

ABSTRACTS FROM SYNTHESE

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AXIOMATIC THERMODYNAMICS AND EXTENSIVE MEASUREMENT

FRED S. ROBERTS and R. DUNCAN LUCE

Foundational thermodynamics is discussed in the context of the theory of measurement. A numerical representation theorem for systems $\langle \mathcal{S}, \preceq, 0 \rangle$ is presented, generalizing Hölder's theorem to the case where the relation \preceq is nonconnected. The theorem is suggested when \mathcal{S} is interpreted as the possible states of a class of isolated thermodynamical systems, $a \preceq b$ means that it is physically possible for a system in state a to pass in time into state b , and $a \circ b$ denotes the state of the system that obtains when one considers the noninteracting union of systems in states a and b . As a corollary, compact necessary and sufficient conditions for traditional extensive measurement are derived.

ENERGY AND ENTROPY AS REAL MORPHISMS FOR ADDITION AND ORDER

J. J. DUISTERMAAT

The physical concepts of energy and entropy are defined as real-valued functions on a state space S , which are *additive* with respect to a structure of addition ('joining') in S and *monotonous* with certain processes in S . In particular, energy is monotonously decreasing with passive processes and entropy is monotonously increasing with adiabatic processes. The general mathematical properties of such 'morphisms for addition and order' are studied. Secondly, the connections with the usual definitions of energy and entropy are discussed and an introductory treatment of mechanics and thermodynamics is presented which is formulated entirely in terms of the structures of addition and the corresponding processes in the state space.

IS OPERATIONISM UNJUST TO TEMPERATURE

FRED WILSON

Hempel has argued that the operationist is unable to do justice to such scientific concepts as that of temperature, for which there are several different test procedures. The operationist claims, and Hempel denies, that such concepts are explicitly defined on the basis of the tests and their results. A model of what the operationist might reasonably say about the logic of the concept of temperature is developed and a detailed examination of some basic aspects of classical thermodynamics shows it to be adequate. This model and this examination are used to defend the operationist's claim, to establish the insufficiency of Hempel's objections.

FUNDAMENTAL AXIOMS FOR PREFERENCE RELATIONS

BENGT HANSSON

The common part of different theories of preference relations is only the trivial result that preference relations must be strict preorders, i.e. irreflexive and transitive relations. This paper is mainly a critical survey of axiom suggestions which try to carry the theory beyond this trivial level. The results are much in the negative—most proposed axioms imply too strange consequences to be acceptable in a general theory of preference.

CHOICE STRUCTURES AND PREFERENCE RELATIONS

BENGT HANSSON

A problem with many applications is that of how to pick out the best one in a set of alternatives. It is possible to give axioms for a function, picking out elements like that. This problem is obviously closely related to the theory of preference relations—more specifically to the question of when there are maximal elements in a set in respect to a given preference relation. This paper investigates which axioms one has to presuppose about the 'picking'-function in order to make the two approaches equivalent.

ON PRESCRIBING DESCRIPTION

CARL R. KORDIG

In order to scrutinize conceptual revolutions in science, Stephen Toulmin has recommended the use of a purely descriptive methodology. His analysis is examined and found to be unsatisfactory: (a) it is either logically untenable or else it leads to an unjustified dualism; (b) it precludes the appraisal of different theories; (c) it prolongs the acceptance of unsatisfactory scientific hypotheses. The author then suggests that, contrary to Toulmin, norms and a-historical standards are needed to generalize about the merits of rival scientific theories.

REPLY

STEPHEN TOULMIN

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QUINE'S PHILOSOPHY OF SCIENCE

J. J. C. SMART

Quine's philosophy of science in *Word and Object* contains the following features. (1) A denial of any sharp distinction between philosophy and science. (2) Realistic attitude to theoretical entities. (There are few traces of the pragmatism and instrumentalism which can be found in some of his earlier writings.) One may have certain qualms about his treatment of set theoretical entities as theoretical posits, much as electrons are, but it is hard to find good arguments against Quine's position here. (3) Quine's philosophy of science is hospitable to both relational and absolute theories of space-time. (4) An advocacy of extensional languages for science, and arguments against intensional languages. It is suggested that even apart from Quine's arguments against intensional languages, one should prefer an extensional language for science on account of considerations of economy and elegance.

AN INTRODUCTION TO 'TRANSLATION AND MEANING'

CHAPTER TWO OF *WORD AND OBJECT*

GILBERT HARMAN

Quine's thesis of the indeterminacy of radical translation may be explicated by consideration of various ways to translate number theory into set theory. The issue between Quine and his opponents reduces to an issue in psychological theory: does psychological explanation require postulation of propositional attitudes over and above sentential attitudes? The author agrees with Quine that it does not, although this has not been conclusively demonstrated. In any event, various *prima facie* objections to Quine's argument can be shown to be without force.

BEGINNING WITH ORDINARY THINGS

ERIK STENIUS

In Quine's *Word and Object* the title of the first section is 'Beginning with Ordinary Things'. In the present paper the author maintains that really beginning with ordinary things leads to an entirely different kind of theory of language. So, for instance, a sound theory of language must make a sharp distinction between the functioning of the expression 'My foot' as a one-word sentence and its functioning as a name of an individual. The possibility of reducing individual names to predicates is contested: whereas the semantics of predicates is intensional, the semantics of individual names is extensional. This observation leads to a new analysis of Quine's paradoxes in modal logic.

QUINE'S EMPIRICAL ASSUMPTIONS

NOAM CHOMSKY

In the early chapters of his *Word and Object*, Quine discusses the nature and acquisition of language and common sense knowledge in a way that seems susceptible to interpretation as

involving certain empirical assumptions. These empirical assumptions, however, seem very dubious, in fact, in conflict with what is known about these matters. Correspondingly, any philosophical conclusions based on these assumptions in part seem to be without force.

BEHAVIORAL CRITERIA OF RADICAL TRANSLATION

JAAKO HINTIKKA

It is suggested that the game theoretical interpretation which the author has put forward in *American Philosophical Quarterly, Monograph Series 2* (1968) 46–72, offers a possibility of translating radically by means of the behavior that characterizes the ‘games’ associated with quantified sentences. It is also suggested that this possibility shows an important gap between what can be specified by means of those particular dispositions (to assent and dissent) in terms of which Quine wants to distinguish ostensive meanings and what is translatable by the help of the totality of (actual or possible) observable behavior of language-speakers. Finally, some implications of these observations for the concept of ontic commitment are sketched.

CONVENTIONALISM AND THE INDETERMINACY OF TRANSLATION

BARRY STROUD

Quine’s arguments for the indeterminacy of translation demonstrate the existence and help to explain the rationale of restraints upon what we can say and understand. In particular they show that there are logical truths to which there are no intelligible alternatives. Thus the standard view that the truths of logic differ from ‘synthetic’ statements in being true solely by virtue of linguistic convention—which requires for its plausibility the existence of intelligible alternatives to our present logical truths—is opposed directly, and not by the espousal of “a more thorough pragmatism.” This raises problems about possibility and novelty.

SINGULAR TERMS AND PREDICATION

P. F. STRAWSON

QUINE’S SYNTACTICAL INSIGHTS

P. T. GEACH

Four syntactical insights in Quine’s works are here discussed: (1) the importance for syntactical analysis of the scope of operators; (2) the strict syntactical correspondence between certain pronouns in the vernacular and bound variables in symbolic logic; (3) the eliminability of complex designations; (4) the utility of regarding a sentence as obtained by introducing a predicable as interpretation of a schematic letter.

As regards (1), it is stressed that proper names are essentially scopeless, whereas phrases like ‘some man’ have a scope. Failure to grasp (2) leads to inept dissections of sentences. An attempt is made to apply insight (3) to vernacular by developing a ‘Latin prose’ theory of relative clauses. Finally, it is shown that insight (4) is needed in the analysis of quite simple sentences.

ON SAYING THAT

DONALD DAVIDSON

Quine’s discussion of indirect discourse (and sentences about other propositional attitudes) in *Word and Object* ends by tentatively accepting an analysis that would prevent the recursive characterization of a Tarski-type truth predicate. This situation is remedied by developing clues provided by Quine into a theory according to which the ‘that’ of indirect discourse is conceived as a demonstrative referring to an immediately subsequent utterance. Thus substitution in the utterance following ‘said that’ that would not change its truth-value may change the truth-value of the utterance ending with the words ‘said that’ by changing the reference of the ‘that.’

QUINE ON MODALITY

DAGFINN FØLLESDAL

An appraisal of the current status of the modalities and of Quine’s arguments against them. The author accepts ‘Quine’s thesis,’ that one cannot quantify into referentially opaque contexts,

and argues that nobody has succeeded in making sense of such quantification. However, it is shown that modal constructions, being constructions on general terms and sentences, can be referentially transparent and extensionally opaque and consequently the collapse of modal distinctions warned against by Quine in *Word and Object* can be avoided. This combination of referential transparency and extensional opacity is just what Quine means by essentialism, and the author therefore agrees with Quine that quantified modal logic commits one to essentialism.

SOME PROBLEMS ABOUT BELIEF

WILFRID SELLARS

QUANTIFYING IN

DAVID KAPLAN

Certain problems which arise in connection with the analysis of oblique contexts are discussed. Frege's method of analysis is contrasted with that of Quine. It is argued that Frege's method does not in itself immediately provide for the most interesting form of quantification into such contexts. Some new notions are introduced which may prove useful in analyzing such quantifications.

LOGIC WITH PLATONISM

GEORGE BERRY

ON THE CONSISTENCY OF A SLIGHT (?) MODIFICATION OF QUINE'S NEW FOUNDATIONS

R. B. JENSEN

Let T be ordinary type theory. Let NFU be Quine's system NF with the axiom of extensionality weakened so as to permit Urelemente. We show that NFU is consistent relative to T . Moreover, letting Inf be the axiom of infinity and AC the axiom of choice, $NFU + Inf$ ($NFU + Inf + AC$) is consistent relative to $T + Inf$ ($T + Inf + AC$). Inf is not provable in NFU (though Specker showed $\neg AC$ to be provable in NF).

REPLIES

W. V. QUINE