

# CONTENTS

<i>Preface</i>	vii
<b>Chapter 1. Uses of Mathematics in Sociology</b>	<b>1</b>
The Results of Social Research	4
Uses of Mathematics in Research and Theory	8
1. Descriptive Statement of Observed Behavior	10
2. Mathematical Techniques for Arriving at "Disposition" Properties	16
3. Quantitative Empirical Generalizations	25
4. Uses of Mathematics in Theory Construction	34
5. Prediction Models	52
6. Conclusion	53
<b>Chapter 2. Problems of Quantitative Measurement in Sociology</b>	<b>55</b>
1. Introduction	55
2. Criteria For Ordinal and Cardinal Measurement	57
3. Are the Classical Criteria Necessary?	70
4. When Are The Two Types of Theories Applicable?	73
5. Disposition Properties and Index Formation	75
6. Group and Individual Variables	94
<i>Appendix</i> —Measurement of Prestige	90
<b>Chapter 3. Mathematics as a Language for Relations Between Variables</b>	<b>93</b>
1. Mechanics	94
2. Mathematics as a Language For Economics	95

3. Empirical Investigations and Regression Analysis	98
4. Conclusion	102
<b>Chapter 4. Mathematical Language for Relations Between Qualitative Attributes</b>	<b>103</b>
1. Theory And Research in Sociology: Lack of a Mathematical Language	103
2. Continuous-Time, Discrete-State Model With Random Shocks	106
3. Examples of Use of Continuous-Time, Discrete-State Models	112
4. Relations Between Dichotomous Attributes: The Partitioning of $q_{ij}$	116
5. Effect Of One Independent Attribute in Theoretical Propositions And Empirical Data	117
6. Two-Attribute Systems	123
<i>Appendix 1</i> —The Relation of Discrete-Time Markov Processes to the Continuous-Time Process	127
<b>Chapter 5. Relations Between Attributes: Over-Time Data</b>	<b>132</b>
1. Introduction To Over-Time Data: Continuous Observation	132
2. "Turnover" In A Single Attribute	135
3. An Independent And Dependent Attribute: Over-Time Data	139
4. Over-Time Data Without Internal Changes	145
5. Possible Relations Between Cognitive States And Attitudinal States	149
6. An Independent And Dependent Attribute In An Ongoing Situation With Over-Time Data	151
7. Two Attribute-Systems With Over-Time Data	162
8. Exact Estimates For Transition Rates in Multi-State Systems	177
9. Projection Of The System Forward In Time	182
<i>Appendix 1</i> —Calculation of $3^{*}2131t$	183
<i>Appendix 2</i>	185
<b>Chapter 6. Multivariate Analysis</b>	<b>189</b>
1. Development Of The Model For Three Attributes	192
2. The General Equations For $m$ Dichotomous Independent Attributes	199
3. Sampling Variations And The Problem of Weighting	201
4. Independent Attributes Which Are Ordered Or Unordered Classifications Of Three Or More Classes	213
5. Multiplicative Or Interaction Effects	224
6. One-Way Effects vs. Two-Way Effects	235
7. Unsolved Problems	237
<b>Chapter 7. Multiple-Level Systems and Emergent Propositions</b>	<b>241</b>
1. Activity As A Function Of Consensus	242
2. Consensus As A Function Of Activity	248
3. Conclusion	251
<b>Chapter 8. One-Way Process with a Continuous Independent Variable</b>	<b>253</b>
1. Introduction	253
2. Purchases Of Consumer Goods As A Function Of Income	256
3. Census Statistics: Illiteracy Rates	260
4. Probit Analysis: A Comparison With This Model	263

<b>Chapter 9. Social and Psychological Processes and their Equilibrium States</b>	<b>269</b>
1. Two-Directional Processes	269
2. Voting For In-Group Member In An Election As A Function Of Size Of In-Group	271
3. Propriquity, Friendship, and Group Size	277
4. Involvement In Workers' Activities As A Function Of Size Of Workplace	283
<b>Chapter 10. The Poisson Process and its Contagious Relatives</b>	<b>288</b>
1. The Assumptions Underlying The Poisson	288
2. The Poisson With Exhaustion, And The Two-State Model	293
3. A Contagious Poisson	299
4. An Exhaustible Contagion Model	308
5. When To Use Frequency Distributions And When Expected-Value Equations	311
<i>Appendix</i> —Deprivation of the Distribution of $p_i$ for the Contagious Poisson	312
<b>Chapter 11. The Poisson Process and its Contagious Relatives— Equilibrium Models</b>	<b>315</b>
1. A Poisson with a Backward Flow	316
2. A Modification of the Model, and Application to Consumer Behavior	319
3. A Two-Way Contagious Poisson	326
4. An Equilibrium Contagious Poisson with Exhaustion	333
5. A Model For Voting In Small Groups: An Equilibrium Exhaustible Poisson	336
6. Voting Models: Contagion Within The Group	343
7. Reward Structures And The Allocation Of Effort	353
8. The Equilibrium Size Distribution Of Freely Forming Groups	361
9. Unsolved Problems And Future Directions For Poisson-Type Models	375
<b>Chapter 12. Social and Psychological Organization of Attitudes</b>	<b>381</b>
1. Transition Of Elements Within The Individual	381
2. Successive Responses To One Item	383
3. Relation Between This Model And That of Previous Chapters	389
4. Successive Responses To One Item With A Trend	390
5. Responses To Different Items At One Time	395
6. $1/N$ As Psychological Unidimensionality, And $\sigma$ As Social Polarization	398
7. Additional Uses and Further Developments	402
<b>Chapter 13. Change and Response Uncertainty</b>	<b>406</b>
1. Introduction To The Problem	406
2. The Contagious Binomial and Its Appropriateness Here	411
3. A Continuous-Space Process Incorporating Uncertainty and Change	413
4. Interdependent Attributes and Multicategory Items with Both Uncertainty and Change	420
5. Conclusion	428
<b>Chapter 14. Measures of Structural Characteristics</b>	<b>430</b>
1. A Source-Oriented Measure of Hierarchization	434
2. A Consequence-Oriented Concept of Hierarchization: The "Disorder" of the Choices	441

3. "Connectedness" of the Structure	444
4. Measures of Political or Social Diversity: Political Diversity in Illinois Counties	456
5. Source-Oriented Measures Through Process Models: Generational Mobility	459
<b>Chapter 15. The Method of Residues</b>	<b>469</b>
1. The "Distance-Interaction Hypothesis"	470
<b>Chapter 16. The Study of Local Implications</b>	<b>479</b>
1. Relative Sizes of Groups and Relative Strength of Group Norms in a Community	480
2. Withdrawal to Maintain Group Norms	483
3. Ease of Withdrawal as a Function of Group Size	484
4. Psychological Rejection of the Out-Group	488
5. Maintenance of Cultural Equilibrium	491
<b>Chapter 17. Diffusion in Incomplete Social Structures</b>	<b>492</b>
1. Introduction	492
2. Stochastic and Deterministic Models with Complete Intermixing	494
3. Incomplete Social Structures: I. Small Separate Groups	495
4. Incomplete Social Structures: II. Partially Inter-Penetrating Groups	505
5. Conclusion	514
<b>Chapter 18. Tactics and Strategies in the Use of Mathematics</b>	<b>515</b>
1. The Sometimes-True Theories of Social Process	516
2. Breaking Down a Single Complexity into Multiple Simplicities	519
3. The Overlay of Structural Variations on Simple Processes	520
4. The Method of Residues	521
5. Qualitative Generalizations and Their Uses	522
6. Normative Models vs. Descriptive Models.	524
7. Probabilistic Mathematics vs. Deterministic Mathematics	526
8. The Use of Electronic Computers as a Substitute for Mathematics	528
<i>References</i>	531
<i>Index</i>	543