

Cambridge University Press

0883850370 - From Error-Correcting Codes Through Sphere Packings to Simple Groups

Thomas M. Thompson

Table of Contents

[More information](#)

## CONTENTS

	PAGE
PREFACE .....	vii
CHAPTER 1. THE ORIGIN OF ERROR-CORRECTING CODES .....	1
1. An introduction to coding .....	1
2. The work of Hamming .....	13
3. The Hamming-Holbrook patent .....	27
4. The Hamming codes are linear .....	29
5. The work of Golay .....	33
6. The priority controversy .....	56
CHAPTER 2. FROM CODING TO SPHERE PACKING .....	61
1. An introduction to sphere packing .....	61
2. The Leech connection .....	71
3. The origin of Leech's first packing in $E^{24}$ .....	81
4. The matrix for Leech's first packing .....	87
5. The Leech lattice .....	100
CHAPTER 3. FROM SPHERE PACKING TO NEW SIMPLE GROUPS .....	109
1. Is there an interesting group in Leech's lattice? .....	109
2. The hard sell of a simple group .....	118
3. Twelve hours on Saturday, six on Wednesday .....	120
4. The structure of $\cdot 0$ .....	123
A. Introduction .....	123
B. More on A .....	124
C. The Mathieu groups .....	127
D. The group $N$ .....	137
E. The order of $\cdot 0$ .....	152
5. New simple groups .....	162
APPENDIX 1. DENSEST KNOWN SPHERE PACKINGS .....	176
APPENDIX 2. FURTHER PROPERTIES OF THE (12,24) GOLAY CODE AND THE RELATED STEINER SYSTEM $S(5, 8, 24)$ .....	187
APPENDIX 3. A CALCULATION OF THE NUMBER OF SPHERES WITH CENTERS IN $\Lambda_2$ ADJACENT TO ONE, TWO, THREE AND FOUR ADJACENT SPHERES WITH CENTERS IN $\Lambda_2$ .....	193

Cambridge University Press

0883850370 - From Error-Correcting Codes Through Sphere Packings to  
Simple Groups

Thomas M. Thompson

Table of Contents

[More information](#)

---

xiv

CONTENTS

APPENDIX 4. THE MATHIEU GROUP $M_{24}$ AND THE ORDER OF $M_{22}$ .....	197
APPENDIX 5. THE PROOF OF LEMMA 3.3 .....	209
APPENDIX 6. THE SPORADIC SIMPLE GROUPS .....	211
BIBLIOGRAPHY .....	217
INDEX .....	225