# Contents


Preface vii

**1 Introduction** 1
- 1.1 From classical mechanics to symplectic geometry 1
- 1.2 Symplectic embedding obstructions 4
- 1.3 Symplectic embedding constructions 11

**2 Proof of Theorem 1** 23
- 2.1 Comparison of the relations $\preceq_i$ 23
- 2.2 Rigidity for ellipsoids 24
- 2.3 Rigidity for polydiscs ? 28

**3 Proof of Theorem 2** 31
- 3.1 Reformulation of Theorem 2 31
- 3.2 The folding construction 39
- 3.3 End of the proof 47

**4 Multiple symplectic folding in four dimensions** 52
- 4.1 Modification of the folding construction 52
- 4.2 Multiple folding 53
- 4.3 Embeddings into balls 57
- 4.4 Embeddings into cubes 73

**5 Symplectic folding in higher dimensions** 82
- 5.1 Four types of folding 82
- 5.2 Embedding polydiscs into cubes 84
- 5.3 Embedding ellipsoids into balls 90

**6 Proof of Theorem 3** 107
- 6.1 Proof of $\lim_{a\to\infty} p_a^P(M,\omega) = 1$ 107
- 6.2 Proof of $\lim_{a\to\infty} p_a^E(M,\omega) = 1$ 123
- 6.3 Asymptotic embedding invariants 147

**7 Symplectic wrapping** 149
7.1 The wrapping construction 149
7.2 Folding versus wrapping 157

**8 Proof of Theorem 4** 162
8.1 A more general statement 162
8.2 A further motivation for Problem $\zeta$ 165
8.3 Proof by symplectic folding 168
8.4 Proof by symplectic lifting 177

**9 Packing symplectic manifolds by hand** 188
9.1 Motivations for the symplectic packing problem 189
9.2 The packing numbers of the 4-ball and $\mathbb{CP}^2$ and of ruled symplectic 4-manifolds 194
9.3 Explicit maximal packings in four dimensions 198
9.4 Maximal packings in higher dimensions 213

**Appendix** 215
A The Extension after Restriction Principle 215
B Flexibility for volume preserving embeddings 219
C Symplectic capacities and the invariants $c_B$ and $c_C$ 224
D Computer programs 235
E Some other symplectic embedding problems 238

References 241

Index 247