

## Principles Of Metal Casting By Heine Loper Rosenthal

*Part II: Casting Metallurgy 1. The Melt 2. Entrainment 3. Flow 4. Molds and Cores (updated and expanded) 5. Solidification Structure 6. Casting Alloys (new chapter) 7. Porosity 8. Cracks and Tears (new consolidated chapter) 9. Properties of Castings Part II: Casting Manufacture 10. The 10 Rules 11. Filling System Design Fundamentals 12. Filling System Components 13. Filling System Design Practice 14. Melting 15. Molding 16. Casting 17. Controlled Solidification Techniques 18. Dimensional Accuracy 19. Post-Casting Processing Index.*

*Ceramic Processing is the first comprehensive, stand alone, multi-authored book on advanced ceramic processing. It provides an overview of the important processing steps involved in the fabrication of advanced ceramics for structural and functional applications.*

*This work offers a comprehensive source of information on metallographic techniques and their application to the study of metals, ceramics, and polymers. It contains an extensive collection of micro- and macrographs.*

*Direct strip casting is a continuous casting process for producing metallic sheet directly from the molten state that minimises the need for substantial secondary processing. This important book is the first to review the implications of strip casting technology for a range of alloys, including carbon and stainless steel, aluminium, magnesium, titanium, copper and other non-ferrous alloys. The book is divided into six chapters, with the first two describing the physical metallurgy of candidate alloys for direct strip casting and the development of microstructure during solidification. Chapter 3 describes the principles of continuous casting processes and the evolution of direct strip casting. It provides the foundation for the following two chapters which describe process variables and their impact on microstructure and strip quality. The final chapter describes possible techniques in secondary processing and fabrication of the as-cast strip. Two appendices discuss simulation and modelling issues, and the measurement and representation of textures in metal strip. Direct strip casting of metals and alloys is a standard reference on a technology destined to have a profound impact on the manufacturing landscape of the twenty-first century. First book to review the implications of strip technology for a range of alloys Essential book on a technology destined to have a profound impact on the manufacturing landscape of the twenty-first century*

*Complete Casting Handbook*

*Shape Casting*

*Al-Si Alloys*

*Principles & Techniques*

*Principles of Foundry Technology*

*The Foseco Ferrous Foundryman's Handbook is a practical reference book for all those concerned with making castings in any of the commonly used alloys, by any of the usual moulding methods. International SI units are used throughout, but in almost all cases conversions to the more familiar Metric and Imperial units are given. Wherever possible, Casting Alloy Specifications include equivalent specifications for several countries as well as international specifications. Individual chapters cover the casting of light alloys, copper-based alloys, all types of cast-iron and steel.*

*This book deals with various science and technology factors that need careful consideration in producing a casting. It consists of 11 chapters contributed by experts in their respective fields. The topics include simulation of continuous casting process, control of solidification of continuous castings, influence of mold flux in continuous casting, segregation in strip casting of steel, developments in shell and solid investment mold processes, innovative pressure control during filling of sand molds, fracture toughness specifically of castings, permanent molding of cast iron, wear resistant castings and improvement of accuracy in estimating graphite nodularity in ductile iron castings.*

*Applied Science in the Casting of Metals focuses on metallurgical operations. The book first discusses the manufacture of iron and steel. Concerns include treatment of liquid iron and steel; treatment of molten iron between blast furnace and steelworks; and treatment of liquid steel. The text takes a look at casting pit practice, including ingot feeding, hot topping of alloy steels, methods of applying hot-tops, and hot-topping methods. The selection focuses on spray steel making and continuous casting of steel. The process involved in spray steel making; the basic principles of casting of steel; and metallurgical aspects are discussed. The text describes the treatment of cast iron; treatment of non-ferrous heavy metals; treatment of aluminum and magnesium alloys; and treatment of molding sand from molds and cores. The book explains the feeding of steel castings. Topics include development of exothermic feeding; mechanisms of aluminio-thermic reactions; applications of exothermics to steel castings; and surface additions. The text is a valuable source of data for readers interested in metallurgical operations.*

*Major casting processing advancements have been made in experimental and simulation areas. Newly developed advanced casting technologies allow foundry researchers to explore detailed phenomena associated with new casting process parameters helping to produce defect-free castings with good quality. Moreover, increased computational power allows foundry technologists to simulate advanced casting processes to reduce casting defects. In view of rapid expansion of knowledge and capability in the exciting field of casting technology, it is possible to develop new casting techniques. This book is intended to discuss many casting processing technologies. It is devoted to advanced casting processing technologies like ductile casting production and thermal analysis, casting of metal matrix composites by vortex stir casting technique, aluminum DC casting, evaporative casting process, and so on. This book entitled Advanced Casting Technologies has been organized into seven chapters and categorized into four sections. Section 1 discusses the production of ductile iron casting and thermal analysis. Section 2 depicts aluminum casting. Section 3 describes the casting manufacturing aspects of functionally graded materials and evaporative casting process. Section 4 explains about the vortex stir casting technique to process metal matrix composite castings. All the chapters discussed in detail the processing steps, process parameters involved in the individual casting technique, and also its applications. The goal of the book is to provide details on the recent casting technologies.*

*Applied Science in the Casting of Metals*

*Metallography, Principles and Practice*

*Metal Casting: Principles And Practice*

*Automotive, Aeronautical, and Aerospace Applications*

The definitive metal casting resource—fully updated Written by prominent industry experts, Principles of Metal Casting, Third Edition, addresses the latest advances in the field such as melting, casting processes, sand systems, alloy development, heat treatment, and processing technologies. New chapters cover solidification modeling, casting defects, and zinc and zinc alloys. Detailed photographs, illustrations, tables, and equations are included throughout. Ideal for students and researchers in metallurgy and foundry science as well as foundry industry professionals, this authoritative guide provides all of the information needed to produce premium-quality castings. Comprehensive coverage includes: Patterns Casting processes Solidification of metals and alloys Gating and risering of castings Casting process simulation Aluminum and aluminum alloys Copper and copper alloys Magnesium and magnesium alloys Zinc and zinc alloys Cast irons Steel castings Cleaning and inspection Casting defects

"Principles of Solidification" offers comprehensive descriptions of liquid-to-solid transitions encountered in shaped casting, welding, and non-biological bulk crystal growth processes. The book logically develops through careful presentation of relevant thermodynamic and kinetic theories and models of solidification occurring in a variety of materials. Major topics encompass the liquid-state, liquid-solid transformations, chemical macro- and microsegregation, purification by fractional crystallization and zone refining, solid-liquid interfaces, polypphase freezing, and rapid solidification processing. Solid-liquid interfaces are discussed quantitatively both as sharp and diffuse entities, with supporting differential geometric descriptions. The book offers: • Detailed mathematical examples throughout to guide readers • Applications of solidification and crystal growth methodologies for preparation and purification of metals, ceramics, polymers and semiconductors • Appendices providing supporting information on special topics covered in the chapters. Readers in materials, metallurgical, chemical, and mechanical engineering will find this to be a useful source on the subjects of solidification and crystal growth. Chemists, physicists, and geologists concerned with melting/freezing phenomena will also find much of value in this book.

This collection presents papers on the science, engineering, and technology of shape castings, with contributions from researchers worldwide. Among the topics that are addressed are structure-property-performance relationships, modeling of casting processes, and the effect of casting defects on the mechanical properties of cast alloys.

Directional Solidification of Steel Castings summarizes the results of a large number of investigations, mostly scientific in character, on the directional solidification of steel castings. The influence of design on the technical possibilities of producing casting in the foundry is examined. Diagrams, simple basic rules, and formulae are provided, along with many practical examples. This book is comprised of 16 chapters and begins with an introduction to the technical and psychological aspects of steel casting before turning to a discussion of the influence of shape and dimensions on the time it takes for castings to solidify. The thermal gradient, feeder heads, and cavities in steel castings are then considered. In particular, the effect of the thermal gradient on solidification and feeding range are examined. Methods for increasing the thermal gradient in the casting are described, including the use of mold heating pads, breaker cores or Washburn cores; external cooling (iron chills); cooling fins; internal chills; and exothermic pads. Cavities in steel castings which are commonly mistaken for true shrinkage cavities are also analyzed. This monograph is particularly suitable for foundry managers, foremen, technicians, casting designers, and students.

The Metallurgy and Design of Castings

5th International Symposium 2014

Foundry Engineering

Principles of Metal Manufacturing Processes

Fundamentals of Metal Casting

**Casting Aluminum Alloys, Second Edition, the follow up to the fall 2007 work on the structure, properties, thermal resistance, corrosion and fatigue of aluminum alloys in industrial manufacturing, discusses findings from the past decade, including sections on new casting alloys, novel casting technologies, and new methods of alloys design. The book also includes other hot topics, such as the implementation of computational technologies for the calculation of phase equilibria and thermodynamic properties of alloys, the development of software for calculation of diffusion processes in aluminum alloys, computational modeling of solidification microstructure and texture evolution of multi-component aluminum materials. In addition to changes in computational predictive abilities, there is a review of novel casting aluminum alloy compositions and properties, as well as descriptions of new casting technologies and updates to coverage on the mechanical properties of aluminum casting alloys. Presents a discussion of thermodynamic calculations used for assessing non-equilibrium solidifications of casting aluminum alloys Expands coverage of mathematical models for alloy mechanical properties, helping facilitate the selection of the best prospective candidate for new alloy development Contains a new section that describes the self-consistent evaluation of phase equilibria and thermodynamic properties of aluminum alloys**

**This book, Casting Processes and Modelling of Metals, Materials, explores the various casting and modelling activities related to metallic alloy systems. The book provides results of research work conducted by experts from all over the globe to add to the research community in the era of the casting process and modelling. Dr. Abdallah and Dr. Aidounani, whom both have several publications in peer-reviewed journals, worldwide conferences, and scientific books. The book introduces the casting processes and then discusses the various issues and possible solutions. Over the past years, various models have been proposed and utilized to predict the performance of castings. Some of these models proved to be accurate whereas others failed to predict the casting performance. The strength of any predictive tool depends on the employment of physically meaningful parameters that replicate the real-life conditions. This has been illustrated in the current book with such predictive models and finite element (FE) modelling to illustrate the behaviour of castings in real-life conditions.**

**Describes the sand foundry, the characteristics of molding sand, the types of mold and pattern making equipment, and the various sand casting procedures for forming metals**

**This book covers the science, engineering, and current art of the creation of metalcastings. Basic theory on gating design, solidification, and risering are presented. The metallurgy and processing of aluminum, cast iron, and steel are covered.**

**Basic Principles of Metal Casting**

**Castings Practice**

**Fundamentals of Aluminium Metallurgy**

**Principles of Metal Casting, Third Edition**

**Direct Strip Casting of Metals and Alloys**

Principles of Metal Casting, Third EditionMcGraw-Hill Education

This book details aluminum alloys with special focus on the aluminum silicon (Al?Si) systems – that are the most abundant alloys second only to steel. The authors include a description of the manufacturing principles, thermodynamics, and other main characteristics of Al?Si alloys. Principles of processing, testing, and in particular applications in the Automotive, Aeronautical and Aerospace fields are addressed.

Metals are still the most widely used structural materials in the manufacture of products and structures. Their properties are extremely dependent on the processes they undergo to form the final product. Successful manufacturing therefore depends on a detailed knowledge of the processing of the materials involved. This highly illustrated book provides that knowledge. Metal processing is a technical subject requiring a quantitative approach. This book illustrates this approach with case studies derived from industry. Real industrial case studies Quantitative approach Challenging student problems

Materials Processing is the first textbook to bring the fundamental concepts of materials processing together in a unified approach that highlights the overlap in scientific and engineering principles. It teaches students the key principles involved in the processing of engineering materials, specifically metals, ceramics and polymers, from starting or raw materials through to the final functional forms. Its self-contained approach is based on the state of matter most central to the subject: the material, melt, solid, powder, dispersion and solution, and vapor. With this approach, students learn processing fundamentals and appreciate the similarities and differences between the materials classes. The book uses a consistent nomenclature that allow for easier comparisons between various materials and processes. Emphasis is on fundamental principles that gives students a strong foundation for understanding processing and manufacturing methods. Development of connections between processing and structure builds on students' existing knowledge of structure-property relationships. Examples of both standard and newer additive manufacturing methods throughout provide students with an overview of the methods that they will likely encounter in their careers. This book is intended primarily for upper-level undergraduates and beginning graduate students in Materials Science and Engineering who are already schooled in the structure and properties of metals, ceramics and polymers, and are ready to apply their knowledge to materials processing. It will also appeal to students from other engineering disciplines who have completed an introductory materials science and engineering course. Coverage of metal, ceramic and polymer processing in a single text provides a self-contained approach and consistent nomenclature that allow for easier comparisons between various materials and processes Emphasis on fundamental principles gives students a strong foundation for understanding processing and manufacturing methods Development of connections between processing and structure builds on students' existing knowledge of structure - property relationships Examples of both standard and newer additive manufacturing methods throughout provide students with an overview of the methods that they will likely encounter in their careers

The Ten Rules of Castings

Casting Processes and Modelling of Metallic Materials

An Introduction to Modern Casting and Crystal Growth Concepts

The Complete Handbook of Sand Casting

Science and Technology of Casting Processes

*Each chapter of Professor Cambell's new book Castings Practice will take a look at one of his 10 rules. It is to be expected that the Rules will one day be taken as an outline or blueprint for an international specification on the methods for making reliable castings. John Cambell has over two decades of experience in the casting industry and is the author of over 40 technical papers and patents. He has become well-known in the foundry industry as the originator of the Cosworth casting process, which is becoming accepted throughout the world as a new production process for the casting of cylinder heads and blocks. He is now Federal Mogul Professor of Casting Technology at the University of Birmingham. \* Must-follow rules of castings, from one of the world's leading experts \* Companion volume to the renowned book 'Castings' \* Accessible and direct, provides essential information for students of metallurgy and foundry professionals alike*

*Foundry Technology brings together basic metal casting phenomena, foundry techniques and product characteristics in a single work of reference. Peter Beedy was a foundry manager before he became a senior lecturer in metallurgy, and subsequently maintained continuous links with the castings industry and associated research activities and publications. His book is designed to serve as a bridge between the study of the basic principles of metal founding and their application in the producing and user industries. A particular aim of Foundry Technology is to assist engineers and engineering students in appreciating the role of castings in design and materials selection. Orthodox and specialized casting processes, and both ferrous and non-ferrous founding are considered on a comparative basis, and the place of castings in design is critically examined and related to other products. The revised edition takes account of the main changes in casting processes and products since the publication of the original edition in 1972. While retaining treatments of basic aspects of molding, solidification, cast structures and feeding, newer developments in modeling and rapid prototyping are reviewed, together with quality, environmental, health and other issues of growing importance. New edition of well-known book Fully updated with latest technology*

*Campbell's Complete Casting Handbook: Metal Casting Processes, Techniques and Design, Second Edition provides an update to the first single-volume guide to cover modern principles and processes in such breadth and depth, while also retaining a clear, practical focus. The work has a unique viewpoint, interpreting the behavior of castings, and metals as a whole, in terms of their biofilm content, the largely invisible casting defects which control much of the structure and behavior of metals. This new edition includes new findings, many from John Campbell's own research, on crack initiation, contact pouring, vortex gates, and the Cosworth process. Delivers the expert advice that engineers need to make successful and profitable casting decisions Includes established, must-have information, such as Campbell's '10 Rules' for successful casting manufacture Includes numerous updates and revisions based on recent breakthroughs in the industry*

*"It's about time that a practicing engineer with casting and academic experience has written a book that provides answers to questions about squeeze casting and semi-solid molding/forming that many engineers and students of casting need answered!" —Joseph C. Benedek, PhD, Consultant and retired technical director, Alcoa High Integrity Die Casting Processes provides a comprehensive look at the concepts behind advanced die casting technologies, including vacuum die casting, squeeze casting, and several variants of semi-solid metalworking. Practical applications for these processes are illustrated in numerous case studies. This single-source reference text presents the latest material in five sections: Basic concepts of the casting and molten metal flow High integrity die casting processes with case studies Product design considerations Controlling quality and avoiding defects Future advances under development Key coverage includes a survey of liquid metal flow, strategies to overcome the limitations of conventional die casting, and potential defects unique to high integrity die casting processes. Also featured are methods for minimizing porosity, reducing cost by design, practical applied statistical process control techniques, designing for manufacturability, and containment methods for potential processing defects. Several chapters present detailed real-world examples illustrating the broad range of applications possible using high integrity die casting processes. Included with this book is a CD-ROM containing PowerPoint presentations for each chapter. These presentations can be used for training purposes in conjunction with numerous study questions designed to practically apply the content of the book to real-world situations. Selected PowerPoint slides can be used to support engineering proposals, marketing presentations, or customer education seminars. High Integrity Die Casting Processes is a valuable reference for both component producers and component users alike. Process engineers, tool designers, manufacturing engineers, production managers, and machine operators will acquire a better understanding of these advanced die casting processes to optimize manufacturing and improve product quality. Component designers, product engineers, purchasing agents, buyers, supplier quality engineers, and project managers will gain insight into these processes and develop superior products by design.*

*Principles of Metal Casting*

*Castings*

*By Richard W. Heine and Others*

*Recent Advances*

*Mold and Core Sands in Metalcasting: Chemistry and Ecology*

The metal casting, uses large amounts of natural resources, energy and metals as well as generates significant amounts of gases and solid wastes, which have an essential influence on the natural environment and work conditions in casting houses. The condition of the further development is the adjustment to the strategy of the sustainable development.This book examines potential solutions to the economic, ecological, and occupational hazards generated by the foundry industry. It focuses on emissions of chemical compounds during the preparation and formation of molding sands, molds pouring with molten metal, molds cooling and castings knocking out. It also addresses the effects of the spent molding sands reclamation process and the influence of spent sands on the environment during their storage. Establishing the most sustainable techniques for limliting the negative impact of foundry processes on the environment is explored in detail. The book will be valuable to academics and industry professionals alike. Describes the mechanisms of hardening and thermal destruction of individual binders in moulding and core sands; Assesses the influence of moulding and core sands technology on the environment; Discusses state of the art moulding and core sand technology.

Complete Casting Handbook is the result of a long-awaited update, consolidation and expansion of expert John Campbell's market-leading casting books into one essential resource for metallurgists and foundry professionals who design, specify or manufacture metal castings. The first single-volume guide to cover modern principles and processes in such breadth and depth whilst retaining a clear, practical focus, it includes: A logical, two-part structure, breaking the contents down into casting metallurgy and casting manufacture Established, must-have information, such as Campbell's '10 Rules' for successful casting manufacture New chapters on filling system design, melting, molding, and controlled solidification techniques, plus extended coverage of a new approach to casting metallurgy Providing in-depth casting knowledge and process know-how, from the noteworthy career of an industry-leading authority, Complete Casting Handbook delivers the expert advice needed to help you make successful and profitable castings. Long-awaited update, consolidation and expansion of expert John Campbell's market-leading casting books into one essential handbook Separated into two parts, casting metallurgy and casting manufacture, with extended coverage of casting alloys and new chapters on filling system design, melting, moulding and controlled solidification techniques to compliment the renowned Campbell '10 Rules' Delivers the expert advice that engineers need to make successful and profitable casting decisions

Manufacturing and Design presents a fresh view on the world of industrial production: thinking in terms of both abstraction levels and trade-offs. The book invites its readers to distinguish between what is possible in principle for a certain process (as determined by physical law); what is possible in practice (the production method as determined by industrial state-of-the-art); and what is possible for a certain supplier (as determined by its production equipment). Specific processes considered here include metal forging, extrusion, and casting; plastic injection molding and thermofforming; additive manufacturing; joining; recycling; and more. By tackling the field of manufacturing processes from this new angle, this book makes the most out of a reader's limited time. It gives the knowledge needed to not only create well-productible designs, but also to understand supplier needs in order to find the optimal compromise. Apart from improving design for production, this publication raises the standards of thinking about producibility. Emphasizes the strong link between product design and choice of manufacturing process Introduces the concept of a "production triangle" to highlight tradeoffs between function, cost, and quality for different manufacturing methods Balanced sets of questions are included to stimulate the reader's thoughts Each chapter ends information on the production methods commonly associated with the principle discussed, as well as pointers for further reading Hints to chapter exercises and an appendix on long exercises with worked solutions available on the book's companion site: http://booksite.elsevier.com/9780080999227/

In This Book, The Topics/Syllabus Adequately Cover Metal Casting Subject In The Courses Of Mechanical, Production And Metallurgy Branches For B.E., B.Tech. As Well As Production And Industrial Metallurgy For M.Tech.With His Direct Experience In Metal Casting Industry And Teaching Academics The Author Attempts To Bridge The Gap Existing Between Essential Theory In Books And Vital Practical Applications In Industry.It Contains All The Molding Processes Normally Used With Details Of Ingredient Testing.Different Stages Of Casting Production Essential Theory Of Gating And Riserling, As Well Asfinishing, Inspection And Quality Control.Over 80 Line Sketches Facilitate Easy Understanding. Information Given Through Over 20 Tables Help Easy Comprehension, Comparison And Remembrance. Exhaustive Examples Of Specific Components Normally Made By Casting Process Help To Build Confidence When Entering Industry. Over 200 Technical Books And Research Papers Upto May 1996 Are Referred. Examples Of Working Computer Programs Given, Form The Basis For Modern Practice-Oriented Projects In Final Year For Practising Engineers, Managers And Entrepreneurs, This Book Provides Useful Theory And Practical Aspects On Foundry Management. Exhaustive Treatment Of Critical Gating & Riserling With Many Industry Examples, Practical Solutions To Melting Problems, Casting Defects Analysis Through Cause-Effect Diagrams Will Be Very Useful. Essential Information, On Energy Conservation And Environmental Pollution Control Is Also Given In The Last Chapter.

**Foundry Technology**

**Manufacturing and Design**

**Directional Solidification of Steel Castings**

**A Unified Approach to Processing of Metals, Ceramics and Polymers**

**Materials Processing**

*This text emphasizes the underlying metallurgical principles of casting technology so that the students can develop a sound set of analytic skills, helpful in the development of improved casting processes and products. The pictorial and diagrammatic support provided throughout reinforces the clarity of the text for a thorough understanding of the metal casting concepts and technologies. Besides comprehensive coverage of the casting processes and elaborate discussion of properties of cast irons, cast steels, and cast nonferrous alloys, the text also familiarizes the students with the most recent developments in binder systems, casting practices, solidification processing, metal filtration, metallurgy of cast alloys, alloy design, and energy and environment management. The book is primarily designed for degree and diploma students pursuing courses in metallurgical, mechanical, and production engineering disciplines as well as for candidates studying for Associate Membership Examinations (AMIM, AMIE, Grad. IIF). It would also benefit M.Tech, M.E. students specializing in foundry technology and allied disciplines.*

**Fundamentals of Aluminium Metallurgy: Recent Advances updates the very successful book Fundamentals of Aluminium Metallurgy. As the technologies related to casting and forming of aluminum components are rapidly improving, with new technologies generating alternative manufacturing methods that improve competitiveness, this book is a timely resource. Sections provide an overview of recent research breakthroughs, methods and techniques of advanced manufacturing, including additive manufacturing and 3D printing, a comprehensive discussion of the status of metalcasting technologies, including sand casting, permanent mold casting, pressure diecastings and investment casting, and recent information on advanced wrought alloy development, including automotive bodysheet materials, amorphous glassy materials, and more. Target readership for the book includes PhD students and academics, the casting industry, and those interested in new industrial opportunities and advanced products. Includes detailed and specific information on the processing of aluminum alloys, including additive manufacturing and advanced casting techniques Written for a broad ranging readership, from academics, to those in the industry who need to know about the latest techniques for working with aluminum Comprehensive, up-to-date coverage, with the most recent advances in the industry**

*This is the key publication for professionals and students in the metallurgy and foundry field. Fully revised and expanded, Castings Second Edition covers the latest developments in the understanding of the role of the liquid metal in controlling the properties of cast materials, and indeed, of all metallic materials that have started in the cast form. Practising foundry engineers, designers, and students will find the revealing insights into the behaviour of castings essential in developing their interstanding and practice. John Campbell OBE is a leading international figure in the castings industry, with over four decades of experience. He is the originator of the Cosworth Casting Process, the pre-eminent production process for automobile cylinder heads and blocks. He is also co-inventor of both the Baxi Casting Process (now owned by Alcoa) developed in the UK, and the newly emerging Alotech Casting Process in the USA. He is Professor of Casting Technology at the University of Birmingham, UK. New edition of this internationally respected reference and textbook for engineers and students Develops understanding of the concepts and practice of casting operations Castings is the key work on castings technology and process metallurgy, and an essential resource on contemporary developments and thinking on the new metallurgy of cast alloys Revised and updated throughout, with new material on subjects including surface turbulence, the new theory of entrainment defects including folded film defects, plus the latest concepts of alloy theory*

*Principles of Metal Casting [by] Richard W. Heine [and] Philip C. Rosenthal. Prepared in Cooperation with the Textbook Committee of the Education Division, American Foundrymen's Society, Des Plaines, Ill*

*Understanding the Principles of How Things Are Made*

*Principles of Solidification*

*Ceramic Processing*

*Their Physical and Mechanical Metallurgy*