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A Calculus of Individuals Based on 'Connection'

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Although Aristotle (*Metaphysics*, Book IV, Chapter 2) was perhaps the first person to consider the part-whole relationship to be a proper subject matter for philosophic inquiry, the Polish logician Stanislow Leśniewski [15] is generally given credit for the first formal treatment of the subject matter in his Mereology.[1] Woodger [30] and Tarski [24] made use of a specific adaptation of Leśniewski's work as a basis for a formal theory of physical things and their parts. The term 'calculus of individuals' was introduced by Leonard and Goodman [14] in their presentation of a system very similar to Tarski's adaptation of Leśniewski's Mereology. Contemporaneously with Leśniewski's development of his Mereology, Whitehead [27] and [28] was developing a theory of extensive abstraction based on the two-place predicate, 'x extends over y', which is the converse of 'x is a part of y'. This system, according to Russell [22], was to have been the fourth volume of their *Principia Mathematica*, the never-published volume on geometry. Both Leśniewski [15] and Tarski [25] have recognized the similarities between Whitehead's early work and Leśniewski's Mereology. Between the publication of Whitehead's early work and the publication of *Process and Reality* [29], Theodore de Laguna [7] published a suggestive alternative basis for Whitehead's theory. This led Whitehead, in *Process and Reality*, to publish a revised form of his theory based on the two-place predicate, 'x is extensionally connected with y'. It is the purpose of this paper to present a calculus of individuals based on this new Whiteheadian primitive predicate.

Although the calculus presented below utilizes most of Whitehead's mereological definitions, it differs substantially from Whitehead's system presented in *Process and Reality*. Whitehead does not axiomatize his theory, but refers to assumptions which include both probable axioms and desirable theorems without any distinction. There is, however, a difficulty with his definitions and assumptions which has led me to revise his system in the

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