THE MYSTERY OF KNOTS

Computer Programming for Knot Tabulation

Charilaos N. Aneziris

Brookhaven National Laboratory
USA
CONTENTS

INTRODUCTION 1

PART ONE, A Knot Theory Primer 11
1) A General Understanding of Topology 13
2) Knot Theory as a Branch of Topology 19
3) The Regular Presentations of Knots 25
4) The Equivalence Moves 29
5) The Knot Invariants 35
6) Elements of Group Theory 43
7) The Fundamental Group 49
8) The Knot Group 53
9) The Colorization Invariants 61
10) The Alexander Polynomial 71
11) The Theory of Linear Homogeneous Systems 75
12) Calculating the Alexander Polynomial 83
13) The "minor" Alexander Polynomials 91
14) The Meridian-Longitude Invariants 97
15) Proving a Knot's Chirality 105
16) Braid Theory - Skein Invariants 113
17) Calculating the HOMFLYPT Polynomials 125
18) Knot Theory after the HOMFLYPT 135

PART TWO, The Problem of Knot Tabulation 141
1) Basic Concepts of Computer Programming 143
2) The Dowker Notation 151
3) Drawing the Knot 155