Design And Analysis Of Experiments Solutions Manual

This carefully edited collection synthesizes the state of the art in the theory and applications of designed experiments and their analyses. It provides a detailed overview of the tools required for the optimal design of experiments and their analyses. The handbook covers many recent advances in the field, including designs for nonlinear models

Design and Analysis of ExperimentsJohn Wiley & Sons

This book discusses special modifications and extensions of designs that arise in certain fields of application such as genetics, bioinformatics, agriculture, medicine, manufacturing, marketing, etc. Well-known and highly-regarded contributors have written individual chapters that have been extensively reviewed by the Editor to ensure that each individual contribution relates to material found in Volumes 1 and 2 of this book series. The chapters in Volume 3 have an introductory/historical component and proceed to a more advanced technical level to discuss the latest results and future developm.

An invaluable reference on the design of experiments. Includes hard-to-find information on change-over designs and analysis of covariance.

Emphasizes the strategy of experimentation, data analysis, and theinterpretation of experimental results. Features numerous examples using actual engineering andscientific studies. Presents statistics as an integral component of experimentationfrom the planning stage to the presentation of theconclusions. Deep and concentrated experimental design coverage, withequivalent but separate emphasis on the analysis of data from thevarious designs. Topics can be implemented by practitioners and do not require ahigh level of training in statistics. New edition includes new and updated material and computeroutput.

Design and Analysis of Experiments provides a rigorous introduction to product and process design improvement through quality and performance optimization. Clear demonstration of widely practiced techniques and procedures allows readers to master fundamental concepts, develop design and analysis skills, and use experimental models and results in real-world applications. Detailed coverage of factorial and fractional factorial design, response surface techniques, regression analysis, biochemistry and biotechnology, single factor experiments, and other critical topics offer highly-relevant guidance through the complexities of the field. Stressing the importance of both conceptual knowledge and practical skills, this text adopts a balanced approach to theory and application. Extensive discussion of modern software tools integrate data from real-world studies, while examples illustrate the efficacy of designed experiments across industry lines, from service and transactional organizations to heavy industry and biotechnology. Broad in scope yet deep in detail, this text is both an essential student resource and an invaluable reference for professionals in engineering, science, manufacturing, statistics, and business management.

This textbook presents the basic concepts of linear models, design and analysis of experiments. With the rigorous treatment of topics and provision of detailed proofs, this book aims at bridging the gap between basic and advanced topics of the subject. Initial

chapters of the book explain linear estimation in linear models and testing of linear hypotheses, and the later chapters apply this theory to the analysis of specific models in designing statistical experiments. The book includes topics on the basic theory of linear models covering estimability, criteria for estimability, Gauss–Markov theorem, confidence interval estimation, linear hypotheses and likelihood ratio tests, the general theory of analysis of general block designs, complete and incomplete block designs, general row column designs with Latin square design and Youden square design as particular cases, symmetric factorial experiments, missing plot technique, analyses of covariance models, split plot and split block designs. Every chapter has examples to illustrate the theoretical results and exercises complementing the topics discussed. R codes are provided at the end of every chapter for at least one illustrative example from the chapter enabling readers to write similar codes for other examples and exercise. Praise for the First Edition: "If you . . . want an up-to-date, definitive reference written by authors who have contributed much to this field, then this book is an essential addition to your library." —Journal of the American Statistical Association Fully updated to reflect the major progress in the use of statistically designed experiments for product and process improvement, Experiments, Second Edition introduces some of the newest discoveries—and sheds further light on existing ones—on the design and analysis of experiments and their applications in system optimization, robustness, and treatment comparison. Maintaining the same easy-to-follow style as the previous edition while also including modern updates, this book continues to present a new and integrated system of experimental design and analysis that can be applied across various fields of research including engineering, medicine, and the physical sciences. The authors modernize accepted methodologies while refining many cutting-edge topics including robust parameter design, reliability improvement, analysis of non-normal data, analysis of experiments with complex aliasing, multilevel designs, minimum aberration designs, and orthogonal arrays. Along with a new chapter that focuses on regression analysis, the Second Edition features expanded and new coverage of additional topics, including: Expected mean squares and sample size determination One-way and two-way ANOVA with random effects Split-plot designs ANOVA treatment of factorial effects Response surface modeling for related factors Drawing on examples from their combined years of working with industrial clients, the authors present many cutting-edge topics in a single, easily accessible source. Extensive case studies, including goals, data, and experimental designs, are also included, and the book's data sets can be found on a related FTP site, along with additional supplemental material. Chapter summaries provide a succinct outline of discussed methods, and extensive appendices direct readers to resources for further study. Experiments, Second Edition is an excellent book for design of experiments courses at the upper-undergraduate and graduate levels. It is also a valuable resource for practicing engineers and statisticians.

The design of experiments holds a central place in statistics. The aim of this book is to present in a readily accessible form certain theoretical results of this vast

field. This is intended as a textbook for a one-semester or two-quarter course for undergraduate seniors or first-year graduate students, or as a supplementary resource. Basic knowledge of algebra, calculus and statistical theory is required to master the techniques presented in this book. To help the reader, basic statistical tools that are needed in the book are given in a separate chapter. Mathematical results from Modern Algebra which are needed for the construction of designs are also given. Wherever possible the proofs of the theoretical results are provided.

The eighth edition of Design and Analysis of Experiments continues to provide extensive and in-depth information on engineering, business, and statistics-as well as informative ways to help readers design and analyze experiments for improving the quality, efficiency and performance of working systems.

Design and Analysis of Experiments with R presents a unified treatment of experimental designs and design concepts commonly used in practice. It connects the objectives of research to the type of experimental design required, describes the process of creating the design and collecting the data, shows how to perform the proper analysis of the data, and illustrates the interpretation of results. Drawing on his many years of working in the pharmaceutical, agricultural, industrial chemicals, and machinery industries, the author teaches students how to: Make an appropriate design choice based on the objectives of a research project Create a design and perform an experiment Interpret the results of computer data analysis The book emphasizes the connection among the experimental units, the way treatments are randomized to experimental units, and the proper error term for data analysis. R code is used to create and analyze all the example experiments. The code examples from the text are available for download on the author's website, enabling students to duplicate all the designs and data analysis. Intended for a one-semester or two-quarter course on experimental design, this text covers classical ideas in experimental design as well as the latest research topics. It gives students practical guidance on using R to analyze experimental data.

Learn How to Achieve Optimal Industrial Experimentation Through four editions, Douglas Montgomery has provided statisticians, engineers, scientists, and managers with the most effective approach for learning how to design, conduct, and analyze experiments that optimize performance in products and processes. Now, in this fully revised and enhanced Fifth Edition, Montgomery has improved his best-selling text by focusing even more sharply on factorial and fractional factorial design and presenting new analysis techniques (including the generalized linear model). There is also expanded coverage of experiments with random factors, response surface methods, experiments with mixtures, and methods for process robustness studies. The book also illustrates two of today's most powerful software tools for experimental design: Design-Expert(r) and Minitab(r). Throughout the text, You'll find output from these two programs, along with detailed discussion on how computers are currently used in the analysis and

design of experiments. You'll also learn how to use statistically designed experiments to: * Obtain information for characterization and optimization of systems * Improve manufacturing processes * Design and develop new processes and products * Evaluate material alternatives in product design * Improve the field performance, reliability, and manufacturing aspects of products * Learn how to conduct experiments effectively and efficiently Other important textbook features: * Student version of Design-Expert(r) software is available. * Web site (www.wiley.com/college/montgomery) offers supplemental text material for each chapter, a sample syllabus, and sample student projects from the author's Design of Experiments course at Arizona State University. Market_Desc: Practicing engineers and scientists, statisticians, managers, students and professors of industrial engineering. Special Features: · Includes new software examples taken from Minitab, JMP, and SAS· Presents new examples and exercises that illustrate the use of designed experiments in service and transactional organizations· Offers expanded coverage on optimal designs that is reinforced with computer software examples· Discusses new developments on robust design as well as the latest software techniques· Examines the new features of Design-Expert V7 About The Book: This bestselling professional reference has helped over 100,000 engineers and scientists with the success of their experiments. The new edition includes more software examples taken from the three most dominant programs in the field: Minitab, JMP, and SAS. Additional material has also been added in several chapters, including new developments in robust design and factorial designs. New examples and exercises are also presented to illustrate the use of designed experiments in service and transactional organizations. Engineers will be able to apply this information to improve the quality and efficiency of working systems. Design and analysis of experiments/Hinkelmann.-v.1.

With a growing number of scientists and engineers using JMP software for design of experiments, there is a need for an example-driven book that supports the most widely used textbook on the subject, Design and Analysis of Experiments by Douglas C. Montgomery. Design and Analysis of Experiments by Douglas Montgomery: A Supplement for Using JMP meets this need and demonstrates all of the examples from the Montgomery text using JMP. In addition to scientists and engineers, undergraduate and graduate students will benefit greatly from this book. While users need to learn the theory, they also need to learn how to implement this theory efficiently on their academic projects and industry problems. In this first book of its kind using JMP software, Rushing, Karl and Wisnowski demonstrate how to design and analyze experiments for improving the quality, efficiency, and performance of working systems using JMP. Topics include JMP software, two-sample t-test, ANOVA, regression, design of experiments, blocking, factorial designs, fractional-factorial designs, central composite designs, Box-Behnken designs, split-plot designs, optimal designs, mixture designs, and 2 k factorial designs. JMP platforms used include Custom Design, Screening Design, Response Surface Design, Mixture Design, Distribution, Fit Y by X, Matched Pairs, Fit Model, and Profiler. With JMP software, Montgomery?s textbook,

and Design and Analysis of Experiments by Douglas Montgomery: A Supplement for Using JMP, users will be able to fit the design to the problem, instead of fitting the problem to the design.SAS Products and Releases: JMP: 9.0.2, 11.0, 10.0.2, 10.0.1, 10.0 Operating Systems: All

Now in its 6 th edition, this bestselling professional reference has helped over 100,000 engineers and scientists with the success of their experiments. Douglas Montgomery arms readers with the most effective approach for learning how to design, conduct, and analyze experiments that optimize performance in products and processes. He shows how to use statistically designed experiments to obtain information for characterization and optimization of systems, improve manufacturing processes, and design and develop new processes and products. Readers will also learn how to evaluate material alternatives in product design, improve the field performance, reliability, and manufacturing aspects of products, and conduct experiments effectively and efficiently. Written in simple language with relevant examples, Statistical Methods in Biology: Design and Analysis of Experiments and Regression is a practical and illustrative guide to the design of experiments and data analysis in the biological and agricultural sciences. The book presents statistical ideas in the context of biological and agricultural sciences to which they are being applied, drawing on relevant examples from the authors' experience. Taking a practical and intuitive approach, the book only uses mathematical formulae to formalize the methods where necessary and appropriate. The text features extended discussions of examples that include real data sets arising from research. The authors analyze data in detail to illustrate the use of basic formulae for simple examples while using the GenStat® statistical package for more complex examples. Each chapter offers instructions on how to obtain the example analyses in GenStat and R. By the time you reach the end of the book (and online material) you will have gained: A clear appreciation of the importance of a statistical approach to the design of your experiments, A sound understanding of the statistical methods used to analyse data obtained from designed experiments and of the regression approaches used to construct simple models to describe the observed response as a function of explanatory variables, Sufficient knowledge of how to use one or more statistical packages to analyse data using the approaches described, and most importantly, An appreciation of how to interpret the results of these statistical analyses in the context of the biological or agricultural science within which you are working. The book concludes with a guide to practical design and data analysis. It gives you the understanding to better interact with consultant statisticians and to identify statistical approaches to add value to your scientific research.

This richly illustrated book provides an overview of the design and analysis of experiments with a focus on non-clinical experiments in the life sciences, including animal research. It covers the most common aspects of experimental design such as handling multiple treatment factors and improving precision. In addition, it addresses experiments with large numbers of treatment factors and response surface methods for optimizing experimental conditions or biotechnological yields. The book emphasizes the estimation of effect sizes and the principled use of statistical arguments in the broader scientific context. It gradually transitions from classical analysis of variance to modern linear mixed models, and provides detailed information on power analysis and sample size determination, including 'portable power' formulas for making quick approximate

calculations. In turn, detailed discussions of several real-life examples illustrate the complexities and aberrations that can arise in practice. Chiefly intended for students, teachers and researchers in the fields of experimental biology and biomedicine, the book is largely self-contained and starts with the necessary background on basic statistical concepts. The underlying ideas and necessary mathematics are gradually introduced in increasingly complex variants of a single example. Hasse diagrams serve as a powerful method for visualizing and comparing experimental designs and deriving appropriate models for their analysis. Manual calculations are provided for early examples, allowing the reader to follow the analyses in detail. More complex calculations rely on the statistical software R, but are easily transferable to other software. Though there are few prerequisites for effectively using the book, previous exposure to basic statistical ideas and the software R would be advisable.

This textbook gives a representation of the design and analysis of experiments, that comprises the aspects of classical theory for continuous response and of modern procedures for categorical response, and especially for correlated categorical response. Complex designs, as for example, cross-over and repeated measures, are included. Thus, it is an important book for statisticians in the pharmaceutical industry as well as for clinical research in medicine and dentistry.

Designed primarily as a text for undergraduate and post-graduate students of statistics, the book introduces the readers to the fundamentals of Galois field and finite geometry. It lays emphasis on different aspects of construction of Design and Experiments with Projective geometry and Euclidian geometry. The book deals with the construction of mutually orthogonal latin squares (MOLS) and Hyper Graeco-Latin square and discusses construction of incomplete block design such as balanced incomplete block design (BIBD), partially balanced incomplete block design (PBIBD), including Lattice designs and ?-Designs based on Galois field. Besides, the book focuses on cofounding in factorial experiments, and it also describes quadratic residue as well as orthogonal arrays through Galois field. A separate chapter on Analysis of block design is included which contains some of the concepts developed recently.

This user-friendly new edition reflects a modern and accessible approach to experimental design and analysis Design and Analysis of Experiments, Volume 1, Second Edition provides a general introduction to the philosophy, theory, and practice of designing scientific comparative experiments and also details the intricacies that are often encountered throughout the design and analysis processes. With the addition of extensive numerical examples and expanded treatment of key concepts, this book further addresses the needs of practitioners and successfully provides a solid understanding of the relationship between the quality of experimental design and the validity of conclusions. This Second Edition continues to provide the theoretical basis of the principles of experimental design in conjunction with the statistical framework within which to apply the fundamental concepts. The difference between experimental studies and observational studies is addressed, along with a discussion of the various components of experimental design: the error-control design, the treatment design, and the observation design. A series of error-control designs are presented based on fundamental design principles, such as randomization, local control (blocking), the Latin square principle, the split-unit principle, and the notion of factorial treatment structure. This book also emphasizes the practical aspects of designing and analyzing

experiments and features: Increased coverage of the practical aspects of designing and analyzing experiments, complete with the steps needed to plan and construct an experiment A case study that explores the various types of interaction between both treatment and blocking factors, and numerical and graphical techniques are provided to analyze and interpret these interactions Discussion of the important distinctions between two types of blocking factors and their role in the process of drawing statistical inferences from an experiment A new chapter devoted entirely to repeated measures, highlighting its relationship to split-plot and split-block designs Numerical examples using SAS® to illustrate the analyses of data from various designs and to construct factorial designs that relate the results to the theoretical derivations Design and Analysis of Experiments, Volume 1, Second Edition is an ideal textbook for first-year graduate courses in experimental design and also serves as a practical, hands-on reference for statisticians and researchers across a wide array of subject areas, including biological sciences, engineering, medicine, pharmacology, psychology, and business.

This bestselling professional reference has helped over 100,000 engineers and scientists with the success of their experiments. The new edition includes more software examples taken from the three most dominant programs in the field: Minitab, JMP, and SAS. Additional material has also been added in several chapters, including new developments in robust design and factorial designs. New examples and exercises are also presented to illustrate the use of designed experiments in service and transactional organizations. Engineers will be able to apply this information to improve the quality and efficiency of working systems. The development and introduction of new experimental designs in the last fifty years has been quite staggering, brought about largely by an ever-widening field of applications. Design and Analysis of Experiments, Volume 2: Advanced Experimental Design is the second of a two-volume body of work that builds upon the philosophical foundations of experimental design set forth by Oscar Kempthorne half a century ago and updates it with the latest developments in the field. Designed for advanced-level graduate students and industry professionals, this text includes coverage of incomplete block and row-column designs; symmetrical, asymmetrical, and fractional factorial designs; main effect plans and their construction; supersaturated designs; robust design, or Taguchi experiments; lattice designs; and cross-over designs.

First published in 1986, this unique reference to clinical experimentation remains just as relevant today. Focusing on the principles of design and analysis of studies on human subjects, this book utilizes and integrates both modern and classical designs. Coverage is limited to experimental comparisons of treatments, or in other words, clinical studies in which treatments are assigned to subjects at random.

The principles of experimental design. An introduction to the therory of least squares. The general lenear hypothesis or multiple regression and the analysis of variance. The analysis of multipli classifications. Randomization. The valdity of analysis of randomized experiments. Randomized. Latin squares. Plot technique.

The sensitivity of randomized blook and latin square experiments. Experiments involving sevaral factors. Confonding in 2 factorial experiments. Partial confounding in 2 factorial experiments. Experiments involving factors with 3 levels. The general p factorial system. Other factorial experiments. Split-plot experiments. Fractional replication. The general case of fractional replication. Quasifactorial or latice and incomplete block designs. Lattice designs. Lattice designs with two restrictions. Rectangular lattices. Balanced incomplete block designs. Partially balanced incomplete block designs.Experiments on infinite populations and groups of experiments. Treatments applied in sequence. Emphasizes the strategy of experimentation, data analysis, and the interpretation of experimental results. Features numerous examples using actual engineering and scientific studies. Presents statistics as an integral component of experimentation from the planning stage to the presentation of the conclusions. Deep and concentrated experimental design coverage, with equivalent but separate emphasis on the analysis of data from the various designs. Topics can be implemented by practitioners and do not require a high level of training in statistics. New edition includes new and updated material and computer output. Introduction to the Design & Analysis of Experiments introduces readers to the design and analysis of experiments. It is ideal for a one-semester, upper-level undergraduate course for majors in statistics and other mathematical sciences, natural sciences, and engineering. It may also serve appropriate graduate courses in disciplines such as business, health sciences, and social sciences. This book assumes that the reader has completed a two-semester sequence in the application of probability and statistical inference. KEY TOPICS: An Introduction to the Design of Experiments; Investigating a Single Factor: Completely Randomized Experiments; Investigating a Single Factor: Randomized Complete and Incomplete Block and Latin Square Designs; Factorial Experiments: Completely Randomized Designs; Factorial Experiments: Randomized Block and Latin Square Designs; Nested Factorial Experiments and Repeated Measures Designs; 2f and 3f Factorial Experiments; Confounding in 2f and 3f Factorial Experiments; Fractional Factorial Experiments0; Regression Analysis: The General Linear Model; Response Surface Designs for First and Second-Order Models. MARKET: For all readers interested in experimental design.

An accessible and practical approach to the design and analysis of experiments in the health sciences Design and Analysis of Experiments in the Health Sciences provides a balanced presentation of design and analysis issues relating to data in the health sciences and emphasizes new research areas, the crucial topic of clinical trials, and state-of-the- art applications. Advancing the idea that design drives analysis and analysis reveals the design, the book clearly explains how to apply design and analysis principles in animal, human, and laboratory experiments while illustrating topics with applications and examples from randomized clinical trials and the modern topic of microarrays. The authors

outline the following five types of designs that form the basis of most experimental structures: Completely randomized designs Randomized block designs Factorial designs Multilevel experiments Repeated measures designs A related website features a wealth of data sets that are used throughout the book, allowing readers to work hands-on with the material. In addition, an extensive bibliography outlines additional resources for further study of the presented topics. Requiring only a basic background in statistics, Design and Analysis of Experiments in the Health Sciences is an excellent book for introductory courses on experimental design and analysis at the graduate level. The book also serves as a valuable resource for researchers in medicine, dentistry, nursing, epidemiology, statistical genetics, and public health.

The design and analysis of experiments. Randomised blocks and latin squares. Simple factorial and split plot designs. General factorial and split-plot designs. Factorial desing involving factors at two levels. Factorial desing involving factots at three levels. Complex factorial desings. Incomplete block desings for a single set of treatments. Lon-term experiments. Planning of groups of experiments. Combination of experimental experimental results. Combination of experimental results. Special designs and analysis. Missing observation. Scaling of observations.

An applied introduction to statistics for students with no background in the subject. The author places a strong emphasis on choosing sound design structures prior to a formal discussion of ANOVA, and then goes on to explore real data sets using a variety of graphs and numerical methods, before testing the assumptions behind standard ANOVA texts. Throughout the book, the author emphasises the contextual understanding and interpretation of data analysis rather than stressing formal deductive, mathematical reasoning, while the more difficult algebraic discussions are contained in optional sections.

Designed primarily as a text for the undergraduate and postgraduate students of industrial engineering, chemical engineering, production engineering, mechanical engineering, and quality engineering and management, it covers fundamentals as well as advanced concepts of Design of Experiments. The text is written in a way that helps students to independently design industrial experiments and to analyze for the inferences. Written in an easy-to-read style, it discusses different experimental design techniques such as completely randomized design, randomized complete block design and Latin square design. Besides this, the book also covers 22, 23, and 3n factorial experiments; two-stage, three-stage and mixed design with nested factors and factorial factors; different methods of orthogonal array design; and multivariate analysis of variance (MANOVA) for one-way MANOVA and factorial MANOVA. KEY FEATURES : Case Studies to illustrate the concepts and techniques Chapter end questions on prototype reality problems Yates algorithm for 2n factorial experiments Answers to Selected Questions

This book offers a step-by-step guide to the experimental planning process and the ensuing analysis of normally distributed data, emphasizing the practical considerations governing the design of an experiment. Data sets are taken from real experiments and sample SAS programs are included with each chapter. Experimental design is an essential part of investigation and discovery in science; this book will serve as a modern and comprehensive reference to the subject.

Market_Desc: · Statisticians· Engineers· Chemical Scientists· Physical Scientists Special Features: The book features more emphasis on using the computer, with extensive illustrations from Design-Expert and Minitab.· An overall revision of the text gets readers to the important topics on factorial designs more quickly than before· All the material on the basics of analysis

of variance now appear in a single chapter About The Book: This best-selling text continues to provide an accessible approach to learning how to design and analyze experiments that improve quality and efficiency in systems developed by engineers and managers. It includes new topics, examples, reorganization and greater emphasis on the use of the computer. Design and Analysis of Time Series Experiments presents the elements of statistical time series analysis while also addressing recent developments in research design and causal modeling. A distinguishing feature of the book is its integration of design and analysis of time series experiments.Drawing examples from criminology, economics, education, pharmacology, public policy, program evaluation, public health, and psychology, Design and Analysis of Time Series Experiments is addressed to researchers and graduate students in a wide range of behavioral, biomedical and social sciences.Readers learn not only how-to skills but, also the underlying rationales for the design features and the analytical methods. ARIMA algebra, Box-Jenkins-Tiao models and model-building strategies, forecasting, and Box-Tiao impact models are developed in separate chapters. The presentation of themodels and model-building assumes only exposure to an introductory statistics course, with more difficult mathematical material relegated to appendices. Separate chapters cover threats to statistical conclusion validity, internal validity, construct validity, and external validity with an emphasison how these threats arise in time series experiments. Design structures for controlling the threats are presented and illustrated through examples. The chapters on statistical conclusion validity and internal validity introduce Bayesian methods, counterfactual causality and synthetic control groupdesigns. Building on the earlier of the authors, Design and Analysis of Time Series Experiments includes more recent developments in modeling, and considers design issues in greater detail than any existing work. Additionally, the book appeals to those who want to conduct or interpret time seriesexperiments, as well as to those interested in research designs for causal inference.

A culmination of the author's many years of consulting and teaching, Design and Analysis of Experiments with SAS provides practical guidance on the computer analysis of experimental data. It connects the objectives of research to the type of experimental design required, describes the actual process of creating the design and collecting the data, shows how to perform the proper analysis of the data, and illustrates the interpretation of results. Drawing on a variety of application areas, from pharmaceuticals to machinery, the book presents numerous examples of experiments and exercises that enable students to perform their own experiments. Harnessing the capabilities of SAS 9.2, it includes examples of SAS data step programming and IML, along with procedures from SAS Stat, SAS QC, and SAS OR. The text also shows how to display experimental results graphically using SAS ODS graphics. The author emphasizes how the sample size, the assignment of experimental units to combinations of treatment factor levels (error control), and the selection of treatment factor combinations (treatment design) affect the resulting variance and bias of estimates as well as the validity of conclusions. This textbook covers both classical ideas in experimental design and the latest research topics. It clearly discusses the objectives of a research project that lead to an appropriate design choice, the practical aspects of creating a design and performing experiments, and the interpretation of the results of computer data analysis. SAS code and ancillaries are available at http://lawson.mooo.com

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