

Contents

Foreword	ix
1 Definition and Short Time Existence	
1.1 Notation and Preliminaries	1
1.2 First Variation of the Area Functional	5
1.3 The Mean Curvature Flow	7
1.4 Examples	11
1.5 Short Time Existence of the Flow	18
1.6 Other Second-order Flows	23
2 Evolution of Geometric Quantities	
2.1 Maximum Principle	25
2.2 Comparison Principle	28
2.3 Evolution of Curvature	32
2.4 Consequences of Evolution Equations	36
2.5 Convexity Invariance	42
3 Monotonicity Formula and Type I Singularities	
3.1 The Monotonicity Formula for Mean Curvature Flow	49
3.2 Type I Singularities and the Rescaling Procedure	52
3.3 Analysis of Singularities	69
3.4 Hypersurfaces with Nonnegative Mean Curvature	74
3.5 Embedded Closed Curves in the Plane	84
4 Type II Singularities	
4.1 Hamilton's Blow-up	86
4.2 Hypersurfaces with Nonnegative Mean Curvature	95
4.3 The Special Case of Curves	98
4.4 Hamilton's Harnack Estimate for Mean Curvature Flow	100
4.5 Embedded Closed Curves in the Plane	105

5	Conclusions and Research Directions	
5.1	Curves in the Plane	115
5.2	Hypersurfaces	116
5.3	Mean Curvature Flow with Surgeries	117
5.4	Some Problems and Research Directions	121
 Appendix		
A	Quasilinear Parabolic Equations on Manifolds	
A.1	The Linear Case	124
A.2	Regularity in the Linear Case	128
A.3	The General Case	136
B	Interior Estimates of Ecker and Huisken	145
C	Hamilton's Maximum Principle for Tensors	147
D	Hamilton's Matrix Li–Yau–Harnack Inequality in \mathbb{R}^n	149
E	Abresch and Langer Classification	151
F	Important Results without Proof in the Book	155
 Bibliography		157
Index		165



<http://www.springer.com/978-3-0348-0144-7>

Lecture Notes on Mean Curvature Flow

Mantegazza, C.

2011, XII, 168 p., Hardcover

ISBN: 978-3-0348-0144-7

A product of Birkhäuser Basel