Synopsis

The following brief summaries, arranged here alphabetically by author, provide an introduction to each of the papers in this volume.

1. *Wanted Dead or Alive: Two Attempts to Solve Schrödinger's Paradox.* **David Albert and Barry Loewer.** We discuss two recent attempts two solve Schrödinger's cat paradox. One is the modal interpretation developed by Kochen, Healey, Dieks, and van Fraassen. It allows for an observable which pertains to a system to possess a value even when the system is not in an eigenstate of that observable. The other is a recent theory of the collapse of the wave function due to Ghirardi, Rimini, and Weber. It posits a dynamics which has the effect of collapsing the state of macroscopic systems. We argue that the modal interpretation cannot account for non-accurate measurements and that both accounts have the consequence that in ordinary measurement situations (including the situation of Schrödinger's cat) the observables that ends up well defined are not quite the ones that we want to be well defined.

2. *Paradigms, Populations and Problem-Fields: Approaches to Disagreement.* **Douglas Allchin.** Kuhn's distinction of within- and between-paradigm thinking can be extended using his notion of a problem-field. Hull's notion of populational variation applies within paradigms; his type specimen approach allows one to analyze disagreement and identify the problem-field. Categories of questions or problem frames can also partition debate, establishing interparadigm variation. A case where multiple simultaneous paradigms compete highlights the role of empirical domains. The Ox-Phos Controversy in bioenergetics (1961-1977) serves as a case study. Conclusions are framed as strategies for scientists.

3. *Kochen's Interpretation of Quantum Mechanics.* **Frank Arntzenius.** Kochen has suggested an interpretation of quantum mechanics in which he denies that wavepackets ever collapse, while affirming that measurements have definite results. In this paper I attempt to show that his interpretation is untenable. I then suggest ways in which to construct similar, but more satisfactory, hidden variable interpretations.

4. *Logicism, Pragmatism, and Metascience: Towards a Pancritical-Pragmatic Theory of Meta-level Discourse.* **G.S. Axtell.** The faults of logical empiricist accounts of metascientific discourse are examined through a study of the modifications Carnap makes to his version of the program over four decades. As empiricists acquiesced on the distinction between theory and observation, Carnap attempted to retain and insulate an equally suspect sharp distinction between the theoretic and the pragmatic. Carnap's later philosophy was understood as a modification of the program in the direction of pragmatism. But neither the key notion of "external questions" nor an instrumentalist understanding of "pragmatic utility" are genuinely compatible with pragmatism. This underlines the need to clarify what is unique to pragmatic views of cognitive evaluation and normative discourse as they affect scientific reasoning. I conclude by suggesting how pragmatic conceptions of metascientific discourse can work to correct misconceptions about norm generation and governance that are shared in logicist and historicist accounts.

5. *Scientific Evidence: Creating and Evaluating Experimental Instruments and Research Techniques.* **William Bechtel.** The production of evidence for scientific hypotheses and theories often depends upon complex instruments and techniques for employing them. An important epistemological question arises as to how the reliability of these instruments and techniques is assessed. To address that question, this paper examines the introduction of electron microscopy and cell fractionation in cell biology. One important claim is that scientists often arrive at their techniques for employing instruments like the electron microscope and the ultracentrifuge by tinkering and that they evaluate the resulting techniques in part by whether they produce plausible data given developing theories.

6. *Causal Independence in EPR Arguments.* **Jeremy Butterfield.** I show that locality, as it occurs in EPR arguments for the incompleteness of quantum mechanics, can be construed as causal independence understood in terms of Lewis' counterfactual analysis of causation. This construal has two benefits. It supplements recent analyses, which have not treated locality in detail. And it clarifies the relation between two EPR arguments that have recently been distinguished. It shows that the simpler of the two is more complex than has been thought; and that the other argument does not need 'counterfactual definiteness'.

7. Causes and Laws: The Asymmetry Puzzle. **Henry Byerly.** For many laws causal asymmetries in dependencies among the variables are not reflected in functional relations of the law equation. In the case of the simple pendulum law, why can we cite the length to explain the period but not the period to explain the length? After surveying attempts to explain the asymmetries, I propose a new account based on an analysis of the relation of causes and laws. This analysis is used to criticize the very notion of causal laws and to clarify the role of ceteris paribus clauses in interpreting scientific laws.

8. *Local Incommensurability and Communicability.* **Xiang Chen.** Kuhn regards local incommensurability as an unavoidable result of changes in worldview, but his account fails to explain both historical cases in which rivals with different paradigms obtained consensus, and psychological experiments in which people with different cultural backgrounds accurately presented other points of view. Although the conditions required to generate local incommensurability were present in the dispute between Brewster and Herschel on light absorption, they succeeded in communicating. Ultimately Brewster understood his opponent's position, in the same way that subjects in Barsalou's recent psychological experiments proved able to comprehend alien conceptual structures. Building upon recent cognitive theories of graded conceptual structures, I offer a new account of incommensurability, which accommodates these historical cases and psychological results. By correcting and extending Kuhn's account I show that local incommensurability may be a matter of degree.

9. *The Explanatory Tools of Theoretical Population Biology.* **Gregory Cooper.** What is the role (or roles) of mathematical theory in ecology and evolutionary biology? How does the construction of such theory advance our understanding? The lack of clear answers to this pair of questions has been a source of controversy both within the sciences themselves, and in the philosophical discussions of these sciences as well. In an attempt to shed some light on these issues, I look at what some biologists have had to say on the matter and at some particular examples. I then draw some morals about the constraints on a successful philosophical treatment of the problem and on the limitations of current philosophical approaches to this type of theoretical explanation.

10. *Interpreting State Reduction from the Practices-up.* **Alberto Cordero.** This paper examines some physical sources of the concept of objective state reduction in quantum mechanics. Using case studies from nuclear physics and quantum chemistry, the question of whether one can induce a collapse theory from the practices of scientists working on specific problems is considered. A specific proposal is explored, with emphasis on such features as coherence, testability, unifying power and fertility. It is shown that, contrary to recent suggestions by David Albert, collapse theories are philosophically promising developments worthy of further study. Some philosophical implications of the development of collapse theories are discussed.

11. *Herbert Simon's Computational Models of Scientific Discovery.* **Stephen M. Downes.** In this paper I evaluate Herbert Simon's important computational approach to scientific discovery, which can be characterized as a contribution to both the "cognitive science of science" and to naturalized philosophy of science. First, I tackle the empirical adequacy of Simon's account of discovery, arguing that his claims about the discovery process lack evidence and, even if substantiated, they disregard the important social

dimension of scientific discovery. Second, I discuss the normative dimension of Simon's account, here I argue that Simon's project is best understood as a contribution to "android epistemology." I conclude with some comments on the direction a naturalized yet normative philosophy of science might take.

12. *Laudan's Model of Axiological Change and the Bohr-Einstein Debate.* **Henry J. Folse, Jr.** According to the naturalistic normative axiology of Laudan's reticulated model of scientific change, empirical discoveries in the advance of science can provide a rational basis for axiological decisions concerning which epistemic goals scientific inquiry ought to pursue. The Bohr-Einstein debate over acceptance of quantum theory is analyzed as a case of axiological change. The participants' aims are incompatible due to different formulations of the goal of objective description, but neither doubts the realist commitment to the existence of microsystems or the intention of quantum mechanics to provide knowledge of them. Thus the general aim of realism is not at issue.

13. *Observation: An Empirical Discussion.* **Daniel Gilman.** Various claims for theory-laden perception have involved empirical as well as conceptual considerations. Thomas Kuhn cites New Look psychological research in discussing the role of a paradigm in perception (1970) and Paul Churchland (1988) appeals to biological evidence, as well as New Look sources similar to Kuhn's. This paper offers a critical examination of the empirical evidence cited by Kuhn and Churchland, including a look at the underlying experimental work. It also offers a comment on the application of such evidence in a naturalized epistemology.

14. *Reinventing Certainty: The Significance of Ian Hacking's Realism.* **Alan G. Gross.** This paper examines Ian Hacking's arguments in favor of entity realism. It shows that his examples from science do not support his realism. Furthermore, his proposed criterion of experimental use is neither sufficient nor necessary for conferring a privileged status on his preferred unobservables. Nonetheless his insight is genuine; it may be most profitably seen as part of a more general effort to create a space for a new form of scientific and philosophical certainty, one that does not require foundations.

15. *Does Representational Content Arise from Biological Function?* **Richard J. Hall.** In virtue of what does a representational state have the content it does? Several philosophers have recently proposed that a representational state gets its content from its biological function. After explaining the sense of biological function used in these views, I criticise the proposal. I argue that biological function only determines representational content up to extensional equivalence. I maintain that this holds even if biological function is defined in terms of an intensional notion like Sober's "selection for".

16. *How the Models of Chemistry Vie.* **James R. Hofmann.** Building upon Nancy Cartwright's discussion of models in How the Laws of Physics Lie, this paper addresses solid state research in transition metal oxides. Historical analysis reveals that in this domain models function both as the culmination of phenomenology and the commencement of theoretical explanation. Those solid state chemists who concentrate on the description of phenomena pertinent to specific elements or compounds assess models according to different standards than those who seek explanation grounded in approximate applications of the Schroedinger equation. Accurate accounts of scientific debate in this field must include both perspectives.

17. *Reproducibility as a Methodological Imperative in Experimental Research.* **Michael J. Hones.** A methodological imperative, reproducibility, is proposed for experimental research. This is motivated by recent discussions of normative naturalism as well as the recent interest in the philosophical implications of experimental research. The role of this norm is examined in the context of the routine research procedures in a high-energy

scattering experiment. The specific details of the experimental analysis of resonance pro-
duction in the interaction $\pi + P \rightarrow P\pi^+ \pi^+ \pi^- \pi^0$ at 18.5 GeV/c are discussed in
light of the importance of reproducing experimental results. In this context, a more com-
plex meaning of this norm emerges. It is suggested that this type of empirical evaluation
of hypothetical imperatives should be at the core of the normative naturalist's program.

18. *Singular Causation and Law.* **Gürol Irzik.** Humean accounts of law are at the
same time accounts of causation. Accordingly, since laws are nothing but contingent cos-
mic regularities, to be a cause is just to be an instance of such a law. Every particular
cause-effect pair, according to these accounts, instantiates some law of nature. I argue
that this claim is false. Singular causation without being governed by any law is logically
and physically possible. Separating causes from laws enables us to see the distinct role
each plays in science, especially in matters related to prediction and explanation.

19. The Phenotype as the Level of Selection: Cave Organisms as Model Systems.
Thomas C. Kane, Robert C. Richardson and Daniel W. Fong. Selection operates at
many levels. Robert Brandon has distinguished the question of the level of selection
from the unit of selection, arguing that the phenotype is commonly the target of selection,
whatever the unit of selection might be. He uses "screening off" as a criterion for distin-
guishing the level of selection. Cave animals show a common morphological pattern
which includes hypertrophy of some structures and reduction or loss of others. In a study
of a cave dwelling crustacean, Gammarus minus, we find evidence for selection for both
increased antennal size and reduction of eyes. The genetic structure of the population
does not support the view that the phenotype screens off the genotype in explaining the
differences in fitness. Nonetheless, the results do indicate that the level of selection is at
least at the level of the phenotype in both cases.

20. *Getting to the Truth Through Conceptual Revolutions.* **Kevin T. Kelly and Clark
Glymour.** There is a popular view that the alleged meaning shifts resulting from scientif-
ic revolutions are somehow incompatible with the formulation of general norms for sci-
entific inquiry. We construct methods that can be shown to be maximally reliable at get-
ting to the truth when the truth changes in response to the state of the scientist or his soci-
ety.

21. *Assessing Functional Explanations in the Social Sciences.* **Harold Kincaid.**
Functionalism is a dominant but widely criticized perspective in social theory; my goal in
this paper is to help clarify what functionalists claim, identify what would count as evi-
dence for those claims and evaluate some standard criticisms. Functionalism relies essen-
tially on functional explanations of the form "A exists in order to B." I point out prob-
lems with previous accounts of such explanations, offer an improved account, and discuss
in detail evidence that might confirm such explanations and its difficulties. I argue that
some functionalist accounts can be confirmed and that, contra the critics, functionalism's
problems are not inherent errors, "only" (avoidable) practical ones.

22. *Jarrett Completeness and Superluminal Signals.* **Frederick M. Kronz.** Jarrett
has demonstrated that "strong locality," one of the conditions used by Bell to derive his
well known inequality, is equivalent to the conjunction of two other conditions which he
calls "hidden locality" and "completeness." He has also demonstrated that if it is possi-
ble to control the hidden states of the measured system, then violations of hidden locality
can be used to transmit information superluminally; and that this is not so with respect to
violations of completeness. This he has taken to mean that it is not possible to use viola-
tions of completeness to do so under any circumstances. In this essay, it is argued that
such violations can be used to do so, if one other condition is satisfied.

23. *Ten Types of Scientific Progress.* **Andre Kukla.** The taxonomy of scientific prob-
lems constructed by Laudan is not exhaustive of all types of scientific work. For one

thing, it does not take into account projects which produce an increase of theoretical virtue in a theory that does not suffer from conceptual problems. It is argued that any work which alters the amount of theoretical virtue possessed by a theory constitutes a scientific advance. A new taxonomy is proposed which distinguishes scientific contributions on the basis of which theoretical virtue is altered, whether the alteration produces an increase or a decrease in virtue, and whether the alteration is due to a logical invention, a logical discovery, or an empirical discovery.

24. *Acceptance Without Belief.* **Patrick Maher.** Van Fraassen has maintained that acceptance of a scientific theory does not involve the belief that the theory is true. Blackburn, Mitchell and Horwich have claimed that acceptance, as understood by van Fraassen, is the same as belief; in which case, van Fraassen's position is incoherent. Van Fraassen identifies belief with subjective probability, so the question at issue is really whether acceptance of a theory involves a high subjective probability for the theory. Van Fraassen is not committed to this, and hence the charge of incoherence is misplaced. Indeed, van Fraassen is *correct* on this point. However, he is wrong to think that acceptance requires a high subjective probability that the theory is empirically adequate; and his reason for thinking that science aims at empirical adequacy rather than truth rests on an overly crude theory of rational choice.

25. *Time-Travel and Topology.* **Tim Maudlin.** This paper demonstrates that John Wheeler and Richard Feynman's strategy for avoiding causal paradoxes threatened by backward causation and time-travel can be defeated by designing self-interacting mechanisms with a non-simple topological structure. Time-travel therefore requires constraints on the allowable data on space-like hypersurfaces. The nature and significance of these constraints is discussed.

26. *Visual Perception and the Wages of Indeterminacy.* **Richard Montgomery.** Three case studies offered here will support the conclusion that a successful scientific theory of visual cognition still makes room for some rather systematic and rather striking semantic indeterminacies—W.V. Quine's well-known pessimism about the wages of such indeterminacy not withstanding. The first case concerns the perception of shape, the second concerns color vision, and the third concerns the rules of inference involved in "unconscious inference" within the visual system.

27. *Mathematical Physics and Elementary Logic.* **Brent Mundy.** I outline an intrinsic (coordinate-free) formulation of classical particle mechanics, making no use of set theory or second-order logic. Physical quantities are accepted as real, but are constrained only by elementary axioms. This contrasts with the formulations of Field and Burgess, in which space-time regions are accepted as real and are assumed to satisfy second-order comprehension axioms. The present formulation is both logically simpler and physically more realistic. The theory is finitely axiomatizable, elementary, and even quantifier-free, but is provably empirically equivalent to the standard coordinate formulations.

28. *Measuring the Success of Science.* **Ilkka Niiniluoto.** This paper discusses alternative ways of defining and measuring institutional, pragmatic, empirical, and cognitive success in science. Four realist measures of epistemic credit are compared: posterior probability, confirmation (corroboration), expected verisimilitude, and probable verisimilitude. Laudan's non-realist concept of the empirical problem-solving effectiveness of a theory is found to be similar to Hempel's notion of systematic power. It is argued that such truth-independent concepts alone are insufficient and inadequate to characterize cognitive success. But if they are used as truth-dependent epistemic utilities, they serve as fallible indicators of the truth or truthlikeness of a theory.

29. *Positivism and the Pragmatic Theory of Observation.* **Thomas Oberdan.** The purpose of this paper is to undermine Paul Feyerabend's claim, which is crucial to the success

of his analysis of Positivism, that the Pragmatic Theory of Observation was first developed by Rudolf Carnap in his early discussions of protocol sentences. Rather, it will be argued that Carnap's conception of protocols was founded on considerations drawn from his conception of language so that Carnap's reasons for endorsing certain aspects of the Pragmatic Theory are nothing like Feyerabend's. Moreover, Carnap never approved the final conclusion of the Pragmatic Theory, that observational reports are distinguished by their causes. These historical conclusions provide the basis for arguing that, despite Feyerabend's critique, Carnap's later views (in "The Methodological Character of Theoretical Concepts") clearly countenance theoretical influences on observational statements.

30. *Scientific Realism, Perceptual Beliefs and Justification.* **Richard Otte.** This paper investigates the justification of certain beliefs central to scientific realism. Some have claimed that the underdetermination of a theory by empirical evidence implies that belief in the truth of the theory and in the existence of the corresponding unobservable entities is unjustified. It is argued that the justification of certain realist beliefs is similar to the justification of our perceptual beliefs. Neither are justified by argument from more basic beliefs, and their underdetermination by the evidence does not affect their justification.

31. *Beyond Numerical and Causal Accuracy: Expanding the Set of Justificational Criteria.* **Jeffry L. Ramsey.** I argue that numerical and causal accuracy arguments can be successful only if: (1) the theories in use are known to be true, (2) computational difficulties do not exist, and (3) the experimental data are stable and resolved. When any one or more of these assumptions are not satisfied, additional justificational considerations must be invoked. I illustrate the need for range of validity and intelligibility claims with examples drawn from chemical kinetics. My arguments suggest that the realist and anti-realist accounts of justification are incomplete. Finally, I sketch some reasons why additional justificatory criteria are needed.

32. *How Not to Russell Carnap's Aufbau.* **Alan Richardson.** On the standard interpretation Rudolf Carnap's *Der logische Aufbau der Welt* amounts to a highly derivative work—a rigorous thinking through of Russell's External World program. An examination of the aims and methods of logical analysis reveals significant differences between the epistemologies of Russell and Carnap, however. It is argued that Russell's reliance on acquaintance makes logical analysis subservient to empiricist epistemic concerns while Carnap is determined to carry out a broadly Kantian program of guaranteeing the objectivity of science through the application of formal logic.

33. *The Infinite Apparatus in the Quantum Theory of Measurement.* **Don Robinson.** It has been suggested that we ought to idealize the apparatus used to measure quantum systems as consisting of an infinite number of particles. Various authors have claimed that if we do so we do not need to take seriously the limitations on measurement incorporated into the Wigner-Araki-Yanase quantum theory of measurement. Bub (1988) and (1989) claims we can solve the measurement problem if we make this assumption. I argue against both claims on the basis of differences between the role of such idealizations in classical and quantum mechanics.

34. *Independence from Future Theories: A Research Strategy in Quantum Theory.* **Alexander Rueger.** The paper argues that renormalization in quantum field theory was not a radically new — and possibly *ad hoc* — technique to save a badly flawed theory, but rather the culmination of a methodological strategy that physicists had been applying for a long time. The strategy was to obtain reliable results from unreliable theories by making the derivation of the results independent of possible future modifications of the theory. Examples of this practice include Bohr's use of the Correspondence Principle and Heisenberg's S-matrix theory.

35. *On the Possibility of Directed Mutations in Bacteria: Statistical Analyses and Reductionist Strategies.* **Sahotra Sarkar.** The ongoing controversy about the possibility of directed mutations in bacteria is examined for its methodological, and thereby philosophical, implications. The method of fluctuation analysis, widely used to investigate whether mutations are random or directed, is described and subjected to a conceptual critique which shows that it cannot decide whether some mutations are directed while most are random. In this context, recent experiments that exploit this possibility to suggest that directed mutations occur in bacteria are described. Interpretive and experimental responses to such claims are briefly analyzed. Finally it is argued that mere statistical analysis, such as fluctuation analysis, cannot resolve this dispute. What will probably be required is an investigation of mechanisms of mutagenesis, an investigation that is intrinsically reductive.

36. *Epistemological Time Asymmetry.* **Steven F. Savitt.** In a recent book, *Asymmetries in Time,* Paul Horwich presents a systematic account of various temporal asymmetries, including a neo-Reichenbachian account of the (apparent) fact that we know more about the past than the future, the epistemological time asymmetry. I find some obscurities in Horwich's presentation, however, and I argue that when his view is understood in a way that I shall propose, it does represent an advance on Reichenbach's, but it fails to vindicate Horwich's "main point...that our special knowledge of the past derives from the fork asymmetry.

37. *When Fair Betting Odds are Not Degrees of Belief.* **T. Seidenfeld, M.J. Schervish, and J.B.Kadane.** The "Dutch Book" argument, tracing back to Ramsey and to deFinetti, offers prudential grounds for action in conformity with personal probability. Under several structural assumptions about combinations of stakes (that is, assumptions about the combination of wagers), your betting policy is coherent only if your fair odds are probabilities. The central question posed here is the following one: Besides providing an operational test of coherent betting, does the "Book" argument also provide for adequate measurement (elicitation) of the agents degrees of beliefs? That is, are an agent's fair odds also his/her personal probabilities for those events? We argue the answer is "No!" The problem is caused by the possibility of state dependent utilities.

38. *Behavior, Biology, and Information Theory.* **Dennis M. Senchuk.** The notion of information has figured prominently in much modern evolutionary theorizing. But while theorists usually concede the importance of distinguishing between our ordinary use of this notion and its special acceptation in information theory, some biological theorizing requires "information" to serve a double duty. Lorenz's ethological theorizing is a case in point, and this paper challenges its conceptual underpinnings. Special attention is paid to Lorenz's contention that adaptation to an environment is akin to representation, and it is urged that many purportedly (phylogenetically) adapted behaviors might well instead be better interpreted as non-information-laden (ontogenetically) adaptive behaviors.

39. *Island Biogeography, Species-Area Curves, and Statistical Errors: Applied Biology and Scientific Rationality.* **Kristin Shrader-Frechette.** When Kangas suggested in 1986 that wildlife reserve designs could be much smaller than previously thought, community ecologists attacked his views on methodological grounds (island biogeographical theory is beset with uncertainties) and on conservation grounds (Kangas seemed to encourage deforestation and extinction). Kangas' defenders, like Simberloff, argued that in a situation of biological uncertainty (the degree/type of deforestation-induced extinction), scientists ought to follow the epistemologically conservative course and risk type-II error (the risk of not rejecting a null hypothesis that is false), rather than type-I error. (This is the risk of rejecting a null hypothesis that is true). Kangas' opponents, like Noss, argued that, in a situation of scientific uncertainty, scientists ought to risk type-I, rather than type-II, error. This essay argues that there are different types of rationality appropriate to science and applied science and, therefore, in cases of applied science (like conservation biology), the more conservative course of action is for scientists to risk type-I

error. The essay argues further that, on grounds of scientific rationality, Kangas, Simberloff, and others were correct in risking type-II error, but that, on grounds of decision-theoretic rationality, Noss, Waide, and others were correct in risking type-I error.

40. *Assessing Inductive Logics Empirically.* **Howard Smokler.** I argue, in opposition, to the traditional approach that systematic psychological inquiry of a type frequently practiced by people like Edwards, Kahneman and Tversky, and Schum is relevant to the choice of the best inductive logic. In the paper, I present some provisional arguments against the traditional view and sketch some of the relevant evidence. This effort is made with the aim of aiding the development of a naturalistic epistemology.

41. *Conditional Probabilities, Conditionalization, and Dutch Books.* **Jordan Howard Sobel.** Relations between conditional probabilities, revisions of probabilities in the light of new information, and conditions of ideal rationality are discussed herein. The formal character of conditional probabilities, and their significance for epistemic states of agents is taken up. Then principles are considered that would, under certain conditions, equate rationally revised probabilities on new information with probabilities reached by conditionalizing on this information. And lastly the possibility of kinds of 'books' against known non-conditionalizers is explored, and the question is taken up, What, if anything, would be wrong with a person against whom such a book could be made?

42. *Theory of the Apparatus and Theory of the Phenomena: The Case of Low Dose Electron Microscopy.* **Zeno G. Swijtink.** In this paper I give a Bayesian criterion for when an experiment is a test of the theory of the apparatus, rather than a test of the theory of the phenomena, and describe strategies used to ensure that tests of the theory of the phenomena are possible. I extend this framework to low dose electron microscopy which has a stochastic instrument theory and which provides an exception to a thesis by Robert Ackermann on the independence between theory and instrumentation.

43. *The Chromosome Theory of Mendelian Inheritance: Explanation and Realism in Theory Construction.* **Marga Vicedo.** This paper examines the process that led to the identification of chromosomes as carriers of genes. It focuses on the role played by explanations in theory construction and analyzes the status given to the entities and processes introduced through such explanations. I argue that the theory of the gene was a functional explanation that, as such, could not offer decisive support for the existence of genes. However, I maintain that functional explanations set the conditions of identification needed to discover the physical structure that has a certain function in a given system. In this case, the theory of the gene helped to select the chromosomes as the physical structure responsible for the Mendelian segregation of genes. In its turn, the theory of chromosome inheritance helped to reduce the permissive character of the theory of the gene, regulating its further development.

44. *Stich, Content, Prediction, and Explanation in Cognitive Science.* **Charles S. Wallis.** In this paper I consider Stich's principle of autonomy argument (From Folk Psychology To Cognitive Science) as an argument that computationalism is an incorrect approach to explanation and prediction in cognitive science. After considering the principle of autonomy argument in light of several computational systems and psychological examples, I conclude that the argument is unsound. I formulate my reasons for rejecting Stich's argument as unsound into the conjunction argument. Finally, I argue that the conjunction argument is sound, and that its soundness adds additional plausibility to computationalism as an explanatory schema in cognitive science.

45. *Why the Anti-reductionist Consensus Won't Survive: the Case of Classical Mendelian Genetics.* **C. Kenneth Waters.** Philosophers now treat the relationship between classical genetics and molecular biology as a paradigm of nonreduction and this example is playing an increasingly prominent role in debates about the reducibility of

theories in other sciences. This paper shows that the anti-reductionist consensus about genetics will not withstand serious scrutiny. In addition to defusing the main anti-reductionist objections, this critical analysis uncovers tell-tale signs of a significant reduction in progress. It also identifies philosophical issues relevant to gaining a better understanding of what is now happening in genetics and of what we might expect to happen in other sciences.

46. *Theory Pursuit: Between Discovery and Acceptance.* **Laurie Anne Whitt.**
Drawing on diverse historical cases, this paper describes and examines various aspects of a modality of scientific appraisal which has remained largely unexplored, theory pursuit. Specifically, it addresses the following issues: the epistemic and pragmatic commitments involved in theory pursuit, including how these differ from those characteristic of theory acceptance; how the research interests of scientists enter into their pursuit decisions; some of the strategies for the refinement and extension of a theory's empirical abilities which typify theory pursuit; and the need to distinguish between individual and community rationality in contexts of pursuit.

47. *The Problem of Protocol Statements and Schlick's Concept of "Konstatierungen".*
Zhenming Zhai. For the logical positivists, protocol statements are points of contact between experience and knowledge. But within the Vienna Circle there were controversies with regard to how protocol statements are to play the key role in the process of verification. The uniqueness of Schlick's concept of protocol statement consists in the unity between its intelligibility and its validity. When the protocol statements are formulated during observations, the statements themselves are not verified but the whole body of the theory is. The momentary experience confirms the protocol statement at the moment, and the satisfaction of the knower attained through confirmations is the end of scientific inquiries.