

Center for Systems Research ¹
Working Papers ²

System and Significance

Foundations of System Analysis

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Outline S&S 1

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I. THE EPISTEMOLOGICAL PROBLEM

- A. Nature of Knowledge
- B. Nature of Science
- C. Nature of Behavioral Science
- D. Systems Analysis

II. FUNDAMENTAL ANALYTIC OPERATIONS

- A. Symbols, Connectives, Statements and Inference
- B. Sets and Variables
- C. Relations and Systems
- D. Equivalent Descriptions of Systems
- E. Quantifiers and Functions
- F. States and Structures: Their Expression, Transformation and Conservation
- G. Types
- H. Dimensional and Qualitative Analysis
 - 1. In Physics
 - 2. In Set Theory and Topology
 - 3. Relation to Phenomenology

III. FUNDAMENTAL EPISTEMIC OPERATIONS

- A. Epistemic Discourse
- B. Epistemic Decisions
- C. Science as an Epistemic Institution

IV. FUNDAMENTAL EXPLANATORY OPERATIONS

A. Lexical Definition

1. Constructs and Scales
2. Measurement

B. Interpretation

C. Explanation

D. Deductive inference

E. Nature and Forms of Scientific Explanation

F. The Deterministic Form

1. Differential Calculus

G. The Functional Form

1. Teleology: Basic Structure
2. Calculus of Variations
3. Type Formulation
4. Feedback, Regulation and Cybernetics
5. Decision and Game Theory
6. Relativity
7. Absolute Calculus
8. Gage Theory

H. The Comparative-Genetic Form

1. Time and Space
2. Generalization to Other Dimensions
3. Homogeneity, Symmetry and Isotropy
4. Uniqueness and Identity
5. Process and Development
 - a) Locus
 - (1) Trajectory: Time as Parameter
 - (2) Transition: Any Parameter
 - b) Stages and Regions
 - c) Emergence and Catastrophes
 - (1) Apex Specification of Systems

- d) Taxonomy and Stochastic Formulation
 - (1) Historicity
- e) Integro-Differential Calculus
- f) Types of Transaction and Deterministic Formulation

I. The Probabilistic Form

1. Ignorance and Uncertainty
 - a) Density, Inhibition and Collapse
2. The Deterministic Nature of Probability Functions
3. Explanatory, Descriptive and Decision Statistics
4. Information Theory
5. Indefinite Assemblies
6. Insufficient Assemblies
 - a) Blurring
 - b) Hazy Manifolds
7. Emergence
8. The Very Large System
 - a) Thermodynamics
 - (1) Entropy
 - (2) Closed and open systems
 - (a) Szilard
 - (b) Far from equilibrium
 - (c) Dissipative structures
9. The Very Complex System
 - a) Chaos
10. The Very Small System
 - a) Discontinuities, Quanta and Over-determination
 - (1) Levels
11. Quantum Theory
 - a) Indeterminacy
 - b) Complementarity
 - (1) Types of (from set to quaternion)
12. Hilbert Space
13. Wave function
 - a) Collapse of wave function
 - (1) Operators

- b) Collapse of the observer
- c) Macro objects as self-collapsing
 - (1) Collapse of normal possibility space
- d) Distribution of uncertainty between conjugate operators

V. FUNDAMENTAL METHODOLOGICAL OPERATIONS

A. Interpretation as Indicator

- 1. Facts and Indices
 - a) Observation
 - b) Capta

B. Operational Definition

C. Inductive Generalization and Statistical Decisions

D. Formulation and Testing of Hypotheses

- 1. Experimental and Other Designs
 - a) Popper and inverse

VI. FUNDAMENTAL REPRESENTATIONAL OPERATIONS

A. Representation

- 1. Artifacts
 - a) Participation
 - b) Data

B. Production

- 1. Models, Simulation and Gaming

VII. AGGREGATION AND REDUCTION

A. Individual, Collective, and Derived Properties

B. Fallacious Aggregation and Reduction

C. Pseudo-Aggregation and Pseudo-Reduction

D. Empirical Parameters and Theoretical Terms in Transformation Equations