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On the History of Quantifiers: A Mathematical Point of View



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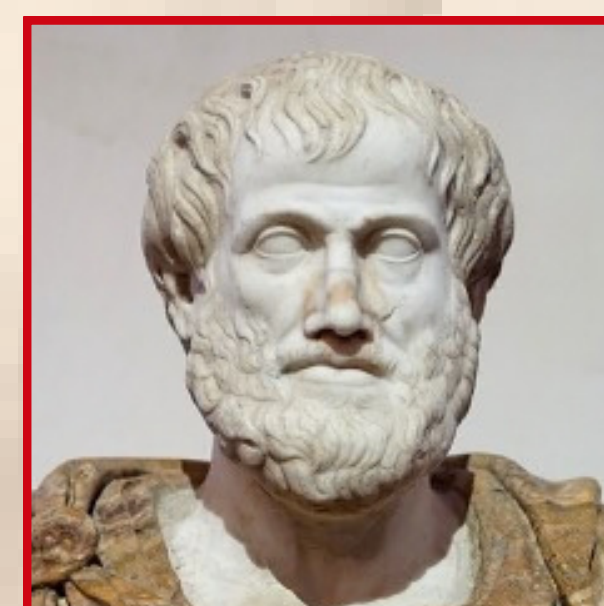
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ABSTRACT:

Explicit quantifiers are omnipresent in modern mathematics. Despite **Aristotle's** early invention of quantified reasoning, with mathematics as a model, mathematicians worked for centuries without explicit quantifiers: they used arbitrary objects instead, such as “any magnitude whatever” or “an arbitrary triangle”. By the eighteenth century, the language of mathematics itself was being questioned: is an infinitesimal a magnitude belonging to the domain over which variables range? The ε - δ definition of a limit (Bolzano, Cauchy, Weierstrass) requires explicit quantifiers with well-defined scopes and domains.

In our historical presentation, **Hilbert** plays an important rôle. Indeed, recent historical studies have challenged the familiar story of a direct path from Frege to modern quantification. Hilbert brought together various influences, arrived at essentially the quantifiers we still use today, and left his own stamp on them. This was an important step both for mathematical practice and for mathematical logic, as we shall see.

Finally, we shall present Hilbert's fascinating ε -calculus, which, in a sense, returns to generic objects and remains an active field of research in proof theory today.



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