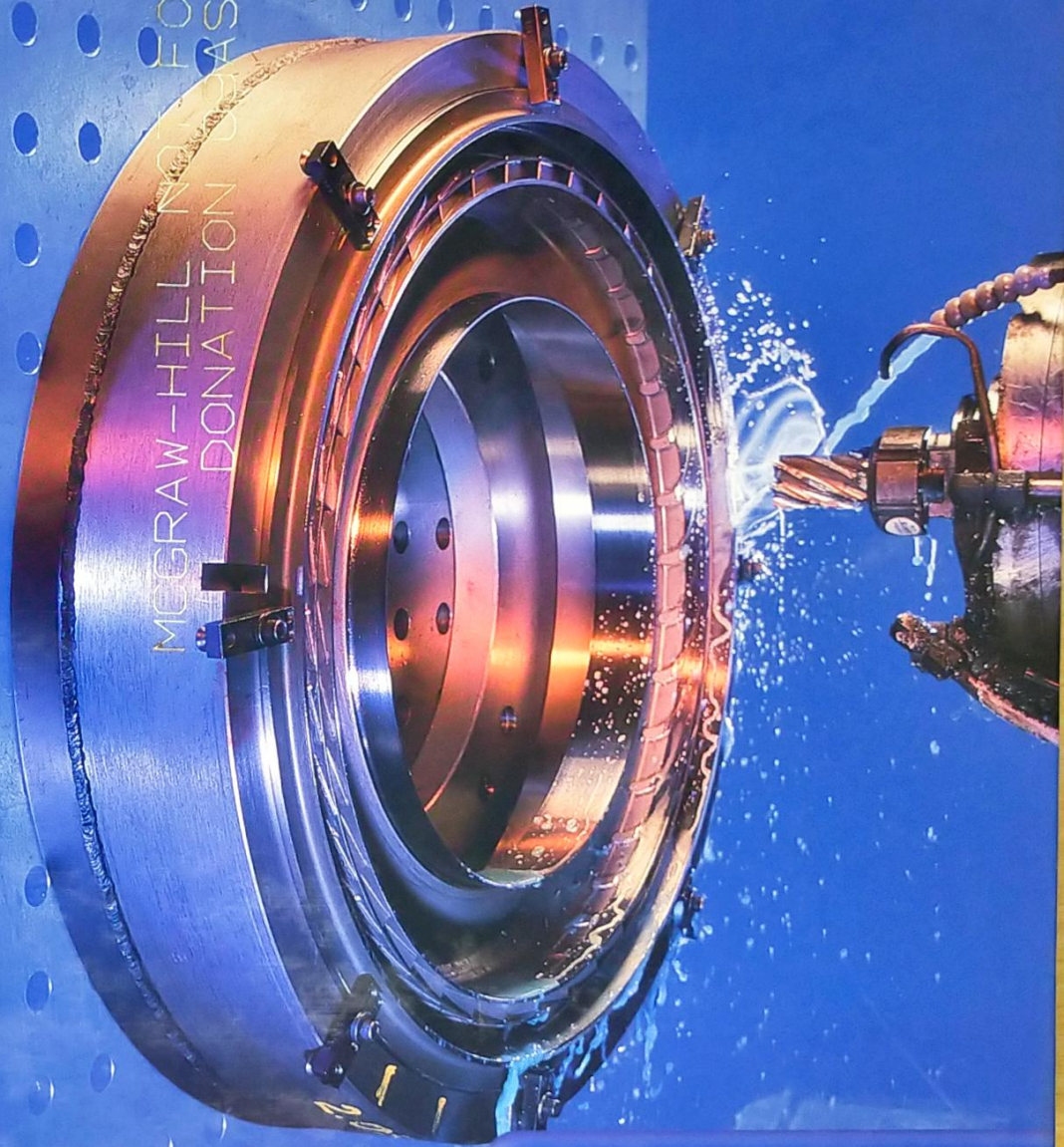


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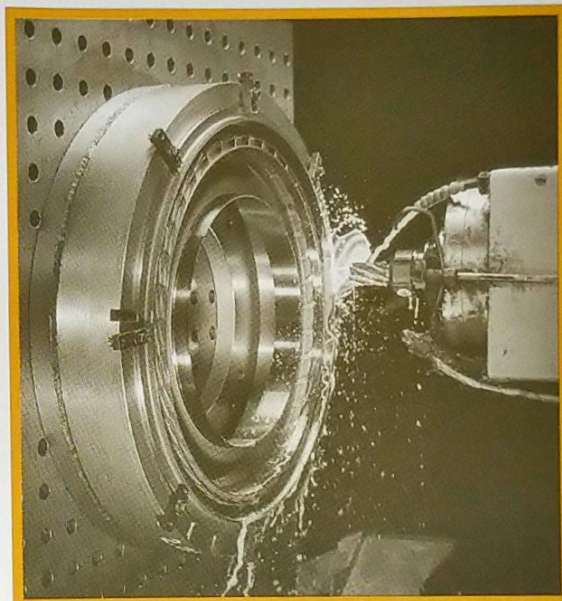


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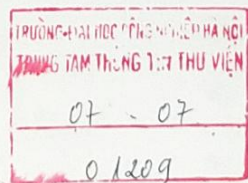


# TECHNOLOGY OF MACHINE TOOLS

FIFTH EDITION



**Steve F. Krar**  
**Albert F. Check**



**GLENCOE**

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# P R E F A C E



**D**uring the last two or three decades, computers have been applied to all types of machine tools to program and control various machine operations. Computers have steadily improved until there are now highly sophisticated units capable of controlling the operation of a single machine, a group of machines, or even a complete manufacturing plant. Section 14, "Computer-Age Machining" has been expanded to include computer numerical control machine tools such as turning centers, machining centers, and electro-discharge machines. For these new machine tools to reach their full potential, new cutting tools are being developed to produce accurate parts faster and at competitive prices. With this in mind, the authors have expanded machining processes such as flexible manufacturing systems and added new cutting tools and materials such as polycrystalline cubic boron nitride, polycrystalline diamond, and SG ceramic aluminum oxide.

This book is based on the authors' many years of practical experience as skilled workers in the trade and as specialists in teaching. To keep abreast of rapid technological change, the authors have researched the latest technical information available and have visited industries that are leaders in their field. Sections of this book were reviewed by key personnel in various manufacturing firms and leading educators so that accurate and up-to-date information is presented. The authors are grateful to Don W. Alexander, Wytheville Community College, Wytheville, VA; James D. Smith, Tennessee Tech Center, Crump, TN; and William L. White, Director of Engineering Laboratories, GMI Engineering and Management Institute, Flint MI for technical and practical suggestions that were incorporated into the text.

The fifth edition of *Technology of Machine Tools* is presented in unit form; each unit is introduced with a set of objectives followed by related theory and operational sequence. Dual dimensioning (inch/metric) is used throughout the book. Because we live in a global society it is important for machine tool technicians to be familiar with both systems of measurement. Each operation is explained in a step-by-step procedure that students can readily follow. Advanced operations are introduced by problems, followed by step-by-step solutions and matching procedures. So this text will be easily understood, each unit contains many new illustrations and photographs with color used to emphasize important points. End-of-unit review questions can be used for review or for homework assignments to prepare students for subsequent operations.

The purposes of this text are to assist instructors in providing the basic training on conventional machine tools; to cover basic programming for CNC machines (such as turning centers, machining centers, and electro-discharge machines); and to introduce new manufacturing technologies and processes. To make this course interesting and challenging for students, videotapes can be used to cover new technologies. They are available on loan or for a small fee from technical societies, manufacturers, and publishers. The instructor's manual includes sources of videotapes along with answers to the review questions in the text. A student workbook is also available.

A technician in the machine shop trade should be neat; develop sound work habits; and have a good knowledge of mathematics, print reading, and computers. To keep current on technological changes, technicians must expand their knowledge by reading specialized texts, trade literature, and magazine articles in this field.

**Steve F. Krar**  
**Albert F. Check**

## ABOUT THE AUTHORS

### **Steve F. Krar**

Steve F. Krar majored in Machine Shop Practice and spent fifteen years in the trade, first as a machinist and finally as a tool and diemaker. After this period, he entered Teachers' College and graduated from the University of Toronto with a Specialist's Certificate in Machine Shop Practice. During his twenty years of teaching, Mr. Krar was active in vocational and technical education and served on the executive committees of many educational organizations. For ten years, he was on the summer staff of the College of Education, University of Toronto, involved in teacher training programs. Active in machine tool associations, Steve Krar is a Life Member of the Society of Manufacturing Engineers and former Associate Director of the GE Superabrasives Partnership for Manufacturing Productivity.

Mr. Krar's continual research over the past thirty-five years in manufacturing technology has involved many courses with leading world manufacturers and an opportunity to study under Dr. W. Edwards Deming. He is co-author of over forty technical books, such as *Machine Shop Training*, *Machine Tool Operations*, *CNC Technology and Programming*, *Superabrasives—Grinding and Machining*, some of which have been translated into five languages and used throughout the world.

### **Albert F. Check**

Albert F. Check has worked as a machinist, including setup and operation of NC/CNC machine tools. During this period, he pursued his education, attaining an M.S. Ed. degree in Occupational Education from Chicago State University. Mr. Check has been a full-time faculty member at Triton Community College for 20 years and served as the Coordinator for Machine Tool Technology for 16 years. His extensive trade background makes him well suited for teaching industrial in-plant training courses through the Employee Development Institute. Mr. Check keeps up to date with technological developments by attending industrial training seminars offered by the Society of Manufacturing Engineer (SME), industrial machine tool manufacturers, and GE Superabrasives Grinding and Machining Technology.

Mr. Check is a Senior Member of SME, has been a VICA judge for the State of Illinois Precision Machining Skill Olympics, as well as an active participant in the Vocational Instruction Practicum sponsored by the State of Illinois. Mr. Check has mentored a visiting Turkish Educator as part of a World Bank Project. He has served on many college and local elementary education committees and is currently a member of the Educator's Advisory Council of the Industrial Diamond Association's Partnership for Manufacturing Productivity.