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BELNAP, NUEL DINSMORE JR. (1930–)

Nuel Belnap was born on 1 May 1930 in Evanston, Illinois. He received an Illinois BA in 1952, and moving to Yale for postgraduate study in logic under the supervision of Alan Anderson, he received an MA in 1957 and a PhD in 1960. After graduation, Belnap continued to work at Yale as an Assistant Professor until 1963, whereupon he moved to the Department of Philosophy at the University of Pittsburgh to take up a position as an Associate Professor. He remains there to this day, where he is now the Alan Ross Anderson Distinguished Professor of Philosophy, in addition to holding positions in Sociology, History and Philosophy of Science, and in the Intelligent Systems Program.

Belnap's research covers logic and related fields such as the philosophy of language and metaphysics and philosophy of science. His name is most often associated with his teacher and colleague Alan Anderson and their research program in *relevance logic*. Belnap's research, with Anderson, and their colleagues and students, first at Yale, and then at Pittsburgh, provided a rigorous formal theory of logical consequence and implication that takes account of *relevance*. The two volumes *Entailment* (1975, 1992) provide a survey of work in this field, which has continued since the 1950's. Belnap's contributions to relevance logic are too numerous to list here, but many have gone on to shape a thriving, if not quite orthodox, research community. A good example of Belnap's contributions here is his paper "Display Logic" (1982), which develops a new way of seeing the structure of proof, encompassing classical, intuitionistic, modal and relevance logic.

Belnap's research is not restricted to relevance logic. He has also written extensively on the logic of questions (1976), arguing against formal logic's near-exclusive focus on declarative forms; on truth, working on both the *prosentential* theory of truth (with Grover and Camp, 1975) according to which "is true" functions something like a pro*sentence* in analogy with pronouns, and on the *revision* theory of truth (with Gupta, 1993), arguing that the circular phenomena exhibited self-referentially paradoxical sentences (such as the liar: "this sentence is not true") should not be avoided but rather, should be taken to be a defining feature of the concept.

More recently, Belnap has published on the philosophy of physics, and the semantics of agency in his work on *branching spacetime* (1992) and on the STIT (for "sees to it that") theory of agency, (*Facing the Future* 2001). This work takes the picture of branching times (or space-time locations, in a relativistic setting) as the grounds of a precise theory. In the context of metaphysics, Belnap provides a theory of indeterminism in branching time that is consistent with general relativity and the absence of a single privileged "present moment." In the context

of semantics and agency, STIT theory provides a formal setting for understanding indeterminism, choice and the open future.

Belnap's work is often collaborative, and he has played a central role in supporting and developing work in philosophical logic in the United States, and elsewhere. At Pittsburgh, Belnap has taught many graduate students, many of whom, such as Robert K. Meyer, J. Michael Dunn and Alasdair Urquhart, have gone on to become eminent logicians in their own right. Furthermore, Belnap played a major role in the formation for the *Society of Exact Philosophy* (serving as Vice-President from 1971–1974, and President from 1974–1976), and the *Journal of Philosophical Logic* (serving on the editorial board from 1970 to date, as treasurer from 1970–1976, vice president from 1976–1982, and chairman of the Board of Governers from 1982–1988). Both the *Society* and the *Journal* have been crucial to the success of philosophical logic as a discipline in philosophy in North America in the second half of the 20th Century.

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LAMBERT, J. KAREL (1928–)

J. Karel Lambert was born in 1928 outside Chicago, Illinois. He received a BA (1950) from Willamette University and an M.S. a year later from the University of Oregon in Experimental Psychology. In 1956 he finished graduate school at Michigan State University writing a doctoral thesis (*A Logical-Mathematical Analysis of Tolman's Theory of Learning*) under Henry S. Leonard (Philosophy) and M. Ray Denny (Psychology). His first position was as Assistant Professor in the Psychology Department at the University of Alberta in Canada.

However, Lambert was not to stay working in psychology for long. During his doctoral study, he became convinced that a revision in classical predicate logic was required: a revision to accommodate non-denoting singular terms (such as "the knife seen by Lady Macbeth" or "five divided by zero") as genuine singular terms and not merely as disguised descriptive phrases. Lambert came to this conclusion through considerations in psychology, and in particular, through the requirements for formalising a theory of learning. So while in Alberta, Lambert developed "free logic" in the early 1960s. The development of revisions of the classical predicate calculus to admit non-denoting terms was not unique to Lambert. In the 1960s, a number of other proposals emerged (for example, those due to Henry Leonard, Hugues Leblanc, and Jaakko Hintikka). Nonetheless, it is fair to say that Lambert's formalisation of free logic — and especially his proposal for combining free logic with a theory of definite descriptions, proposing a law governing descriptions now acknowledged as *Lambert's Law* — is the default position among proponents of free logic. For accessible recent discussions of Lambert's work, see Lambert's survey article "Free Logics" (2001).

As a result of the shift in his research interests to logic and the philosophy of science, Lambert transferred to the Philosophy department at the University of Alberta in the early 1960s, and then in 1963 he became Professor and Chairman of the Department of Philosophy at West Virginia University. Alongside his responsibilities administering the department, Lambert's research on free logic and free definite description theory continued, and Lambert regularly taught classes on the philosophy of science. These lectures were eventually published in 1970 in *An Introduction to the Philosophy of Science* (written with Gordon Brittan). This textbook has been widely used to teach introductions to the philosophy of science, and it has been translated into a number of languages and published in multiple editions (the latest in 1992).

In 1967 Lambert moved to the University of Calfiornia, Irvine as Professor. He remains there to this day, having taken up a position as Research Professor of Logic and the Philosophy of Science in 1994. His more recent research has continued to develop the formal theory of free logic, together with explorations of applications in metaphysics, philosophy of language, philosophy of science, and, more recently, in the theory of computation. His book *Meinong and the Principle of*

Independence (1983) is a detailed study of Meinong's distinction between being (*sein*) and "being so" (*sosein*). Long derided as incoherent after Bertrand Russell's devastating critique, Lambert shows that Meinong's account contains much from which we can learn. He uses the tools of free logic and shows that the theory of predication — and in particular, the options for the truth or falsity of *atomic* predications — is more complicated than the standard classical picture would lead us to believe. Another application of Lambert's work in free logic is to be found in the more recent literature on free logic and the theory of computation. Lambert's collaboration with the computer scientist Raymond Gumb (1997) provides a good example of how these techniques have also found a home outside philosophy.

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