL UNIVERSITY

DEPARTMENT OF PHILOSOPHY
(2708)

History and Philosophy of Science

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Theme 7. The structure and level of scientific knowledge. The methodology of science.

- **The purpose of the lecture:** identifying the structure of scientific knowledge, the analysis of methodology of science.

Plan:

1. Levels of scientific knowledge.
2. A variety of methods of scientific research.

Basic concepts:

- Levels of scientific knowledge
- Philosophical methods
- Scientific methods
- Particular methods
- Techniques of scientific research.

Levels of scientific knowledge

- Empirical (sensory) level
- Basic forms are sensations, perception and representation.
- Common characteristics of sensory perception are its specificity and finiteness.

Empirical level

- Sensations are the most basic sensory data, a kind of “atoms" of sensory perception. Typically, they are simple in sensory modality, i.e., represent a pure sound, color, taste, etc. and, moreover, instant in time.

Empirical level

- Perception is more integrated form of sensory perception, is a complex of sensations, organized in space and time.
- Representations are higher level of organization of sensory perception, combining a variety of perceptions of time and space. A classic example of the representation is memory.

Levels of scientific knowledge

- Theoretical (rational) level
- Basic shapes are concepts, judgments and conclusions.
- Main characteristics of rational cognition are abstract and timeless.

Theoretical (rational) level

- Concept - a form of thinking; a thought on the subject, expressing its essential features.
- Each concepts distinguish two main features - the scope and the meaning.
- Scope of the concept is a set of objects, which are indicated by this concept.
- The meaning is a set of attributes, which are characterized by the concept in the definition.

Theoretical (rational) level

- Judgment is a next form of rational knowledge, which representing a communication of concepts.
- The third form of rational cognition is a conclusion. This is high level of rational knowledge, which is expressed in relation of set of propositions.

Metatheoretical level

- Metatheoretical level is a highest level of scientific knowledge, which is a set of principles, norms, ideals that make up the foundation of scientific theories and science in general, which provide unity and certainty of scientific activity, affect the nature of the emerging theoretical knowledge.

The structure of scientific knowledge appears as a unity of the following elements:

- 1) The actual detection of the objective laws, drawn from empirical experience;
- 2) The result of the initial generalizations in terms of;
- 3) The problem and research hypotheses based on the facts;
- 4) The laws, principles and theories;
- 5) The philosophical position;
- 6) The methods and standards of scientific knowledge;
- 7) Social cultural basis;
- 8) Style of thinking.

Methodology of scientific knowledge

1. General, philosophical methods.
2. Scientific methods.
3. Specific methods.
4. Private techniques.

General, philosophical methods

- Scope of philosophical methods most widely used. Among the philosophical methods belongs to the dialectical method.

Dialectical method

1. The laws of dialectics

a) the unity and struggle of opposites;

b) transition from quantitative to qualitative changes;

c) the negation of the negation.

Dialectical method

- 2. Philosophical categories:
  general, special and individual;
  content and form;
  essence and phenomenon;
  possibility and reality;
  necessity and chance;
  cause and effect.

Dialectical method

- 3. Refers to the object of research as an objective reality.
- 4. Consider the studied objects and phenomena:
- a) thoroughly;
- b) in the universal connection and interdependence;
- c) continuous change and development;
- g) concretely and historically.

Scientific methods

- All scientific methods for the analysis it is advisable to distribute into three groups: general logical, theoretical and empirical.
- General logical methods include analysis, synthesis, induction, deduction, analogy.

Scientific methods

- The methods of the theoretical level:
- axiomatic, hypothetical, formalization, abstraction, generalization, ascent from the abstract to the concrete, historical, method of system analysis.

Scientific methods

- The methods of empirical level:

  observation, description, measurement, comparison, experiment, modeling.

Specific methods

- Special methods specific to individual sciences or practice areas. These are the methods of chemistry or physics, biology or mathematics, or metalworking methods of construction.

Private techniques

- A special group of methods form a methods, which are receptions and ways produced for solving some special, private problems. Choosing the right techniques - an essential condition for the success of the study.