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The Mathematics of Charles Sanders Peirce

Louis H. Kauffman[1]

I. Introduction

This essay explores the Mathematics of Charles Sanders Peirce. We concentrate on his notational approaches to basic logic and his general ideas about Sign, Symbol and diagrammatic thought.

In the course of this paper we discuss two notations of Peirce, one of Nicod and one of Spencer-Brown. Needless to say, a notation connotes an entire language and these contexts are elaborated herein. The first Peirce notation is the portmanteau (see below) Sign of illation. The second Peirce notation is the form of implication in the existential graphs (see below). The Nicod notation is a portmanteau of the Sheffer stroke and an (overbar) negation sign. The Spencer-Brown notation is in line with the Peirce Sign of illation. It remained for Spencer-Brown (some fifty years after Peirce and Nicod) to see the relevance of an arithmetic of forms underlying his notation and thus putting the final touch on a development that, from a broad perspective, looks like the world mind doing its best to remember the significant patterns that join logic, speech and mathematics. The movement downward to the Form ("we take the form of distinction for the form."[9, Chapter 1, page 1]) through the joining together of words into archetypal portmanteau Signs can be no accident in this process of return to the beginning.

We study a system of logic devised by Peirce based on a single Sign for inference that he calls his 'Sign of illation". We then turn to Peirce's Existential Graphs. The Existential Graphs lead to a remarkable connection between the very first steps in Logic and mirror plane symmetries of a "Logical Garnet" [30] in three dimensional space. Peirce's ideas about these graphs are related to his ideas about infinity and infinitesimals, and with his more general philosophy that regards a human being as a Sign. It is the intent of this paper to bring forth these themes in both their generality and their particularity.

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