

A FORMAL THEORY OF SORTAL QUANTIFICATION

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1 *Introduction* The standard quantification theory, first-order predicate calculus with identity, (called **QT** hereinafter; see [2], §§30, 40, 48, and [9], Ch. 2, §§1, 3, 8, for standard formulations) makes no distinctions between different kinds of one-place predicate. But many philosophical logicians have made a distinction between "sortal" predicates such as 'is a man' and other predicates such as 'is white'. Aristotle introduced the notion of "secondary substance"—the kind of substance a particular thing is, as opposed to the qualities it has ([1], Ch. 5, see especially 2^a11, 2^b29, 3^b10). Frege distinguished concepts which "isolate in a definite manner what falls under them" from those which do not ([3], §54, p. 66), although he did not represent the distinction in his formal system of quantification. In recent philosophical logic, Strawson has distinguished sortal universals from characterizing ones ([18], Ch. 5, §8, p. 168ff), Quine has distinguished terms with divided reference from mass terms ([10], Ch. 3, §19, p. 90ff), and Geach has distinguished substantival countable terms from those which are adjectival or non-countable ([4], Ch. 2, §31, p. 38ff).

We can distinguish between a sortal predicate, e.g., 'is a man', and the corresponding sortal term, 'man'. Grammatical marks of sortal terms are that they admit the definite and indefinite articles, they have plurals, they can appear in the singular after 'every', 'some', 'no', 'this', etc., and in the plural after 'all', 'some', 'most', 'at least two', 'those', etc., and in the singular in phrases of the form 'is the same . . . as'. But words like 'object', 'individual', 'thing', 'entity', etc., pass these grammatical tests. We shall say that a word is a sortal term iff it supplies a *criterion of numerical identity* for whatever it applies to, that is, iff it can occur in true or false sentences of the form 'There are *n* F's such that . . .', where *n* is any integer. The fact that there are no determinate truth-conditions for 'There are three red things in this room' implies that 'red thing' is not a sortal term (cf. [4], p. 38-9 and [3], p. 66). So 'man', 'tree', 'lump of coal', 'university', 'battle', 'real number', 'character in Shakespeare's plays' are sortal terms, but 'white', 'new', 'coal', 'six feet tall', 'interesting', 'came into existence in 1925', 'divisible by three', are not. Thus by the