CAD/CAM NEWSLETTER

March 1986.

Information Compiled by the Canadian CAD/CAM Council

for the Advancement of Computer Integrated Manufacturing *

Summary of this Issue

1 - January & February Newsletters - Reference Issues
2 - Book Reviews
3 - Slide Set & Photo Salon Proposed
4 - Conferences, Exhibitions, Workshops & Seminars
5 - Twenty Selected Publications to Provide a World View of CAD/CAM
6 - CAD/CAM Quotes

1. Reference Issues on Information Sources

Newsletter readers are reminded that the January and February Newsletters have been reference issues on information sources.

The January issue lists the CAD/CAM Centres in Canada which are available to assist you plus a list of over twenty technical societies. A schedule of major CAD/CAM conferences for the full 1986 year is included.

The February issue lists approximately thirty regularly published journals, eighteen publications in newsletter format plus close to thirty industry directories and bibliographies.

Why search for information and lose time when it is so readily available? We suggest that at least some of these publications belong on your bookshelf. These newsletter issues provide an opportunity to check the technology transfer and information sources available in your firm or organization and arrange to obtain some that are missing.

2. Book Reviews

The CAD/CAM Newsletter for March 1985 listed over one hundred books devoted to aspects of computer integrated manufacturing. As was noted at the time, more than fifty percent were new publications within the preceding year.

The March 1986 Newsletter focusses again on books, with a series of book reviews and a partial update of new titles that have come to our attention. Copies of the March 1985 Newsletter are available to new readers on request.

- "CAD/CAM: Computer-Aided Design and Manufacturing" - Mikell P. Groover, Emory W. Zimmers, Jr., Prentice Hall, Inc., Englewood Cliffs, N.J., U.S.A., 489 pp., 1985, hard cover.

  This book is intended to provide the reader with a strong introduction to the topics related to CAD/CAM with an emphasis on CAD, CAM, and CAD/CAM integration. In fact, an alternate title to this book could be "The role of computers in design and manufacturing" since it includes chapters on computers as the foundation of CAD/CAM, Computer-Aided Design (including basics on computer graphics), Numerical Control (including part programming with APT), computer-integrated production management systems (including production planning and control, inventory management, MRP, shop floor control), computer control (including process control, computer-aided quality control, and FMS). The book is concluded by recommendations on CAD/CAM implementation.

  This book is the result of extensive experience developed at Lehigh University in the area of CAD/CAM, robotics, and CIM by the authors, their colleagues and their students. These efforts have recently been honored by the attribution of the first University LEAD Award given by CASA/SME. I strongly recommend this book for self-study or as a classroom textbook (problems are included, but not their answers). Each chapter is terminated by a list of relevant references. The text is easily readable, well-structured, well-illustrated, and up-to-date.

  It is really one of the best books to understand any aspects of the CIM framework and see how they relate to one another. However, since each chapter could be a book per se, this text is really suitable for management or persons new to the field. The bibliography suggests relevant further readings.

  Reviewed by Dr. F. Vernadat, a research officer working on CAD/CAM and CIM data bases in the Laboratory for Intelligent Systems, Division of Electrical Engineering, National Research Council, Ottawa. Dr. Vernadat has also been teaching a full term course at Carleton University in which the above book is used as a text.

- "Computer-Aided Design and Manufacture" - C.B. Besant, C.W.K. Lui, Ellis Horwood, Chichester, UK, 3rd edition, 1986, 410 pp., hard cover.

  The third edition of this book is a largely augmented version of the previous two editions and therefore makes it much more complete with respect to its title. It would appear that the re-writing of this publication may have been influenced by other publications, such as the book of M.P. Groover et al., "CAD/CAM", since new chapters on CAM have been added to cover topics such as computer systems, industrial robots,

robot progamming, APT programming, automated guided vehicles, FMS, process planning, and factory management. Even more, existing chapters on hardware and software of CAD and on geometric modelling have been updated and augmented, and more up-to-date illustrations have been inserted. The chapter on finite element analysis has also been modified and a chapter on draughting has been added.

This book is, in part, based on the experience acquired by the authors and their students at the Imperial College of Science and Technology, University of London. Many references, given at the end of each chapter, refer to their work and may be hard to get, but other relevant and recognized references are also listed. The book is intended to be a classroom or self-study textbook for an in-depth introduction to the field of CAD/CAM. It includes no exercises. Reading this book, which can be considered as a complement to the book by Groover et al., is recommended. Illustrations are of good quality and the text is easily readable and informative. The conciseness of chapters on robots, FMS, and factory management is the major criticism.

Reviewed by: Dr. F. Vernadat, a research officer working on CAD/CAM and CIM data bases in the Laboratory for Intelligent Systems, Division of Electrical Engineering, National Research Council, Ottawa.

- "Robots in Manufacturing: Key to International Competitiveness" - J. Baranson, Lomond Publication, Inc., Mt. Airy, Maryland, U.S.A., 152 pp., 1983, price $32.50, hard cover.

The author is a former senior economist with the World Bank and currently President of a consulting company, Developing World Industry and Technology Inc. His book discusses issues related to the use of computer-based technologies by manufacturing industries to maintain competitive positions in the international marketplace. The national economic environments of the United States, Japan and several European countries are contrasted. The effects of government policies and corporate attitudes on the development and implementation of Automated Manufacturing Equipment and Systems (AMES) in each country are discussed. Also included in the book is a series of company profiles of selected AMES producers from the United States, Japan and Europe.

Despite its title, the book does not address technical issues related to the use of robotic systems in manufacturing. Instead it is a discussion of economic and structural concepts directed at public policy makers and corporate planners. The book is concisely written and the author raises some interesting points. However, it was written while the US economy was still in the recession of the early 1980's and consequently some of the discussions are somewhat dated. Therefore, while this book is generally recommended, it should be supplemented by other books or reports which are more current and which are directed more toward the Canadian situation.

Reviewed by David Travers, P.Eng. Mr. Travers is a CAD/CAM Engineer with the Manufacturing Technology Centre of New Brunswick, UNB. He has a B.Eng., from the Technical University of Nova Scotia, 1981 and a MASc., University of Waterloo, 1985.

- "Computer Aided Design-Fundamentals & System Architectures" - J. Encarnaçao and E.G. Schlechtendahl, Springer-Verlag, 1983, 346 pp., hard cover.

The book's prime interest is in the area of CAD, and system design, omitting such topics as Computer Aided Manufacturing (CAM), Computer Aided Engineering (CAE), and Computer Aided Planning (CAP).

It is based on an assumption that the reader is fully acquainted with computer software tools such as graphical kernel system (GKS), which is mentioned throughout the book. I found most of the pertinent information that was discussed well annotated, but it would take a great deal of bibliographic research to fully understand the material to which the authors were referring.

Major areas of information such as 3-D Modeling, Wire Frame Modeling, and Solid Modeling are covered in four and a half pages. On the other hand, Finite Element Modeling is covered in great depth with comparison charts, simulation packages and optimization programs.

In summary, the book is intended primarily for computer scientists and research engineers who would be interested in trying to write or develop their own CAD system. It is not suitable for management or personnel new to the CAD field.

On a scale of 1 to 10, as required reading in industry, I would put this book at a 2, whereas academically, the rating may be higher.

Reviewed by M.P. O'Grady, Manager of CAD/CAM at Bristol Aerospace Limited, Winnipeg, Canada. Mr. O'Grady having spent the last ten years in the prime areas of CAD/CAM is a former teaching master at George Brown College, Toronto, Ontario. Currently, and for the last six years, he is Manager of CAD/CAM at Bristol Aerospace Limited, Winnipeg, Manitoba.

- "Computer Graphics Programming GKS the Graphics Standard" - G. Enderle, K. Kausy, G. Pfaff, Springer Verlag (hard cover), 1984, 542 pages.

This book is an introduction to computer graphics and is based on the GKS computer graphics standard. The main aim of the book is to present in some detail the Graphical Kernel System and consequently the entire view of computer graphics is discussed in the context of GKS. There are four parts. The introduction presents graphics primitives, attributes, coordinate systems and a description of input. The second part presents the history of the development of the standard and gives a detailed discussion of some of the controversial issues that were resolved in the standards development process. The programmer's view of GKS is

presented in great detail in Part 3. All the callable functions are
described in detail with examples of their use in Fortran. Part 4
presents the GKS environment as well as some of the logical models of a
graphics system. Also, Fortran language "binding" or the form of
Fortran callable routines is presented here in some detail.

The book is a complete reference text containing great detail, and was
written by some of the architects of GKS. However, it is an introverted
book. It is of greatest interest to those who have participated in the
development of GKS and also to graphics programmers. The book is likely
too difficult for a casual programmer to learn about using GKS.

A note about Appendices: Appendix 1 describes the GKS metafile, a
data format for storage, retrieval and transfer of graphical data. The
format presented is not part of GKS, but it has been in interium use in
Germany. Hence it is of little interest here. Appendix 2 is a very
useful glossary of terms used in graphics, in both English and French
(in addition to German).

Reviewed by Dr. M. Wein, Laboratory for Intelligent Systems, Division
of Electrical Engineering, NRC, and Chair (1980-85) CSA Working Group in
Graphics.

- "Introduction to the Graphical Kernel System (GKS)" - F.R.A. Hopgood,
D.A. Duce, J.R. Gallop and D.C. Sutcliffe, Academic Press (hard cover)
1983, 200 pages.

This book was written by the British members of the working group
which developed GKS. Part I of this book presents the main themes in
computer graphics: graphical output and graphics primitives, coordinate
systems, a discussion of input and interaction. Part II presents the
GKS environment and describes in detail a computer graphics system.

This is a small and delightful book, with an easily approachable
introduction to writing graphics programs using GKS. The style of the
presentation is a series of examples of Fortran programs with the
corresponding graphical output. The specifics of GKS are introduced, as
required, as the theme of the book is being developed. The book is
ideally suited as a self teaching introduction to graphics programming
using GKS.

Two points may detract from this book. Having been published in 1983,
it predates the final acceptance of GKS as a standard. Consequently
there are subtle differences between the book and the actual GKS
document. These differences do not reduce materially the usefulness of
the book as a highly readable introduction. The second point is that
the book presents only the Fortran 77 "binding" of GKS (as it appears in
that language), because the Fortran binding was the only one being
developed in 1983. At present there are also Pascal, C and Ada versions
nearing acceptance.

Reviewed by Dr. M. Wein, Laboratory for Intelligent Systems, Division of Electrical Engineering, NRC, and Chair (1980-85) CSA Working Group in Graphics.

- "Handbook of Industrial Robotics" - S.Y. Nof, John Wiley & Sons, 1985, 1358 pp., hard cover, $109.50 in Canada.

It is hard to know what to say concerning such a remarkable "tour de force". Guided by an eleven person advisory board, 93 contributors have provided 77 chapters in 1358 information packed pages.

Normally a reviewer might be expected to have read any book thoroughly from cover to cover before presenting his review. Clearly an impracticality in this case, although this reviewer has devoted many worthwhile and pleasant hours with this work, reading some chapters thoroughly, and others partially, and intends to continue to do more. From the forward by I. Asimov, with his well known three laws of robotics and their extension to the three laws of robotics applications by S. Nof of the School of Industrial Engineering at Purdue University, to the final appendix of fourteen robot organizations and 238 manufacturers around the world, the book is packed with readily understandable and useable information.

As one would expect, the chapters follow the usual sequence starting with mechanical design and control and ending with those on applications. Almost all chapters are well illustrated with diagrams, photographs and include references, making this book useful as a self tutorial and textbook as well as a reference.

Most chapters are easily read, but a few, such as chapter six on kinematics and dynamics, and to a lesser degree chapter eleven on control, pre-suppose familiarity with a highly concise mathematical notation which few readers are likely to possess. In this reviewer's opinion it seems that a less mathematical explanation devoted to considerations such as accuracy, repeatability, overshoot, offsets, damping, hunting and instability, degrees of freedom, acceleration forces, adaptive control and hierarchical control by multiple microprocessors might have been more appropriate, although information on most of these topics can be found elsewhere via the index. A separate chapter is included on performance testing and other chapters cover control in less mathematical format.

Even just the list of 77 chapter headings is too long for inclusion in this review. The reader can assume that not much has been left out. At less than the cost of almost any seminar or conference, this publication is well deserving of a place on almost every CAD/CAM, robotics and manufacturing engineering bookshelf.

Reviewed by J. Scrimgeour, Senior Advisor, CAD/CAM, Robotics, and Industrial Automation, Laboratory for Intelligent Systems, Division of Electrical Engineering, National Research Council, Ottawa. Mr. Scrimgeour has thirty eight years experience in engineering design, computer aided engineering, process computer control systems, CAD/CAM and industrial automation in both industry and government.

- Previous Reviews Completed

In addition to the above, the following reviews were included in the December 1985 issue of the CAD/CAM Newsletter.

Book	Author	Reviewer
"Computer Controlled Testing & Instrumentation"	M. Colloms	M. Barakat
"All About Computer Aided Design & Manufacture"	J. Fellows	R. Desjardins
"The Role of Computers in Manufacturing Processes"	G. Halevi	P. Jensen
"Automated Guided Vehicles"	T. Muller	I. Hill
"Restoring our Competitive Edge"	Hayes & Wheelright	J. Scrimgeour

- Additional Reviews and Reviewers

Some additional reviews are in preparation and a few additional books have been received for which additional reviewers are needed. Persons interested in acting in this capacity are invited to contact the newsletter editor, stating their subject area of interest and expertise; CAD/CAM, graphic systems, process planning, group technology, NC, robotics, sensors, vision, FMS, etc.

3. Slide Set and Photo Salon

A picture is worth one thousand words! Following this old adage, the CAD/CAM Council proposes to organize a slide set illustrating CAD/CAM applications and development projects across Canada. Here is an opportunity to dig out the best 35 mm colour slide(s) in your organization and get them ready for submission. This will add to the collection in the project and give some useful recognition to all participants at the same time. Please do not submit material yet, until some further details are organized and announced, but it is not too soon to get ready.

Photographs in 35 mm colour slide form will be considered that show all aspects of computer integrated manufacturing, CAD, CAE, CAPP, NC, robotics, computer aided testing and so forth. It is not clear how one photographs a CIM data base, but someone may come up with an imaginative solution. Report covers might qualify in some cases. When later submitted, each entry should be accompanied by a short title of a few words, and a more detailed caption of not more than fifty words.

The intention is that material submitted and subsequently selected for content and photographic quality by a panel from the CAD/CAM Council will

be made available to speakers and participating organizations as a slide
set. It is also possible that a photographic salon of enlargements,
illustrating CAD/CAM applications and developments across Canada, could be
made available for display at conferences and exhibits. Printing in
publication form is also under consideration depending on the availability
of funds.

   Details later, but now is the time to get ready.

4. CAD/CAM Conferences, Exhibitions, Seminars, etc.

   - "Understanding MAP"
     May 13, 1986, The Westin Hotel, Seattle, Washington.

     This workshop will provide a historical outline and other information
     pertaining to the Manufacturing Automation Protocol (MAP), in relation
     to local area networks and other protocols. Fee $180 (U.S.) for members
     or affiliates $230 (U.S.) for non-members.

     Contact: Society of Manufacturing Engineers
               One SME Drive
               P.O. Box 930
               Dearborn, MI 48121, U.S.A.
               Telephone: (313) 271-1080

   - "Low Cost PC Based CADD"
     June 24-25, 1986, Ontario CAD/CAM Centre, Cambridge, Ontario.

     Personal Computer (PC) Based Computer Aided Design and Drafting
     Systems (CADD) are emerging very rapidly and will be used by many firms.
     Because they are available, quite literally "off the shelf" an abundance
     of descriptive information has flooded the marketplace. This two day
     workshop is designed to help attendees determine their needs via a
     "hands-on" learning experience. Registration fee $455.

     Contact: Brenda Bowie, Workshop Registrar
               Ontario CAD/CAM Centre
               400 Collier-MacMillan Drive
               Cambridge, Ontario
               N1R 7H7
               Telephone: (519) 622-3100

   - "Numerical Control (NC) Programming on Personal Computers"
     September 10, 1986, Ontario CAD/CAM Centre, Cambridge, Ontario.

     This one day symposium will review the use of personal computers for
     NC machine tape preparation, an application which is rapidly replacing
     manual programming and time sharing methods. Attendees will learn the
     advantages and disadvantages of current NC programming methods, what
     systems are available and how to configure a PC for NC applications.
     Registration fee $225.

Contact: Ontario CAD/CAM Centre (as above)

- "Second Biennial Conference and Exhibition on Automated Manufacturing"
November 3-6, 1986, Textile Hall, Convention Centre, Greenville, S.C.

   AM '86 is being sponsored by the Consortium for Automated
Manufacturing, and is designed to assist management, engineering,
research and hands-on users.

Contact: AM '86 Office
          P.O. Box 5610
          Greenville, S.C. 29606, U.S.A.
          Telephone: (803) 239-2967

5. Twenty Selected Abstracts Provide a World View on CAD/CAM

   For a monthly review of CAD/CAM developments around the world please
refer to the selection of twenty abstracts in the section attached. These
will assist your organization to meet both the management and technical
challenges of computer integrated manufacturing.

   While the abstracts provided are informative in themselves, in most
cases copies of the complete papers can be obtained from your nearest
technical library, or from the Canada Institute for Scientific and
Technical Information (CISTI), which is part of the National Research
Council, as noted.

6. CAD/CAM Quotes

- "CAD/CAM technology will yield its greatest economic and productivity
  gains when all or most of the [individual] application areas are married
  or joined together to form an integrated system. Hence there is a
  strong development trend in this direction."

     "Strategy for Survival", CAD/CAM Technology Advancement Council
     report, 1980.

- "The computer will be to the organization revolution what steam power
  was to the industrial revolution"

     Edward de Bono, on "Future Positive".

- "I do not believe that the problems in Europe or the USA are other than
  psychological. If a company in the west wishes - for example - to
  obtain a CAD system, the first question that is asked is what is the
  discounted cash flow situation for the project. In Japan the first
  question is will this move help us to wipe out the competition."

     Editorial, CAD/CAM Digest, November 1985.

- The planning phase for a flexible manufacturing system requires a "Definition of <u>technical and economic objectives</u> for the particular project and analysis of their relation to an over-all <u>long-term FMS strategy</u> for the company. As a decision to invest in FMS is one of strategy, it is essential to ensure the involvement and <u>full support of top management,</u> a statement frequently made by companies having accumulated experiences in FMS implementation."

    "Recent Trends in Flexible Manufacturing" a United Nations Publication (Economic Commission for Europe) January 1986.

- "Commitment to and understanding of your plans and objectives is necessary at all levels. This requires training; training which starts at the top of the company, and works downwards. In Rolls-Royce we have established our own training courses for senior and middle management,

which have been held at Cambridge and Warwick Universities, the Cranfield Institute of Technology and the polytechnics local to our major sites. Management must understand the details of and be committed to advanced manufacturing technology if they are to lead others in its implementation."

    As in the above UN publication and from the Third Automated Manufacturing Conference - Challenges for Management, London, 1985. "Automated Machining - Case Study", F. Turner, Rolls-Royce Ltd.

- This FMS project "has already reduced lead times on the production of wheels and discs from 26 weeks to 6, and the number of operations from 21 to 5."

    "Rolls-Royce Opens the Door" - Automation, November/December 1985, a preliminary description of the AIMS system for the production of wheels and discs for jet engines.

- "This study concludes that the greatest benefit of the diffusion of robots among Japanese firms is that the profits created by their use have become the source of capital for R&D on the next generation of robots. Thus, robotization is helping restructure the Japanese economy and build the basis for the country's claim to a share of the future global market for robots."

    "The Diffusion of Robots into Small & Medium-Sized Enterprises in Japan", M. Sasaki-Smith. A manuscript prepared for the Science Council of Canada, February 1985. For a more detailed review of this report see the CAD/CAM Newsletter, March 1985.

7. This newsletter may be reproduced in whole or in part. Reprinting in other Canadian publications is encouraged. Acknowledgement to the Canadian CAD/CAM Council would be appreciated.

> * Secretariat
> Canadian CAD/CAM Council
> Office of Industrial Innovation, 5th Floor Centre
> Department of Regional Industrial Expansion
> 235 Queen Street
> Ottawa, Ontario K1A 0H5
>
> ** Newsletter Editor
> J. Scrimgeour
> Bldg. M-16
> National Research Council of Canada
> Ottawa, Ontario K1A OR6

Please note that requests for additions, deletions or changes to the newsletter distribution list should normally be directed to the secretariat.