

Ruth Barcan Marcus (1921–)

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After undergraduate work in mathematical logic with J. C. C. McKinsey, Ruth Barcan proceeded to Yale to work with F. B. Fitch and to produce a Ph.D. dissertation in modal logic. In the mid-1960s she established the philosophy department at the University of Illinois at Chicago. Later she moved to Northwestern University and to Yale University. She has been President of the Western Division of the American Philosophical Association and of the Association for Symbolic Logic and has been the recipient of many grants and awards, including the Medal of the Collège de France and an honorary doctorate from the University of Illinois.

Ruth Marcus is the author of the earliest published work in modal predicate logic, that is, modal propositional logic extended with quantifiers and predicates. Her first article appears in volume 11 of *Journal of Symbolic Logic* (Barcan 1946). (Rudolf Carnap's "Modality and Quantification" appears later in the same volume.) It is perhaps surprising that although modal logic in the form in which we know it today dates from an article in *Mind* by C. I. Lewis in 1912, it was not until 1946 that there is any consideration in print of what happens when quantifiers and predicates are added. In her first article Marcus considers the predicate extensions of the systems of modal logic known as S2 and S4. S2 was Lewis's preferred modal system, and is the one developed in detail in Lewis and Langford 1932. Many of the theorems of modal predicate logic are simply instances of non-modal predicate logic or of modal propositional logic, but some are not. Of these an axiom that Marcus adopted was $\diamond\exists xA \Rightarrow \exists x\diamond A$ where \diamond is the modal possibility sign, and \Rightarrow is the sign for "strict implication," and where $A \Rightarrow B$ is defined as $\sim\diamond(A \ \& \ \sim B)$. Arthur Prior (1956: 60) called " $\diamond\exists xA \Rightarrow \exists x\diamond A$ " the "Barcan Formula" and the name has stuck. Whether or not to include the Barcan Formula as a truth of modal logic has been a matter of much controversy. Prior (1957: 26) argued that the temporal version of this formula should be rejected on the ground that a sentence like "it will be that someone will be alive in 2150" does not entail that there is anyone who will be alive then. (Prior's example was flying to the moon, but that is now a little anachronistic!) Marcus herself has entered this discussion by defending the formula. She protested (in Marcus 1962) against the reading of $\exists xA$ as "there exists an x such that A ," and proposed instead (p. 252) that it be read as either "some substitution instance of A is true" or, alternatively, as "there is at least one value for x for which A is true." Such a reading allows the quantifier to speak of things which, in the

temporal case, no longer exist or do not yet exist, and in the modal case do not exist but might have.

The alternatives are slightly different. The second can be treated in possible-worlds semantics if the domain of the quantifiers is expanded to include possibilia (things which exist in other worlds but may not exist in ours). The first alternative is the one Marcus herself has championed; it is to adopt a substitutional interpretation of quantification, whereby $\exists xFx$ is true iff Fa is true for some constant a . Marcus's views on this have been developed in more recent work, most of which has been reprinted in *Modalities* (1993). On the substitutional interpretation the Barcan Formula is uncontroversially true, since if $\Diamond\exists xFx$ is true then $\exists xFx$ might have been true. But then, by the substitutional account of the quantifier, some instance Fa of Fx might have been true, and so $\Diamond Fa$ will be true, and so $\exists x\Diamond Fx$ will be true. Nothing is said here about whether or not a exists in this or any other possible world (or perhaps more accurately whether the name " a " refers to anything) though Marcus is not unsympathetic to a defense of the formula in terms of a fixed domain, and undertakes such a defense herself, in *Modalities* (1993: 21f.). There is of course a question of what it means to say that Fa is true. Marcus's attitude is that this is an issue about the interpretation of singular statements involving names, and not an issue about quantification, and that it is a virtue of the substitutional interpretation that it divorces these two questions. It is no longer possible to follow Quine and locate the commitment in the quantifiers via the satisfaction of an open sentence of the form Fx .

In one of Marcus's early papers (Barcan 1947) there is a theorem that if x and y are identical then this is necessarily so. Marcus derives this from the standard principle in ordinary non-modal predicate logic with identity that if $x=y$ then any two formulae that differ only in that one has free x in some places where the other has free y are equivalent. Yet it seems that although nine and the number of the planets are identical, for there are nine planets, this identity is not necessary, for there might have been more or fewer. It is now a commonplace that this puzzle is easily solved by Russell's theory of descriptions without giving up Marcus's theorem about the necessity of identity, as was shown by Arthur Smullyan in the 1948 *Journal of Symbolic Logic*. Yet in 1962, when Marcus presented a paper on the role of identity in modal languages, it was (as she says in her introduction to the paper in 1993: 3) a mistaken assumption on her part that Smullyan's paper was fully appreciated. The appendix to this paper, based on a taped discussion between Marcus, Quine, Kripke, Follesdal, and others, makes it clear how difficult it was to come to grips with these issues in the days before the power of possible-worlds semantics for modal logic was widely understood. Some of Quine's worries about quantified modal logic are on the grounds that it leads to "Aristotelian essentialism." Although noting that modal predicate logic is not committed to essentialism Marcus concedes that it is compatible with it, and defends a form of essentialism in which the modalities are understood causally (1993: 67–70).

Marcus is a strong supporter of the causal theory of names. Proper names, on this view, have as their meaning nothing more than the object they denote, and they are able to have this meaning in virtue of a causal connection between an initial "dubbing" of the object and subsequent uses of the name. (It is somewhat unfortunate that a dispute has grown up, to which neither Marcus herself nor Kripke is a party, about the historical priority between her and Saul Kripke on the treatment of names as mere

“tags” rather than as descriptions. Whatever might be said about that issue does not in the least detract from the value of Marcus’s views on these matters.) If quantification depends on naming, and if naming demands a causal connection, then it is difficult to see how quantification could ever apply to things that do not exist. The causal view of course goes very happily with the view that ontology is linked to reference. “Actual objects are there to be referred to. Possibilia are not” (1993: 205).

Many attempts to defend possibilia appear to be based on the view that we can refer to non-actual objects like Pegasus and Sherlock Holmes. Marcus rightly rejects such attempts. She is also rightly points out (1993: 194) that sentences such as “the winged horse does not exist,” when analyzed according to Russell’s theory, involve no reference to a possible but non-actual winged horse (see RUSSELL). But she is well aware that the difficult cases are not these. They are sentences like “There might have been more things than there are,” where there is no question of referring to any of them. A philosopher with a more realistic attitude to possible worlds than Marcus might no doubt say that any possible but non-actual object can be referred to, but of course only in a world in which it exists, not in our world. Marcus’s attitude to such views is not sympathetic and she speaks of such semantics for quantified modal logic as providing it with “a different subject matter from that of non-modal logic” and as not being “a straightforward extension of standard predicate logic” (1993: 191).

A third theme in Marcus’s work is connected with contradictions. She defends the claim that moral dilemmas are real, but need not threaten the consistency of a moral code. If we think of a moral code as a set of sentences, then a code will be inconsistent if and only if all its members cannot be simultaneously true. In this sense a consistent code may well allow the possibility of dilemmas. For suppose that the code says that if p then Oq (“ Oq ” means that q is obligatory) and that if p then $O\sim q$ (it is obligatory that not q). If this is formalized as $(p \rightarrow Oq) \ \& \ (p \rightarrow O\sim q)$ then even if we grant that Oq and $O\sim q$ are jointly inconsistent it still does not follow that $(p \rightarrow Oq) \ \& \ (p \rightarrow O\sim q)$ is inconsistent since $(p \rightarrow Oq) \ \& \ (p \rightarrow O\sim q)$ will be true if p is false. In describing a game, Marcus says “a game might be so complex that the likelihood of its being dilemmatic under any circumstances is very small and may not even be known to the players” (1993: 134). If I have understood her correctly, her point is that although it is possible that the moral life might land us in situations where we cannot do the right thing, yet moral dilemmas may often be avoided provided that the world cooperates. She endorses a second-order moral principle (pp. 139f.) to the effect that we should so order our lives that as far as possible they are in fact avoided.

Her attitude to believing the impossible is different. An impossible proposition is a proposition true in no possible world. So there is no possible world which would be the way things are if a belief in an impossibility were true. Yet it would seem that we often do believe contradictions. Marcus discusses Kripke’s well-known example of Pierre who believes that London (the city he knows as “Londres”) is pretty, and also that London (a city he has come to know as “London”) is not pretty. Since this conjunction is a contradiction Marcus claims that Pierre cannot have this belief (1993: 158).

Marcus’s work (excluding the early technical articles) has been collected in *Modalities* (1993) and essays in her honor appear in *Modality, Morality and Belief* (Sinnott-Armstrong et al. 1995). However, her influence is not restricted to her writings, and perhaps does not even primarily come from her writings. At the institutions

at which she has taught she has influenced several generations of students who have become leading philosophers; and her role in the international philosophical community has been no less significant.

Bibliography

Marcus's earliest work is listed under her maiden name, Barcan. Of her later articles, those that are referred to specifically are listed here; others can be found in the 1993 collection.

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