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Heritability for Threshold Traits -- 2.4 Heritability Values Among Different Types of Trait -- 2.5 Dominance Variance in the Different Types of Trait -- 2.6 Heritability Values in Nature -- 2.7 Summary -- 3—The Genetic Correlation -- 3.1 Theory -- 3.2 Estimation of the Genetic Correlation Between Traits Within an Individual -- 3.3 Estimation of the Genetic Correlation Between Different Environments -- 3.4 The Distribution of Genetic Correlations -- 3.5 Is the Phenotypic Correlation a Reasonable Estimate of the Genetic Correlation? -- 3.6 Comparison of Genetic Variance-Covariance Matrices -- 3.7 Summary -- 4—Directional Selection -- 4.1 The Basic Equation: $R = h^2S$ -- 4.2 Evolvability -- 4.3 Predicted Response in a Very Large Population -- 4.4 Predicted Response in a Finite Population -- 4.5 Asymmetry of Response -- 4.6 Estimating Heritability from a Directional Selection Experiment -- 4.7 Empirical Findings on the Response to Artificial Selection -- 4.8 Predicting Responses in Nature -- 4.9 Summary -- 5—Directional Selection and the Correlated Response -- 5.1 Derivation of the Correlated Response to Selection -- 5.2 Correlated Response with Selection on One Trait -- 5.3 Correlated Response to Selection on Several Traits -- 5.4 Summary -- 6—Phenotypic Plasticity and Reaction Norms -- 6.1 Two Perspectives: Character State Versus Reaction Norm -- 6.2 Evolution of Plastic Traits -- 6.3 The Genetic Basis of Plasticity -- 6.4 Summary -- 7—Sex-Related Effects on Quantitative Variation -- 7.1 Influence of Loci Located on the Sex Chromosomes -- 7.2 Sexual Dimorphism -- 7.3 Maternal Effects: A Theoretical Framework -- 7.4 Measuring Maternal Effects -- 7.5 Summary -- 8—Bottlenecks, Finite Populations, and Inbreeding -- 8.1 Effective Population Size -- 8.2 The Influence of Population Bottlenecks on Quantitative Genetic Variation -- 8.3 The Influence of Finite Population Size on Quantitative Variation -- 8.4 Inbreeding -- 8.5 Summary -- 9—The Maintenance of Genetic Variation -- 9.1 Stabilizing Selection -- 9.2 Disruptive Selection -- 9.3 Mutation-Selection Balance -- 9.4 Heterozygous Advantage -- 9.5 Antagonistic Pleiotropy -- 9.6 Frequency-Dependent Selection -- 9.7 Environmental Heterogeneity -- 9.8 Summary -- 10—A Summing Up -- 10.1 Are the Basic Assumptions of Quantitative Genetics Reasonable? -- 10.2 Is Heritability a Useful Parameter? -- 10.3 How Should Heritability Be Estimated? -- 10.4 Are Laboratory Estimates of Heritability Useful? -- 10.5 How Does Heritability Vary with Trait Type? -- 10.6 The Genetic Correlation: From the Sublime to the Ridiculous? -- 10.7 Directional Selection on a Single Trait: Is It Predictable? -- 10.8 Can We Go from One to Several Traits? -- 10.9 Phenotypic Plasticity: An Experimental Nuisance? -- 10.10 Parental Effects: Another Nuisance? -- 10.11 Should We Worry About Population Size? -- 10.12 Inbreeding Effects: Partial Dominance or Overdominance? -- 10.13 What Maintains Genetic Variation in Populations? -- 10.14 Is Quantitative Genetic Analysis a Viable Approach to the Understanding of Evolution? -- Glossary of Terms -- Glossary of Symbols -- References -- Taxonomic Index.

Sommario/riassunto

The impetus for this book arose out of my previous book, *The Evolution of Life Histories* (Roff, 1992). In that book I presented a single chapter on quantitative genetic theory. However, as the book was concerned with the evolution of life histories and traits connected to this, the presence of quantitative genetic variation was an underlying theme throughout. Much of the focus was placed on optimality theory, for it is this approach that has proven to be extremely successful in the analysis of life history variation. But quantitative genetics cannot be ignored, because there are some questions for which optimality approaches are inappropriate; for example, although optimality modeling can address the question of the maintenance of phenotypic

variation, it cannot say anything about genetic variation, on which further evolution clearly depends. The present book is, thus, a natural extension of the first. I have approached the problem not from the point of view of an animal or plant breeder but from that of one interested in understanding the evolution of quantitative traits in wild populations. The subject is large with a considerable body of theory: I generally present the assumptions underlying the analysis and the results, giving the relevant references for those interested in the intervening mathematics. My interest is in what quantitative genetics tells me about evolutionary processes; therefore, I have concentrated on areas of research most relevant to field studies.
