

**Bay Area Chrome Users Society
Symposium
June 8 and 9, 1982
Santa Clara, California**

BAY AREA CHROME USERS SOCIETY
SYMPOSIUM

JUNE 8 AND 9, 1982
SANTA CLARA, CALIFORNIA

BACUS
P.O. BOX 1571
CUPERTINO, CA
95014

MEMBER COMPANIES
OF THE
BAY AREA CHROME USERS SOCIETY

AMERICAN MICROSYSTEMS, INC.
SANTA CLARA, CALIFORNIA

MICROFAB SYSTEMS CORPORATION
PALO ALTO, CALIFORNIA

CYANTEK CHEMICALS
MOUNTAIN VIEW, CALIFORNIA

MICROMASK, INC.
SUNNYVALE, CALIFORNIA

FAIRCHILD SEMICONDUCTOR
MOUNTAIN VIEW, CALIFORNIA

NATIONAL SEMICONDUCTOR
SANTA CLARA, CALIFORNIA

HEWLETT-PACKARD
SANTA CLARA, CALIFORNIA

RAYTHEON SEMICONDUCTOR
MOUNTAIN VIEW, CALIFORNIA

INTERNATIONAL BUSINESS MACHINES
SAN JOSE, CALIFORNIA

SIGNETICS CORPORATION
SUNNYVALE, CALIFORNIA

INTEL CORPORATION
SANTA CLARA, CALIFORNIA

SILICONIX, INC.
SANTA CLARA, CALIFORNIA

MASTER IMAGES, INC.
SAN JOSE, CALIFORNIA

SYNERTEK
SANTA CLARA, CALIFORNIA

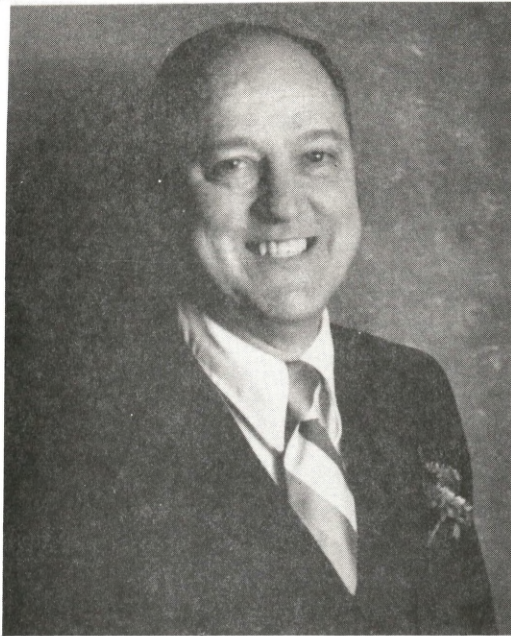
ULTRATECH CORPORATION
SANTA CLARA, CALIFORNIA

PROCEEDINGS EDITOR
ASSOCIATE EDITOR
TYPIST

SARA CALVILLO
KURT GRAVENHORST
LISA BERTOLI

BACUS SYMPOSIUM PROCEEDINGS PUBLISHED BY
AMERICAN MICROSYSTEMS, INC.

BACUS DEDICATION
GEORGE FREDERICK DAMON



July 30, 1922 - March 9, 1983

The 1982 BACUS publication is dedicated to one of the organizers of BACUS, George Damon, who recently passed away after a long fight against cancer.

George attended the University of Michigan and graduated with a degree in chemistry in 1948. He started his career with Allied Chemical Company where he worked in support of the Manhattan Project. He continued his career on the East Coast over the next 22 years working for Mobil Oil, General Electric, and RCA before moving his family to Saratoga, California to work for Fairchild Semiconductor.

While at Fairchild he developed the emulsion process - admittedly the best in the industry by Kodak - and was involved with computer applications for production control, materials investigation, E-beam process development, resist evaluation and X-ray lithography. In 1977 George was awarded his MBA after graduating with honors from the University of Santa Clara.

George continually demonstrated his value to his peers and the industry by basic contributions (as witnessed by citations in texts, reference works and other publications as well as by patents held) and excellent performance in all areas in which he was involved. Of even greater importance to those who were fortunate enough to work with George was his exceptional personality. He was generous with both his time and his vast technical knowledge, and he was always enthusiastic about projects and ideas of his co-workers. These qualities and the warmth of his character made working with George both a joy and a privilege.

In spite of George's ambitious career, he always managed to find time to enjoy life; whether it be skiing in the Sierras, enjoying the Crosby Clambake, cheering the Giants on to victory, cooking an oriental meal for family and friends, reading one of the old classics, or sharing humorous stories (often a believable, but implausible anecdote about a situation he got himself into, and out of) with friends and fellow workers.

His widespread association with Societies, Symposia and committee work won him an extensive group of friends from coast to coast who will greatly miss, and fondly remember, George Damon.

TABLE OF CONTENTS

AUTHORS' BIOGRAPHIES	9
WELCOME NOTE	
James F. Riley, Dataquest	13
KEYNOTE SPEECH	
Patrick Lamey, Ruddel & Associates	15
PANEL DISCUSSION: SO, WHERE DO WE GO FROM HERE?	
Moderator: James F. Riley, Dataquest	25
TECHNICAL PAPERS	
<i>Glass/Quartz Substrates Available for Photomask Fabrication</i>	
Dr. Gilbert Zinsmeister, Balzers AG	47
<i>The Performance of Chrome Materials with Use</i>	
Dr. Humbert Noll and Paul H. Johnson, American Microsystems, Inc.	55
<i>Optimized Chrome Films for Photomask Manufacture</i>	
Dr. Shoichi Harada, Hoya Electronics Company, Ltd.	63
<i>Defects on Chrome Masks</i>	
George Brooks, KLA Instruments Corp.	73
<i>E-beam Materials</i>	
Steve Lierman, BMI/Textron	79
<i>Pellicles and Alternative Materials for Minimized Defect Imaging</i>	
Dr. Ron Herschel, Herschel Consultant	83
<i>Functional Testing of Chrome Materials</i>	
Virgle Hedgcoth, Electronic Materials Corporation	93
<i>Process Chemistry Applicable to Chrome Materials</i>	
Ken Caple, Cyantek Chemicals, a Division of Precision Photoglass, Inc.	107
<i>CD Control as a function of Resist Thickness and Chrome Interface</i>	
Robert Quinn, Optifilm	117
<i>Mask Requirements for 1:1 Lithography</i>	
Michael King, Perkin-Elmer	127
<i>Correlation of Visual vs. Machine Inspection of Chrome Blanks and Finished Masks</i>	
T. Hisano, Toppan Printing Co. (America), Inc.	143
PANEL DISCUSSION: QUALITY AT WHAT PRICE?	
Moderator: Jim Reynolds, Consultant	157
CLOSING ADDRESS	
David L. Angel, American Microsystems, Inc.	177

AUTHORS' BIOGRAPHIES

George Brooks - Mr. Brooks has a degree in Physics from the Massachusetts Institute of Technology and an M.B.A. from the University of Santa Clara. He is Product Marketing Manager for Photomask Inspection at KLA Instruments. He has over eight years of experience in the manufacture and marketing of sophisticated optical products.

Ken Caple - Mr. Caple has worked in photomask making since 1965, beginning with Motorola S.P.D. in Phoenix, Arizona. He founded Cyantek Corporation in 1975. Cyantek designed and manufactured emulsion and hard surface photomask chemistry for 1-1/2 years prior to being acquired by Precision Photoglass, Inc. Today, he is Vice President and General Manager of Precision Photoglass, Inc., Cyantek Division in Mountain View, California.

Dr. Shoichi Harada - Dr. Harada graduated from Tokyo Scientific University and joined Hoya Glass Laboratory in 1963, specializing in the polishing of optical glass and IC substrates. After becoming Production Manager of Glass Substrates and Blanks at Hoya Electronics, he earned his Ph.D. from Kyoto University, specializing in the polishing mechanism of glass. Dr. Harada is now General Manager of Hoya Electronics, USA Branch.

Marta Hecht - After graduation from the University of Hungary with a B.S. in Mechanical Engineering, Ms. Hecht worked in engineering, marketing, and management positions for Fairchild, Micromask, and IMR. She is currently the Western Regional E-Beam Manager for BMI Textron.

Virgle Hedgcoth - Mr. Hedgcoth is a graduate of UCLA with a degree in Chemistry. After two years with Northrop Aircraft, he spent five years at Teic/ARMCO doing research on sputtering devices and films. He was Director of Research for Indicator Corporation, and Vice-President of Display Components Laboratories involved in the manufacture of liquid crystal materials. He joined EMC/Micro Mask in 1978 and is Engineering Manager.

Dr. Ron Herschel - Dr. Herschel received his Ph.D. in Optical Sciences from the University of Arizona, and he was a university professor from 1972 through 1979. He founded Herschel Consulting Incorporated, and he has been the chief optical designer of the Ultratech Stepper since 1978. He is consultant to Advanced Semiconductor Products, and his other activities include new technologies in process monitoring and precision instruments.

T. Hisano - Mr. Hisano joined Toppan Printing Co., Ltd. in 1968 after graduating from Fukui University, Japan, with a B.S. in Chemical Engineering. He has over 14 years of mask shop experience, specializing in hard surface masks. Mr. Hisano is currently the Photomask Engineering Manager for Toppan Printing.

Paul H. Johnson - Paul Johnson graduated from Rochester Institute of Technology in 1960 with a B.S. degree in Photographic Science and Engineering. From there he went to Curtis Wright Corporation until 1962 when he joined Aero Service Corporation as senior engineer and manager of photographic engineering. In 1965 he became manager of Microtronics Division of Photics Research Corporation, directing the volume production of photomasks for the semiconductor industry. He joined Texas Instruments in Dallas in 1968 and became manager of product engineering for the photomask services group. Since 1977 Mr. Johnson has been at American Microsystems, Inc. in Santa Clara, California, where he is the manager of engineering for the Image Technology Center.

Dr. Michael C. King - Dr. King received his Ph.D. in Physics in 1967 from Carnegie Mellon University. He went to Bell Labs in Murray Hill, N.J., and in 1976 he moved to Qualitron, a mask making company in Danbury, Connecticut. Dr. King has been with the Perkin-Elmer Corporation since 1977, initially as Program Manager for the Model 200 and more recently as Technical Director of the Microlithography Division. He is currently heading a Mask Technology Program for Perkin-Elmer.

Patrick H. Lamey, Jr. - Mr. Lamey holds a Bachelor of Mechanical Engineering degree from the University of Minnesota (1969) and an MBA from the College of St. Thomas (1978). His career began in 1969, and he has held engineering and management positions in wafer and mask processing at Sperry Univac, National Semiconductor, and Fairchild Semiconductor. Mr. Lamey joined Ruddell & Associates in 1981 where he is Senior Associate.

Dr. Humbert Noll - Dr. Noll graduated from the University of Graz, Austria, in 1977 with a Ph.D. in Physics. He worked in the field of Laser Physics and Laser Spectroscopy. From there he went to the University of Linz where he was involved in Nonlinear Optics and Chemical Vapor Deposition investigations. He joined AMI-Austria in 1981 and is currently responsible for the technology transfer of photolithographic processes.

Robert Quinn - Mr. Quinn was initiated into the semiconductor industry in 1959 with Pacific Semiconductors (now TRW). He later spent seven years with Northrup Electronics before

founding Optifilm in 1970.

Dr. Gilbert Zinsmeister - Dr. Zinsmeister is a citizen of Liechtenstein and holds a Ph.D. in Physics from the Technical University, Vienna, Austria. He joined Balzers in 1955 where he worked in vacuum technology and thin films. He started the Thin Film Electronics Department at Balzers which is occupied with the manufacturing of chrome blanks, films for Hybrid circuits, and resistor network chips. He has published more than 25 technical papers.

WELCOME NOTE
BACUS SYMPOSIUM
JUNE 8-9, 1982
MARRIOTT'S, SANTA CLARA, CA

Jim Riley

I'd like to call the meeting to order and welcome you to the 1982 Bay Area Chrome Users Society annual meeting. We have a very select group of people here, and we're very excited to see the number of people who have honored us by attending. These are the people who determine what goes on with chrome masks in the Bay Area, the United States, and in many other parts of the world.

We have very few changes in the program, and I will quickly summarize one or two of them. Rick Ruddell of Ruddell and Associates is unable to be here this evening, but his associate, Pat Lamey, will be ably filling in for him. This is a unique circumstance, for Pat will be able to comment on Rick's prognostications of last year, and we can see if his boss was right or not. You are going to cover that, aren't you Pat? Also, Dick Stengle from Synertek is replacing John Skinner from Bell Labs. I haven't found out exactly why John is unable to attend, but I think it had something to do with getting an E-Beam up.

At this point, I'd like to introduce Pat Lamey. Pat is not only a personal friend of mine but also a person I respect tremendously as a mask maker. Pat has a Bachelor of Arts in Mechanical Engineering and a Master's in Business Administration. Pat was with Fairchild Semiconductor for three years in the Photomask Department, three years at National Semiconductor in Photomasking, and five years with Sperry Univac with photomasks, bipolar wafer fab, and physics lithography on the TRW team. He's been a consultant now with Ruddell and Associates for a year and a half, and he is taking Rick's place here tonight. I'd like you to welcome my friend, Pat Lamey.

