Theory and History of Ontology by Raul Corazzon | e-mail: rc@ontology.co

Logical and metaphysical works of Richard Sylvan [*né* Routley] (1960-1977)

Contents

This part of the section Ontologists of 19th and 20th centuries includes of the following pages:

Richard Sylvan [*né* Routley] on Nonexistent Objects

Selected Bibliography of Richard Sylvan's Works on Logic and Metaphysics:

1960 - 1977 (Current page)

1978 - 1988

1989 - 2020

Bibliography of studies on His logic work

Bibliography

N. B. *In 1983 Richard Routley changed is name in Richard Sylvan and Val Routley changed is name in Val Plumwood.*

1. Routley, Richard, and Gunderson, K. 1960. "Mr. Rescher's Reformulation of the Ontological Proof." *Australasian Journal of Philosophy* no. 38:246-252.
"In the midst of revived philosophical interest in theological issues, we wish to record our objections to one recent attempt at reformulating the ontological proof for the existence of God. x In trying to navigate around what he calls the three "traditional objections" to the proof viz.: (1) that it "rests upon an explicit definition per genus et differentiam" which in turn "depends upon the thesis that existence has the status of a predicate", (2) that it invokes "the procedure of defining into existence", and (3) that if
the "proof were logically sound, its theological serviceability would be insignificant'--Mr. Rescher, we believe, runs aground on the following criticisms." (p. 246)
(1) "The Ontological Proof Revisited", this Journal, August, 1959.
2. Routley, Richard. 1963. "Review of *Abstract Sets and Finite Ordinals*, by G. B. Keene." *Australasian Journal of Philosophy* no. 41:279-284.
3. ———. 1965. "What Numbers Are." *Logique et Analyse* no. 8:196-208.
Abstract: "Cardinal numbers are non-distributive properties of certain manifolds. This thesis, the P-C thesis, though often (in effect) proposed, does not seem to have been fully worked out, and has in fact been subject to repeated attacks. Recently the thesis that numbers properties of classes has been criticised by Professor Benacerraf

(*). My main aim here is to elaborate the initially plausible P-C thesis and to defend it against criticisms."
(*) In his stimulating article 'What numbers could not be', *Philosophical Review* LXXIV (1945), 47-73.

4. ———. 1966. "On a Significance Theory." *Australasian Journal of Philosophy* no. 44:172-209.
"Not all declarative sentences are statement-capable. A declarative sentence P is *statement-capable* in context c if and only if P yields a statement in c. Given that all statements are either true or false, P is statement-capable in c if and only if P is *truth-valued* in c., i.e., yields a truth or falsehood in c." (p. 172)
(...)
"Motivation for developing a significance theory arises from several connected sources: firstly, from the role of significance in the solution of a whole range of philosophical paradoxes and puzzles; secondly, from the fact that philosophers repeatedly appeal to significance considerations and principles; and thirdly, from the fact that many idiolects, both ordinary and technical, distinguish some sentences as non-significant and satisfy some significance principles. The importance of the first source is illustrated by the role significance and category theories have played in epistemology and particularly in the philosophy of mind. With respect to the second source, a significance logic has a similar role to play in assessing the correctness of philosophical arguments and moves as Aristotelian and classical logic have had. Given the
third source, a significance theory is a vital ingredient in attempts to further formalise discourse, and to take further account of both everyday and technical usage." (p. 177)

5. ———. 1966. "Some Things Do Not Exist." *Notre Dame Journal of Formal Logic* no. 7:251-276.
"The main objects of this paper are to suggest a definition of 'exists', to propose solutions to difficulties raised within restricted predicate logic with identity by failures of existential presuppositions of purportedly referring expressions such as individual constants and definite descriptions, to develop within a semantical system R*, with the syntax of a restricted applied predicate calculus, the logic of 'exists', and to unify within =R*, i.e. R* with identity, several hitherto distinct logical theories, to construct theories of definite descriptions, and to criticize certain widely accepted criteria for the ontological commitment of a theory. The logical developments in this paper are limited almost entirely to those that can be carried out in a first-order predicate logic with identity but without modal or intensional functors." (p. 251)

6. Routley, Richard, and Goddard, Lenn. 1966. "Use, Mention and Quotation." *Australasian Journal of Philosophy* no. 44:1-49.
"It is the thesis of this paper that an extensive revision of those ways of talking about expressions which are usually recognized by logicians is of paramount importance if we are to escape the absurd conclusions and purely technical restrictions which arise from a confusion of the kinds of distinctions which it is often necessary to make both in logical and non-logical contexts. We propose, therefore, to consider in detail the commonly recognized distinction between types and tokens, and secondly between use and mention, in order both to emphasize the deficiencies of the standard account and to indicate the steps which are required for the development of a special and systematic vocabulary for talking about linguistic expressions. It is necessary, however, for the purposes of exposition before new conventions are introduced
to adopt the ordinary practice of using single quotes to indicate the fact that a linguistic expression is being mentioned, and double quotes to indicate reported speech (and other *quasi*-mentionings);
sometimes, too we set off an expression which is to be mentioned on a line by itself." (p. 2)

7. Routley, Richard, and Montgomery, Hugh. 1966. "Contingency and Non-Contingency Bases for Normal Modal Logic." *Logique et Analyse* no. 9:318-328.
"Contingency and non-contingency bases for modal logics provide direct bases for various logical investigations of philosophical interest. For example: for logics of causation and causal implication, for certain theories of entailment, for syllogistic systems with only contingent propositions, and for theories of future contingents. Furthermore by taking contingency as primitive various new extensions of weak modal logics - extensions which include systems S6-S8 and provide interpretations of philosophical interest for these neglected systems - are suggested. Contingency and non-contingency bases are also of some formal interest; for instance S5 has a very simple and elegant formulation in terms of non-contingency. In this paper we present contingency and non-contingency bases for familiar normal modal logics, specifically for T, S4 and S5." (p. 318)

8. Routley, Richard. 1968. "Decision Procedures and Semantics for C1, E1 and S0.5." *Logique et Analyse* no. 11:468-471.

9. ———. 1968. "The Decidability and Semantical Incompleteness of Lemmon's System S0.5." *Logique et Analyse* no. 12:413-421.
"Two decision procedures are given for the modal system SO.5, a Gentzen style decision procedure and a von Wright-Anderson type decision procedure. The second procedure leads easily, as Cresswell has indicated in [2] using Kripke semantics, to a completeness result for SO.5. However under the intended interpretation for SO.5 proposed by Lemmon in [6] and [7] and adopted by Cresswell, namely that the necessity connective is interpreted as 'it is tautologous (by truth-table) that', the system is incomplete. To complete the system under the intended interpretation conventionalistic theses like $\nabla \Box p$ (contingently necessarily p) must be added to SO.5. But this augmented SO.5 is under its intended interpretation a formalised metalogic of classical sentential logic {see [7]). Hence the (usual) metalogic of classical sentential logic is conventionalistic about modality. (p. 413)

10. Routley, Richard, and Montgomeery, Hugh. 1968. "Non-Contingency Axioms for S4 and S5." *Logique et Analyse* no. 11:422-424.
"In [3] some contingency and non-contingency bases were developed for normal modal logics. Some of the axioms presented there for extending T to S4 and S5 are sufficiently strong to give these latter systems when added to the non-normal system S3." (p. 422)
References
[3] H. Montgomery and R. Routley, Contingency and non-contingency bases for normal modal logics, *Logique et Analyse*, n.s. vol. 9 (1966), pp. 318-328

11. ———. 1968. "The Inadequacy of Kripke's Semantical Analyses of D2 and D3." *Journal of Symbolic Logic* no. 33:568.

12. Routley, Richard, and Montgomery, Hugh. 1968. "On Systems Containing Aristotle's Thesis." *Journal of Symbolic Logic* no. 33:82-96.
"Apart from merits or defects of P_{A1} however, its existence demonstrates the feasibility of a new approach to the logic of propositions involving the principle of subjunctive contrariety. We thus have good reason to investigate the effect this principle, and a concept of conditionality compatible with it, might exert if introduced into standard quantification theory, into set theory, into modal logic and into epistemology and the philosophy of science." R. B. Angell(1)
"Introduction. The thesis $p \rightarrow q \rightarrow \sim (p \rightarrow \sim q)$, Angell's *principle of subjunctive contrariety*, here called *Boethius' thesis*(2) or *Boethius*, has as a consequence *Aristotle's thesis*(2) $\sim (\sim p \rightarrow p)$. The effect of *Boethius* or even of *Aristotle* alone, in quite weak sentential logics, is sufficient to cast serious doubt both on the merit of proceeding in the directions Angell suggests and on the value of connexive logics. (3) To show this we examine the consequences of adding to a basic system Z1 which we describe as *strong normal implication*, the axiom *Aristotle*. This

augmented system Z1a is inconsistent with a number of principles of implication which it is very difficult to reject on semantic grounds. Further semantic problems arise when Z1a is augmented by *Fact* to give Z1b, and when Z1b is augmented by *Antilogism* and *Mat Taut* to give Z1c or by *Boethius* to give Z1d. As these five systems are all sublogics of both Angell's P_{A1}, and McCall's CCl (see [6]) tlfe'consequent interpretational problems for P_{A1}, and CC1 are immediate. In the *Analytica priora* (57b-3 f) Aristotle argues that ... it is impossible that the same thing should be necessitated by the being and by the not-being of the same thing'".
(1) [R. B. Angell, A propositional logic with subjunctive conditionals, this JOURNAL, vol. 27 (1962), pp. 327-343, p. 342].
(2) Following McCall [Storrs MCall, Connexive implication, this JOURNAL, vol. 31 (1966), pp. 415-433, p. 415].
(3) 'Connexive logics' are characterised by McCall in [Connexive implication, pp. 415-416].
Fact $p \rightarrow q \rightarrow . p . r \rightarrow q . r$ Principle of the factor
Antil $p.q \rightarrow r \dashrightarrow . p. \sim r \rightarrow \sim q$ Antilogism.
*Mat Tau*t $p \supset p . p$ Material tautology.

13. ———. 1968. "Modal Reduction Axioms in Extensions of S1." *Logique et Analyse* no. 11:492-501.
"Modal logics are commonly formulated with a primitive necessity or possibility operator, though often they may equally well have non-contingency or contingency as the sole modal primitive, necessity and possibility being introduced by definition (1). Examples of normal modal logics with such bases are given in [2], and similar foundations can easily be constructed for the weaker classical systems such as S1, S2 and S3. One attraction of these formulations is that non-contingency extension axioms often provide very simple and illuminating relationships between different modal systems, and another is that iterated modalities are seen from a different aspect (2)." (p. 492)
(1) Sufficient conditions for this to be possible are that SSE is derivable and that p. $(\Box p \vee \Box \sim p) = \Box p$ is provable. Example of systems for which these conditions fail are SO.5. S1°. S2°.
(2) By an 'iterated modality' we mean a sequence of zero or more symbols each of which is either a negation symbol or a primitive monadic modal symbol.
References
[2] Montgomery, H. and Routley, R., Contingency and non-contingency Bases for normal modal logics, *Logique et Analyse*, vol. 9 (1966), 318-328.

14. Routley, Richard. 1969. "The Need for Nonsense." *Australasian Journal of Philosophy* no. 47:367-383.
"It *is* important to have a distinct category of nonsense into which to bundle grammatical indicative sentences which do not express truths or falsehoods.
For, on the one hand, a high redefinition of 'grammar" which brings nonsignificant sentences out as ungrammatical, not only eliminates the valuable distinction between sentences with textbook grammatical defects and nonsignificant sentences; it also makes the quite unwarranted assumption that all non-significance is recursively generated non-significance. But not all nonsense is obvious, or recursive nonsense. Still more damaging, nonsignificant sentences, unlike seriously ungrammatical sentences, can figure in valid arguments and can occur as unquoted components of grammatical sentences. Yet, on the other hand, theories which eschew non-significance as a further sentence-value beyond truth and falsehood are not only bound to be less comprehensive than, and mere special cases of significance theories (see [15]); they are in fact inadequate to deal with the logical and linguistic data--linguistic data which the grammatical theory does acknowledge--which significance theories are designed to handle. (For a sketch of some of the relevant data, see [15], p. 177)." (p. 367)
(...)

"Significance logics are richer than classical logic; for they include all theses of classical logic for suitably restricted significant sentences; but even the fundamental predicate 'S' of significance theory cannot be explicitly defined in classical predicate logic. Now where two theories are not equivalent theories there are two cases to consider. Either the theories cover (roughly) the same data and one or the other contains false or defective sentences.
Then the one that does is false or defective, and the other, if true, is to that extent preferable. Or both theories are true. Then they must cover different fields and so are not distinguishable through simplicity; in particular one theory may be more comprehensive than the other, so overriding simpficity.
Simplicity then is not an adequate ground for deciding against significance theories." (p. 383)
References
[15] R. Routley, 'On a Significance Theory', *The Australasian Journal of Philosophy*,
Vol. 44 (1966), pp. 172-209.

15. ———. 1969. "A Simple Natural Deduction System." *Logique et Analyse* no. 12:129-152.
"A natural deduction system ND is introduced and proofs in it illustrated. This system is much simpler and more flexible than familiar natural deduction systems: it avoids completely such complicating devices as subscripting, flagging, ordering of vari- ables, and distinctions of several sorts of variables or parameters. Furthermore proofs are valid line by line. ND is presented as a formal system. It still needs emphasizing that natural deduction systems can be made just as. formal as Hilbert-type systems. The precise conditions on substitution - quite important for natural deduction but often suppressed - are made explicit in the rules of ND." (p. 129)

16. ———. 1969. "Existence and Identity in Quantified Modal Logics." *Notre Dame Journal of Formal Logic* no. 10:113-149.
"The aim of this paper is to present a way in which philosophical objections to the development of a combined quantification and modal logic based on S5 can be overcome. In more detail, the objectives are to show that S5 is immune to criticisms directed at those theorems which distinguish it from S4 and T; that problematic theorems(1) of modalised predicate logic like the Barcan formulae $[\Diamond(\exists x) f(x) \supset (\exists x) \Diamond f(x)]$ and $[\Diamond(\exists t) g(x, t) \supset (\exists t) \Diamond g(x, t)]$ can be appropriately qualified once existence is explicitly treated; that puzzles over identity can be escaped by a more elaborate treatment of identity than the standard treatment; and that difficulties associated with quantification into modal sentence contexts can be cleared away given these treatments of existence and identity. A combination of these moves suffice, so it will be argued, to meet standard objections, most forcefully presented by Quine(2), to quantified modal logics. Admittedly a full elaboration of these moves calls for some sentence/statement distinction, some analytic/synthetic (or necessary/contingent) distinction, and some sense/designation (or connotation/denotation) distinction: but although, consequently, it is not to be expected that a combination of these moves will satisfy Quine, they may satisfy some who have been disturbed by the objections Quine raises." (p. 113)
(1) On the defects and difficulties of such theorems see, e.g., W. and M. Kneale, *The Development of Logic*, Oxford (1962), and A. N. Prior, *Time and Modality*, Oxford (1957).
(2) See, especially, W. V. Quine: "The problem of interpreting modal logic," *The Journal of Symbolic Logic*, vol. 12 (1947), pp. 43-48; *From a Logical Point of View*, Revised edition, Cambridge, Mass. (1961); *Word and Object*, New York (1960).

17. Routley, Richard, and Montgomeery, Hugh. 1969. "Modalities in a Sequence of Normal Noncontingency Modal Systems." *Logique et Analyse* no. 12:225-227.

"Some properties of sequences of systems lying between T and S4, and T and S5, having added axioms of the form $\Box^n p \supset \Box^{n+1} p$ have been investigated in [4] and elsewhere (1). These systems have infinitely many modalities for $n > 1$. Here we consider an analogous sequence of noncontingency based systems, the *i*-th member of the sequence being denoted by T_Δ^i where *i* is any positive integer. The primitive basis of T_Δ^i is given by adding the axiom $\Delta^i p$ (where ' Δ^i denotes *i* iterations of the noncontingency modal connective 'Δ', and 'Δ° *p* denotes '*p*') to either $S1_\Delta$ (see [3]) or to one of the noncontingency based formulations of T given in [2]. The equivalence of these bases follows from Theorem 5. of [3]. The first member of this sequence, T_Δ^1, is deductively equivalent to the Trivial System, the second, T_Δ^2, to S5, and the remaining members of the infinite sequence lie between S5 and T. Each system T_Δ^i has 2 (*i* + 1) distinct modalities" (p. 225)

(1) See remarks and footnotes in [1], pp. 259-260.

References

[1] Hughes, G. E. and Cresswell. M. *An Introduction to Modal Logic*, Methuen, London (1968).

[2] Montgomery, H. and Routley, R. 'Contingency and non-contingency bases for normal modal logics', *Logique et Analyse*, vol. 9 (1966), pp. 318-328.

[3] Montgomery, H. and Routley, R., 'Modal reduction axioms in extensions of S1', *Logique et Analyse*, vol. 11 (1968), pp. 492-501.

[4] Thomas, I., 'Modal systems in the neighbourhood of T', *Notre Dame Journal of Formal Logic*, vol. 5 (1964), pp. 59-

18. Routley, Richard, and Routley, Val. 1969. "Categories - Expressions or Things?" *Theoria* no. 35:215-238.

"Is significance a matter of things or of descriptions of things?

That is to say, is it the couplings of certain individuals and certain properties or relations that are properly said to be significant or non-significant, or is it the couplings of descriptions and predicates?

A common answer is that it is either or both, or that it doesn't matter which we say. For it is assumed that to any non-significant coupling of an individual and a property there corresponds a nonsignificant

coupling of expressions, and vice versa. This isomorphism thesis(1) can be stated more generally as follows: there is a one-one correspondence between things-relations couplings and description-predicate couplings preserving significance.

Another answer to the main question is that significance is a matter of things and their relations, and not really a question of description at all. There is a strong temptation, supported by tradition and by some ordinary speech, to adopt such a thing or essentialist thesis of significance, to say that significance is concerned with things irrespective of how they are referred to or even whether they are referred to, and that, furthermore, things fall into logical kinds or categories as they do into natural kinds." (p. 215)

(...)

"The distinction between significance and absurdity resolves the initial puzzles, which arose from incompatible ways of looking at significance. Category theories based on both significance and absurdity are viable. Because, however, one theory is not the isomorphic image of the other the isomorphism thesis is false; and since the theories cannot be confused without disastrous consequences, it does matter what we say." (p. 238)

(1) An isomorphism thesis is stated explicitly by F. Sommers 'Types and Ontology' *Philosophical Review*, vol. 72 (1963), pp. 327-363; e.g. pp. 350-1: 'linguistic structures and ontological structures are isomorphic'.

19. ———. 1969. "A Fallacy of Modality." *Noûs* no. 3:129-153.

"The ancient principle of distributivity of necessity (DN for short), that necessary propositions only entail necessary propositions, has acquired an upstart companion,

the distributivity of contingency (DC), which threatens to borrow some plausibility from DN; violations of these principles are sometimes lumped together as "fallacies of modality". The DC principle, according to which contingent statements only entail contingent statements, has played a specially important role in the discussion of entailment; and in particular it has taken a central part in Anderson and Belnap's important theory of entailment E. The DC principle has also had a major part in attacks on linguistic theories of logical necessity. We contend, however, that the principle and minor modifications of it, are false. We argue that the principle provides an example of a strong false thesis drawing its plausibility from its association with a weak but trivial counterpart which cannot however perform the task of the strong principle. We also explain in detail why no version of the principle can fulfill the role for which it is needed in E.
It is our contention that the real fallacy concerning DC is that of taking violations of DC as fallacious. For DC itself is a modal fallacy." (pp. 129-130, a note omitted)

20. Routley, Richard. 1970. "Non-Existence Does Not Exist." *Notre Dame Journal of Formal Logic* no. 11:289-320.
"The main aims of this paper are to explain criteria for the identity of individuals, to compare various criteria for the existence of properties and for the existence of propositions, and to present certain theses concerning the existence and identity of individuals, of propositions, and of properties.
Several other topics are, however, treated incidentally; for example an extended sentential logic designed to take care of certain semantical paradoxes and truth-value gaps by allowing for statement-incapable sentences is sketched.
In order to attack in a formal way the question of the existence of properties and relations and to formalise widely employed criteria for the existence of attributes, i.e. of properties and relations, an extended predicate calculus must first be introduced. As a first move it is valuable to determine how much can be done in the simplest and most accessible of higher order functional calculi, viz. second-order functional calculus. Now this logic has to be so designed that it can express such propositions as "Some properties do not exist" and "All properties, whether possible or impossible,... .(e.g. exist)". At first this suggests that a system like R*, which allows for quantification over all possible individual items, be extended to second order.(1)" (p. 289)
(1) The system R* is presented in R. Routley, "Some things do not exist," *Notre Dame Journal of Formal Logic*, Vol. 7 (1966), pp. 251-276.

21. ———. 1970. "Decision Procedures and Semantics for Fey's System $S2^0$ and Surrounding Systems." *Zeitschrift für mathematische Logik und Grundlagen der Mathematik* no. 16:165-174.
"The systems investigated in detail are Feys system S2° (of [3]), $S2^e$, S2, C2 and E2. The same methods as are used in studying these systems extend to a much larger class of modal logics; some extensions are outlined in section IV. For the systems studied three decisions are provided; in section I by Gentzen methods; in section II by extended truth-table methods; and in section III, as a corollary to completeness results, by the finite model property." (p. 165)
References
[3] R. Feys, Modal Logics. Louvain 1965.

22. ———. 1970. "Extensions of Makinson's Completeness Theorems in Modal Logic." *Zeitschrift für mathematische Logik und Grundlagen der Mathematik* no. 16:239-256.
"Completeness theorems are derived, using the maximal consistent set construction, for a large class of sentential modal logics. The paper extends MAKINSON's[1)]method (of [6]) to systems based on the modal logic C2 (cf LEMMON[4]), on the system $C2^a$ (of FEYS[1]), on system C2" for each *n*, and on the weak system C1 (of LEMMON[3]) and S0.5". The systems considered include, among others, all systems treated in MAKINSON[6], all modal systems treated in LEMMON[4] and [5], various systems introduced in [7], all E systems, all C

systems, D1 and D2, S0.5, S2°, S2^{e}, S3°, S3^{e}, S4°, T*, Parry's system S3 + □ ◊□ A → □ A, S3.5, S6, S7, S8 and S8.5. (For details of many of these systems see FEYS [1].)
The methods are readily extended to various other systems, e.g. to the conventionalist systems of [7] and, as is well-known, to extensions of 54, and they can be extended to quantified modal logics. For certain systems considered the completeness results are combined with a solution of the decision problem by the finite model property." (p. 239)
References
[l] R. FEYS, Modal Logics. Louvain 1965.
[2] S. A. KRIPKE, Semantical analysis of modal logic II, Non normal modal propositional calculi. Symposium on the Theory of Models, Amsterdam 1965, 206-220.
[3] E. J. LEMMON. New foundations for Lewis modal systems. Journal Symb. Logic 22 (1957), 176- 186.
[4] E. J. LEMMON, Algebraic semantics for modal logics I. Journal Symb. Logic 31 (1966), 46-65.
[5] E. J. LEMMON, Algebraic semantics for modal logics 11. Journal Symb. Logic 31 (1966),
[6] D. MAKINSON, On some completeness theorems in modal logic. This Zeitschr. 12 (1966),
[7] H. MONTGOMERY and R. ROUTLEY Conventionalist and contingency-oriented modal logics (1971).

23. ———. 1971. "Domainless Semantics for Free, Quantification and Significance Logics." *Logique et Analyse* no. 14:603-626.
"The standard semantics for quantification logics have serious limitations; they are more complicated than they need be and more set theoretical than they should be. In support of this evaluation alternative simpler and leas set-theoretical semantics are provided for quantification and free quantification logics both without and with identity, and for second-order significance logic. These semantics, domainless semantics, are defended against objections as to their intelligibility and satisfactoriness, and appropriate consistency and completeness theorems are proved in order to show the comparative adequacy of the semantics. Domainless semantics, by assigning values en bloc to atomic wff, eliminates the otiose notion of a domain of interpretation and n-place relations on this domain of entities, and thereby eliminates the associated correspondance theory of truth which is built into the reference selections and truth evaluations of standard semantics. It does this without introducing names in the style of, what is similar, the substitution interpretation of quantifiers, and so it avoids legitimate objections that have been made to substitution semantics (1)."
(1) (*) For these objections, and for answers to many objections to substi- tution semantics, see Dunn and Belnap [3].
References
[3] J. M. Dunn and N. D. Belnap, 'The Substitution Interpretation of the Quantifiers', Noûs, vol. 2 (1968), pp. 177-185

24. ———. 1971. "Conventionalist and Contingency-Oriented Modal Logics." *Notre Dame Journal of Formal Logic* no. 12:131-152.
"No modal logic so far presented adequately represents radical conventionalism. Yet conventionalism about modalities is a very pervasive doctrine. In this paper we make a start on filling this serious gap in the
literature.
Radical conventionalism is distinguished by the thesis:
(R). *All assertions of modalities are contingent.*
(...)
Radical conventionalism is inconsistent with *all* Lewis modal logics, as we shall show. It does not follow, however, that radical conventionalism is, as has often been

assumed, inconsistent. One of our main aims is to exhibit a class of consistent modal logics in which thesis (R) is satisfied. This is a major step towards showing that radical conventionalism is a consistent doctrine.
We distinguish radical conventionalism from two other main positions regarding modality which have also been called conventionalisms. For radical conventionalism has frequently been confused with these other doctrines, to the detriment of each position since each pair of positions entails mutually inconsistent principles." (p. 131)

25. ———. 1971. "Review of A. Trew's 'Incompleteness of a Logic of Routley's." *Mathematical Reviews* no. 41:1507.

26. ———. 1972. "A Semantical Analysis of Implication System *I*, and of the First Degree of Entailment." *Mathematische Annalen* no. 196:58-84.
Abstract: "A semantics for the implicational system *I* is described, and the completeness and decidability of *I* and related systems established.
lt is shown that *I* has the same first-degree logic as Anderson-Belnap system *E* and Ackermann system π and the same positive logic as Lewis system S3. A detailed semantical investigation is made or the first degree of entailment systems, and important matrices and algebras are derived and thereby interpreted."

27. ———. 1972. "Vredenduin's System of Strict Implication." *Logique et Analyse* no. 15:435-437.
About P. G. J. Vredenduin, "A system of strict implication", *Journal of Symbolic Logic*, 4, 1939, pp. 73-76.

28. Routley, Richard, and Meyer, Robert K. 1972. "The Semantics of Entailment II." *Journal of Philosophical Logic* no. 1:53-73.
Abstract: "In the first part of this paper, we developed a semantics for the system R of relevant implication, which is the non-modal part of Anderson-Belnap style systems of entailment. In the present paper, which we have endeavored so far as possible to render self-contained, we add an S4-style theory of necessity, getting the system NR of [1]. This enables us to introduce an entailment connective on the definition. (1) $A \Rightarrow B =_{df} N(A \rightarrow B)$, where →, is relevant implication, and accordingly to adapt the semantics for relevant logics developed in [2] to a theory of entailment proper.' We note that although the question whether the NR-theory of entailment coincides exactly with that of E remains open, both the results of [1] and the motivation provided for the pure theory of entailment in [3] suffice to settle it for all practical purposes - every motivating condition ever put forth for E is satisfied in NR, and in all known cases of interest involving formulas built up from entailment and the truth-functions, E and NR coincide exactly with respect to provability. Indeed, although we should like very much to see the remaining open question definitively solved, we hazard here the guess that if E and NR should happen to diverge on some formula, it will be E which turns out thereby to be semantically deficient; we do not think that will happen. In any event, we present with confidence the present results as the semantics for Anderson-Belnap style entailment." (p 53, a note omitted)
References
[1] Meyer, R. K., 'Entailment and Relevant Implication', *Logique et Analyse*, No. 44 (1968), 472-9.
[2] Routley, R. and R. K. Meyer, 'The Semantics of Entailment - I', to appear in *Truth, Syntax Modality* (ed. by H. Leblanc), North-Holland, Amsterdam, forthcoming. [1973]
[3] Anderson, A. R. and N. D. Belnap, Jr., 'The Pure Calculus of Entailment', *The Journal of Symbolic Logic* 27 (1962), 19-52.

29. ———. 1972. "The Semantics of Entailment III." *Journal of Philosophical Logic* no. 1:192-208.
"In [1] and [2], we developed Kripke-style semantical postulates for the system R of relevant implication and the system NR of relevant implication with modality. The

latter suffices for a theory of entailment as well, though we left the question open in [2] whether that theory is precisely the Anderson-Belnap system E of entailment. The time has come to extend our semantical methods to other systems of relevant logic besides the system R. We shall do so in two stages. The present paper deals only with positive systems of entailment, since these may be handled quite simply along previous lines; complications arising from negation are put off until the sequel. We do not consider quantified entailment logics explicitly, though quantifiers may be handled in the style of [1] (or differently, if the reader prefers). Accordingly, we present here a semantical analysis of the Anderson-Belnap systems R+ of positive relevant implication, E+ of positive entailment, and T+ of positive ticket entailment; by ringing the changes on the axiomatizations of these particular systems, we include as well related relevant logics; there is, on our approach, a natural minimal one, which we can call B+." (p. 192)

References

[1] R. Routley and R. K. Meyer, 'The Semantics of Entailment' (I), in H. Leblanc (ed.), *Truth, Syntax, Modality*, North-Holland Publ. Co., Amsterdam, forthcoming [1973].

[2] R. Routley and R. K. Meyer, 'The Semantics of Entailment' (II), *The Journal of Philosophical Logic 1* (1972), 53-73.

30. ———. 1972. "Algebraic Analysis of Entailment I." *Logique et Analyse* no. 15:407-428.

"In [1]-[4], the authors have developed a semantical analysis of Ackermann-Anderson-Belnap style systems of entailment similar to the well-known analyses of Lewis style strict implication due to Kripke, Hintikka, Lemmon, and others. The present paper uses these semantic insights - in particular those of [3] - to develop a general algebraic analysis of entailment logics. Such an analysis has already been furnished by Dunn in [5] for the system R of relevant implication, who interpreted the system R in a certain class of partially ordered algebraic structures, namely the DeMorgan monoids (1). A similar analysis, as we report, will do for entailment logics generally. This present analysis, as it remarkably turns out, is strongly reminiscent of the very differently motivated connections drawn between the theory of combinators and certain theorems of intuitionist logic by H. B. Curry in [6] and [7]. The present paper will analyze chiefly negation-free entailment logics, which are the most natural algebraically; some remarks, however, will be inserted to show where the enterprise tends when negation too is added. Our key algebraic notion will be that of an Ackermann groupoid, defined below, which serves to explicate algebraically the minimal relevant logic B+ of [3] and which comes on the addition of postulates to explicate also more familiar relevant, modal, and intuitionist logics, such as T+, E+, R+, S4+, and the intuitionist sentential calculus J." (p. 407)

(1) The theory of residuation, on which Dunn's and the present work rests, was developed by Ward and Dilworth; cf. [7] for references.

References

[1] Routley, R., and R. K. Meyer, "The semantics of entailment," (I), forthcoming in *Truth , Syntax, Modality*, ed. by H. Leblanc, N. Holland, Amsterdam, 1973.

[2] Routley, R., and R. K. Meyer, "The semantics of entailment," (II), forthcoming in the *Journal of Philosophical Logic*.

[3] Routley, R., and R. K. Meyer, "The semantics of entailment," (III), forthcoming.

[4] Routley, R., and R. K. Meyer, "The semantics of entailment," (IV), in preparation.

[5] Dunn, J. M., *The algebra of intensional logics*, doctoral dissertation (U. of Pittsburgh 1966), University Microfilms, Ann Arbor.

[6] Curry, H. B., and R. Feys, *Combinatory logic*, v. I, N. Holland, Amsterdam, 1958.

[7] Curry, H. B., *Foundations of mathematical logic*, McGraw-Hill, N. Y., 1963.

31. ———. 1972. "A Kripke Semantics for Entailment (Abstract)." *Journal of Symbolic Logic* no. 37:442-443.

32. Routley, Richard, and Routley, Val. 1972. "The Semantics of First Degree Entailment." *Noûs* no. 6:335-358.
"We concentrate on first degree semantics because this sharpens and simplifies the choice among rival systems. For different systems may have a common first degree theory. In particular a large class of strict implication systems (including all Lewis systems) have the same first degree; and the system FD coincides with the f.d. theory of the system E of Anderson and Belnap (presented in [1] and [2]) and also of a number of rival entailment systems both included in, including, and only intersecting E (see [11]). Thus the divergence of entailment from strict implication, and from other implications such as connexive implication,
is already clear at the first degree. Most of the traditional and current disputes come up and can be settled at the first degree level, for example, disputes about the paradoxes and their effects, and as to the adequacy of principles such as Disjunctive Syllogism. Thus choice of a first degree system already fixes in large measure one's position on entailment. Furthermore, for a number of important notions the higher degree structure is either peripheral, as with inclusion of logical content, or, as with causal sufficiency, not well defined.
Finally the first degree has much simpler semantics than the full systems; it is not complicated by questions as to which setups or structures implications are in or what relations hold between set-ups, which determine the fate of higher degree laws." (pp. 335-336)
References
[1] A. R. Anderson, 'Some open problems concerning the system E of entailment' *Acta Philosophica Fennica*, fasc. 16, (1963): 7-18.
[2] A. R. Anderson and N. D. Belnap, 'Tautological entailments', *Philosophical Studies*, XIII (1961): 9-24.
[11] R. Routley, 'A semantical analysis of implicational system I and of the first degree of entailment' *Mathematische Annalen*, 196 (1972): 58-84.

33. Routley, Richard. 1973. *The Logic of Significance and Context*. Edinburgh: Scottish Academic Press.
Contents of Volume 1 (the only published): Introduction 1; Part I: Context logic. 1. The semantic theory 21; 2. Elements of the sentential theory 44; 3. Elements of the predicate and quantification theory 120; Part II. The principles of significance. 4. Toward a logic of significance 219; 5. Sentential significance logics I: The matrix approach 256; 6. Sentential significance logics II: The axiomatic approach 368; 7. Intensional and quantified significance logics 431; Bibliography 637-641.
"In spite of the central role which the concept of significance has played in recent philosophy, very little has been done to produce a general theory in terms of which the various claims can be evaluated. Both Russell and Ryle go some way towards the development of particular significance theories which they then apply to the examination of philosophical theses, and Russell's theory of types is expressed partly in terms of formal criteria. But the two theories, though similar, are inconsistent with each other, and each is seriously incomplete. Both depend crucially on the acceptance of intuitive and unstated principles.
It is our purpose to develop a general formal theory of significance in terms of which significance claims, and arguments by means of which they are made, can be assessed. Thus we aim, eventually, to provide a logic, not previously developed, for much of modern philosophy.
This aim might be challenged in one of three ways. First, even though it is accepted that some sentences are nonsignificant, it might be thought that there is no need of a special logic to take account of them since the ordinary principles of classical two-valued logic can be applied to arguments in which they occur. Secondly, it might be said, given that there is a need for a special logic, the peculiar features of nonsignificant sentences make its development impossible. Thirdly, it has sometimes been suggested, nonsignificance can be wholly explained in terms of other well-understood concepts: in particular, it can either be identified with the ungrammatical, in which case nonsignificant sentences should be excluded from all

arguments and the only logic which is necessary is the classical two-valued logic over significant sentences; or it can be identified with the necessarily false, and in this case significance claims and arguments can be handled within classical modal logic.

Consider the first objection. The point of and need for a general formal theory of significance can be justified on general grounds by appealing to the usual reasons for underpinning philosophical investigations by logical studies: namely the clarity and systematisation which result, and the fact that the philosophical theory can be tested for consistency and is generally more readily assessed and open to falsification. But it can also be justified on special grounds since, without it, the assessment of particular significance theories, if not impossible, is at best intuitive. Unless general principles are formulated and justified, it remains obscure which critical arguments are valid within and against a particular theory. Thus, without some systematisation of significance principles, many philosophical arguments, such as those of Ryle and Strawson on the philosophy of mind, are impossible to assess.

As one example of the need to make explicit the principles which are assumed, and the need to evaluate them, consider Russell's assumption, which is nowhere justified, that the paradox argument evaporates and the conclusion no longer follows once it has been shown that the premisses are meaningless. This amounts to saying, in general, that a nonsignificant sentence has no implications. But if this is so, then Ryle's *reductio ad absurdum* technique, and Wittgenstein's declared aim, seem to be illogical. For here, the intention is to show that a given sentence is nonsignificant because it has implications which are nonsignificant. But if it is indeed nonsignificant, then it was so before the actual implications were drawn, and in terms of Russell's principle it cannot have these implications because it has none at all.

In order to resolve problems such as this, it is necessary to construct associated significance logics for particular theories of significance and to ask whether there is an internal inconsistency in either theory, whether there are general principles incompatible with either or both, and whether there is a general theory which can consistently include both. It may be, for example, that the apparent incompatibility of Russell's principle and Ryle's is not real. This would be so if they were adopting different implication connectives; in this case, both principles could consistently appear in the same general theory.

None of these questions can be settled using only a classical two-valued logic, however, since what is in issue is just which relations hold between truth-valued sentences, on the one hand, and nonsignificant sentences, on the other. Similarly, it is inadmissible to evaluate positivist criteria of significance using principles of two-valued logic alone since, given that some sentences are nonsignificant, such a logic cannot hold generally. But the mere recognition that at least a three-valued logic is necessary is of itself inadequate. For unless the *relevant* three-valued logic is specified, the criteria are still not fully assessable." (pp. 5-7)

34. Routley, Richard, and Brady, Ross. 1973. "Don't Care was Made to Care." *Australasian Journal of Philosophy* no. 51:211-225.

"We believe that the deep structure of natural languages, and hence of the languages in which philosophical problems are characteristically formulated, will have to be based on an enriched significance logic which has a third value -- nonsense or non-significance -- and not on a classical two-valued logic which only has truth and falsity as its values. Such logics will be required not just in providing a semantics for natural language but also, for what is even more important, in the assessment of informal reasoning and in determining the scope of valid argument. But our view that there is a need for nonsense as a value has been challenged, most recently by Haack(1) who thinks that a variation on Quine's position can be sustained, that central examples of non-significant sentences are 'Don't Cares' which can be brought within the scope of classical logic by some fairly arbitrary assignments of truth-values to them. Though we shall concentrate on Haack's case against nonsense

as a further value, our criticism has more than merely local interest, for many of the defective moves that Haack makes in defence of classical logic have wide currency." (p. 211)
(1) R. J. Haack: 'No Need for Nonsense': this journal, 49 (1971) pp. 71-7. Page references in the text are to this article. Overlapping criticisms may be found in E. Erwin: *The Concept of Meaninglessness* (1970).

35. Routley, Richard, and Meyer, Robert K. 1973. "Classical Relevant Logics I." *Studia Logica* no. 32:51-68.
"In a number of papers, the authors have offered semantic and algebraic analyses of the relevant logics of Ackermann, Anderson, and Belnap, and of logics akin thereto. The most interesting of these logics, in our opinion, are the Anderson-Belnap system R, which we analyzed in [1], and our own system B, studied in [5] and [6]. These are respectively the strongest and the weakest relevant logics, others being intermediate. Now one of the chief features of the relevant logics -- indeed, the chief feature on the motivational lines of [7], [8], and [1] -- lies in their blocking the so-called paradoxes of material and strict implication. The paradox which has drawn the most ink, particularly in Meyer's remarks, is the old saw that from a contradiction anything follows: i.e.,
(1) $A \& \neg A \rightarrow B$.
One would have thought, accordingly, that addition of (1), with other classical negation principles, to positive relevant logics would result in their breakdown, just as intuitionist logic fails to accomodate, on pain of breakdown, (1) together with excluded middle. Like so many things one would have thought, this is false. In fact, on a semantical analysis akin to that of [1] and [5] but in certain respect more natural as regards negation, the positive insights emerge unscathed. The purpose of this paper is to present that semantics and the *classical relevant logics* to which it gives rise. Arising out of this analysis are new algebraic insights as well; classical relevant logics are Boolean and so the algebras of these logics -- sufficing in particular for the positive parts of the relevant logics studied to date and in distinction to the algebras developed by Dunn in [9] and by us in [6] -- are just Boolean algebras with an additional binary operation. Indeed, as we show, we may limit our considerations to *set algebras* -- i.e., algebras whose domain is the power set of some set. This leads to considerable simplification of some outstanding problems for positive relevant logics -- in particular, for the long-open decision question for R^{+} -- and we suggest lines along which we believe a successful solution of this question can be obtained." (p. 51)
References
[l]-[5] Routley R. and Meyer R. K.: The semantics of entailment, I, II, III, IV, V. I appears in H. Leblanc (ed.): *Truth, Syntax and Modality*, North-Holland 1973. II appears in *The Journal of Philosophical Logic* 1 (1972), 53-73. Ill is to appear in the same journal. IV and V are in preparation.
[6] Meyer R. K. and Routley R.: Algebraic analysis of entailment I, to appear [*Logique et Analyse*, 15, 1972, pp. 407-428]
[7] Anderson A. R. and Belnap N. D. Jr.: The pure calculus of entailment. *The Journal of Symbolic Logic* 27 (1962), 19-52.
[8] Meyer R. K.: Entailment. *The Journal of Philosophy* 21 (1971), 808-817.
[9] Dunn J. M.: The Algebra of Intensional Logics (doctoral dissertation), University Microfilms, Ann Arbor 1966.

36. ———. 1973. "The Semantics of Entailment." In *Truth, Syntax and Modality: Proceedings of the Temple University Conference on Alternative Semantics*, edited by Leblanc, Hugues, 199-243. Amsterdam: North-Holland.
"Word that Anderson & Belnap had made a logic without semantics leaked out. Some thought it wondrous and rejoiced, that the One True Logic should make its appearance among us in the Form of Pure Syntax, unencumbered by all that set-theoretical garbage. Others said that relevant logics were Mere Syntax. Surveying the situation Routley, and quite independently Urquhart, found an explication of the

key concept of relevant implication. Building on Routley [1972] , and with a little help from our friends - Dunn and Urquhart in particular, with thanks also due to Anderson, Belnap, V. Routley, and Woodruff - we use these insights to present here a formal semantics for the system R of relevant implication, and to provide it with proofs of consistency and completeness relative to that semantics." (pp. 199-200)
(...)
"Our introductory remarks conclude with the observation that, as a result of this paper and of Urquhart's [1972] related work, the relevant logics now have a formal semantics; but relating such a semantics to the informal claim that a system of logic has captured one's intuitions is ever a matter of private judgment, and that judgment we leave, as his rightful due, to the reader." (p. 204)
References
Routley, R., 1972, The Semantics of First-degree Entailment, forthcoming [*Noûs,* 6, 192, pp. 335-358].
Urquhart, A., 1972, Semantics for Relevant Logics, *The Journal of Symbolic Logic*, forthcoming [37, 1972, pp. 159-169].

37. ———. 1973. "An Undecidable Relevant Logic." *Zeitschrift für mathematische Logik und Grundlagen der Mathematik* no. 19:389-397.
"The purpose of this paper is to exhibit a simple, undecidable sentential calculus in the ANDERSON-BELNAP family of relevant logics. We call this system Q^+. We use the semantical methods of [1] and [3] to show that if Q^+ is decidable then the word problem for semigroups is solvable, contradicting POST's [2] and establishing our main result. Q^+, we add, is not our favorite sentential logic, but it is closely related to the viable ANDERSON-BELNAP system R of relevant implication. Accordingly we believe to it be the best approximation yet to HARROP's request in [4] for a philosophically interesting undecidable sentential logic." (p. 389)
References
[l] ROUTLEY R. and R. K. MEYER, The semantics of entailment I. In: H. LEBLANC (ed.). *Truth, Syntax and Modality*. North-Holland, Amsterdam 1973, 199-243.
[2] POST, E., Recursive unsolvability of a problem of Thue. *J. Symb. Log*. 12 (1947), 1-11.
[3] ROUTLEYR, and R. K. MEYER , Ts~em~a ntics of entailment 111. *J. Philos. Log*. 1 (1972).
[4] HARROPR,. , Scme structure results for propositional calculi. *J. Symb. Log.* 30 (1965).

38. Routley, Richard, and Routley, Val. 1973. "Ryle's *Reductio ad Absurdum* Argument." *Australasian Journal of Philosophy* no. 51:125-138.
"According to Gilbert Ryle (in his *Collected Papers*) a certain sort of *reductio ad absurdum* argument, distinct from Euclid's argument, has a central place in philosophical argument. This *reductio ad absurdum* argument is applied in the following way: if it can be shown that an apparently meaningful thesis, such as that the mind is in the body, implies indisputable cases of absurdity, then the thesis itself is absurd (nonsense). Thus the argument is of the form: If q follows from p and q is absurd then p is absurd,
i.e., using some symbols,
if $p > q$ and $-Sq$ then $-Sp$ (1)
Throughout $p > q$ reads '(that) p entails (that) q' and $-Sq$ reads '(that) q is not significant (is absurd)'. But the notation may alternatively (by trading 'that' in for quasi-quotes) be read metalinguistically.
(...)
We want to argue here that there are grave difficulties in maintaining the correctness of the *reductio* argument (1), but that, fortunately for the project in *The Concept of Mind*, it is doubtful that the arguments used
there are in fact of this form or have to depend for their correctness on the correctness of (1). Once again the case for a special philosophical argument appears

to fall down." (p. 125)

39. ———. 1973. "Rehabilitating Meinong's Theory of Objects." *Revue Internationale de Philosophie* no. 27:224-254.
"Meinong's theory of objects makes an important contribution to the logical theory and semantics of that large and indispensable part of discourse which is intensional. Despite this, his theory has been, and continues to be, the target for a barrage of supposedly devastating criticism and ridicule, which is without much parallel in modern philosophy, so that even to mention Meinong's theory gives rise to amusement, and practically any theory can be condemned by being associated with Meinong (e.g. 'shades of Meinong!' Ryle [1] p. 234; 'Meinong's jungle of subsistence,' 'the horrors of Meinong's jungle' [2] pp. 12, 32, 'the unspeakable Meinong', James cited in [3], p. 187. The effects of this have not merely been an historical injustice to a courageous and original thinker; it has also had the effect of blocking off, or at least inordinately delaying, a whole avenue of research, especially of non existential logic and of alternatives to the entrenched Russellian theory and its modern variations and simplifications. For the fact is that many of the more general objections which are supposed to destroy Meinong's theory would, if correct, be equally effective against non-existential logic, with which Meinong's theory shares important features. Our project of considering these objections has then wider importance than just that of clearing Meinong's name and rehabilitating his theory. In this paper we want to defend Meinong's theory of objects, or rather a modern logical reconstruction of a substantial part of it, against some of the common general objections which are taken to have completely discredited it. (Thus, e.g. Ryle [4]: *'Gegenstandtheorie* itself is dead, buried and not going to be resurrected'). We shall argue that these criticisms do not stand up to examination, and that it is not Meinong but his critics who are involved in a naive and mistaken theory of meaning, the Reference Theory." (p. 224)
References
[î] G. Ryle, *Collected Papers,* Volume I: *Critical Essays*, Hutchinson, London (1971).
[2] W. Kneale, *Probability and Induction*, Clarendon Press, Oxford (1949).
[3] J - Passmore, *A Hundred Years of Philosophy*, Duckworth, London (1957).
[4] G. Ryle, 'Intentionality Theory and the Nature of Thinking', *Meinong-Kolloquium*: To appear, edited by R. Haller, Graz (1972) [Rudolf Haller (ed.), *Jenseits von Sein und Nichtsein. Beiträge zur Meinong-Forschung*, Graz: Akademische Druck- u. Verlagsanstalt, 1972]

40. ———. 1973. "Ideal Objects on a Meinongian Theory of Universals." In *Proceedings of the XVth World Congress of Philosophy Varna; 17th to 22nd September, 1973, Varna, Bulgaria. Vol. 5*, 581-584. Sofia: Sofia Press.
"The rejection of the Ontological Assumption (hereafter OA), according to which one cannot make true statement about what does not exist, together with the further step of admitting that non entities, i.e. items which do not exist, have determinate properties, makes it possible for a theory of items, such as Meinong's theory of objects, to avoid the standard positions on universal and many of their difficulties. (...)
The rejection of the OA does not give a Meinongian position a merely terminological advantage or claim to novelty, nor does the position differ merely terminologically from Platonism (as the official positions are inclined to claim). The distinction is not merely terminological because the question of what exists is not completely uncontrolled by conditions: one cannot say what one likes about what exists. For to exist is to be in the actual world, and the logical properties of entities are controlled by those of the actual world. Hence these conditions which derive from the logical features of the actual world: - *first*, what exists is consistent; *second*, what exists is complete or determinate; and *third*, what exists is unqualifiedly assumptible, e.g. if the x which fs exists then the x which fs does f. In short, in the case of an entity we do not require further guarantees about the suitability of its description: the guarantee is provided by its existence." (p. 581)

(...)
"Terms like 'the Triangle' and 'triangularity', and also mass terms, are irregular subjects. Accordingly there is nothing to be lost and much to be gained by admitting such subjects within the formal framework of quantification logic (see [3]). But once such subjects are admitted, and the domain of items in the semantical frame correspondingly widened, it is decidedly preferable to switch to a quantified significance logic to cope with the very large class of non significant sentences that result in typical applications of the logic. Then special postulates, each as part of (F), governing the new universal terms can be adjoined, but their exact form has still to be worked or argued out. Likewise a semantical rule for form terms, non trivial enough to verify the admissible half of requirement (F) (though not its converse, except under appropriately restricted conditions) remains, so far as we know, an open problem." (p. 584)
References
[3] L. Goddard and R. Routley, *The Logic of Significance and Context*, volume l, Scottish Academic Press, Edinburgh (1972).

41. Routley, Richard. 1974. "A Rival Account of Deductibility and Logical Consequence." *Reports on Mathematical Logic*:41-52.

42. ———. 1974. "Another 'Fatal' Objection to Meinongian Object." *Philosophical Studies* no. 25:131-135.
"Professor Bernard Williams' arguments that "fatal difficulties beset the account of Meinongian 'pure objects'" ([1]), p. 55; my rearrangement) are, I try to show, simply invalid: the main argument effectively distributes a universal quantifier across a disjunction." (p. 131)
(...)
"Meinong's theory of incomplete objects is a going enterprise; but it has yet to be shown so far as I can see, if it can be shown at all, that statements about Universals can always be eliminated, preserving relevant properties, in favour of hypothetical statements about 'ordinary' objects.
All we have been offered by those who would eliminate 'systematically misleading' statements about Universals (e.g. Ryle [3]) are sample eliminations, which however exemplify schemes such as (Q), which break down if applied generally. And it would appear to be an outcome of Ackermann's demonstration of the unsolvability of the elimination problem for second-order predicate logic (see [4], p. 304) that a general elimination of polyadic Universals in the proposed style is impossible." (p. 135)
References
[1] J. Margolis (ed.), *Fact and Existence*, Blackwell, Oxford, 1969.
[2] A. Meinong, *Über Moglichkeit und Wahrscheinlichkeit*, Barth, Leipzig, 1915.
[3] G. Ryle, *Collected Papers, Volume 2: Collected Essays*, Hutchinson, London, 1971.
[4] A. Church, *Introduction to Mathematical Logic*, Princeton University Press, Princeton, 1956.

43. ———. 1974. "Semantical Analyses of Propositional Systems of Fitch and Nelson." *Studia Logica* no. 33:283-298.

44. Routley, Richard, and Meyer, Robert K. 1974. "Classical Relevant Logics II." *Studia Logica* no. 33:183-194.
"The purpose of this note is to extend the simplifications of [1] to the system R of relevent implication analyzed semantically in [2]. In [1], it was established that the system R +, which is the negation-free fragment of R, could be furnished with a negation ¬ more classical in most respects than the preferred negation ─ of [3]. This was rather astonishing, since an important motivating condition on relevant logics had been absence of the classical paradoxes of implication (1). It turned out, however, that one could have the most objectionable of the paradoxes anyway, namely $A \,\&\, {\sim} A \rightarrow B$ and $A \rightarrow B \vee \neg B$, without the least interference with the positive ideas." (p. 182)

(1) Other scholars, notably Urquhart and Gabbay, have thought independently about classical negation in relevant logics. But [1], so far as we know, contained the first demonstration that the system R + does not collapse under the admission of such negation." (p.183)
Referencs
[1] R.K. Meyer and R. Routley, Classical relevant logics (I), *Studia Logica*, 32 (1973), pp. 51-68.
[2] R. Routley and R.K. Meyer, The semantics of entailment (I), *Truth, Syntax and Modality*, edited by H. Leblanc, forthcoming, North-Holland, 1973.
[3] A.R. Anderson and N.D. Belnap, Jr., *Entailment*, vol. 1, forthcoming [Princeton: Princeton University Press 1976].

45. ———. 1974. "E is a Conservative Extension of E_i." *Philosophia* no. 4:223-249.

"The purpose of the present note is to solve the most recalcitrant of the conservative extension questions presented by Anderson for E in [1], by showing that E is a conservative extension of the system E_i, formulated as in [2]. The proof proceeds by reducing this question to the analogous question for the system NR introduced by the first author [Meyer](1) I in [3] and which was studied by us semantically in [4]. By showing that NR is a conservative extension of an appropriate system NR_i,, we complete the proof. The result is of interest, as was noted in [1], in that E_i is under more firm control that E, having been Gentzenized and furnished with a decision procedure in [2].(2) The method of proof, too, is of some interest, the most important part of the argument (in II below) lying in the replacement of truth-functional &, V with their intensional analogues -, + in adapting the characterization of [4] of theory and of prime theory in an appropriate completeness proof. One concludes that the point of view of [4], and of related papers, is less dependent on properties of &, V - in particular, their general lattice properties - than one might have thought. Hopefully this will yield further insight into the semantics of E, which though in a sense completed in [6] and [7], remains too formally cluttered to be completely satisfactory.(3)." (p. 223)
(1) Bacon had the idea earlier, and independently. In principle it's due to Anderson and Belnap. And accordingly to Ackermann. And accordingly ... to Adam.
(2) We suppose, too, that E_i and NR_i have appropriate finite model properties on the present semantics, given the result of [10] that R_i has the finite model property. For E and NR and R, on the other hand, these questions are open.
(3) In contrast, e.g., to R.
References
[1] A.R. Anderson, "Some open problems concerning the system E of entailment," *Acta Philosophical Fennica* 16 (1963), 7-18.
[2] N.D. Belnap, Jr., and John R. Wallace, "A decision procedure for the system E_i of entailment with negation," *Zeitschrift fur mathematische Logik und Grundlagen der Mathematik* 11 (1965), 277-89.
[31 R.K. Meyer, "Entailment and relevant implication," *Logique et Analyse* 11 (1968), 472-9.
[41 R. Routley and R.K. Meyer, "The semantics of entailment II" *Journal of Philosophical Logic* 1 (1972), 53-73.
[51 A.R. Anderson, and N.D. Belnap, Jr., *Entailment,* Princeton, 1974.
[6] R. Routley and R.K. Meyer, "The semantics of entailment IV," *The Journal of Symbolic Logic*, forthcoming [Appendix 1 to *Relevant Logics and their Rivals. Vol. 1: The Basic Philosophical and Semantical Theory*, (1982), pp. 407-424]
[7] Kit Fine, "Models for entailment," forthcoming [*Journal of Philosophical Logic*, 3, 1974, pp. 347-372]

46. Routley, Richard, Meyer, Robert K., and Goddard, Lenn. 1974. "Choice and Descriptions in Enriched Intensional languages — I." *Journal of Philosophical Logic* no. 3:291-316.

Reprinted in: Edgar Morscher, Johannes Czermak, Paul Weingartner (eds.). *Problems in Logic and Ontology*, Graz: Akademische Druk-u Verlaganstalt 1977, pp. 147-172.

"Many intensional logicians have not abandoned, as unrealisable, the dream of something like Leibniz's *characteristica universalis*, of an almost universal logical language, with simple components, and with a
precise and acceptable semantics, within which the whole of (English) discourse can be expressed, and whose semantics provides theories of truth, consequence and meaning for the discourse expressed. Admittedly things did seem rather desperate when, after the initial successes of the pioneering days of Wittgenstein's *Tractatus Logico-Philosophicus* and Camap's *The Logical Syntax of Language* had faded, it was shown that the theories of these texts fail at point after point. However, most of the objections which were taken as winning the day against these theories - for example the inability of the theories to cope at all adequately with intensional discourse, with context dependence, with non-significance and other discourse failures - are now seen to rest on the paucity of the logical, and especially semantical, equipment then available, not in inherent limits to logic and semantical analysis.(1) make the dream a little more real then, both the logical syntax and the semantical framework will have to be much enriched.(2)

Realising the dream involves however a very ambitious program. We don't pretend to know whether it can be brought off, or how exactly.

But we do believe that if the program is to stand a chance of succeeding its logical theory will have to include enrichments like those we go on to discuss. These enrichments in turn however lead to many new problems, several of them philosophical (and the regress in philosophical problems set up by technical solutions to earlier philosophical problems may well be vicious). We opt, in later sections of the paper, to concentrate on one important set of these problems, one which has a special bearing on the shape the grand semantics should take, the general admission of descriptions into intensional discourse, and of a choice descriptor in particular." (p. 291)

(1) This point is elaborated in [1], Chapter 4.

(2) Ideally these developments would be carried out in combination since, as Montague has emphasized (e.g. [2] p. 212), 'there will often be many ways of syntactically generating a given set of sentences, but only a few of them have semantic relevance'. Ideally - but there is a danger, in the current rudimentary state of semantical and context theory, that important notions, as well as discourse that cannot be properly digested by the theory, will be inadequately or roughly treated, if investigated at all.

References

[1] L. Goddard and R. Routley, *The Logic of Significance and Context Scottish Academic Press*, Edinburgh, 1973.

[2] R. Montague, 'English as a Formal Language' in *Linguagi nella società e nella tecnica* (edited B. Visentini ef al., Edizioni di Communità, Milan, 1970, pp. 189-223. [Reprinted in R. H. Tomason (ed.), *Formal Philosophy: Selected Papers of Richard Montague*, New Haven: Yale University Press, 1974. pp. 188-221]

47. Routley, Richard, and Routley, Val. 1974. "Degree of Conclusiveness of Arguments, and a new Probability Logic (Abstract)." *Journal of Symbolic Logic* no. 39:207.

48. ———. 1974. "The Semantics of Belief and the Laws of Thought and Myth (Abstract)." *Journal of Symbolic Logic* no. 39:206-207.

49. ———. 1974. "Intensional Quantification and Choice in Intensional Logics (Abstract)." *Journal of Symbolic Logic* no. 39:207.

50. Routley, Richard. 1975. "Universal Semantics?" *Journal of Philosophical Logic* no. 4:327-356.

"It is a vogue idea that semantical analyses of natural languages such as English can be accomplished within the framework of a λ-categorial or type-theoretical

language,(1) or of a language which can be included in such a λ-categorial language (e.g. Montague [7], Lewis [6], Parsons [8], Tichy [17], Cresswell[3]).
The leading assumption are (1) that the surface structure or grammar of a given language can be transformed, or translated, by a series of reductions into a canonical form, commonly called 'deep structure', which is appropriately λ-categorial or as a special case thereof, categorial), and (2) that the semantic, which it is enough of course to furnish for the deep structure, is (some complication of) a two-valued possible worlds semantics. The assumed procedures is exhibited in a rudimentary way in the pedagogical practice of transforming English arguments into quantified modal logic as a preliminary to assessing validity, etc." (p. 327)
References
[3] M.J. Cresswell, *Logics and Languages*, Methuen, London, 1973.
[6] D. Lewis, 'General Semantics, *Synthese* 22 (1970) 18-67; reprinted in *Semantics of Natural Language* (ed. by D. Davidson and G. Harman), p,p. 169-218.
[7] R. Montague, 'Universal Grammar', *Theoria*, 36 (1970) 373-398.
[8] T. Parsons, 'A Semantics for English', unpublished draft (1972).
[17] P. Tichy, 'An Approach to Intentional Analysis', *Noûs* 5 (1971) 273-297.

51. ———. 1975. "The Role of Inconsistent and Incomplete Theories in the Logic of Belief." *Communication and Cognition* no. 8:185-235.

52. ———. 1975. "Review of Eight Articles in English and German by Riddler, by Ohnishi, and by Matsumoto, on Gentzen Methods in Modal Logic." *Journal of Symbolic Logic* no. 40:97-98.

53. Routley, Richard, and Meyer, Robert K. 1975. "Towards a General Semantical Theory of Implication and Conditionals. I. Systems with Normal Conjunction and Disjunction and Aberrant and Normal Negations." *Reports on Mathematical Logic* no. 19:67-90.

54. Routley, Richard. 1976. "The Semantical Metamorphosis of Metaphysics." *Australasian Journal of Philosophy* no. 54:187-205.
"Much fresh light is cast on traditional metaphysical proposals, and on associated philosophical programmes designed to indicate or explain these proposals, by recent rapid advances in the areas of discourse which succumb to semantical analysis. Indeed, through semantical analysis various pervasive metaphysical proposals--which lie behind and thus propel modern philosophical programmes--can be conclusively demonstrated in appropriately qualified form, and the strength, limitations, and inadequacies of the more traditional forms can be revealed." (p. 187)
(...)
"The main thesis to be argued on this point is simply that *many philosophically influential reductive positions, when generously construed, furnish semantical analyses whose correctness can be demonstratively established*. In short, the *wide* reductions, taken as semantic analyses, are necessarily true, and thus reconcilable with transcendental positions.
Where this is so the reductions furnished are not paradoxical, or wrong, but demonstrably correct, and not trivial, though sometimes virtually platitudinous. So results the promised synthesis.
What has generally happened, however, is that the reductions adopted are intended to work with a narrower reduction base which fits in with some cherished programme, such as empiricism. Under this contraction
of the base, the reductions cease to be demonstrable, and succumb to formal counter-examples and their more familiar intuitive analogues; and it is under these narrow construals that the reductions are paradoxical in Wisdom's sense.[*] But one important reason why the reductions are so appealing, a reason which Wisdom neglects, is that they rely on widened, correct, versions of the reductions where further situations are admitted into the analysis." (p. 193)
[*] See John Wisdom, *Paradox and Discovery*, Oxford Blackwell, 1965.

55. ———. 1976. "The Durability of Impossible Objects." *Inquiry* no. 19:247-250.
See the Reply by Karel Lambert (pp. 251-253).
"Meinong's theory of impossible objects, though an enduring contribution to semantics, has been subject to much misrepresentation and to repeated criticism, much of it based on Russell's criticism of the theory. Lambert, in an unusually sympathetic discussion of Meinong's theory argues that:
Russell's well-known argument fails. However, it is possible to augment Russell's argument against Meinong with sound Russellian principles in such a way that it presents at least a strong inclining reason against
Meinong's theory of impossible objects.(1)
The object of this note is to show that Lambert's 'augmentation of Russell's argument to show that there are at any rate no impossible objects' (p. 310) fails, and fails for essentially the reasons that Russell's well-known argument fails." (p. 247)
(1) K. Lambert, 'Impossible Objects', *Inquiry*, 17 (1974), pp. 303-14; quotation from abstract, p. 303. All page references in the text are to this article.

56. Routley, Richard, and Meyer, Robert K. 1976. "Dialectical Logic, Classical Logic and the Consistency of the World." *Studies in Soviet Thought* no. 16:1-25.
Italian Translation: "Logica Dialettica, Logica Classica e Non-Contraddittorietà del Mondo", in Diego Marconi (a cura di), *La formalizzazione della dialettica*, Torino: Rosenberg & Sellier 1979, pp. 324-353.
"Dialectical logic, especially Soviet logic, has customarily received sharp and summary treatment at the hands of Western critics.
(...)
To date classical logic - which is Western mainstream logic - has been strongly on the offensive in the ideological logical warfare between East and West, with many supporters in fact among the Soviets, and dialectical logic has been very much on the defensive. The object of this paper is to try to upset this ideological power structure by furnishing dialectical logic with the framework at least of a viable semantics, and at the same time to shatter the imperviousness of mainstream Western logic, and thereby to assist the cause of that newer, less orthodox and so far minor, logical theory - relevance logic.
It will emerge that the differences between the orthodox Western and Soviet positions cannot be satisfactorily represented as logic, or formal or classical logic, on the one side, and anti-logic or the rejection of formal logic on the other; each position can furnish viable, equally formal, but competing logical theories, and the differences between these positions will come down to philosophical differences about such highly debatable and empirically untestable matters as the consistency of the world." (p. 1)

57. ———. 1976. "Every Sentential Logic has a Two-Valued Worlds Semantics." *Logique et Analyse* no. 19:345-365.
"No one anywhere will design a sentential logic without a quite familiar kind of semantics, and no one can now scorn any such logic just because it lacks a semantics. For just as every sentential logic has a characteristic Lindenbaum algebra, so, and less trivially, every such logic has a bivalent relational (and also an operational) semantics." (p. 345)
(...)
"But even if the models the method generates are sometimes skew, or even inconsistent, the method promises a big payoff not only in logic, but also for linguistics and philosophy. This payoff will be increased still further when the methods are extended to logics and languages far richer than sentential ones, as they can be (see [8]). Indeed the method presented below already suffices for all zero-order logics under a truth-valued interpretation; but for an objectual semantics further features have to be included in the models (see [10]). We conjecture that every logic has a two-valued worlds semantics ; but there remain some conspicuous problems in the way of proving such a result, e.g. the problem of characterising logics and logical languages generally. The logical payoff comes through the theories and results semantical analyses of logics and languages open up, for

example, theories of truth, reference, meaning and consequence, and, less generally, results such as compactness, separation and decidability. The philosophical and linguistic pay-off derives from this logical payoff: it is that any area of language that can be supplied with an exact logical syntax and set of principles can automatically be furnished with an extensional semantics, and so provided with associated logical theories of truth, meaning, consequence and so on. If, for example, the theory of propositional attitudes or notions such as belief or perception have a logic, or a structure, then they have a worlds semantics." (p. 347)
References
[8] R. Routley, «Universal Semantics?» *Journal of Philosophical Logic*, 4 (1975), 327-356.
[10] R. Routley, «General model theory I. Every quantificational logic is complete». [typescript, Canberra 1974]

58. Routley, Richard, and Montgomery, Hugh. 1976. "Algebraic Semantics for S2° and Necessitated Extensions." *Notre Dame Journal of Formal Logic* no. 17:44-58.
"Algebraic techniques are used to show that Feys' system S2°(cf. [1]) and certain necessitated extensions of S2°, such as Lewis' systems S2 and S3, have the finite model property, and accordingly are decidable.
Representation theorems are then used to establish set-theoretical semantics for the modal systems studied. Where the results obtained are not new they improve on earlier results (such as those of Lemmon in [3]) in two respects; first they provide direct algebraic treatments of the systems, and second they furnish better semantical results (see the discussion of theorem J for S2). The techniques used however follow those of McKinsey (in [4]) and Lemmon (in [2] and [3]). Since it is now known that these techniques do not work for all necessitated extensions of S2°, a somewhat piecemeal approach is inevitable. Weak results are also obtained for Feys' system Sl° and Lewis' system SI (for details of these systems see [1])." (p. 44)
References
[1] Feys, R., Modal Logics, E. Nauwelaerts, Louvain (1965).
[2] Lemmon, E. J., "Algebraic semantics for modal logics I," *The Journal of Symbolic Logic*, vol. 31 (1966), pp. 46-65.
[3) Lemmon, E. J., "Algebraic semantics for modal logics II," *The Journal of Symbolic Logic*, vol. 31 (1966), pp. 191-218.
[4] McKinsey, J. J. C., "A solution of the decision problem for the Lewis systems S2 and S4, with an application to topology," *The Journal of Symbolic Logic*, vol. 6 (1941), pp. 117-134.

59. Routley, Richard. 1977. "Meaning as Semantical Superstructure: A Universal Theory of Meaning, Truth and Denotation?" *Philosophica (Belgium)* no. 19:33-67.
"It is one thing to give a general theory of or semantics for truth, or even for truth and significance, and thereby provide for the main ingredients of a full theory of referential (or denotation style) notions. It is quite another, so it is commonly enough claimed (following Quine [1]), to characterise any of the notions of the full theory of meaning - synonymy, sense, entailment, and so forth. The extent to which this popular dogma - one of the newer dogmas of empiricism - is correct, is an issue even within empiricist semantics." (p. 33)
(...)
"Because intensional discourse has to be encompassed in the theory of truth, the general semantical framework of a satisfactory theory has to include worlds far beyond the actual, or the like. But in including these - especially impossible worlds, which are essential for example, for the semantical analysis of propositional attitudes such as belief (see [14]) - it far exceeds what is empirically admissible. By including these
worlds, however, the *full* theory of truth offers a framework for definitions of central intensional notions, such as meaning: but a less extensive modelling, with worlds restricted to the actual or to those of modal logics, would *not* suffice." (p. 36)
References

[1] W.V. Quine, *From a Logical Point of View*, Second revised edition, Harvard University Press, 1961.
[14] R. and V. Routley, 'The role of inconsistent and incomplete theories in the logic of belief', *Communication and Cognitio*n, 8 (1975), 185-235.

60. ———. 1977. "Welding Semantics for Weak Strict Modal Logics into the General Framework of Modal Logic Semantics." *Zeitschrift für mathematische Logik und Grundlagen der Mathematik* no. 23:497-510.
"Weak strict modal logics, strict modal logics which are weaker than systems which contain the rule of necessitation (that where *A* is a theorem so is its necessitation, □A), form an important, but somewhat neglected and under-rated, class of modal logics. They have, however, attractive semantics which form an integral part of general semantics for modal logics. A sentential *modal* logic is a system which includes as well as classical sentential logic *SL*-taken to hold at *every* world-at least one oneplace non-truth-functional connective, □ say. Semantics for sentential modal logics are a special case of the universal semantics of [4], with the rules for classical connectives reducing to classical evaluation rules (such as Iii) and Iiii) below). With just one further modelling condition, a natural semantics for weak strict modal systems emerges. Semantics for such systems are, of course, far from uniquely determined." p. 497)
References
[4] ROUTLEY, R., and R. K. MEYER, Every sentential logic has a two valued words semantics. *Logique et Analyse* 19 (1976), 174-194.

61. ———. 1977. "Choice and Descriptions in Enriched Intensional languages II." In *Problems in Logic and Ontology*, edited by Morscher, Edgar, Czermak, Johannes and Weingartner, Paul, 173-204. Graz: Akademische Druck- u. Verlagsanstalt.

62. ———. 1977. "Choice and Descriptions in Enriched Intensional languages III." In *Problems in Logic and Ontology*, edited by Morscher, Edgar, Czermak, Johannes and Weingartner, Paul, 205-222. Graz: Akademische Druck- u. Verlagsanstalt.

63. ———. 1977. "Postscript: Some Setbacks on the Choice and Descriptions Adventure." In *Problems in Logic and Ontology*, edited by Morscher, Edgar, Czermak, Johannes and Weingartner, Paul, 223-227. Graz: Akademische Druck- u. Verlagsanstalt.

64. ———. 1977. "Ultralogic as Universal?" *Relevance Logic Newsletter* no. 2:50-90 and 138-175.
Reprinted in: R. Routley, *Exploring Meinong's Jungle and Beyond*, (1980) pp. 892-962 and in R. Routley, V. Routley, *Ultralogic as Universal? The Sylvan Jungle — Volume 4 with notes and commentaries* (2019).

65. Routley, Richard, and Meyer, Robert K. 1977. "Towards a General Semantical Theory of Implication and Conditionals II: Improved Negation Theory and Propositional Identity." *Reports on Mathematical Logic* no. 21:47-62.

66. ———. 1977. "Extensional Reduction I." *The Monist* no. 60:355-369.
"Philosophers of modern logic have cherished no project more dearly than that of extensional reduction. Despite occasional protests that this project was ill-conceived from the start, or that it fails to account for important areas of experience and thought, the extensionalist mills have been grinding away anyhow. Their grinding has brought with it a number of important technical successes, replete with philosophical claims that light has finally been shed on areas hitherto buried in incomprehensible darkness.
There has, frankly, always been something self-serving about these claims. A man who understands no language but French will find nothing comprehensible until it has been translated into French. This does not mean, surely, that Shakespeare reads better in French than in English. It means rather that those who are unwilling to make the effort to comprehend Shakespeare in his native linguistic habitat will have to make do with what can be preserved of him in a foreign language.

Nevertheless, the fruits of the project have been impressive. Nor is there any doubt that some areas?e.g., Lewis-style modal logics?have been rendered, if not necessarily more intelligible, at least simpler and closer to what one took to be an underlying philosophical motivation?e.g., by Kripke-style possible world analysis. So, in short, it seems good to us to have another look at the entire program of extensional reduction. We shall ask in particular whether successful extensional reduction should be taken as a touchstone of good semantical analysis. Relevant to this question will be certain technical results to be newly presented here." (p. 355)