

The Mathematics of Marriage Dynamic Nonlinear Models

**John M. Gottman, James D. Murray,
Catherine C. Swanson, Rebecca Tyson,
and Kristin R. Swanson**

**A Bradford Book
The MIT Press
Cambridge, Massachusetts
London, England**

Contents

Preface	xi
1 What Do We Mean by Theory?	1
2 What Phenomena Are We Modeling?	5
2.1 Brief Review of Research on Marriage	6
2.2 The Problem of Power	28
2.3 Review of Gottman and Levenson	29
2.4 What Phenomenon Are We Modeling?	34
2.5 Two More Mysteries in Marital Research	34
3 Nonlinear Dynamic Modeling	35
3.1 The General Systems Theory of von Bertalanffy	35
3.2 Two or more equations	36
3.3 Outline of the Subsequent Chapters	38
4 Calculus—the Mathematics of Change	41
4.1 Dynamical Motion as Slope	42
4.2 The Concept of a Function	45
4.3 Limits	51
4.4 The Derivative Is a Limit	52
4.5 Common Derivatives in Functional Form	53
4.6 Rules for Differentiation	54
4.7 Integration—the Reverse of Differentiation	56
4.8 Maxima and Minima	56
4.9 Problem	58
4.10 Writing Differential Equations	59
4.11 Taylor's series	61
5 Introduction to Dynamic Modeling	65
5.1 Philosophy of Modeling	65
5.2 A Bit of Dynamical Modeling History	68

5.3	One Equation: Malthus Revisited	69
	Appendix 5.1: Stability Results	79
6	Modeling Catastrophic Change	81
6.1	The Spruce Budworm Problem	82
6.2	Spruce Budworm Catastrophe	88
6.3	Examples of Catastrophic Change: Zeeman	89
6.4	Catastrophes in Perception	93
6.5	Chapter Summary	97
	Appendix 6.1: Nondimensionalization	98
7	Intuitive Discussion of Phase Space Plots	99
7.1	Phase Space Portrait	99
7.2	Force Field Portrait	100
7.3	Null Clines and Steady States	101
7.4	Chapter Summary	104
	Appendix 7.1: Phase Plane Analysis	104
8	Interacting Dyadic Systems	111
8.1	A Linear Marriage Model: Romeo and Juliet	111
8.2	Predator and Prey (Lotka-Volterra Equations)	113
8.3	Competition Models	119
8.4	Cooperation Models	122
8.5	Chapter Summary	122
	Appendix 8.1: Nonlinear Modeling Concepts	124
9	Writing the Equations of Marriage	127
9.1	The Model	129
9.2	Estimating of Parameters	134
9.3	Finding Null Clines	135
9.4	Steady States and Stability	137
9.5	Catastrophes in this Model	141
	Appendix 9.1: The Inertia Parameter	144
	Appendix 9.2: Stability of Steady States	145
	Appendix 9.3: Strength of Attraction	149
10	Initial Results of Our Modeling	151
10.1	Power and Affect: Influence Functions	151
10.2	Mismatch Theory of Unstable Marriages	154
10.3	Set Points and Inertia	156
10.4	Validation of the Model Parameters	157
10.5	Discussion of Initial Modeling Results	160
10.6	Prospects for Extending the Model	162

16.3	Goals & Rationale for the Marriage Experiments	302
16.4	Dreams-within-Conflict Intervention	310
16.5	Angie and Dave: Overview	313
16.6	Angie and Dave: Intervention	317
16.7	Angie and Dave: Second Conversation	323
16.8	Angie and Dave: Math Model	331
16.9	Alan and Eve	333
16.10	Chapter Summary	335
17	How to prepare data for modeling	337
17.1	Obtaining the Model Program	337
17.2	Basic Concepts in Data Preparation	338
17.3	Example: Deriving Model Data from SPAFF	339
	Bibliography	343
	Appendix A	361
	Appendix B	365
B.1:	Own Slope/Own Score Repair	366
B.2:	Spouse's Slope/Own Score Repair	376
B.3:	Own Slope/Spouse's Score Repair	381
B.4:	Spouse's Slope/Spouse's Score Repair	391
	Index	397