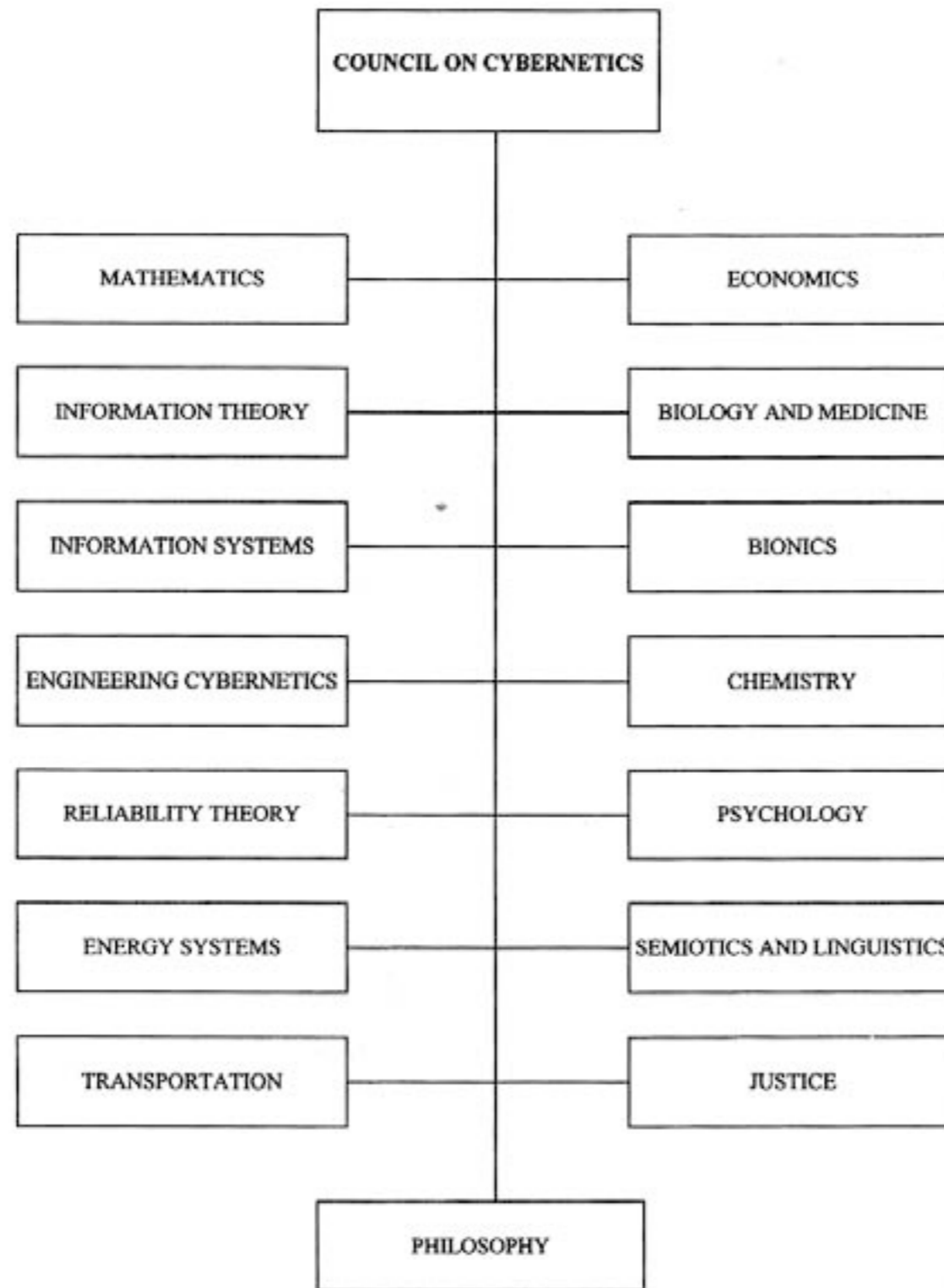**Figure 5.1**
The interdisciplinary role of cybernetics. Adapted from Kraizmer, *Kibernetika*.

TASK	DESCRIPTION	MATHEMATICAL APPARATUS	COMPUTER SCIENCE	ECONOMICS	HARDWARE DESIGN	PRODUCTION CONTROL	LINGUISTICS	GENETICS	EVOLUTIONARY THEORY	NEUROPHYSIOLOGY
1. Determine information flows	Determine connections with environment and external memory	Observation	Memory allocation	Study the distribution of information that controls the economy (economic documentation)	Study the flows of information in a computer	Study the flows of information that controls production		Study the methods of transmitting hereditary information	Study the flows of information that controls evolution	Study the circulation of information in the nervous system and in the receptors
2. Determine the information code	Determine how information is coded	Statistical and logical analysis, coding theory	Creating a language for task formulation, input, and output	Study the methods of economic information coding	Study the methods of coding numbers and operators in a computer	Study the methods of information coding in production control	Study the methods of linguistic information coding in a computer	Study the methods of hereditary information coding	Study the methods of coding of information that controls evolution	Study the methods of information coding in the nervous system and in the receptors
3. Determine the functions of a control system	Setting specific time intervals, determine the functions of a control system	Cybernetic experiment, probabilistic processes	Determine the function of a computer program	Study the functioning of systems that control the economy	Determine if the computer functions according to design	Determine the function of production control	Study the possibility of machine translation algorithms	Study the ways in which genotype is expressed (phenogenetics)	Study the evolution of populations under specific conditions	Study reactions, reflexes, and behavior of animals
4. Study the functioning of a control system	Evaluate the achievement of goals, organization, and communication	Information theory, game and automata theory, operations research	Evaluate the entropy of various task classes and the redundancy of various coding methods; evaluate working time and computer time	Evaluate the amount of information, channel capacity, transmission time, and methods of decision-making and self-regulation	Evaluate the amount of information in the computer and its productivity, and collect operations statistics	Analyze operations, evaluate the amount of information, channel capacity, and information delays	Evaluate the entropy of text classes and information search tasks; evaluate work time and computer time	Evaluate the amount and study the transmission of genetic information, mutation and selection	Evaluate the amount of information that controls evolution; study population dynamics	Evaluate the amount of information and channel capacity of the nervous system; derive its structure from its functioning
5. Determine the elements of a control system	Determine the elements, study their properties, and classify them by types	Statistical analysis, logical analysis	Determine the classes of operators and develop standard subroutines	Determine the elements of economic processes and the elements of economic regions; use statistics to determine their functions	Design elements and storage devices	Determine the chain of production control and the functions of its links; develop standardized links	Determine the elementary acts of linguistic algorithms and develop methods of implementation	Determine the biochemical carriers of hereditary information ("the gene problem")	Determine the elementary acts at the basis of evolution ("evolutionary factors")	Determine the elementary constituents of the nervous system, the receptors, and their elementary reactions
6. Study the relations among the elements	Determine all the relations essential for the functioning of the system	Cybernetic experiment, graph theory, network theory	Determine the types of relations between different operators	Study the relations among the elements of economic processes and among the elements of economic regions	Study the interaction of elements	Determine the relations among links and classify them by types	Determine the relations among different operators in linguistic algorithms	Study the structure of genotype, the localization of genes, and the structure of DNA	Study the interactions of different evolutionary factors	Study the relations among individual organs of the nervous system
7. Determine the algorithms of a control system	Determine the (approximate) algorithms of a certain class of control systems	Cybernetic experiment, game theory, theory of algorithms	Develop algorithms of automatic programming and automatic program testing	Develop approximate algorithms for controlling the economy	Give a formal description of the structure and functioning of machines	Develop (possibly, approximate) algorithms for production control	Develop algorithms for machine translation and information systems	Develop an algorithmic description of the transmission of hereditary information	Study the circulation of information that controls evolution	Develop an algorithmic description of the functioning of the nervous system and the receptors
8. Analysis of a control system	Study the properties of algorithmic control	Information theory, game theory, linear programming	Derive an algorithm from a program; study the completeness of a programming method for a given class	Analyze the control of the economy	Study statistics of the operation of circuits	Study algorithms of production control; collect production statistics	Experiment with algorithms for machine translation and information systems	Perform a genetic analysis of individual organisms and populations	Study population dynamics and the struggle for existence	Study algorithms of information processing in the nervous system

Figure 5.4
Methods and fields of cybernetic analysis. Adapted from Liapunov and Iablonskii, "Teoreticheskie problemy kibernetiki."

Figure 5.6
The structure of the Scientific Council on Cybernetics of the Soviet Academy of Sciences. Adapted from Berg, ed., *Kibernetiku—na sluzhbu kommunizmu*, volume 5.