University of Canterbury, Christchurch

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Lectures on Topos Theory

I. A philosophical and historical perspective (cycles and elephants)

II. Local homeomorphisms and sections

III. Yoneda Lemma and Kan Theorem

IV. Presheaves, etale spaces, sheaves
Examples: Sheaves of functions
Spectrum and structure sheaf of a ring

V. Elementary toposes (development of intuitionistic set theory)
Examples: Spatial toposes
G-sets (or more generally $[\mathcal{C}^{op}, Set]$)

VI. Geometric morphisms
Examples: Generalized spaces (sobriety)
Generalized groups
Local structures (local-ringed spaces)

VII. Grothendieck topologies: lex totality; TopSp as a site; Giraud's Thm

VIII. Classifying toposes

IX. Analysis in a topos

X. Representation theory of rings
Example: Kaplansky becomes Swan

XI. Elementary set theory (axiom of choice and theorem of Barr)

XII. Non-standard analysis of A. Robinson

XIII. Independence results in set theory

XIV. Cohomology

XV. Stacks

XVI. Topological groupoids

XVII. Structure Theorem (Grothendieck-Joyal(-Tierney)