

Contents

Preamble	1
The Roots of Informatics	3
Informatics and Mathematics	3
Numerical Calculations	7
Arithmetic Computation and Its Mechanization	7
Computation in the Binary Number System	14
Floating-Point Arithmetic	18
Calculations Using Symbols	23
Cryptology	23
Logical Calculation	27
Codes Used in Data Transmission Technology	30
The Principle of Binary Coding	35
Mathematical Roots of the Burgeoning Science of Informatics	36
After 1890: In Thrall to Mechanical and Electromechanical	
Devices	41
Mechanization and Automation of Digital Calculations	41
Mechanical and Electrical Cryptological Instruments	46
Message Coding Technology and Information Theory	53
Instruments and Machines for Propositional Calculus,	
Signaling and Safety Technology	55
Digression into Analog Computers	57
Musical Boxes and Other Precursors of Automata	62
Automata, the Principle of Automatic Machines	63
Process Control as a Precursor of Program Control	64
Universal Program Control	67
Feedback and Regulation	70
After 1935: Formal Languages and Algorithms, ‘Universal	
Machines’ and Electronic Solutions	73
Basic Data Structures	76
Binary Arithmetic	77
Floating-Point Arithmetic	80

Unlimited Integer Arithmetic	81
The Binary Principle	83
Recursive Data Structures and Syntax Diagrams	84
Basic Operative Structures	86
Algorithms	86
Algorithmic Languages	88
Recursion	90
The von Neumann Machine	91
Sequential Formula Translation and Pushdown Mechanisms	93
High-Level Programming Languages and Algorithms	95
Machine-Oriented Programming	98
The End of Analog Computers	100
Systems	100
Recognition Systems	101
Cryptanalysis	104
Effects of Cryptanalysis	106
Networked Systems	107
Digression into Electronic Circuits, Devices and Machines	111
After 1960: Informatics Begins to Take Shape	113
Applications	114
Constructive Logic – ‘Proofs as Programs’, ‘CIP’	115
Programming Languages	116
Software Engineering	118
The Transition to Minicomputers and Highest-Performance Computers	119
Conclusion: Informatics and Microelectronics Are Mutually Dependent	123
Index	129
Index of Figures	139
Selected Readings	141