

Contents

Preface	xiii
List of Contributors	xv
CHAPTER 1 DENNIS LINDLEY: THE FIRST 70 YEARS	1
<i>P. Armitage</i>	
Acknowledgements	12
References	12
CHAPTER 2 THE OPERATIONAL BAYESIAN APPROACH	19
<i>R. E. Barlow and M. B. Mendel</i>	
2.1 Introduction	19
2.2 The Indifference Principle	20
2.3 Indifference Relative to Transformed Random Quantities	23
2.4 Conclusions	26
References	27
CHAPTER 3 PIVOTAL INFERENCE ILLUSTRATED ON THE DARWIN MAIZE DATA	29
<i>G. A. Barnard</i>	
3.1 The Darwin Data	29
3.2 Estimating the Difference δ	32
3.3 Limits for the Ratio θ	34
3.4 Combining Sets of Data	37
3.5 General Logical Considerations	38
References	39
CHAPTER 4 BAYES' THEOREM IN LATENT VARIABLE MODELLING	41
<i>D. J. Bartholomew</i>	
4.1 Setting the Scene	41
4.2 A General Formulation	42
4.3 The Normal Linear Model	45

4.4 Binary Data	46
4.5 Linear Structural Relations Model	48
References	49
CHAPTER 5 BAYESIAN SAMPLING SCHEMES FOR AUDITORS	51
<i>J. A. Bather and P. J. Browne</i>	
5.1 Introduction	51
5.2 Dynamic Programming	54
5.3 Numerical Illustration	57
5.4 Continuity and Uniqueness	59
References	65
CHAPTER 6 OPTIMIZING PREDICTION WITH HIER- ARCHICAL MODELS: BAYESIAN CLUSTERING	67
<i>J. M. Bernardo</i>	
6.1 Introduction	67
6.2 The Prediction Problem	67
6.3 The Decision Problem	69
6.4 The Clustering Algorithm	70
6.5 An Application to Election Forecasting	71
6.6 A Case Study: State Elections in Mexico	73
6.7 Discussion	75
References	75
CHAPTER 7 INFERENCE FOR A COVARIANCE MATRIX	77
<i>P. J. Brown, N. D. Le and J. V. Zidek</i>	
7.1 Introduction	77
7.2 Inverted Wishart Prior Distribution	79
7.3 Some Alternative Prior Distributions	81
7.4 Generalized Inverted Wishart (GIW)	82
7.5 Implementing the GIW Prior	87
7.6 Concluding Remarks	90
Acknowledgements	90
References	90
CHAPTER 8 THE ROLE OF STATISTICAL THEORY IN DECISION AIDING: MEASURING DECISION EFFECTIVENESS IN THE LIGHT OF OUTCOMES	93
<i>R. V. Brown</i>	
8.1 Some Past Developments in Prescriptive Statistics	94
8.2 Statistical Development Needed on Evaluating Decision Effectiveness	99

8.3 Conclusions	114
Acknowledgements	114
References	115
CHAPTER 9 THE SIGNATURE AS A COVARIATE IN RELIABILITY AND BIOMETRY	119
<i>S. Campodónico and N. D. Singpurwalla</i>	
9.1 Introduction and Overview	119
9.2 The Spectrum and Its Least-squares Estimation	120
9.3 The Signatures of Vibrations and Cardiograms	123
9.4 Bayesian Estimation of the Spectrum	125
9.5 The Spectrum as a Covariate	133
9.6 Application: Service Life of Traction Motors	137
Appendix A	142
Appendix B	143
Appendix C	145
References	146
CHAPTER 10 RESIDUAL ANALYSIS AND OUTLIERS IN BAYESIAN HIERARCHICAL MODELS	149
<i>K. Chaloner</i>	
10.1 The Realized Errors	149
10.2 The One-way Model	150
10.3 Unknown Variances	152
10.4 Discussion	156
Acknowledgement	156
References	156
CHAPTER 11 THE ISLAND PROBLEM: COHERENT USE OF IDENTIFICATION EVIDENCE	159
<i>A. P. Dawid</i>	
11.1 Introduction	159
11.2 The Island Problem	160
11.3 Which Answer?	162
11.4 Searching for Suspects	165
11.5 The Presumption of Innocence	168
11.6 Conclusion	170
References	170
CHAPTER 12 UTILITY: PROBABILITY'S YOUNGER TWIN?	171
<i>S. French</i>	
12.1 Introduction	171

12.2	Two Families of Axiomatizations	172
12.3	Modelling Decision Situations	174
12.4	The Reference Experiment	175
12.5	The Importance of Being both Belief and Preference Analysts	178
12.6	Concluding Remarks	178
	References	179
CHAPTER 13 FULLY BAYESIAN HIERARCHICAL ANALYSIS FOR EXPONENTIAL FAMILIES VIA MONTE CARLO COMPUTATION		181
<i>E. I. George, U. E. Makov and A. F. M. Smith</i>		
13.1	Motivation	181
13.2	Monte Carlo Evaluation of the Posterior	186
13.3	Application of Fully Bayesian Hierarchical Analysis	193
	References	196
CHAPTER 14 REVISING EXCHANGEABLE BELIEFS: SUBJECTIVIST FOUNDATIONS FOR THE INDUCTIVE ARGUMENT		201
<i>M. Goldstein</i>		
14.1	Introduction	201
14.2	Tossing Coins	203
14.3	Exchangeable Structures	206
14.4	Posterior Expectations	209
14.5	Posterior Expectations for Population Quantities	211
14.6	Learning from Exchangeable Data	213
14.7	Separating Posterior Beliefs for the Exchangeable Model	215
14.8	Exchangeable Posterior Beliefs	217
14.9	Exchangeable Revisions of Beliefs	220
14.10	Concluding Comments	221
	References	222
CHAPTER 15 ON STEINIAN SHRINKAGE ESTIMATORS: THE FINITE/INFINITE PROBLEM AND FORMALISM IN PROBABILITY AND STATISTICS		223
<i>B. M. Hill</i>		
15.1	Finite and Infinite	223
15.2	Admissibility and Boundedness	225
15.3	Using the True Sphere	231

15.4	The Risk Functions	238
15.5	Extended Admissibility	242
15.6	Random Effects Models	244
15.7	The Steinian Paradoxes and Assorted Red Herrings	249
15.8	Conclusions	254
	References	258
CHAPTER 16 BAYESIAN DECISION THEORY AND THE LEGAL STRUCTURE		261
<i>J. B. Kadane</i>		
16.1	Introduction	261
16.2	Abolition of Judgements of Guilt	262
16.3	Admission of all Cost-free Evidence	264
16.4	Abolition of the Adversarial Approach	265
16.5	Conclusion	265
	References	266
CHAPTER 17 EXPERIMENTAL DESIGN FROM A SUBJECTIVE UTILITARIAN VIEWPOINT		267
<i>F. Lad and J. Deely</i>		
17.1	Introduction	267
17.2	The Problem	269
17.3	Mixing Distributions	271
17.4	Elicitation	272
17.5	Experimental Design as a Decision Problem	275
17.6	A Benchmark Utility Valuation	275
17.7	Related Conceptions of Utility as Information	277
17.8	The Expected Utility Valuation of Each Design	279
17.9	Conclusions and Remarks	280
	References	281
CHAPTER 18 THE BAYESIAN ANALYSIS OF CATEGORICAL DATA—A SELECTIVE REVIEW		283
<i>T. Leonard and J. S. J. Hsu</i>		
18.1	The Foundations of the 1960s	283
18.2	Numerical Examples	287
18.3	Bayes–Stein Methods of the 1970s	289
18.4	Smoothing Grade Distributions for 40 London High Schools	293
18.5	Computational Techniques of the 1980s	295
18.6	Three-way Tables and Simpson’s Paradox	296

18.7 Further Problems with Non-randomized Data	304
Acknowledgements	306
References	306
CHAPTER 19 CONFLICTING INFORMATION AND A CLASS OF BIVARIATE HEAVY-TAILED DISTRIBUTIONS	311
<i>A. O'Hagan and H. Le</i>	
19.1 Heavy-tailed Bayesian Modelling	311
19.2 Multivariate Heavy-tailed Distributions	313
19.3 A Class of Bivariate Distributions	315
19.4 A Simple Example	317
19.5 A More Complex Example	321
19.6 Final Remarks	324
Acknowledgements	325
References	326
CHAPTER 20 APPLICATIONS OF LINDLEY INFORMATION MEASURE TO THE DESIGN OF CLINICAL EXPERIMENTS	329
<i>G. Parmigiani and D. A. Berry</i>	
20.1 Introduction	329
20.2 First-order Conditions	332
20.3 Information and Sample Size	334
20.4 Duration and Follow-up Time	336
20.5 Multicentre Clinical Trials	341
20.6 Conclusions	345
References	346
CHAPTER 21 ON TWO CLASSIC THEOREMS INVOLVING THE CHARACTERISTIC FUNCTION	349
<i>W. L. Smith</i>	
21.1 Some General Comments	349
21.2 The Lindberg Central Limit Theorem	350
21.3 Cramér's Theorem on the Normal Distribution	359
References	361
CHAPTER 22 HIERARCHICAL PRIORS AND MIXTURE MODELS, WITH APPLICATION IN REGRESSION AND DENSITY ESTIMATION	363
<i>M. West, P. Müller and M. D. Escobar</i>	
22.1 Introduction	363

22.2 Hierarchical Models with Mixture Priors	364
22.3 Posterior Computations	366
22.4 A Regression Example	372
22.5 A Multivariate Density Estimation Example	376
Acknowledgements	385
References	385
Index	387