No philosopher of logic can afford to ignore Quine's work. Like most great philosophers, Quine has been influenced by different and even seemingly incompatible perspectives. From the point of view of influence Quine, I believe, is really two philosophers; a combination of Frege on the one hand, and Dewey on the other. In this paper I want to consider the influence on Quine's theory of logic of Frege's logicism, particularly his universalist theory of logic, and of Dewey's pragmatism or instrumentalism. I want this paper to serve as a prelude to a much more thorough-going pragmatist or instrumentalist theory of logic and mathematics than Quine's. I shall use the terms 'pragmatist' and 'instrumentalist' interchangeably. Quine's views will be subject to criticism from this more radical perspective. An assumption behind this paper is the view that conceptions of, or better, theories of, logic are as a controversial a matter as specific issues in the philosophy of logic. With this, of course, Quine would agree.

1. THE FREGEAN LOGICIST-UNIVERSALIST INFLUENCE

The Fregean influence on Quine is evident in Quine's early work, Mathematical Logic [1940]. Prima facie, it is not easy to see how logicism with its corresponding foundationalism can be made to square with Quine's pragmatism, which is fallibilist. However, the seeming incongruity is dispelled when we see that Quine's foundationalism is much more meagre than Frege's. Quine recognises that set theory is much more problematic than elementary number theory. Quine says:

Clearly we must look to the set-theoretic foundation of mathematics as a way of allaying misgivings regarding the soundness of classical mathematics. Such misgivings are scarce anyway, once such offences against reason as the infinitesimal have been set right. Conceptual unification, merely, is what the set-theoretic foundation is notable for. Foundation ceases to be the apt metaphor; it is as if a frail foundation were supported by suspension from a sturdy superstructure. For the one thing we insist on, as we sort through the various possible plans for passable set theories, is that our set theory be such as to reproduce, in the eventual superstructure, the accepted laws of classical mathematics. . . We may look upon set theory, or its notation, as just a conveniently restricted vocabulary in which to formulate a general axiom system for classical mathematics - let the sets fall where they may. [1964], pp. 33–34.
This kind of pragmatism is far removed from Frege's view. Quine also illustrates with the examples of problems about infinitesimals and about imaginary numbers how, by what Lakatos [1962] calls the 'retransmission of falsity', which is based upon what older logicians called 'antilogism', foundations need to be modified in light of false consequences. This pragmatic outlook leads Quine to consider mathematics as more like physics than like logic:

Thus, it seems that mathematics generally (including geometry and number theory as well as set theory) is from an evidential point of view more like physics and less like logic than was once supposed. On the whole the truths of mathematics can be deduced not from self-evident axioms, but only from hypotheses which, like those of natural science, are to be judged by the plausibility of their consequences. [1970c], p. 29.

Quine, then, may be viewed as advocating a quite consistent position achieved by softening both logicist foundationalism and pragmatism. Steiner puts the former weakening well:

Quine's only claim in favour of the reduction of mathematics to set theory is an Ockhamite lessening of the number of kinds of things that mathematics is forced to contemplate. The theory of classes has the power to unify mathematics, and this goal itself justifies the logicist programme. [1975], p. 19.

The motivation, then, for Quine's logicism is ontological economy, an instance of his taste for desert landscapes. The hope is that we will not need to posit numbers as well as sets.

Frege's universalist view of logic has a more pervasive influence on Quine. Frege, in the introduction to his *Begriffsschrift*, states that he is in agreement with Leibniz's idea of a universal characteristic, of a *calculus philosophicus* or *ratiocinator*. Frege criticizes Leibniz for attempting to supply such a notation 'in one leap' but agrees with the aim, and attempts to further it by 'a slow, step-by-step approximation':

When a problem appears to be unsolvable in its full generality, one should temporarily restrict it; perhaps it can then be conquered by a gradual advance.

It is possible to view the signs of arithmetic, geometry, and chemistry as realizations, for specific fields, of Leibniz's idea. The ideography proposed here adds a new one to these fields, indeed the central one, which borders on all the others. If we take our departure from there, we can with the greatest expectation of success proceed to fill the gaps in the existing formula language, and extend this domain to include fields that up to now have lacked such a language. [1967], pp. 6–7.

Frege is confident that his ideography can be used to establish the validity of proofs in the differential and integral calculus and in geometry, and he