



***Celebrating 35 years of Biomedical Engineering:
An Historical Perspective***

1968 - 2003

BMES

35 YEARS OF
EXCELLENCE

*Biomedical Engineering
Society*

Biomedical Engineering Society

8401 Corporate Drive, Suite 225 • Landover, MD 20785-2224

301-459-1999 • Fax: 301-459-2444

Web: www.bmes.org

The Full Service Professional Society for Biomedical Engineering and Bioengineering

The Biomedical Engineering Society:

An Historical Perspective

Editor

Paul H. Fagette, Jr., Ph.D.

Managing Editor

Patricia I. Horner

Biomedical Engineering Society

8401 Corporate Drive, Suite 225 • Landover, MD 20785-2224

301-459-1999 • Fax: 301-459-2444

Web: www.bmes.org

The Full Service Professional Society for Biomedical Engineering and Bioengineering

Biomedical Engineering – A Personal View

Peter G. Katona, ScD

*President, The Whitaker Foundation
BMES Past President*

I received Pat Horner's phone call with mixed emotions. On one hand, it was a great honor to be invited to write the foreword for this special historical publication. On the other hand, how to say anything novel and profound about biomedical engineering when so many of the readers of this publication have spent their lives shaping the field? I doubt that any of you who know Pat could ever say "no" to her, so I decided to write rather than run.

Not trying to go further back than I can remember, I see the first phase of biomedical engineering as being in the sixties and early seventies. That was a period of hope and aspirations, accompanied by considerable growth. Computers were being applied to automate clinical laboratories, and predictions were made that new measurement techniques and computer-based records would revolutionize the delivery of medical care. Mathematical models were to increase our understanding of physiology, and advances in materials were to help restore diminished or lost function.

The optimism gave rise to and was buoyed by institutionalizing the field. Training grants from the National Institutes of Health (NIH), individual research grants from the National Science Foundation (NSF), and the establishment of the Biomedical Engineering Society (BMES) are examples of the ferment. Biomedical engineering programs and departments were started at many universities; the number of U.S. programs granting undergraduate or graduate degrees was about 40 in 1975.

In the second phase, the late seventies and the eighties, it was realized that the promises had been too bold. Linear models, even nonlinear ones, did not often reveal mechanisms, and introducing computer-based records into medical care proved challenging. The medical industry was not yet seeking biomedical engineers. There was time consuming debate whether bioengineering or biomedical engineering was the appropriate term, and cooperation between proliferating professional societies was minimal. The number of degree-granting biomedical engineering programs rose only to about 50 by 1990.

The nineties mark the beginning of a third and happy phase of biomedical engineering. The number of degree-granting biomedical engineering programs, especially at the undergraduate level, has increased dramatically in the past few years, reaching over 100

by 2003. Most of these programs are now being offered by departments, rather than by loosely knit groups of faculty members. Attendance at BMES meetings is setting records almost every year, and BMES has become the lead society for accrediting biomedical engineering programs. The establishment of the American Institute for Medical and Biological Engineering (AIMBE) as an umbrella organization and joint meetings of the BMES and the Institute of Electrical and Electronics Engineers (IEEE) Engineering in Medicine and Biology Society (EMBS) promise increased cooperation among biomedical engineers of differing backgrounds. The recent establishment of the National Institute for Biomedical Imaging and Bioengineering (NIBIB) is another cause for optimism not only because of potential new funding mechanisms, but because the new Institute signifies recognition of our field.

What is the reason for this resurgence? I believe that the spectacular advance in the biological sciences is the primary one. The increased understanding of the molecular and genetic bases of cellular function and cellular interactions raises the promise of personalizing, and thus greatly improving, diagnosis and therapy. Nothing less than changing the practice of medicine is on the horizon. Of course, such promises have been made before, so the challenge is to make this happen sooner rather than later.

And this is where biomedical engineers come in. An increasing number of biomedical engineering departments are establishing molecular and cellular orientations that were absent just a few years ago. Mathematical modeling, a tool of engineers, is being increasingly used to integrate molecular, cellular, and systems level understanding of life processes. Such understanding will open new technologies to solve problems not only in the life sciences and medicine, but it may also suggest solutions to engineering problems that are outside these areas.

The second major reason for the resurgence of biomedical engineering is the growing interest of students in the field. It is reassuring that a combination of engineering and biology is attractive to students, but it is especially noteworthy that biomedical engineering students are reported to be among the very best at almost all universities. This is fortunate since biomedical engineers need to integrate in-depth

knowledge in both biology and engineering, which is a challenging task.

It has also helped that the rapidly growing medical industry has started to recognize that biomedical engineers can accelerate the development and dissemination of diagnostic and therapeutic devices. While the biomedical industry is not exempt from economic fluctuations, jobs in the industry have opened up where none existed before.

The Whitaker Foundation is often mentioned as one of the reasons for the current boom in biomedical engineering. I am convinced that the Foundation, through funding both individuals and the establishment of programs, has indeed accelerated the process. Without its

underlying merit and the talented individuals it attracts, however, the field could not have prospered.

We are often asked if biomedical engineering will continue to thrive after the Foundation closes in 2006. I am convinced that it will. The in-depth integration of the life sciences and engineering is a prerequisite to advances in basic biology, as well as to the practice in modern medicine. Industry seeks individuals with breadth and depth. Our profession is increasingly in the hands of talented, energetic, and enthusiastic individuals who are well positioned to train the next generation of leaders.

The best phase of biomedical engineering is just beginning.

The Biomedical Engineering Society: A New Science - A New Tradition

Paul Fagette, PhD
BMES Historian

Introduction

As we enter the new millennium, the Biomedical Engineering Society (BMES) celebrates this age as the premier professional engineering society of a modern interdisciplinary area of study. The Society's Annual Meetings now regularly attract more than 1,000 attendees, a number far too large for the meetings to be held on university campuses. Undergraduate and graduate programs are spread around the United States with increasing numbers of students drawn from around the globe. New positions proliferate in universities and industry. The Society's journal, the *Annals of Biomedical Engineering*, has also become the preeminent source of biomedical engineering science. Even the US Congress has recognized the importance of this area of study by passing legislation to create a new National Institutes of Health (NIH) institute: the National Institute for Biomedical Imaging and Bioengineering (NIBIB). All these are signal achievements for a professional group barely three decades old.

The general historic setting for biomedical engineering was marked by significant federal aid to biomedical research beginning in the early 1950s and which increased virtually each year. Vitally, public support and interest grew in proportion to dissemination of information, achievements, and concern over health issues. More specifically, clinical issues continued to emerge that required more creative, innovative approaches. Basic science sought answers to physiological problems that proved incredibly complex. Engineers brought new perspectives and solutions to these pressing clinical and physiological questions. Thus, the founders of the Society arose out of a generation that matured professionally in an environment conducive to high research support, public acclaim, and a positive view that science could overcome human ailments. The urge to solve widespread problems such as heart disease prompted creativity and a willingness to seek new paths.

Established and well-respected physicians, scientists, and engineers came together in a unique interdisciplinary manner to confront the new challenges. What is interesting about the emergence of BMES is

that the usual path toward specialization occurs within a single society. Disciplinary fragmentation has occurred across all scientific and social scientific areas. The common result is new societies and journals. For example, both bio-chemistry and physical chemistry followed this path.^{4,9,12} Biomedical engineering did not take this route; instead, a cooperative, interdisciplinary society was created that cut across established academic and societal boundaries. Thus, BMES is atypical and presents new questions and challenges in order to understand its formation and its thirty-five years of life.

This special historical publication is devoted to presenting an insider's perspective to these questions and to celebrate the Society's achievements at the millennium. The historic medium elected is the reflections of BMES presidents. Through their eyes, the struggle to found, maintain, and mature is told. Details drawn from Board Minutes and Business Meetings accompany each presidential entry to flesh out the story. Pat Horner, current Executive Director, has also supplied photographs and other early documents that further chronicle societal history. Pat also presents a picture of the Society from the perspective of the Executive Director. Kay Lyou, the first Executive Director of the Society, recalls the early years. Jim Bassingthwaite, who has a long and distinguished tenure in the Society including Editor in Chief of the *Annals*, traces the development of the journal from an editorial viewpoint. Fred Weibell, who has served the Society for many years as Secretary-Treasurer, details the important financial history of the Society. Dan Schneck, founding editor of the *BMES Bulletin* and Jerry Collins, immediate past editor of the *Bulletin*, trace the development of this important means of communication for the membership. Lastly, this special publication includes a discussion by Larry Young of the predominant interest of the founding and charter members in systems physiology.

The generosity and support of the Whitaker Foundation has enabled the Society to publish this historical publication. The Whitaker Foundation has played a significant role in establishing the discipline in universities throughout the United States. This role is recanted in virtually each of the presidents' contributions.

Overview

A reading of the presidents' articles and the Board minutes reveal a story in four stages:

- 1) An early formative period where a research elite built upon an impetus begun in the early 1960s with NIH support. Highlights of this period included establishment of procedural and constitutional bylaws. An early relationship with the Federation of American Societies for Experimental Biology (FASEB) for joint meetings was established
- 2) Next the Society began to undergo new pressures as it expanded its basic role to provide another fundamental service of a science organization by publishing a journal.
- 3) The Society expanded in several ways for the next decade and a half. The numbers of members steadily grew. An important part of this growth was students, a testament to the growing importance of the field. The increase in programs and student membership also fostered a long-lived and lively debate regarding the role of BMES in the Accreditation Board for Engineering and Technology (ABET). Numbers of subscribers to the *Annals* likewise increased. The success of the Society became an essential force for change. A part of this included escalating costs for running the Society and the journal. The Society's intellectual growth has been previously documented. Articles published in the *Annals* reflected an ever-growing array of interest areas. For example, topics in circulatory and mechanics came to outnumber early dominance in subjects favored by electrical engineers and physiologists.³ These changes are mirrored in the session themes for the annual meetings.
- 4) The late 1980s began a new phase for the Society. Virtually each president realized that they were in the midst of change. The meetings with FASEB were not addressing the needs and costs of growing membership. The idea of a separate annual meeting, which had been floated to membership from time to time without success, resurfaced and found form with the Annual Fall Meeting.

Historical Viewpoint

From an historical perspective several salient points merit consideration. The activities of the dedicated founding and charter members and their quest to realize a Society to meet their interdisciplinary needs offers a glimpse into a unique scientific world. The Society came out of several years of sustained interdisciplinary research, significant NIH support, and steady development of academic programs.^{1,7} The founding members,

including Otto Schmitt, Jack Brown, John Jacobs, Herman Schwann, and Fred Grodins, worked closely in NIH developing policy and assisting the new discipline. By 1967, the impetus for a formalized society to provide essential services emerged.²

First, the founding of BMES was a typical experience in that a community of inquirers distinguished itself from others and immediately endeavored to enhance communication.^{5, 6} This usually occurs through journals and meetings as it did with this society. BMES also worked to create a pool of trained personnel who could function as leaders.^{5, 8} The earliest presidents were keenly aware of this. Talented members were recruited to the Board of Directors and given substantial responsibility in the committee system. Presidents emerged from this training ground. Further definition of professional boundaries was determined and maintained by the development of membership guidelines.

On the other hand, BMES was unusual in that it did not emerge from a parent discipline, e.g., electrical engineering from physics. In this way, there were no professional impediments as was the case of chemical engineers who faced opposition in separating from the American Chemical Society.¹¹ BMES had a different set of obstacles. Founders had to overcome resistance from already established interdisciplinary approaches.¹⁰ FASEB and other alliances already dealt with biomedical research including engineering. The main argument against BMES was that biomedical cooperative research needs were already being met. The struggle for the first few years was to demonstrate the uniqueness of the Society.

Second, reading through the minutes virtually each Board meeting grappled with refining the Constitution. The Constitution and Bylaws Committee became the key means of adapting the functions of the Society to a rapidly changing environment. While this may seem a rather unexciting subject, in fact, the evolution of the Constitution is directly related to the growth of the Society. This is hardly unexpected. Gene Yates commented that Jim Reswick pulled pieces from other professional constitutions and plugged them together like "boiler plates" in order to provide a legal basis for incorporation. Thus, some reordering was necessary. But the Society grew and new procedures were necessary; these changes had to be incorporated into the Constitution usually on an annual basis.

Last, the dedication of the officers of the Society is apparent from the beginning. A small society is the extension of forceful personality. In reality, BMES was more the hopes and aspirations shaped by the actions of early leadership than a self-sufficient, bureaucratic entity. Kay Lyou's description of how

early issues of the *Annals* were spread about John Lyman's living room while he cooked dinner attests to how the Society existed: because members were devoted to the cause. Presidents and Directors gave then and continue now to donate considerable time and effort. The science achieved by graduates and staff of multiple biomedical engineering departments is impressive; the *Annals* has provided an important source of research results. However, the role of individuals in the Society is as pivotal as the scientific results. Dedication and commitment are the heart and soul of a society. The story that emerges from these articles validates this interpretation.

Acknowledgments

As a last comment, I would like to thank Herb Voigt and Pat Horner, for entrusting this task to me. I have been afforded a rare privilege and honor for an outsider. A big thanks, of course, goes to all the presidents, officers, and Society members who have contributed to this issue. Gene Eckstein and Jerry Saidel provided insightful commentary. All took time away from busy schedules to help make this a memorable event.

References:

1. Brown, JHU. A Personal View of biomedical engineering. *IEEE Eng Med Biol* 10:34-37, 46, 1991.
2. Brown, JHU. *Footsteps in Science*. New York: University Press of America, 1993.
3. Fagette, P. Tracking the Historical Development of Biomedical Engineering: the 1960s and 1970s. *IEEE Eng Med Biol* 16:164-173, 175, 1997.
4. Goodwin, T.W. *History of the Biochemical Society, 1911-1986*. London: The Biochemical Society, 1987.
5. Hagstrom, W.O. *The Scientific Community*. New York: Basic Books, 1965.
6. Haskell, T.L. *The Emergence of Professional Social Science: The American Social Science Association and the Nineteen-Century Crisis of Authority*. Chicago: University of Illinois Press, 1977.
7. Jacobs, JE (ed). Papers from Symposium on Educational Frontiers in Bio-Medical Engineering, University of Vermont: May 5-6, 1960. *IRE Trans Bio-Med Elect BME* 8:208-238, 1961.
8. Kirkpatrick, S.D. *Twenty-Five Years of Chemical Engineering Progress*. New York: American Institute of Chemical Engineers, 1933.
9. Kohler, R.E. *From medical chemistry to biochemistry: the making of a biomedical discipline*. New York: Cambridge University Press, 1982.
10. Mowrey, D.C. and N. Rosenberg. *Paths of Innovation: Technological Change in 20th-Century America*. New York: Cambridge University Press, 1998.
11. Reynolds, T.S. Defining Professional Boundaries: Chemical Engineering in the Early 20th Century. In: *The Engineer in America: A Historical Anthology from Technology and Culture*. Chicago: University of Chicago Press, 343-365.
12. Servos, J.W. *Physical Chemistry From Ostwald to Pauling: The Making of a Science in America*. New Jersey: Princeton University Press, 1990.

Table of Contents

i	Foreword - Peter Katona, ScD
iii	The Biomedical Engineering Society: A New Science – A New Tradition - Paul Fagette, PhD
1	BMES Leadership – Officers and Board Members
4	Founding and Charter Members

Past Presidents Contributions:

6	Otto H. Schmitt, PhD
8	Robert F. Rushmer, MD
10	Jack H.U. Brown, PhD
12	Fred S. Grodins, MD, PhD
13	Donald S. Gann, MD
15	James F. Dickson, MD
17	James B. Reswick, PhD
18	F. Eugene Yates, MD
20	Ernst O. Attinger, MD, PhD
22	John Urquhart, MD
23	James B. Bassingthwaite, MD, PhD
26	Richard J. Johns, MD
27	Laurence R. Young, ScD
29	John Lyman, PhD
30	Robert Plonsey, PhD
32	Yuan-Cheng B. Fung, PhD
35	J. Lawrence. Katz, PhD
37	Thomas R. Harris, MD, PhD
40	Peter G. Katona, ScD
42	Richard Skalak, PhD
44	Gerald M. Saidel, PhD
46	Morton H. Friedman, PhD
48	H.K. Chang, PhD
51	Daniel J. Schneck, PhD
53	Geert W. Schmid-Schonbein, PhD
55	John H. Linehan, PhD
58	Robert M. Hochmuth, PhD
61	Jen-shih Lee, PhD
63	Larry V. McIntire, PhD
64	Douglas A. Lauffenburger, PhD
66	Herbert H. Lipowsky
69	Eric J. Guilbeau, PhD

- 73** Herbert F. Voigt, PhD
- 77** Thomas C. Skalak, PhD
- 83** Linda C. Lucas, PhD
- 84** John M. Tarbell, PhD
- 87** The BMES Journal

- 88** *Annals of Biomedical Engineering: An Historical Review* -
J. B. Bassingthwaighe, MD, PhD

- 91** The BMES Newsletter

- 92** The *BMES Bulletin* — Jerry C. Collins, PhD, and Daniel J. Schneck, PhD

- 94** My Association with BMES — Fred J. Weibell, PhD

- 96** The Biomedical Engineering Society and Its Journal - The Early Years — Kay Lyou

- 98** Tributes to Rita Schaffer - Herbert Lipowsky, PhD and Jerry C. Collins, PhD

- 101** The BMES National Headquarters — Patricia I. Horner

- 103** BMES Scientific, Service, and Student Awards

- 109** BMES Service Awards

- 110** BMES Student Chapters

- 112** BMES Student Chapter Awards

- 113** BMES Annual Meetings

- 116** BMES and Systems Physiology — Larry Young, ScD

BMES Leadership

Presidents

Otto H. Schmitt, 1968	Richard Skalak, 1986-1987
Robert F. Rushmer, 1968-1979	Gerald M. Saidel, 1987-1988
Jack H.U. Brown, 1969-1970	Morton H. Friedman, 1988-1989
Fred S. Grodins, 1970-1971	H.K. Chang, 1989-1990
Donald S. Gann, 1971-1972	Daniel J. Schneck, 1990-1991
James F. Dickson III, 1972-1973	Geert W. Schmid-Schonbein, 1991-1992
James B. Reswick, 1973-1974	John H. Linehan, 1992-1993
F. Eugene Yates, 1974-1975	Robert M. Hochmuth, 1993-1994
Ernst O. Attinger, 1975-1976	Jen-shih Lee, 1994-1995
John Urquhart, 1976-1977	Larry V. McIntire, 1995-1996
James B. Bassingthwaite, 1977-1978	Douglas A. Lauffenburger, 1996-1997
Richard J. Johns, 1978-1979	Herbert H. Lipowsky, 1997-1998
Laurence R. Young, 1979-1980	Eric J. Guilbeau, 1998-1999
John Lyman, 1980-1981	Herbert F. Voigt, 1999-2000
Robert Plonsey, 1981-1982	Thomas C. Skalak, 2000-2001
Yuan-Cheng B. Fung, 1982-1983	Linda C. Lucas, 2001-2002
J. Lawrence Katz, 1983-1984	John M. Tarbell, 2002-2003
Peter G. Katona, 1984-1985	Kyriacos A. Athanasiou, 2003-2004
Thomas R. Harris, 1985-1986	

Secretary

Hans U. Wessel, 1969-72

Treasurer

John E. Jacobs, 1968-72

Secretary-Treasurers

John E. Jacobs, 1968-69
Hans U. Wessel, 1972-74
John Lyman, 1974-79
Fred .J. Weibell, 1979-Present

Publications Board Chairs

John Lyman, 1977-78	Bernard L. Zuber, 1987-90
Donald S. Gann, 1978-79	Artin Shoukas, 1990-92
A. Bennett Wilson Jr., 1979-80	Thomas R. Harris, 1992-94
Dudley S. Childress, 1980-81	Irving F. Miller, 1994-96
F. Eugene Yates, 1981-82	Vincent T. Turitto, 1996-98
F. Terry Hambrecht, 1982-83	Shu Chien, 1998-2001
Eugene F. Murphy, 1983-84	Carol L. Lucas, 2001-2003
Lloyd D. Partridge, 1984-85	Roger D. Kamm, 2003-Present
Thomas K. Goldstick, 1985-87	

Executive Directors

Kay Lyou, 1974-81
Rita M. Schaffer, 1981-98
Patricia I. Horner, 1998-Present

Directors

1968-69

Jack H.U. Brown, Michael E. DeBakey, Richard H. Egdahl, John E. Jacobs, Robert F. Rushmer, John G. Truxal

1968-70

W. Ross Adey, Murray Eden, Otto H. Schmitt, Fred M. Snell

1968-71

James F. Dickson III, Josiah Macy Jr., Herman P. Schwan, Lawrence Stark, F. Eugene Yates

1969-71

Leslie A. Geddes

1969-72

George Bugliarello, Glenn V. Edmonson, Leon D. Harmon, Edward F. Leonard

1969-73

Donald S. Gann

1970-72

Peter H. Abbrecht, James B. Reswick

1970-73

Loren D. Carlson, Y.C. Fung, John H. Milsum, Allen M. Scher

1971-74

James B. Bassingthwaite, John W. Moore, Josiah Macy Jr.

1972-74

Ernst O. Attinger

1972-75

Richard J. Johns, Abraham Noordergraaf, John Urquhart, Lawrence R. Young

1973

John Lyman

1974-75

Arthur C. Guyton

1974-76

George A. Bekey, Vincent C. Rideout, Gerald G. Vurek

1974-77

Arnost Fronek, Edward R. Llewellyn-Thomas, Anthony Sances Jr.

1975-76

Frederick L. Thurstone

1975-77

Leon D. Harmon

1975-78

Thelma Estrin, Howard T. Milhorn Jr, Robert Plonsey, George N. Webb

1976-78

Curtis C. Johnson

1976-79

William B. Blesser, Gerald H. Pollack, Stuart J. Updike

1977-80

Richard N. Bergman, Peter G. Katona, James D. Meindl, Hun H. Sun

1978-81

Max Anliker, Neil B. Ingels Jr., Judith M.S. Prewitt, William S. Yamamoto

1979-80

Robert Plonsey

1979-82

David B. Geselowitz, Allen K. Ream, John M. Reid

1980-82

Joseph D. Andrade, Frederick P. Ferguson

1980-83

Lee E. Ostrander, Kiichi Sagawa, Daniel J. Schneck

1981-83

J. Lawrence Katz

1981-84

Philip A. Drinker, Robert W. Mann, Richard Skalak

1982-83

Hans U. Wessel

1982-85

David Garfinkel, Leslie A. Geddes, Carl F. Rothe, Merrill P. Spencer

1983-84

Thomas G. Coleman, Thomas R. Harris

1983-86

Ernest G. Cravalho, Thomas K. Goldstick, Louis C. Sheppard

1984-86

Savio L-Y. Woo, Gerald M. Saidel

1984-87

Neil S. Cherniack, Joseph F. Gross, Lee L. Huntsman

1985-87

Morton H. Friedman

1985-88

H.K. Chang, John W. Clark, William C. Van Buskirk

1986-87

Geert W. Schmid-Schonbein

1986-89

Joseph J. DiStefano III, Leon E. Farhi, Jonathan C. Newell, Lloyd D. Partridge

1987-88

Knowles A. Overholser

1987-90

Rena Bizios, Janie M. Fouke, William A. Hyman, Artin A. Shoukas

1988-90

Geert W. Schmid-Schonbein

1988-91

Robert M. Hochmuth, Carol L. Lucas, Robert A. Nerem

1989-92

William J. Dorson Jr., M. Farrell Epstein, Robert J. Roselli, Sheldon Weinbaum

1990-91

Carl F. Rothe

1990-92

Thomas R. Harris

1990-93

James M. Adams, Dov Jaron, Hun H. Sun

1991-93

Jen-shih Lee

1991-94

Harvey S. Borovetz, Robert S. Langer, Robert E. Mates

1992-93

John M. Tarbell

1992-94

Larry V. McIntire

1992-95

Kenneth R. Lutchen, Aleksander S. Popel, Vincent T. Turitto

1993-94

Michael J. Kallok

1993-96

Paul N. Hale Jr, J. David Hellums, Virginia H. Huxley, Van Mow

1994-97

Eric J. Guilbeau, Roger D. Kamm, Linda C. Lucas, James B. Grotberg

1995-96

Herbert H. Lipowsky

1995-98

Helen M. Buettner, Jeffrey A. Hubbell, Herbert F. Voigt, Eugene C. Eckstein

1996-99

Jerry C. Collins, Rakesh K. Jain, Murray B. Sachs, Thomas C. Skalak

1997-00

Gilda A. Barabino, John A. Frangos, Steven A. Goldstein, Salvatore P. Sutera

1998-01

Kimberly W. Anderson, Cynthia Sung, Robert T. Tranquillo, George A. Truskey

1999-02

Cheng Dong, Linda G. Griffith, Francis A. Spelman, Kevin C. Warnke

2000-03

Dawn R. Applegate, Kyriacos A. Athanasiou, Kristina M. Ropella, Wolf W. von Maltzahn

2001-04

Sonya S. Clemmons, Andrew D. McCulloch, Richard E. Waugh, Frank CP Yin

2002-05

Paul N. Hale Jr., Gabriele G. Niederauer, Melody A. Swartz, George A. Truskey

2003-06

Shu Chien, Robert A. Nerem, Rebecca Richards-Kortum, Lori Setton

Biomedical Engineering Society

Founding and Charter Members

Bernard C. Abbott
 Peter H. Abbrecht
 W. Ross Adey
 Tetsuzo Akutsu
 Norman G. Anderson
 Max Anliker
 Antharvedi Anne
 Julia T. Apter
 Saul Aronow
 Ernst O. Attinger
 Benjamin H. Barbour
 G. Octo Barnett
 Glenn W. Bartlett
 James B. Bassingthwaighte
 William C. Beck
 George A. Bekey
 J. Weldon Bellville
 Spencer L. BeMent
 Leonard F. Bender
 Ivan L. Bennett, Jr.
 Otis O. Benson
 Carl Berkeley
 William B. Blesser
 Robert D. Bloodwell
 Robert L. Bowman
 Silas A. Braley
 Nina S. Braunwald
 George Brengelmann
 Robert D. Brennen
 Stanley A. Briller
 John M. Brookhart
 C. McC. Brooks
 Arthur C. Brown
 Jack H.U. Brown
 Gordon L. Brownell
 Cesar A. Caceres
 Lee Cady
 Loren D. Carlson
 Edwin L. Carstensen
 Britton Chance
 I-Dee Chang
 Dudley S. Childress
 Manfred Clynes
 James L. Cockrell
 James C. Cole
 Morris F. Collen
 J. A.D. Cooper
 Jerome R. Cox
 Leo Cuello

Harry Cullumbine
 John F. Dammann, Jr.
 John F. Davis
 Joseph B. Davis
 Michael E. DeBakey
 Edward W. Dennis
 William S. Derrick
 Erling Dessau
 Gilbert B. Devey
 David J. Dewhurst
 James F. Dickson, III
 Philip A. Drinker
 Kurt M. Dubowski
 Arthur Eberstein
 Murray Eden
 Peter D. Edmonds
 Glenn V. Edmonson
 Richard H. Egdahl
 Melvin H. Ehrenberg
 J.L. Ehrenhaft
 Charles W. Einolf, Jr.
 Kurt Enslein
 William G. Ermond
 Thelma Estrin
 Irving Fatt
 David G. Fleming
 L.E. Flory
 Claude Fortier
 Howard A. Frank
 Victor H. Frankel
 Peter L. Frommer
 Yuan-Cheng B. Fung
 Seymour Furman
 Pierre M. Galletti
 Donald S. Gann
 David Garfinkel
 Leslie A. Geddes
 Frank J. Gerow
 David B. Geselowitz
 Moise H. Goldstein, Jr.
 Lester Goodman
 Martin H. Graham
 Maurice Green
 Robert A. Greenes
 Fred S. Grodins
 Warren G. Guntheroth
 Arthur C. Guyton
 Franz Halberg
 Robert Hall

Anthony J. Hance
 Walter K. Harrison
 Salmon C. Harvey
 Daniel W. Healy
 Charles A. Heisterkamp III
 Elwood Henneman
 George Herrmann
 Alistair D.C. Holden
 D. L. Holmquest
 Robert M. Howe
 Arthur S. Iberall
 George J. Jacobs
 John E. Jacobs
 Bertil Jacobson
 Donald C. Jameson
 Howard P. Jenerick
 Richard J. Johns
 Richard D. Jones
 Gunnar Jungner
 Robert C. Juvinall
 Alan R. Kahn
 Paul Kahn
 Adrian Kantrowitz
 Ephraim Katchalski-Katzir
 Peter G. Katona
 J. Lawrence Katz
 Theodore H. Kehl
 Robert M. Kenedi
 Edwin Kinnen
 Wen H. Ko
 Willem J. Kolff
 Alfred T. Kornfield
 Leonard D. Kurtz
 Clifford S. Kwan-Gett
 Harold Lamport
 Herbert D. Landahl
 Joseph R. Latson
 Harold D. Laufman
 Nelson E. Leatherman
 Edward F. Leonard
 John E. Leonard
 Elliott Levinthal
 F. John Lewis
 Ronald A. Lewis
 Ching-Chung Li
 John G. Linvill
 Domingo Liotta
 Robert S. Litwak
 Josep G. Llaurodo

Edward R. Llewellyn-Thomas
 Edwin Lowenberg
 Lee B. Lusted
 John Lyman
 Harold A. Lyons
 Robert C. Mackowiak
 Josiah Macy, Jr.
 Eugene A.H. Magnier
 George J. Magovern
 William G. Malette
 James V. Maloney, Jr.
 Robert W. Mann
 Gilbert D. McCann
 D.A. McDonald
 R. Stuart McKay
 J.P. Meehan
 James A. Meyer
 John H. Milsum
 Lyle F. Mockros
 Luke H. Montgomery
 John W. Moore
 Eugene F. Murphy
 David Nathan
 Thomas S. Nelsen
 Joel J. Nobel
 Frank W. Noble
 Abraham Noordergraaf
 J.F. O'Donnell
 Clyde L. Owings
 Nello Pace
 Victor Parsonnet
 Lloyd D. Partridge
 M.M. Patton
 Milton H. Paul
 J. Raymond Pearson
 Lysle H. Peterson
 W.A. Petersen
 Mathew L. Petrovick
 William F. Pickard
 Will R. Pierie
 Hubert V. Pipberger

Robert Plonsey
 Kendall Preston, Jr.
 Judith M.S. Prewitt
 W.G. Rainer
 M. Rappoport
 Charles D. Ray
 Warren S. Rehm
 John M. Reid
 Michael H. Reid
 Barney Reiffen
 Antoine Remond
 James B. Reswick
 Verne L. Roberts
 Walter Rosenblith
 Carl F. Rothe
 Robert F. Rushmer
 Toshifusa T.S. Sakamoto
 Philip Samet
 Anthony Sances, Jr.
 William R. Scarborough
 Allen M. Scher
 Neil M. Schmitt
 Otto H. Schmitt
 M.P. Schujtzenberger
 Herman P. Schwan
 Neena B. Schwartz
 B.H. Scribner
 Ernest E. Sellers
 Ascher H. Shapiro
 Robert F. Shaw
 Donald C. Shiley
 Harold W. Shipton
 Edward F. Siegal
 William M. Siler
 Shirleigh Silverman
 William Simon
 Edwin M. Smith
 Josef R. Smith
 Fred Snell
 Merrill P. Spencer
 William A. Spencer

Ralph W. Stacy
 Lawrence Stark
 H.F. Stegall
 George W. Stroke
 Hubertus Strughold
 George D. Summers
 Hun H. Sun
 Louis L. Sutro
 Michael J. Sweeney
 Noel P. Thompson
 Fredrick L. Thurstone
 Alan F. Toronto
 John Truxal
 John Urquhart
 Edmund E. Van Brunt
 Robert L. Van Citters
 Manuel Viamonte, Jr.
 Henning E. Von Gierke
 Gerald G. Vurek
 Ray W. Ware
 Worden Waring
 Homer Warner
 Harold Wayland
 George N. Webb
 John G. Webster
 Sigmund A. Wesolowski
 Hans U. Wessel
 Seymour S. West
 Leon L. Wheelless, Jr.
 William J. Williams
 Matthew B. Wolf
 J. Walter Woodbury
 Max A. Woodbury
 William S. Yamamoto
 Ioannis V. Yannas
 F. Eugene Yates
 Edward L. Yellin
 Allan C. Young
 Laurence R. Young
 Benjamin W. Zweifach

Otto H. Schmitt, PhD, 1913-1998

Founder President – 1968

Board of Directors: W. Ross Adey, Arthur C. Beall (representing Michael DeBakey), J.H.U. Brown, John E. Jacobs, Herman P. Schwan, Lawrence Stark, and F. Eugene Yates

Otto Herbert Schmitt will be remembered for his scientific contributions to biophysics and biomedical engineering, for the crucial role he played in the establishment of these fields, and as a great inventor. He joined the University of Minnesota in 1937 as an instructor and retired in 1983 as professor of biophysics, biomedical engineering, and electrical engineering.

His commitment to interdisciplinary studies along with the other “committee of four” members, Kacy Cole, E. Pollard, and S. Talbot, led to the founding of the Biophysical Society. A few years later the Biomedical Engineering Society was formed with Otto serving as the initial caretaker president.

Otto was an excellent engineer and biologist. The “Schmitt trigger” is an electronic circuit which produces an output when the input exceeds a predetermined threshold; it still appears in hundreds of applications. It is an excellent example of “biomimetics,” a term which Otto coined for a field which applies biological design principles to engineering.

After the Second World War, Otto turned his attention to the relationship between cardiac sources and the surface electrocardiogram. His laboratory was one of four which contributed to this effort to understand the volume conductor problem, and led to the development of lead systems for determining the heart vector. The others were Burger in Utrecht, Frank in Philadelphia, and McFee in Ann Arbor.

The tremendous range of Otto’s contributions is not easy to convey. It is best illustrated by a topical list indicated by his publications, his biography, and our personal experience: nerve impulse mechanisms, tridimensional oscilloscopic displays, bivalent

computers, biological tissue impedance analyses, electronic circuitry, direct current transformer, trigger circuits, electronic plethysmography, antenna radiation pattern measurements, stereovector-electrocardiography, phase space displays, bioastronautics, electro-magneto-biology, technical optimization of biomedical communication and control systems, Santosh Index for quality of life, strand epidemiology, personally portable whole life medical history, biomimetic science and technology.

Otto was widely recognized for his outstanding achievements. He was elected to the National Academy of Engineering in 1979 and to the Minnesota Hall of Fame in 1978. Among his other honors are the Lovelace Award, 1960; Morlock Award, 1963; Wetherill Medal, 1972; IEEE-EMBS Life Achievement Award, 1987; Medical Alley Award, 1988.

**This information was graciously supplied by Herman P. Schwan and David B. Geselowitz, both of whom worked with Otto Schmitt for many years.*

Editor’s Note:

The Biomedical Engineering Society was indeed fortunate to have as its initial leader a scientist of incredible talent and capability. Otto Schmitt’s interdisciplinary interests had manifested themselves in significant research but also institutional creativity. He helped to realize the new Biophysical Society and then BMES itself. His presence gave authority to the fledgling society and his esteem in both the science and engineering communities lent credibility to the meeting with near 90 individuals present at the first



ever open meeting of the “Bio-Medical Engineering Society” at the Ritz-Carlton Hotel in Atlantic City, New Jersey, on 17 April 1968.

Appropriately, the main topics for discussion centered on the organizational details. With Otto Schmitt as caretaker president and chair of the meeting, John Jacobs acted as Secretary-Treasurer until officers could be elected. That election was scheduled for the Annual Conference on Engineering in Medicine & Biology (ACEMB) meeting in Houston in November. Committee Chairs were selected and charged with having reports made ready for that meeting. Herman Schwann headed the Constitution Committee; Eugene Yates assumed the Membership Committee; Lawrence Stark took Publication; and Jack Brown was responsible for Nominations.

After the assignments were completed, an important point was made by President Schmitt. Concern had been expressed to him about the “potential narrowness” of the new society. The group felt that this criticism could be best met by a broad-based membership appointment on the committees.

Dues were set at \$10 for the first calendar year ending in December 1968. A more detailed discussion ensued regarding membership requirements. In the first stage, members would be nominated by the founding members. After that, criteria developed by Dr. Yates would guide recruitment.

This small, dynamic group had created a society and mechanisms to ensure its continuance. The committee chairs were able to utilize the talents of a wide range of personnel. From this first meeting a formal society emerged.

Robert F. Rushmer, MD, 1914-2001

President 1968-1969

Board of Directors: W. Ross Adey, J.H.U. Brown, Michael DeBakey, James F. Dickson, Murray Eden, Richard H. Egdahl, John E. Jacobs, Otto H. Schmitt, Herman P. Schwan, Fred M. Snell, Lawrence Stark, John G. Truxal, F. Eugene Yates

After the initial, founding meeting of BMES in April 1968, the Society leadership met again later that year in November. The Board of Directors assembled at the Shamrock Hilton Hotel in Houston, TX. This small, elite group consisted of caretaker President Otto Schmitt, J.H.U. Brown, James Dickson, Richard Egdahl, John E. Jacobs, Lawrence Stark, and Robert Rushmer. Meeting early in the afternoon, the group dealt with two immediate problems: organizational matters and a new president. Matters were delegated to the five standing committees: Financial (Jacobs, chair), Membership (Yates, chair), Constitution (no chair), Nominations (Brown, chair), and Publications (Stark). Robert Rushmer had the responsibility of the first annual meeting. Quite literally, a handful of members laid down the organizational and procedural operations for the fledgling society.

Dr. Jacobs presented the Financial Committee report and had to immediately deal with the fact that the Articles of Incorporation would have to be modified in order to qualify for tax exempt status with the IRS. The accountant retained by the Society would handle this.

The Constitution Committee was originally headed by Herman Schwan. However, he had to decline and Dr. Jacobs prevailed upon James Dickson to take the chair position. Dr. Dickson agreed and in turn surveyed the document and recommended that the Executive Committee membership be reduced to two from three. The Board approved the action.

Dr. Stark presented the Publications Committee Report. After discussion, the Board endorsed the principle that a journal be established for the Society as

early as the following year (it was another three years in fact). The publication was to be thematic, the timing and content to be determined by a designated editorial staff. The president would appoint the chair and three members of the Publications Committee. That Committee, in turn, would appoint an editor and editorial staff. One concept made clear was that the chair of the committee would not be eligible to be editor to avoid any conflict of interests.

Dr. Brown announced that Robert Rushmer had been nominated as President, Dr. Brown (himself) as President-elect, and John E. Jacobs as Secretary-Treasurer. Dr. Brown moved these nominations be approved. The motion was seconded and passed unanimously. President Rushmer then formally assumed the leadership of BMES. Thus, Robert Rushmer has the distinction of being the first elected president of the Society.

There followed a discussion about the propriety of the Board electing officers rather than in an open meeting. However, it was felt by the early leadership that too little representation from the membership was obtainable due to a lack of cohesiveness and numbers. The Board went on record that Founding and Charter Members (numbering 83 and 178, respectively) would play a prominent future role in elections. Dr. Rushmer took the lead in establishing these steps. With these crucial pieces of business concluded, the Board and new President adjourned until later that evening.

At 9:00 pm, the general meeting began with an introduction by Otto Schmitt and reports by the Committees. President Rushmer then outlined his



ideas and plans on the role the new Society should play, the future involvement of the membership, and first annual meeting which was scheduled for November 1969.

A question about the electoral process in the Society was one of several questions from the floor. President Rushmer explained the interim nature of the first administration and that a more traditional election process would follow. He encouraged the membership to participate and play a prominent role in the nascent society.

Four days later, President Rushmer sent his progress report with future plans to the Board. At this early juncture in its history, the Society was fortunate to have leadership that stepped to the fore and gave prompt and decisive direction. One goal was to expand the membership base and, two, to include more of that base into the leadership structure.

Dr. Rushmer's first concern was how to expand membership. He appointed Ernst Attinger as chair of that committee. Dr. Attinger addressed the question and adjusted membership requirements so as to expand the numbers beyond Founding and Charter status.

Otto Schmitt assumed the chair of the Publications Committee. He and Dr. Rushmer recommended a list of candidates for that committee for the Board to consider. Dr. Josiah Macy took over as chair of the Nominating Committee. He would solicit names from the membership to serve.

James Reswick replaced James Dickson as chair of the Constitution Committee. These two, working with Dr. Rushmer, came up with a list of members which also was submitted to the Board for consideration.

Dr. Rushmer also realized the fragility of a new society. He, therefore, felt communication with the membership was vital. The results and decisions of these meetings would be mailed out to the membership for commentary and action. The list included: 1) minutes of the Houston General Meeting, 2) current membership list, 3) composition of various committees, 4) qualifications for membership as developed by the Membership Committee, 5) ballots for nominating members of the Nominating Committee, and 6) request for suggestions or comments. The materials were mailed out on December 6 true to Dr. Rushmer's promise to make rapid contact with the membership.

J. H. U. Brown, PhD

President 1969-1970

Board of Directors: Otto H. Schmitt, Murray Eden, Fred M. Snell, W. Ross Adey, Josiah Macy, F. Eugene Yates, Herman P. Schwan, Lawrence Stark, James F. Dickson, Leslie A. Geddes, George Bugliarello, Edward F. Leonard, Leon Harmon, Donald S. Gann, Glenn V. Edmonson

Notable achievements for biomedical engineering and BMES include: started original training programs at the National Institutes of Health (NIH) for biomedical engineering; started the special research resources for biomedical engineering at NIH; helped to establish the *Annals of Biomedical Engineering*; first person elected to National Academy of Engineering for “biomedical engineering.”

I have had a life long interest in biomedical engineering. Now at 82, I look back and see the development of the field and my own interest. I began as a theorist and ended as a practitioner. As Executive Secretary of the Physiology Training Committee at the National Institutes of Health in 1960, a committee was formed to explore what would later become biomedical engineering. Most of the early officers in the Society participated in the discussions, including Herman Schwann, Otto Schmitt, John Jacobs, Art Guyton, and Fred Grodins. At the same time NIH Institutes were doing biomedical engineering but under their own rubric. By 1962, NIH supported a Symposium on training held by IRE which resulted in the development of the original biomedical training structure and later NIH started both training committees and research groups.

In the middle sixties, I called a meeting at the Federation of American Societies for Experimental Biology (FASEB) meetings in Atlantic City by passing announcements around asking those interested to attend. About 50 people came to the meeting. The purpose of the meeting was to form a society of biomedical engineers. Some felt that a society was not necessary; that the American Physiology Society and

the engineering societies could perform all necessary functions; others felt that the society should be based in engineering rather than biology and some felt that a separate society was necessary. The latter view prevailed. The Biomedical Engineering Society (BMES) was formed and the organization incorporated under Illinois law in 1968. We had no administrative mechanism so I ran the society out of my office at NIH for the first year. Later the office was moved to Northwestern University and John Jacobs undertook to manage it.

The science also suffered from the lack of identification. The English had a program called Clinical Engineering but the biologists and the physiologists in this country objected to the “clinical” definition. A physician suggested “Medical Engineering.” One night in Memphis, Tennessee, on a site visit to the medical school, Otto Schmitt and I sat in a small cabin provided to visitors and debated the issue. We tried every combination of medical, clinical, and biology terminology with engineering and finally decided that the field was most suitably named “biomedical engineering” as representing most of the interests and the name stuck.

Editor’s Note:

Procedural concerns continued through Dr. Brown’s presidency. Michael DeBaKey submitted that the experience of presidents was of considerable value to the Society and should continue their role. The immediate past president should be a member of the Executive Committee. A Long Range Committee was discussed and the role of corporate groups in the Society needed



to be worked out in the constitution. The Board of Directors was large for a new society: 15 members serving 3 year terms.

Other business saw Dr. Hans Wessel appointed Secretary of BMES. Don Gann was pursuing the possibility of holding the first societal sessions at the FASEB meeting in April 1970.

The Executive Committee consisted of Dr. Brown - President, John E. Jacobs - Treasurer, Robert F. Rushmer - Past President, Fred S. Grodins - President Elect, James F. Dickson III - Director. An array of 10 officers covered integral committees: secretary, treasurer, planning, constitution, finance, membership, nominating, program, biomaterials, and simulation. Part of the planning included what would become a familiar pattern. The spring meeting with FASEB was furthered; BMES would meet in Atlantic City, April 13-14, 1970.

The Society found recognition in publishing opportunities in its third year. President Brown began editing the *Annual Reviews in Biomedical Engineering*, a position he would hold for 8 years. Second, planning for a journal continued along with negotiations with Academic Press who also published *Annual Reviews*.

Dr. Yates reported in his usual succinct manner on the progress toward a journal. The name would be: "Biomedical Engineering Journal." Academic Press

was the recommended publisher. BMES would share operating expenses and ownership with the publisher. Dr. Yates would manage the scientific content as senior editor. Nine section editors would assist. The first issue was tentatively planned for January 1971. The journal would exist on a no risk, non-profit basis for the first three years.

Spirited discussion ensued about whether to submit these proposals to the general membership at the business meeting. There was objection to the nine sections and the method of selection of the associated editors. Clearly, in this early stage some discretion was necessary for leadership. After further debate, the Board approved to recommend the journal to the membership with Academic Press as publisher. The list of proposals made by the Publications Committee would also be submitted to the membership.

At that business meeting, nominations were entertained and balloting ensued. Donald Gann was the president elect. The proposals for the journal were discussed and the issue of copyright ownership was raised. The ideas were approved in general and John Lyman was added to the Publications Committee. Dr. Yates would submit a complete proposal later. Additionally, the issue of a monthly newsletter was raised but postponed.

Fred S. Grodins, MD, PhD, 1915-1989

President 1970-71

Board of Directors: James F. Dickson III, Josiah Macy, Herman P. Schwan, Lawrence Stark, F. Eugene Yates

Fred Grodins, like many of the founders of the Biomedical Engineering Society, had a broad background in physiology, engineering, and medicine. He had earned both an MD and a PhD in physiology. Soon after his service in the Army Air Force, he joined the faculty at Northwestern University as an associate professor of physiology. His research, influenced by aviation medicine, concentrated on respiratory physiology and particularly the control of the “chemostat” served by the respiratory system. In 1963, he published one of his first books, *Control Theory and Biological Systems*. He further established himself as one of the premier systems physiologists, a focus of several founding members.

Dr. Grodins moved to the University of Southern California in 1970 as professor of physiology and electrical engineering where he founded and was chair for 16 years of the Department of Biomedical Engineering. In addition to training many of the future leaders of the discipline and society, he aided in defining the new discipline by building a broad based department with emphases in analog computing, mathematics for nonlinear analysis, clinical applications, and endocrine feedback studies.

As a Societal founder he recognized the technical contributions under the IEEE’s professional group of engineers in biology and medicine but felt that there was more future for application of engineering principles to study of biomedical function than supplying tools for other people’s problems. He saw a need for a professional group of diverse visionary senior scientists to explore directions for potential development. For example, the Board of Directors during Fred Grodins’ presidency reflected the diversity of the Society,

members had MD degrees and others had doctorates in physics, physiology, biophysics, electrical engineering, and mechanical engineering, among others.

**Lloyd D. Partridge, an early member of BMES, graciously submitted this information.*

Editor’s Notes:

Two major societal concerns continued during Dr. Grodins’ presidency: professional meeting and the establishment of a journal. The Society continued to meet in conjunction with the Federation of American Societies for Experimental Biology (FASEB). At this time the question of joining the Alliance for Engineering in Medicine and Biology (AEMB) was raised. The major consideration for this other option was low attendance and abstract submission at the FASEB meeting. On the other hand, the AEMB was an unknown quantity. BMES could not hold separate sessions nor gain any income. The idea arose about holding a separate summer session.

On an equally important note, progress was made toward founding a journal. Approval was given for the appointment of co-editors John Lyman and Eugene Yates for a three year period. Academic Press would be contracted and the *Annals* would appear in January 1972. The contract allowed for a 600 page journal in 4 issues. Subscription cost to members was \$10.

Even as the Society sought its own identity, growth continued. Membership was an issue for any young society. Thus, considerable stress was laid on this aspect. The report of the membership committee was positive. Total membership by mid-1971 was 437, up 86 members from the previous year.



Donald S. Gann, MD

President 1971-72

Board of Directors: James B. Bassingthwaighte, Glenn V. Edmondson, James B. Reswick, Y.C. Fung, John Lyman, John Urquhart, Leon D. Harmon, George Bugliarello, Peter H. Abbrecht, Edward F. Leonard, Loren D. Carlson, John H. Milsum, Allen M. Scher, Josiah Macy, John W. Moore, John G. Truxal

This young Society was still attempting to find its place in the universal order of other societies. Debate continued about membership in the Alliance for Engineering in Medicine and Biology (AEMB). Dr. Gann had been charged by the Board to explore membership in the AEMB. It was noted that the membership had voted on three specific alliance options at the Houston meeting two years previous: a) FASEB; b) FASEB and AEMB; c) AEMB. No majority vote emerged for the first and it was, thus, argued that no support existed for the AEMB. However, Dr. Gann would explore the last option.

Refinement of operating procedures to increase the ability to call upon the expertise of former officers was formulated. Proposed amendments to the Constitution included having the past president serve ex officio as a voting member of the Board of Directors for three years. Dr. Gann proposed that the editors and program chair should also meet with the annual meeting of the Board.

Agreement was, then, reached on the size and composition of the Board of Directors. The overall number should be reduced from 15 to 12. Other voting members should include the president, the secretary, the treasurer, and the immediate past president. The editors and program chair would join the Board as non-voting members. Last, a quorum of the Board would be eight voting members. These changes would circulate first through the Board for approval and then to the general membership at the next general meeting.

Further discussion focused on the activation of the Executive Committee as specified in the

Constitution. Dr. Gann appointed the Board members present to nominate three members to the committee. The Board members then nominated Drs. Bassingthwaighte, Bugliarello, and Edmonson.

The new journal of the Society was nearing its initial issue. The editors were meeting twice weekly to deal with the "substantial" numbers of manuscripts. The first issue was estimated to appear in April 1972. The budget expense for the journal was running between \$100 and \$200 a month, which was covered by a contribution from Academic Press.

Dr. Gann also presented a preliminary budget for the next meeting. The Society would meet just prior to FASEB in April 1972 in Baltimore. The total estimate for the cost of the meeting was \$1,900. Advanced registration was \$10 and \$12 at the door.

Dr. Brown, past president, announced that FASEB had refused to admit BMES. It was decided to dissociate the Society from the Federation. This led to the issue of joining the AEMB. A concern over the financial stability of the AEMB precluded full membership. However, joining as an associate member for \$100 a year was seen as more prudent. This would allow BMES to conduct separate half-day sessions. This passed and the new Executive Committee was charged with creating a program.

A preliminary program for the fourth annual meeting of the Society was presented. It was reflective of the interests of the founding members. The four planned sessions were: physiological modeling and systems identification, technology to assist the disabled, hospital information systems, and monitoring and instrumentation. Eight papers per session were

photo missing

planned at 15 minutes each. Considerable discussion followed since only 32 papers were allowed. A second concern was the location in Palm Springs. It was noted that few students would be attracted due to distance and cost of a resort town. The general membership would be consulted for a final decision.

In the second meeting of the Board in April 1972, Dr. Lyman updated the Board on the progress of the

Annals first issue. It would definitely appear in August 1972. Thirty-two manuscripts had been submitted. Ten had been accepted, nine rejected, and the remainder in process. Another issue would appear in 1972. Thereafter, the journal would have a quarterly schedule. Further debate ensued on the cost of the first issue and whether it might be provided free. Nothing was decided at this time.

James F. Dickson III, MD

President 1972-73

Board of Directors: Ernst O. Attinger, John W. Moore, Josiah Macy, James B. Bassingthwaighe, Y.C. Fung, John H. Milsum, Arthur M. Scher, Richard J. Johns, Abraham Noordergraaf, John Urquhart, Lawrence Young

During my tenure as President, although the principles and practices of engineering science were thought to have considerable to give to biomedical research, development, and the delivery of health services, engineering's contributions to advancement in these areas had been moving towards a phase of consolidation rather than expansion. The reasons for this were: budgets for biomedical research and development reached a plateau; a reluctance of departmentally-oriented university structure to respond to interdisciplinary needs; an increasing difficulty that our 19th Century system for the delivery of health care was having with the assimilation of 20th Century technology; and the failure of the medical engineering consumer market to crystallize more predictably. What appeared likely was that the immediacy of the impact of engineering on biomedicine was becoming somewhat blunted and that it would be realized rather gradually over the next 10 to 15 years.

Nonetheless, this year was an eventful one for members of the Society. Of significance was the appearance of textbooks arranged for the field, the emergence of a variety of new instruments and devices for biomedical research and health care, increasing pressures for attention to the matter of standards and safety for medical devices, and the continued emergence of the Society itself.

The National Institute of General Medical Sciences, through a variety of mechanisms, continued to provide broad support of the advance of the field. Its objective was to support the effective introduction of engineering into fundamental and applied biomedical research and quality research training in the area.

In some selected instances, it supported the development of prototype instrumentation and devices that would be useful in the improvement of health care.

At this time, Congressional Appropriations Committees, recognizing the role of engineering in biomedicine and the general need to expand efforts in biomedical technology, encouraged:

1. The support of projects and programs designed to apply the methods and technologies of the physical sciences and engineering for the development of more effective methods for the prevention, diagnosis, and treatment of medical disorders.
2. A further expansion of the ongoing effort in training programs and fellowships in the field of biomedical engineering and related sciences.
3. Efforts to foster in the private sector of the national economy, through the use of various forms of assistance, the development, and production of new biomedical techniques, methods, and products.

It was felt that activities such as these were a natural outgrowth of existing programs that were on the brink of responsiveness to patients' needs. It was also apparent that the accomplishment of these missions would aid in narrowing the interval between the acquisition and the application of biomedical knowledge in the treatment of disease, and contribute to improvements in hospital care and community health.

Looking ahead to the next decade, the Society felt that to explore and develop optimally the interplay existing between the fields of engineering, biology, and medicine, there was a need to establish several biomedical engineering research centers. Within them, the application of the principles of the engineering



sciences could be realized with less delay: in biomedical research; in the design and development of the instrumentation, devices, and systems required for the further advance of preventive diagnostic, and therapeutic medicine, and in systems for the delivery of health services.

These centers would require the arrangement of prototype university patterns that are appropriate for advancing the relationships between engineering and biomedicine. New institutional forms and linkages between schools, with the requisite capabilities, had to evolve. In these new forms the application of engineering to biomedicine would have an opportunity for its fullest development by virtue of an environment allowing for a broad definition of subject areas and a clear delineation of the scope of opportunities. It was felt that the efforts in these centers should be variously balanced between basic and applied research along with development and delivery of services.

It was also becoming clear at this time that support for the application of the methods and technologies of the physical sciences and engineering would be important in the enhancement of the general public health and welfare. Such an undertaking could be justified on two levels: social need and medical need. On the social level, there was a responsibility of biomedical researchers to be responsive to societal needs and to help, where they could, relieve the inequities of health services in the country. The Society was interested in trying to help narrow the interval between the acquisition and the application of biomedical knowledge by encouraging the continuity inherent in applied research and development. In a period of anti-scientism, it was thought that the demonstrated transfer of basic science into instruments, devices, and systems for health care would be welcome all around. With respect to the field of medicine itself, it was likely that the principal gain would be through the encouragement given to the development of interdisciplinary

professionals—those individuals whose familiarity with basic life science research, medicine, and engineering promised useful contributions in the newer areas where the life sciences, the physical sciences, and engineering were merging. Last, I was asked to design the logo for the Society and I did.

Editor's Note:

Dr. Dickson's presidency witnessed growth in several ways. First, membership reached 470. The Society was growing slowly but at a steady rate. Second, the first two issues of the *Annals* had been distributed by Academic Press, and the third was forthcoming. The Society determined that the first issue would be mailed free to members. Subscription costs to members would be \$10. Both growth and the emergence of the *Annals* signaled that the Society had reached a critical plateau.

The Board of Directors voted to join the Alliance for Engineering in Medicine and Biology (AEMB) as an associate member and could organize sessions in the annual meeting. But this was only a partial solution to a larger issue. BMES membership in FASEB had been declined for primarily financial considerations. Requisite size of a society for membership was 1,000. Thus, a joint meeting with the AEMB or other societies was a potential solution. The Society could also meet just prior to or immediately after the FASEB. A stand-alone meeting had been proposed by the 1974 Program Committee. Working around the FASEB meeting proved to be the most popular but the Society did have a growing sense of independence.

In another vein that reflected growing credibility, Dr. Dickson acted upon behalf of the Society to a request from the American National Standards Institute. The Society was asked to participate along with 19 other organizations to act as an advisory group to establish standards for cardio-vascular implants in the US.

James B. Reswick, PhD

President 1973-74

Board of Directors: James B. Bassingthwaight, Y.C. Fung, Ernst O. Attinger, Richard J. Johns, Abraham Noordergraaf

The factor of size played a role in determining many of the discussions during the presidency of Dr. Reswick. The 4th Annual BMES meeting drew 46 members, 50 non-members, and 37 students. It was originally thought that smallness might detract from effectiveness. However, Dr. Yates believed that the small size was more effective and allowed everyone to interact. This is a common theme in small societies. In such a setting, students mix more easily with faculty and all levels of faculty interact.

The small size of the Society had other effects besides a more intimate setting at conferences. Dr. Yates suggested that each member had the privilege to have 10-15 minutes on a program. He further stated that no attempt to select or reject abstracts should be made. The suggestions were taken under advisement.

Dr. Yates' comments reveal something else about the nature of the young Society. This was an elite research group with senior graduate students. The members were highly regarded professionals who conducted high level research and regularly presented their work at other major conferences. Their credentials were beyond reproach. Couple this fact with the small size of the Society and he believed that everyone could and should be able to present at these small meetings.

Further refinement of procedure and structure continued. The Board had acted in multiple capacities for the first years of the Society but now it was deemed time to disperse authority and create more specific committees. In response to urgent needs, the

Program Committee was created with Dr. Reswick as chair. Budget preparation for meetings was considered an integral part of the planning process.

Four themes continued to dominate the young Society: membership, financial status, election procedures, and payment of dues. Noteworthy for 1973 was the addition of 63 new members increasing membership to 513. The downside was that only 392 had paid their dues.

The other significant issue was the resignation of Hans Wessel as Secretary-Treasurer. He had served the Society for 5 years. John Lyman assumed these duties in addition to his duties as editor of the *Annals*, yet another instance of how the Society was molded and strengthened by the commitment of its members. As a result of the increase in his duties, Dr. Lyman would combine the offices and streamline administration. A part of this was to promote Kay Lyo to Executive Assistant from Editorial Assistant. There were costs associated with growth. Administrative functions could for the present be handled by part-time aid and personnel associated with leadership. But eventually the Society would have to professionalize its organizational structure in order to meet its obligations.

The *Annals* continued to grow. Dr. Lyman reported 114 manuscripts submitted with 50% acceptance. Labor difficulties at Academic Press had been overcome and it was believed that the journal would appear in the future on a quarterly basis.



F. Eugene Yates, MD

President 1974-75

Board of Directors: James B. Bassingthwaite, Ernst O. Attinger, Y.C. Fung, Richard J. Johns, Abraham Noordergraaf, John W. Moore, Josiah Macy, John Lyman

My notable achievements for BMES included: completed definitions of classes of membership and the requirements; made arrangements for Spring meetings of BMES with FASEB, via the American Physiological Society; established the Publications Committee and the *Annals of Biomedical Engineering*; established an Editorial Office with John Lyman and Kay Lyou; began arrangements with the Alza Corporation (through John Urquhart) for a Distinguished Lectureship.

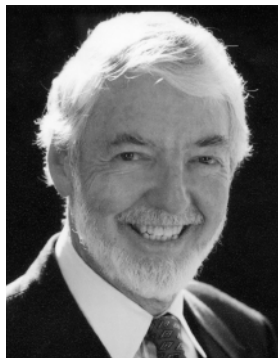
At the start of my presidency, BMES was just two years old and everything procedural needed to be set up or shaken down into a practical, operational mode. I first attended to the activities of the Membership Committee (of which I had previously been chair) to undertake a new membership drive, and to set the definitions of and requirements for the various classes of membership. We accomplished those goals quickly.

More difficult was the planning for meetings of BMES. We were then too small to have a significant meeting on our own, and there was much discussion about how to ride piggy-back on another, larger society's meeting. Associations were proposed with several engineering societies having an interest in biomedical engineering, but I favored starting with a cooperative arrangement with a biological society. I proposed that we approach the American Physiological Society (APS) a member of the Federation of American Societies for Experimental Biology (FASEB). FASEB in those days had an annual Spring Meeting involving six member societies, and an attendance of biologists ranging from 10,000-20,000 in its prime. Negotiations with APS and

FASEB were arduous, and helped by Arthur Guyton who was an early member of BMES, a past President of APS, and currently President of FASEB. BMES was ultimately adopted as a guest society of APS at the Spring Meeting and given space on the program. I was proud of this accomplishment. However, as time passed it later became clear to me (and others) that although we were serving the biologists in BMES, we were not serving the engineers, who understandably did not warm to attending a huge meeting in a foreign culture with such little overall engineering content.

The motivation for the establishment of BMES (I am a founding member) came mainly from engineers. Because I am a biologist (with strong engineering interests) I felt that we needed to attract members from that community but it was not easy. It was already clear to biologists that molecular genetics was going to be their most active area, and they in the main had little interest in engineering system-analytic models of the cardiovascular or vestibular systems, or of papillary dynamics and eye-tracking of targets (examples of good modeling being done at that time with serious mathematical and computational art).

In summary, the biggest issue of my time as President was to find the right balance between engineering communities and biological communities. We stumbled and groped, and made progress only slowly. It is with great satisfaction that I see today the tremendous synergisms among engineering, biology, and medicine. From imaging to materials to DNA chips and the handling of massive genetic databases, the interaction has become essential, and almost seamless. Biomedical engineering has come of age.



Editor's Note:

The Society continued to exhibit growth. Sixty-three new members increased ranks to 513. Subscriptions to the *Annals* numbered 64% of this total, 252. Along with growth came higher operating costs and the effects of inflation. Dues were still set at \$10, a figure established six years earlier. Raising dues by \$5 was discussed and decisions were postponed until the fall board meeting.

The Board also affirmed that the Society would continue to meet in 1975 in conjunction with FASEB.

That fall the new budget with increased dues was debated extensively. But a dues hike passed. An interesting aspect connected to raising dues was a comment by John Lyman. Academic Press was likely to ask for an increase since the numbers of subscribers had increased. The budget was eventually approved.

Donald Marsh, one of the managing editors of the *Annals*, reported on manuscripts submitted in the last year: 44 overall of which 12 were accepted, 6 rejected, 2 withdrawn, and 24 in progress. The flow of submissions needed to increase. Dr. Yates indicated that he believed that many involved with biomedical engineering not in the Society were unaware of the journal. He urged patience since it takes time to build aware-

ness in the larger community. Richard Bergman stated that the steady existence of the journal would accomplish the goal of greater manuscript flow.

Dr. Yates also presided over discussion on the role of BMES and the certification process for Clinical Engineers. Dr. Johns submitted a draft resolution defining the involvement of BMES along with the American Board of Clinical Engineers (ABCE) in certifying clinical engineers (not licensure). Most of the officers of the ABCE were also members of BMES. Dr. Johns offered four reasons: 1) ABCE is a separate entity independent from other group; 2) certification is based upon objective examination by a peer group; 3) trustees act as independent agents; and 4) trustees are nominated by AEMB affiliates such as BMES. The group would be patterned after the American Board of Internal Medicine. The president may name a person to the advisory committee and one to the commission of trustees. The motion carried.

The growth of the Society was further evidenced by an increasing student membership. Dr. Van Buskirk thought that the Society should consider sponsorship of student chapters. Students were finding it financially difficult to attend meetings. Dr. Yates responded that the Society had the matter under consideration.

Ernst O. Attinger, MD, PhD

President 1975-76

Board of Directors: Edward R. Llewellyn-Thomas, Howard J. Milhorn, Jr., Vincent Rideout, William B. Blesser, Thelma Estrin, Robert Plonsey, Anthony Sances, Gerald G. Vurek, George N. Webb

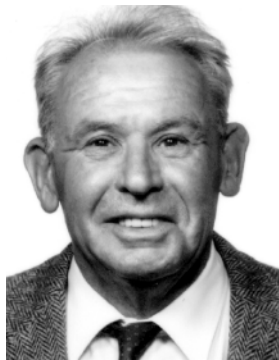
The Biomedical Engineering Society reached a critical size during Dr. Attinger's presidency. The pressures of recognition, increased membership, and costs triggered reflection and discussion on the future of BMES. The Society continued to grow slowly. Richard Bergman, chair of the Membership Committee, reported that there were currently 625 members. Concern was expressed about the expense of students to the Society. They were not a source of income and did not always become full members. Dr. Bergman suggested that this cost could be offset by contacting clinical and industrial people to better balance membership. Clearly, the Society was evolving beyond its original membership.

Regularization of an annual meeting with FASEB commanded considerable attention. Gene Yates believed that the Society would enhance its visibility by meeting with FASEB. Working through FASEB relieved local committees of details or preparation. The sheer size of FASEB, sometimes reaching 20,000 in attendance, enabled BMES to attract a wider audience. Additionally, the Society realized an income of \$1,525 from the meeting with FASEB.

The matter of a draft resolution concerning the American Board of Clinical Engineering was addressed. The modified resolution was discussed and approved. It read: "The Board of Directors of the Biomedical Engineering Society wishes to express its support of the American Board of Clinical Engineers and its plans for the certification of clinical engineers. Although the Biomedical Engineering Society is not in a position to provide financial support for this undertaking, we are pleased to designate Ernst

Attinger, who is the current President of the Biomedical Engineering Society, as our representative to the Commission of Trustees' Advisory Committee. Furthermore, we suggest that J. Weldon Bellville of UCLA and Edward Llewellyn-Thomas of the University of Toronto are persons who might be suitable for election to fill the present vacancies in the Commission of Trustees." The Society had achieved a level of recognition in its early years.

The Task Force on Careers and Education, chaired by John Urquhart, presented a draft brochure for careers and education in biomedical engineering. The title, "Biomedical Engineering—Yesterday, Today, Tomorrow," was developed in response to career inquiries directed to the Society. Considerable debate ensued about the brochure but the draft was accepted as the report from the Committee. However, a deeper question emerged in this discussion. Exactly what was the future of the Society? Was the Society only research-oriented; did it have any responsibility towards clinical engineering? Dr. Yates felt these questions went to the core of the role of the Society. The subject deserved fuller discussion. He went on to state that the number of resignations of founding and charter members indicated that the Society had apparently not fulfilled the hopes of these members. The discussion moved toward a key question. Dr. Llewellyn-Thomas asked, "Are we a learned or an engineering Society?" Dr. Yates replied that the time had come to either change the character of the Society or reassert its original character. Dr. Lyman made a crucial point by suggesting that elitism may not be possible from a purely financial standpoint.



The discussion on organization of student chapters explored the role of the Society from a different perspective. If the Society was to fulfill a broader role for biomedical engineers including preparation and education then greater recognition and inclusion of students was necessary. An easier admission and oversight process for student chapters was discussed. Accordingly, changes in the Constitution had to reflect these procedures.

Gene Yates and John Lyman, both of whom did yeoman's duty in the early years of the Society, submitted a report on behalf of the Constitution and Bylaws Committee. Their rationale reveals again the

pressures of maturation and evolution for the Society. They stated, in part, "The original Constitution was put together by James Reswick using "boiler plates" from other constitutions in an effort to provide the Society with an implement for its organization and to fulfill the legal requirements for incorporation. Though expedient, the original Constitution was clumsy and did not reflect the realities of the functions of the Society." Several components were accordingly submitted to the Board for consideration including changes in voting, more precise language, clarification of meetings, and the like.

John Urquhart, MD

President 1976-77

Board of Directors: George A. Bekey, Vincent Rideout, Gerald G. Vurek, Arnost Fronek, Edward R. Llewellyn-Thomas, Anthony Sances, Jr., Frederick L. Thurstone, Leon D. Harmon, Thelma Estrin, Howard T. Milhorn, Robert Plonsey, George N. Webb, C. Johnson, William B. Blesser, Gerald H. Pollack, Stuart J. Updike

I can recall with great fondness the inspiring Alza Distinguished Lecture given by Max Anliker that year. Dr. Anliker was a professor of biomedical engineering from Zurich and was a leader in biomedical imaging. I had arranged in 1970 the original funding of the Alza Lecture. I thought this apt at the time because Alza was then a newly-formed company, committed to bringing engineering approaches to the design of drug delivery systems—a new concept then. The first Alza lecture was given by Richard Bellman who was selected by Fred Grodins. This lecture series continued for 25 years.

Editor's note:

Dr. Urquhart represented the widely growing interest of biomedical engineering. He is an MD who was a professor of pharmaco-epidemiology at Maastricht University and professor of biopharmaceutical sciences at the University of California San Francisco. During his presidency three major issues reflected the maturation of the Society.

A committee was formed to oversee the establishment of a newsletter for BMES. Such a publication would carry a wide range of information including employment opportunities. Dr. Lyman eventually proposed a structure and cost. The newsletter, 600 copies each in six mailings, would total about \$1,500 a year. The only remaining issue was finding an editor.

The discussion continued on the relationships between BMES and other societies. The immediate interest focused on student organizations and the difficulties associated with meeting student needs. The Alliance for Engineering in Medicine and Biology

(AEMB) did not provide an overall coordination between students of the different societies. This was further exacerbated by the fact that student societies at universities were either in physiology or engineering but not in BMES (seen as a secondary society). This reflected a larger problem for the membership. Many were in BMES as a secondary society but had an older, primary professional liaison, e.g., IEEE-EMB. One response was to suggest that BMES become an accreditation society to enhance its status. It was countered that programs in medical schools fell under other jurisdictions and components that were accredited by other agencies would encounter difficulties. Still, the issue of accreditation and the role of BMES were raised and would continue.

The Alliance for Engineering in Medicine and Biology comprised 23 organizations. The Board felt that BMES could enhance its role in this organization by presenting a series of tutorials for AEMB. A similar precedence had been set earlier in AEMB. BMES was still fighting to establish a distinct disciplinary identity but within the larger confines of AEMB. Thus, the Board resolved: "The Meeting Committee is to consider as part of its charge, interfacing with the Alliance for Engineering in Medicine and Biology, and providing physiology tutorials for AEMB, and engineering tutorials for physiologically oriented meetings."

A last corroborative element of a young society was membership. The Board redefined membership to attract members from a larger audience. The Board passed resolutions and submitted constitutional changes to the membership that widened criteria.



James B. Bassingthwaight, MD, PhD

President 1977-1978

Board of Directors: William B. Blesser, Richard Bergman, Arnost Fronek, Peter G. Katona, Stuart Updike, Thelma Estrin, Curtis C. Johnson, James D. Meindl, Howard T. Milhorn, Robert Plonsey, Gerald H. Pollack, Hun H. Sun, George N. Webb, Judith M.S. Prewitt, Max Anliker

Milestones:

1977

- Annual meeting with FASEB, April 2-3, Chicago, IL
- James Meindl replaces John Lyman as coeditor of *ABME* with Don Marsh
- John Lyman becomes general chair for the Annual Conference on Engineering and Medicine in Biology (ACEMB)
- Student chapters are formed; UCLA is the first
- Lamport undergraduate award offered to BMES

1978

- Annual meeting with FASEB, April 9-10 Atlantic City, NJ
- Earl H. Wood is the Alza Distinguished Lecturer
- Lamport Young Investigator Award established
- Liaisons developed with ACEMB, USNCAUPS, and APS
- Dan Schneck serves as editor of the *BMES Bulletin*
- James Bassingthwaight appointed BMES representative to US National Committee for International Union of Physiological Sciences
- Academic Press ends its service as publisher for *ABME*

Many of the founding and charter members of the Biomedical Engineering Society came out of either

the American Physiological Society (APS) or were members of one of the societies within the Alliance for Engineering in Medicine and Biology (AEMB). The APS was a founding member of the Federation of American Societies of Experimental Biology (FASEB), whose other members were the societies for biochemistry, nutrition, comparative physiology, pathology, and pharmacology. The AEMB was composed of engineering related societies, including the biomechanics section of the ASME, ASAIO (American Society for Artificial Internal Organs), the Engineering in Medicine and Biology section of IEEE, and others—a loose knit group of about twenty societies. Togetherness was the focus of the annual conference, the Annual Conference on Engineering in Medicine and Biology (ACEMB). Kay Lyou reports that the Biomedical Engineering Society was incorporated as a non-profit organization on the first of February 1968. I was one of about 200 people at the first open meeting of the Society, held at the FASEB meeting, April 17, 1968, at the Ritz Carlton Hotel in Atlantic City, New Jersey. At this meeting, Otto H. Schmitt was elected its initial presiding president and John E. Jacobs as the Secretary-Treasurer. This started it off; there was much debate about the structure and form of the society. I remember Gene Yates standing at the side of the room monitoring the procedures and proffering wisdom out of *Robert's Rules of Order* on how we should proceed next in organizing the meeting, and the Society. Later that year, November 18-20, in Houston, there was a proper election and Robert Rushmer became the first formal president to succeed Otto Schmitt. John Jacobs remained treasurer.



For one brought up in the world of biology and medicine, as I was, the ACEMB meetings were a treasure house of analytical technology. It was there that I learned better approaches to deconvolution techniques, the powers of detailed mathematical modeling, the virtues of elegant optimization techniques for fitting models to data, a variety of approaches to signal analysis, and a host of other things that physiologists need to know in order to do quantitative comprehensive analysis of physiological systems. Forming the Society seemed an even better way of bringing these two worlds, of engineering and of biology as applied to medicine, together in a fruitful union.

In the early 1970s, I was lucky enough to serve on the Board of Directors, and thereby to participate in the Society's early growth. There was a great deal of insecurity on how to grow, and why to grow, and in which direction. There was discussion on whether the BMES should become an ABET accrediting body, but the expense seemed too formidable (though it was less than \$1,000 a year), and the prominence of IEEE appeared too great to combat. The Society was certainly dominated in the early years by people with primary appointments in electrical engineering and with an obvious interest in instrumentation. I think that many of these folks, who helped tremendously in the development of BMES, actually felt that their primary affiliation fell with IEEE, and they were just helping to get this new breed of investigators started. At that time virtually all BMES members had a primary affiliation with other societies.

When I joined the Board of Directors in 1976, as the president elect, I raised again the question of taking on the role of the biomedical engineering accrediting body for ABET. The minutes of that meeting reflect our poverty stricken state, namely a bank account of \$20,000 [and an insecurity about competing with the American Society of Artificial Internal Organs (ASAIO)] who at that time had about 3,000 members, whereas we had still less than 500. I thought that taking on the ABET accreditation chores would enhance the role of the Society and aid in its development. Others rightfully argued that we did not have much of a production of students in bioengineering at that point, that there was little urgency, and that we had better leave it to better endowed societies, such as IEEE. Surprisingly enough, the opportunity was not entirely lost and under Paul Hale's leadership we organized our ABET application in 2001.

In the 1971 Board meeting there was much discussion about qualifications for membership. The four qualifications were (1) excellence in science, (2) leadership in education, (3) demonstrated superior management skill, and (4) evidence of a successful

professional career in biomedical engineering of at least four years duration. Some members of the Board felt this should be a scientific society, while others felt that this would be too elitist. Through the '70s and '80s, the Society was regarded as being elitist, and, in fact, had little industrial membership.

When I became President in 1977, these natural processes of evolution within the society continued. The joint annual meetings with the Federation of American Societies for Experimental Biology were working only so-so. The BMES contributions to the meetings were four to six symposia, as a guest society of the American Physiological Society. These symposia, though well attended by persons outside of BMES, tended to be lost in the shuffle of the magnificently sized meetings, which at one point in the 1970s exceeded 35,000 attendees. When FASEB split its meetings so that not all of the societies met simultaneously, this improved our prospects, since only a subset of the six major societies attended each time. We were linked still through the American Physiological Society, but did not really thrive; we really needed a meeting that had more strength in engineering.

The Alliance for Engineering in Medicine and Biology was maturing and the BMES contributions to its ACEMB meetings were substantial. John Lyman was the general chair for the ACEMB meeting in 1977. Pat Horner, the current Executive Director for BMES, served as the executive director of AEMB for many years, and ran the ACEMB meetings, so we are very lucky to have such an experienced person as her currently guiding our society. Unfortunately, the AEMB didn't have many more years to run, and it came apart basically because each of the member societies was putting more effort into their own society meetings.

BMES membership was now growing. A student society was formed at UCLA under the sponsorship of Thelma Estrin. It was the first, and many followed.

The *Annals of Biomedical Engineering* was making headway. Don Marsh had become the editor in 1974, replacing Eugene Yates, and in 1977 Jim Meindl replaced John Lyman as the coeditor. Jim Meindl was an outstanding investigator and soon to become a member of the National Academy of Engineering. The number of submissions had risen from about 40 during the first year, with Yates and Lyman as editors, up to about 60 per year and seemed to flatten at about this level in the mid to late '70s. Academic Press indicated that it was not making any money off the journal and might have to give it up, unless there were increased submissions. The *BMES Bulletin* became operational this year (1977), with Dan Schneck at Virginia Polytechnic as the editor. This started as a newsletter

rather than a formal publication of the Society. A Publications Board was formed and added into the constitution. The minutes stated that the Publications Board was not a committee of BMES and the Chair of the Publications Board was a voting member of the Board of Directors, unlike the other committee chairs.

In 1997, Mrs. Harold Lamport offered the BMES \$100 per year to support an award in honor of her recently deceased husband, a physiologist working in bioengineering, microcirculation, and biophysics. We accepted this offer, and the following year the Lamport Young Investigator Award was established and made available to candidates under age 35 for excellence in their research. The Lamport family continued support of this award until the early '90s, and since then the Society has supported it.

In 1997, the National Academy of Engineering invited associations between that august body and various professional engineering societies. This stimulated thinking about our own situation with respect to our parent societies. That is to say, the ones from whom many of the BMES members had come. We worked out with Orr Reynolds, Executive Director of the American Physiological Society, a way to maintain a relationship between BMES and APS to plan for BMES contributions to the FASEB meeting each spring as a guest society of APS. We had one meeting at Johns Hopkins University preceding the spring FASEB meeting in Atlantic City, which worked out very well. The BMES actually joined with the American Physiological Society in the 1977 fall meeting to participate in their program. These liaisons with APS provided only partial coverage of our society's needs for expression of its science, so participation in the ACEMB was important. In 1978, Earl H. Wood was selected as the Alza distinguished lecturer. He spoke on quantitative vascular physiology, the instrumentation that led up to it, his contributions to studies of gravitational physiology in the practical situation of combat fighting planes, and development of the dynamic spatial reconstructor, giving three-dimensional images at 33 millisecond intervals (Wood, 1979). At that time, it was the duty of the Society president to pick the Alza lecturer. Earl Wood had been my thesis advisor and mentor during my years at Mayo Graduate School of Medicine, so it was a great pleasure for me to hear this beautiful lecture. Earl was later elected president of BMES, but it came at a bad time,

when he was finishing his stint as president of the American Physiological Society and had become President of FASEB. So after being elected, he was forced to relinquish the position.

The relationship between BMES and APS was good, but it was unbalanced, and the other senior member society members of FASEB seemed to look down upon BMES as not having sufficient strength to justify membership in FASEB. Discussions concerning becoming a FASEB member got nowhere, and repeated discussions in the '80s and '90s got nowhere. This was a recurring disappointment for me because I felt that BMES could make a great contribution to FASEB. BMES represented a body of thinking and a contribution to science that was represented nowhere else within FASEB. Engineering style thinking and analysis was, and is, really needed for the furtherance of scientific research in biology.

As Past President, I was appointed to serve as our representative to the US National Committee for the International Union of Physiological Sciences (USNC-IUPS), initially a three year appointment, but which was extended in three year increments into the 1990s. This appointment was a most interesting opportunity. I chaired the USNC's Travel Award Committee, and from 1983 to 1986, chaired the USNC itself, aiding in developing the IUPS programs. This led to the establishment of an IUPS Commission on Bioengineering in Physiology, which I chaired for two terms (the maximum allowed) from 1989 to 1997. This Commission developed bioengineering sessions at the International Congresses (held every four years). In 1997, after the IUPS Congress at St. Petersburg, the Commission, with support from NIH and IUPS, held the first IUPS Satellite Conference on the Physiome Project. Subsequently, the IUPS council formed a new commission, the Physiome Commission of IUPS, chaired by Peter Hunter of New Zealand. Since 1997, the Bioengineering Commission has been chaired by Aleksander S. Popel, who is also the leader (with Axel Pries in Berlin) of the Microcirculatory Physiome.

Reference:

Wood, EH. *Evolution of Instrumentation and Techniques for the Study of Cardiovascular Dynamics from the Thirties to 1980*. Alza Lecture, April 10, 1978. *Ann Biomed Eng* 6:250-309, 1978.

Richard J. Johns, MD

President 1978-79

Board of Directors: Max Anliker, Richard N. Bergman, Neil B. Ingels, Peter G. Katona, Judith M.S. Prewitt, Hun H. Sun, William S. Yamamoto, William B. Blesser, James D. Meindl, Gerald H. Pollack, Stuart J. Updike, David Geselowitz

Membership and publication issues were the prominent themes of Dr. Johns' presidency. John Lyman, Secretary-Treasurer and Chair of the Publications Board, announced that Academic Press would finish volume 6 of the *Annals* and then drop the contract. A new publisher would be needed. On a positive note, there were 388 member subscribers, 581 US subscribers including institutions, and 751 including foreign subscribers. Growth was small.

There was consensus on working with FASEB. That association continued to provide an easier base for meetings rather than a stand-alone. BMES also decided to increase its presence at the upcoming meeting of the Alliance for Engineering in Medicine and Biology (AEMB). An exhibit booth would be set up and manned by volunteers in order to promote the various activities of the Society.

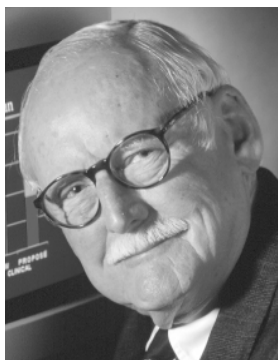
Dan Schneck, editor, reported on his continuing efforts to define and improve the new *Bulletin*. He had established three criteria for content: 1) address issues pertinent to the Society; 2) play "devil's advocate" to generate discussion; and 3) to provide timely information on events and issues.

The report of the Membership Committee, chaired by Abraham Noordergraaf, disclosed 21 new full members, 6 new associate members, 135 new student members, 4 new student chapters. The latter were at: Boston University, Rensselaer Polytechnic

Institute, Duke University, and University of Utah. A recommendation for refinement of membership grades was also included. The designations were: fellow, senior member, member, student member, and sustaining member. Don Gann noted that it was imperative that changes in membership reflect the growth of the Society in order to attract new membership. This would provide a stronger subscription base. After considerable discussion, the level of fellow was deleted from the proposal and the levels were approved for consideration.

The final levels offered to the membership eliminated the associate level. All associates were now Members with voting privileges. Full membership was upgraded to Senior Member.

By the following April, Peter Abbrecht, Managing Editor of the *Annals*, had undertaken negotiations with Pergamon Press to publish the journal. Expense monies from Pergamon would go to the Society rather than directly to the editorial offices for broader application. The merger of the *Annals* with the *Biomedical Engineering Journal* would increase the subscription rate and could increase Society membership. Pergamon had indicated it was ready to sign a contract. Discussion centered on the liability and revenue sharing of the Society. It was hoped to increase the publication rate of the *Annals* from four to six issues a years with an increase in pages.



Laurence R. Young, ScD

President 1979-80

Board of Directors: Max Anliker, Richard N. Bergman, William B. Blesser, Neil B. Ingels, James D. Meindl, Robert Plonsey, Gerald H. Pollack, Judith M.S. Prewitt, Allen K. Ream, John M. Reid, William S. Yamamoto, David B. Geselowitz, Peter G. Katona, Hun H. Sun

Dr. Young's year in office was marked by the continual struggle with budget, meetings, and membership. The proposed budget was predicated on an increase in dues for all members up to \$20. Subscription rate for the *Annals* was an additional \$15. Student rates would not be affected. The current practice was for the Society to subsidize member subscriptions to the *Annals* with an additional \$2.50 from the Society budget. Members paid \$10 and the publisher was paid \$12.50. In the proposed budget, the Society would collect \$15 from members for subscriptions and subsidize \$5 equaling \$20 to the publisher.

The new dues would place BMES in line with other societies. Additionally, the memorandum of agreement with the publisher insured that the cost of the *Annals* would remain at \$20 for the next 5 years.

Dr. Young's tenure continued a familiar theme: relations with FASEB. It was recommended that the Society continue to meet with FASEB. However, there was a perceived need to expand the scope of the meetings. In order to continue this relationship, Dr. Young also noted that the financial arrangements with FASEB had to be reordered. Negotiations were underway to increase the allotment by FASEB to BMES for meeting costs from \$500 to \$1,350. Part of the process might involve upgrading BMES membership to full status.

H.K. Chang reported on the current spring meeting and further emphasized the forces of growth. Of note, the Alza lecture was very crowded accompanied by a heavy submission of manuscripts. It was a challenge to fit in the appropriate papers due to time and size limitations.

These two discussions were related in a fundamental way. The Society was growing and attendance was increasing. The question of how best to manage meetings that worked within a larger host context kept appearing. Certainly the costs associated with meetings would persist. The demand for the *Annals* was also growing, a fact that meant it was becoming more difficult for the Society to underwrite subscription rates. Eventually, membership would have to bear more of that burden, especially if the Society was going to have to contribute more to the cost of conferences. The *Annals* Editor Peter Abbrecht reported the latest on finding a new publisher. The search had concluded with Pergamon Press. Part of the arrangement would have the *Annals* merge with the *Journal of Bioengineering*. The *Annals* would be the official journal of the Society, but for two years there would be a sub-heading for the other journal. Pergamon Press could begin publishing within three months. Key profit sharing and other points were worked out in the agreement. For example, there would be six issues per year with larger page sizes.

The new president elect was John Lyman. Two issues immediately arose with his election. First, he resigned as Secretary-Treasurer. Second, a replacement was necessary. The Board appointed Fred Weibell who was associated with the Veterans Administration Sepulveda in Los Angeles. The Society office would remain in Los Angeles as well where Kay Lyou would be retained as Executive Assistant.

By the following April, the financial status of the Society had improved. Fred Weibell reported that the Society had increased its net worth in large part due to



the additional monies generated by the arrangement with Pergamon Press and the new dues structure.

The Membership Committee brought up several important points. John Lyman noted that the increase in student membership had a two-edged effect on the Society. There were 12 student chapters. Clearly, biomedical engineering was growing and attracting bright students. However, the growth in student membership was costly to the Society. One key was how many of these students moved to regular membership. Student dues were in fact subsidized by the regular membership. Thus, new members were needed to help offset these costs. Sensitive to the changes occurring, Neil Ingels stated that he was concerned about the future identity of the Society. He suggested that the Society undertake a long range planning effort to

determine the direction of change and propose how to meet the new needs. An ad hoc committee was formed. Volunteers included James Bassingthwaite, Allen Ream, Robert Plonsey, John Lyman, and President Young.

Peter Abbrecht reported on the status of the *Annals*. Manuscripts were accepted at the old rate of about 50%. Concern was expressed over the review times for manuscripts and how this process might be speeded up.

Dan Schneck reported on his editorial attempts to make the *Bulletin* reflect more of the changes and accomplishments of the membership. He sought out more information on what was going on but quite often had difficulty in finding information. He invited President Young to contribute a column and Dr. Young agreed.

John Lyman, PhD, 1922-2001

President 1980-81

Board of Directors: Peter G. Katona, Neil B. Ingels, William S. Yamamoto, Frederick P. Ferguson, Daniel J. Schneck, Max Anliker, Judith M.S. Prewitt, David B. Geselowitz, Allen K. Ream, John M. Reid, Joseph D. Andrade, Lee E. Ostrander, Kichi Sagawa

My notable contributions to the Society include: F. Eugene Yates and I founded the *Annals of Biomedical Engineering* prior to my becoming President; James Reswick asked me to become the Secretary-Treasurer for the Society and I performed that service for 5 years until my resignation in order to run for BMES President; I recommended Dr. Fred Weibell as Secretary-Treasurer, a position he holds to this day.

The biggest issue of my time as President was to find the right balance between the engineering and biological communities. We stumbled and groped, and made progress only slowly. It is with great satisfaction that I see today the tremendous synergisms among engineering, biology, and medicine. From imaging to materials to DNA chips and the handling of massive genetic data bases, the interaction has become essential, and almost seamless. Biomedical engineering has come of age.

Editor's Note:

John Lyman gave a career's equivalent of effort to BMES. He held important posts and helped to found and direct the Society headquarters. His efforts as co-editor of the *Annals* and Secretary-Treasurer provided important leadership in the early years of the Society. His reward, in part, was his election to president. It was during his tenure that Kay Lyou announced her resignation. Her replacement would be Rita Schaffer.

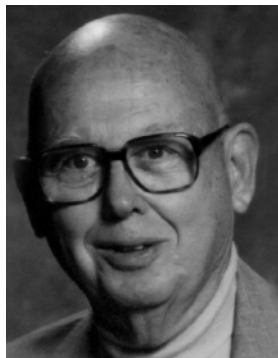
The Society continued to grow and function as a clearinghouse for biomedical research and education. Membership reached 712 members. The Society also regularly sent out over 100 education and career opportunity brochures a month to students.

Peter Katona, chair of the Constitution and Bylaws Committee, made several proposals to revise the constitution. Their revisions, based on extensive research and reflection, helped to "tidy" up the constitution for clarity in execution.

The Board of Directors addressed itself to the issues of the image of the Society, future plans for meetings, and the members' wide range of interests. The Board contemplated the formalizing of the long range planning committee from ad hoc status.

President Lyman reported on the current status of the *Annals*. Issues 4-6 for Volume 8 (1980) will be a single issue. They reflected a Case Western Reserve University workshop on Implantable Transducers and Systems: Closed-Loop Physiological Control. Editor Peter Abbrecht reported that manuscripts for the first three issues of 1981 were being processed but additional manuscripts were needed.

The Society was working with the American Physiological Society to obtain sponsorship into FASEB as a full member. President Lyman indicated that BMES hoped to obtain the necessary second sponsor from the American Pharmacology Society.



Robert Plonsey, PhD

President 1981-82

Board of Directors: Frederick P. Ferguson, Kiichi Sagawa, Daniel J. Schneck, J. Lawrence Katz, Allen K. Ream, Joseph D. Andrade, Lee E. Ostrander, Philip A. Drinker, Robert W. Mann, Richard Skalak, Hans U. Wessel

At that time the BMES annual meeting took place in Atlanta, Georgia; BMES was a participant in FASEB to which we were a perennial invited guest (at the invitation of the American Physiological Society through the good offices of James Bassingthwaite and F. Eugene Yates).

While growth in Biomedical Engineering continued to accelerate there were no qualitative changes in this period. The special recognized attributes of BMES were its strength in engineering and the life sciences, a large fraction of its membership holding doctorates, and its meeting closely associated with that involving the basic life sciences (i.e., FASEB, the Federation of American Societies for Experimental Biology). At the same time it was also recognized that this inhibited an increase in membership by working engineers and ways to remedy this were repeatedly discussed.

Kay Lyou, Executive Assistant 1974-1981, was exchanging hats with Rita Schaffer, who then served nearly 20 years until her untimely death. The Board of Directors in my presidency, along with the past and newly elected presidents was, interestingly, somewhat of a Who's Who in Biomedical Engineering. Many went on to additional recognition for their leadership in Biomedical Engineering.

BMES attendance at the annual meeting could be judged from the 50-60 attending the President's Symposium and the 100 present at the Alza Distinguished Lecture. Other technical sessions had smaller numbers present (around 30). As is usual in other professional societies, service to the general membership is mainly provided by its publications, for BMES this meant the *Annals of Biomedical*

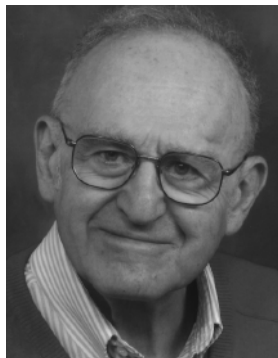
Engineering. Published four times a year, the *Annals* was having difficulty attracting an adequate flow of papers and a discussion at the Board centered on possible remedies (special issues, a conference issue, reduction of review time, etc.). The editor, Peter Abbrecht, and the chair of the publications board, F. Eugene Yates, suggested that three copies of manuscripts be submitted so that parallel review could be achieved to reduce review time. Dr. Abbrecht described a need to make efforts to increase papers in the areas of Biomechanics, Biomaterials, and Rehabilitation for which only a limited number of submissions were being received.

In contrast, the *BMES Bulletin* was doing well under editor Daniel Schneck. The *Bulletin* was published quarterly. In view of the increasing amount of material he was receiving Dr. Schneck was considering the possibility of a bi-monthly or even monthly publication. The cost of preparing each issue was reported as \$100 per issue!

Editors Note:

An important transition in service highlighted this era. Kay Lyou was stepping down as Executive Assistant, a position she had held since 1974. Her replacement, Rita Schaffer would serve the Society for the next 2 decades.

Fred Weibell reported that the Society's income had increased another 10% from the previous year. The subscription rate for the *Annals* would increase 33% but the contract with Pergamon Press guaranteed no change for another three years. The next concern was how to deal with the increase relative to dues. Weibell suggested three choices: 1) increase dues 5%;



2) increase something other than 5%; or 3) absorb the increase. The last alternative was accepted by the President and the Board.

Concern was expressed over the flow of manuscripts to the *Annals*. Y.C. Fung believed that the journal was not that healthy. He felt that there was a need for BMES symposia to be published in the journal which would “thicken” it up.

The Society had applied to FASEB for full membership and the application was under consideration. American Physiological Society members felt that BMES stood a good chance of entrance. However, Gene Yates noted that FASEB had not added any other societies in 85 years. Discussion centered on BMES meeting separately from FASEB at Tulane in 1982. Concern was expressed about the potential lack of income if full membership was achieved. A final decision would be made after FASEB’s deliberation.

At the next year’s board meeting, President Plonsey introduced an international note by announcing that he had visited the People’s Republic of China. He requested that complimentary copies of the *Annals* be sent to no less than three Chinese biomedical engineering societies: Shanghai Biomedical Engineering Society, Chinese Institute of Electronics, and Chinese Biomedical Engineering Society, further evidence of the growth of the discipline. Dr. Plonsey also named Judith Prewitt as BMES representative to the IEEE Computer Society’s First International Symposium on Medical Imaging and Image Interpretation to be held

in Berlin, October 26-29, 1982. BMES was a sponsoring society for that meeting further attesting to the status of the Society.

Janice Maran, chair of the Finance Committee, reported that an effort had begun to increase the number of sustaining members. It was directed towards corporations and two had responded favorably. The effort would continue in order to raise dues monies.

A significant order of business was reported by Earl Wood. He stated that FASEB had finalized the requirements for membership. FASEB asked that their constituent societies use FASEB headquarters facilities. Dr. Wood recommended that BMES join. For this proposal to become effective a two-thirds majority of the Board must approve at the next business meeting and the membership must ratify by two-thirds by a mail vote.

Discussion also centered on the rate of manuscripts submitted for the *Annals*. Dr. Yates reported that on average the journal receives about four manuscripts each month with 40-50% rejection. Therefore, at least 20 a month were needed. He believed that part of the difficulty was that the *Annals* was not a specialty journal; it existed in an umbrella manner—nobody’s first choice as an outlet. Dr. Yates went on to suggest how to deal with this situation. The journal needs to be more attuned to new trends and developments in the field. He stated that some journals attach commentaries to key articles. The suggestions were taken under consideration.

Yuan-Cheng B. Fung, PhD

President 1982-83

Board of Directors: Lee E. Ostrander, Kiichi Sagawa, Daniel J. Schneck, Hans U. Wessel, Philip A. Drinker, J. Lawrence Katz, Robert W. Mann, Richard Skalak, David Garfinkel, Leslie A. Geddes, Carl F. Rothe, Merrill P. Spencer

The year in which I served as the president was the year in which Barney Clark volunteered himself to test a man-made artificial heart for the first time. Mr. Clark was in the headlines. His day-to-day progress was on everybody's mind. People's hopes rose and fell with his appearance and words. His final loss of life affected everybody in the country; many questioned the value of bioengineering. Later in the year, Dr. Hagiwara successfully patented his mother's cancer cell with the monoclonal cell line of the University of California at San Diego for commercial purposes. This was another event that helped make bioengineering a household word.

These headlines, of course, touched bioengineers' conscience. There were more talks about ethics, responsibility, and preparedness, thoroughness of research and action, and competitiveness for success, fame, and money. An unspoken push for quality of research was understandable. The BMES membership was made more aware of our social responsibility.

Our Society fared well in 1982-83. The membership stood at 853. The *Annals of Biomedical Engineering* had caught up with its schedule of publication. Pergamon Press, the publisher of the *Annals*, announced at our Business Meeting that it regarded the *Annals* as its prime publication. Editor Peter Abbrecht assured us that after a few thin issues last year, the journal returned to its normal size. Furthermore, the publication of papers presented at the symposia assured the health and vigor of our Journal.

Our 1982 Annual Meeting was successfully held in New Orleans. Sessions on Biomaterials and Biomechanics, Biochemical Transducers, Bioelectric

Phenomena, Cardio-Respiratory Control, and Quantitative Electrophysiology, as well as the Alza Lecture, were well attended. The Wine and Cheese Party held on Wednesday, April 21, on the campus of Tulane University was a delightful and memorable event.

The 1983 Annual Meeting held in Chicago on April 11-15 was equally successful. We participated as a guest society of APS (American Physiological Society), which is a member of FASEB (Federation of American Societies of Experimental Biology). Our 62 papers presented at the nine symposia and another 62 papers presented at two poster sessions were all of high quality. The symposia sessions were well attended, many over 80 people. Good discussions followed every presentation.

But there was also an unfortunate aspect of the meeting beyond my control for which I apologized to the membership. First, before 1983, we played no role in the programming of the sessions. Programming was entirely in the hands of APS and FASEB which, in 1983, put all BMES contributed papers in poster sessions. Secondly, the poster sessions were presented at McCormick Place, away from the Hilton Hotel where slide sessions were held. As a result, attending both the slide and poster sessions was difficult. Thirdly, the BMES office was tucked away on a different floor away from the meeting rooms, and thus lost much of its effectiveness as a place for social gathering of our members. Rita Schaffer, our Executive Assistant, and I kept the BMES office open all through the meeting, with hot coffee all day. But the location was wrong! To avoid such an occurrence happening again, I contacted APS to put my successor, Dr. Katz, on its Program



Committee. We also resolved to elect our own Meetings Committee Chair early enough so each of them will serve two or three years on the Committee to gain experience and wisdom. This event reinforced my personal opinion that BMES should hold its annual meeting alone in the fall. We discussed this at the 1983 Business Meeting and again at the Board of Directors' Meeting. Meeting with FASEB had the advantage of economy of financing and minimizing travel for many members, but it did not have the advantage of intimate fellowship, which could be obtained in small meetings of our own. As an alternative, additional fall meetings with IEEE and AEMB or other Societies was discussed. Several years later, our society did choose to hold our own meeting in the fall alone. Our meetings began to flourish after that.

A major difficulty arose in the spring of 1982 when the president-elect for 1983-84, Dr. Earl Howard Wood, resigned. Dr. Wood is a famous physiologist at Mayo Clinic and the University of Minnesota (b. 1/1/12, DSc 1941, MD, 1942, U. Minn.) whose research on pulmonary physiology included the building of an acceleration laboratory. He used embedded metallic markers and x-ray photography to measure the strain distribution in the lung. I had long admired him and had looked forward to working with him. His close ties to APS and FASEB would be extremely valuable if BMES decided to join FASEB formally as a member. He resigned because of two unforeseen developments: one, he won a prize from Germany which entailed his spending a major portion of 1983 in Europe; two, a change of status at Mayo Clinic because of his mandatory retirement at his 70th birthday. With regret, the Board of Directors accepted his resignation and elected Dr. Larry Katz the president-elect for 1982-83.

Mandatory retirement was outlawed by the U.S. Congress as age discrimination in the late 1960s, but university professors were made an exception by the Pepper Amendment until 1990 when the Amendment expired.

My philosophy of a professional society organization is to encourage discussions and participation by the general membership. It is true that the Society's affairs are decided by the officers and directors, but the general membership should have as many chances to express an opinion as possible. At the annual general membership meeting of the various Societies participating in the FASEB, in general, all the time was used up by the officers reporting their decisions and actions. I insisted that BMES should be different. We structured each officer's report in such a way that if it involved a meaningful choice of pros and cons, a show of hands by the audience was sought. This is not a call for voting, but is a response of those who came to the

meeting. It is a valuable feedback and it allows a general feeling of participation. This approach carried over in my contact with members.

Other reflections involve memorable individuals. At this time, once a year, BMES selected an outstanding person to deliver the Alza Distinguished Lecture at its Annual Meeting. This lectureship was endowed by Alza Corp. in Palo Alto, California. The 1983 Lecture was delivered by Richard Skalak of Columbia University. Dr. Skalak spoke about "Biomechanics at the Cellular Level." He reviewed his recent work on red blood cells and white blood cells, and related work on sea urchin eggs, cell division, and cellular behavior during growth. Dick, our 20th president, was a man who was always looking to benefit BMES by cooperating with other societies in the U.S. and the world. Dick got us connected with the U.S. National Committee for Biomechanics and other International Organizations. Dick died in 1998. We miss him still.

Working with wonderful people gives me a warm feeling. In my year, I worked with Past President Robert Plonsey, President elect Lawrence Katz, Secretary-Treasurer Fred J. Weibell, Publications Chair Terry Hambrecht, and Directors Lee Ostrander, Kiichi Sagawa, Daniel Schneck, Hans Wessel, Phillip Drinker, Thomas Coleman, Robert Mann, Richard Skalak, David Garfinkel, Leslie Geddes, Carl Rothe, and Merrill Spencer. These guys are wonderful. Thinking back, the way Otto Schmitt, Bob Rushmer, Fred Grodins, Jim Reswick, Ernst Attinger and John Lyman spoke and move are still right in front of my eyes. I still have a pen sketch of John Lyman talking that I sketched in meeting rooms as a silent diversion.

Editor's Notes:

Traditional themes continued through Dr. Fung's presidency. Dr. Fung, chair of the Long Range Planning Committee for 1981-82, submitted five recommendations to enhance the annual meetings. One, the Society should encourage BMES members to submit papers to the *Annals*. Two, members should also be encouraged to promote symposia for the next meeting. Three, sessions should be longer (15-20 minutes). Four, have coffee breaks in between sessions, and five, have coffee available at BMES headquarters to encourage social interaction. By improving the meeting atmosphere, members would hopefully continue in the Society. This proved a segue to the perennial topic of increasing membership. Dr. Schneck agreed to publish membership applications in the *Bulletin*. Dr. Plonsey proposed that the Society office mail out a poster with return postcards inviting students to apply to BMES. The mail out would be to approximately 60 biomedical

engineering departments in the US. This is an important testimony to the growth of the discipline. Even more impressive, Al Potvin had compiled a list of 106 departments.

Jim Bassingthwaight continued to maintain a strong BMES involvement in international symposia. In this regard he proposed that BMES take a strong role in the 1986 XXX Congress of Physiological Sciences. BMES could develop sets of thematic symposia including chairpersons, topics, and speakers. The Board approved a special committee to formulate topics and personnel.

The link to FASEB continued down an additional path. Lloyd Partridge, a member of the FASEB

Program Committee, proposed that BMES contribute to the 1984 FASEB meeting tutorial program whereby technical sessions are offered. These sessions offer introductory level tutorials on pertinent subjects. BMES has special skills and knowledge to offer. Such participation would serve to advertise the Society. Jim Bassingthwaight, a member of the APS Education Committee, felt such a move would be relevant at the upcoming APS meeting.

Lastly, Dr. Bassingthwaight recommended that the Society fund a student award in addition to the Lamport Award for a young investigator. The Awards Committee was charged with working with the Finance Committee to find possible funding.

J. Lawrence Katz, PhD

President 1983-1984

Board of Directors: Ernest G. Cravalho, Thomas K. Goldstick, Thomas R. Harris, Louis C. Sheppard, Thomas G. Coleman, Carl F. Rothe, Leslie A. Geddes, David Garfinkel, Richard Skalak

During the years that included my presidency, the Annual Meeting was held along with the FASEB Annual Meeting. This presented some restrictions to our programming efforts as we were generally limited in the number of oral sessions that we were permitted to have. From 1981-1985, I was chair of the Science Advisory Board of the Explorers Club. So when I was president elect of our Society in 1982-1983, I began to plan on developing a symposium on Biomedical Engineering involved in exploration. My proposal for such a symposium jointly sponsored by the BMES and Explorers Club was approved and held in Chicago. Four areas were covered: cardiopulmonary measurements during a climb of Mount Everest; measurements of bone density in astronauts and mission specialists in space; pulmonary concerns in deep sea diving; and biomedical measurements in Arctic and Antarctic traverses. The Symposium attracted a large number of attendees, considerably more than the number of BMES members attending the meeting.

As president of the Society, I also had the privilege of selecting the Alza Lecturer for that year. Larry Young of MIT gave a superb presentation on his research conducted under NASA sponsorship. His talk and the above Symposium were two of the highlights of the BMES presence at that FASEB Annual Conference.

Our Executive Committee initiated discussions on two aspects of our connection with FASEB. Should we become a full participating member which involved a considerable yearly fee? Or should we sponsor our own meetings separate from the Annual FASEB Conferences in order to attract more of the BMES members from a wider variety of areas than were

attracted to the FASEB conferences? We decided to forgo full membership in FASEB, but continue to participate in some future meetings. With respect to the latter idea we set into motion the planning for future stand-alone meetings which clearly, eventually came to fruition and is the standard now for our society.

Regarding changes in the discipline during the year of my Presidency, there was a steady increase in the number of University programs. In addition to the regular on-going annual conferences held by existing societies, e.g., IEEE-EMBS or ASAIO, etc., several of the sub-fields within the discipline began to establish tri- or quadri-annual World Congresses or Regional Conferences. An example of the latter was the First China-U.S.A.-Japan Biomechanics Conference in Wuham, PRC in 1983. It has continued, having its fifth Conference following the Third World Biomechanics Conference in 1999.

The 1980s were a transitional decade which saw the beginning of BME Departments being established and accredited by the ECPD, the precursor of ABET. The 1990s witnessed phenomenal expansion in BME Departments and programs both in numbers as well as in faculty size. This was primarily due to the profound effect of the Whitaker Foundation and the increased support by Federal Agencies as exemplified by the NIH Engineering Partnerships Research Program.

I was fortunate to be involved in both BME research and teaching, and in the BMES from their early days, in the sixties as a member of the NIH Study Committee for BME Research Training Programs, in the seventies and eighties, as the Founding Chair of the RPI Departmental Center for BME, and through to the



present days continuing with my research in bone biomechanics and biomaterials. There is a great deal to be thankful for about longevity; it certainly has been the case in allowing me these many years of excitement and fulfillment through my activities in BME.

Editor's Note:

The Society was experiencing both growth and increased costs in the 1980s. Fred Weibell predicted a deficit between 25 and 30% (over \$13,000). The Society increased dues over a two year period from \$20 to \$35. Student rates were increased from \$7.50 to \$10. By the next year Dr. Weibell reported that the Society was on a sound financial footing.

BMES continued to work out meeting requirements while working within the FASEB structure. Negotiations continued with APS and FASEB on numbers of meeting rooms and number of symposia. This restricted environment led directly to another concern raised by Tom Harris. He stated that BMES was still not attracting the community's best work. Better communications with other related societies was seen as one solution. This also included coordination with international meetings.

Membership requirements were further refined. The Society had been formed long enough to include

Senior members (those who had been members for at least 6 years). Members, student members, and sustaining members comprised the remaining divisions. The last category allowed for members who supported the purposes of the Society, e.g., corporations. However, members at the senior and regular member level were declining. Efforts to improve the *Annals* and other services were recommended to attract new members as opposed to a membership drive.

A singularly important action during Dr. Katz's tenure was to find a new editor for the *Annals*. Peter Abbrecht had resigned from the editorship and the Publications Board nominated Hun Sun to replace him. Dr. Sun was confirmed as editor for three years.

In a related action, the Constitution and Bylaws Committee recommended further clarification of the BMES Constitution regarding selection of editors. Publications Boards found editors but it was not stated that Boards of Directors had to approve. The Society refined and more closely ordered its procedures.

The Education and Public Affairs Committee recommended that BMES investigate working with the Accreditation Board for Engineering and Technology (ABET) which began accrediting undergraduate BME programs. This relationship was pursued with Board approval.

Thomas R. Harris, MD, PhD

President - 1985-1986

Board of Directors: Ernest G. Cravalho, Thomas K. Goldstick, Louis C. Sheppard, Savio L.Y. Woo, Neil S. Cherniack, Joseph F. Gross, Lee L. Huntsman, Gerald M. Saidel, H.K. Chang, John W. Clark, Morton H. Friedman, William Van Buskirk

While my career in biomedical engineering dates from my dissertation project in the field in 1964 at Tulane University, my more active involvement in the Biomedical Engineering Society began in the early 1970s. While I had and have membership in several larger physiological and engineering societies, I decided at that time that the single society of greatest importance to me and my own vision of the future of biomedical engineering was the Biomedical Engineering Society (BMES). Thus, I made a mental commitment to become engaged in the BMES and to help to build biomedical engineering through its activities. Nothing since that time has altered my view of the importance and mission of the BMES. In fact, I greatly underestimated the personal satisfaction that has come from such affiliation with like-minded colleagues. This discussion presents some observations about two periods—my time as president of BMES, and my tenure as chair of the Publications Board. I include the latter because I served in that capacity at a very interesting juncture in the development of the society and its publications.

Biomedical Engineering and the Society in the mid-1980s

Biomedical engineering was approaching a time of transition in this period. Accomplishments prior to this time had been closely linked to the degree to which biomedical engineers connected their work to traditional engineering, medical, or life science departments, laboratories, and societies. Respect for biomedical engineering as a distinct activity was just beginning to occur. Most workers in the field

felt the need for the imprimatur of an established organization to achieve credibility. This period also created an important aspect of the culture of biomedical engineering—such work had to meet the requirements and achieve the rigor of good medical and biological science as well as good engineering. So, while the identity of biomedical engineers was less distinct than we enjoy today, the field was developing strong foundations.

In the mid 1980s, the main activity of BMES was participation in the annual Federation of American Societies for Experimental Biology (FASEB) meeting each spring. BMES programmed poster and slide sessions for this conference, conducted the meetings of the board, and held the annual business meeting usually accompanied by a dinner and the Alza Award lecture. We participated in FASEB as a “guest society” and received valuable assistance for presenting a program that would have been financially difficult otherwise. In addition, our representative, usually the president, participated in the planning and program discussions in FASEB. This created a great deal of corporate experience in the complexities of meeting organization and management that was transferred to the BMES.

A second area of strength at that time was the collegial atmosphere of the Board of Directors. The Board was a useful forum to discuss the future of biomedical engineering and the Society and to address the many problems in membership and impact that we faced. The BMES Board of that era contained people who would later become university presidents, a provost, deans, and departmental chairs.



We approached our work with several goals in mind:

1. To improve the quantity and quality of participation in the FASEB scientific meeting by BMES members.
2. To maintain our connection with the life sciences through participation on the FASEB organizing committees.
3. To expand the use of the *Annals of Biomedical Engineering* by the scientific community.
4. To expand the professional membership of the society.

Jim Bassingthwaighe of the University of Washington was recognized as the Alza Lecturer during my presidency of the BMES. It was the first of a number of awards that have recognized Dr. Bassingthwaighe's contribution to biomedical engineering and related areas. To some extent, this era was one of slow but steady growth in membership and scope for the society.

Chair of Publications Board, 1992-1994

It was my responsibility to serve as Publications Board Chair from 1992-94. This turned out to be a much more interesting (and challenging) time than I had expected. Hun Sun of Drexel University had served for some years as editor-in-chief of the *Annals of Biomedical Engineering*. He had overseen a growth in paper publication rate and had maintained the journal with a very small amount of financial aid provided by the contract with the publisher at the time, Pergamon Press. Dr. Sun's term as editor was completed at about this time. In addition, the contract with Pergamon was due for renegotiation. It was the feeling of the Publications Board (Irving Miller, Bob Mates, and me) that the *Annals* needed a greater financial return to the editorial office and the Society than had previously been allowed by the contract. We proposed that bids for publishing the *Annals* be solicited from Pergamon and other publishers.

A strategic plan for the further development of the *Annals* was devised which contained proposals to increase the number and quality of papers, increase the number of total pages and subscriptions, as well as increase the scope of the *Annals*. We sought to extend the appeal of the journal to a larger segment of biomedical engineering than had been our habit in the past. It was also planned by the Publications Board and approved by the BMES Board that a national search be conducted for a new Editor-in-Chief.

This all seemed quite straightforward at the time. However, it turned out that Pergamon management took the view that we had to renew the contract with them, that they owned the name of the journal and that BMES did not have the right to seek another publisher.

They intended to exercise that right through refusing to provide us with the subscription list and implied that legal redress might be necessary. This necessitated legal counsel that was immediately provided through the late Rita Schaeffer's office. We then began a long series of discussions among the Publications Board, Rita, our lawyer, and the Pergamon management of the time.

In the hope that this problem would evaporate somehow, we sought bids from several publishers including Pergamon. A few publishers presented more attractive contracts than the existing Pergamon arrangement. Another publisher emerged as our first choice because of a substantial increase in the support of the editorial office and funding to the Society. As this situation came to a crisis point, a very fortunate thing occurred. Pergamon disappeared as a corporate entity and its property was acquired by Elsevier. Upon review, Elsevier recognized our right to change publishers, which we did immediately. Blackwell became the new publisher of the *Annals*. This change enabled the *Annals* to begin a new economic life. Then, James Bassingthwaighe became the editor-in-chief. Jim began an aggressive campaign to improve and extend the *Annals*, which continues to this day.

I regard the reorganization and growth of the *Annals* to be of great importance to the society and I am pleased to have played a small role in it (Dr. Bassingthwaighe deserves the major credit). By building on the excellent work of Dr. Sun and other editors and Publications Board Chairs, we were able to move the *Annals* to a new organizational expression, which has proved to be effective.

Editor's Note:

Dr. Harris and the Board also worked to recognize student achievement. Monies were allocated to the Student Affairs Committee to establish outstanding student awards for the 30 BMES chapters.

During President Harris' tenure, the Long Range Planning Committee, with Jim Bassingthwaighe as advisor, formulated recommendations and suggestions for executive members of the new National Academy of Sciences subcommittee on bioengineering. Kiichi Sagawa, president elect, resigned from his post to take a sabbatical in the Netherlands. After discussion, Peter Katona moved to have the runner-up, Richard Skalak, be appointed as president subject to approval by the membership.

Further evidence of the growth of the discipline was seen with BMES joining JETS. This organization encourages high school students to pursue careers in science and engineering. BMES was invited to become an organizational affiliate for \$200. The Board unanimously approved the venture.

The Board approved the designation of the ACEMB as the Fall Meeting of BMES. The Annual Meeting continued to be the spring meeting of FASEB. The former was based on the strong presence of BMES membership. The importance of the meeting was justifiable even though there were no support monies from ACEMB.

Peter G. Katona, ScD

President 1984-85

Board of Directors: David Garfinkel, Leslie A. Geddes, Carl F. Rothe, Merrill P. Spencer, Ernest G. Cravalho, Thomas K. Goldstick, Louis C. Sheppard, Savio L.Y. Woo, Neil S. Cherniack, Joseph F. Gross, Lee L. Huntsman, Gerald M. Saidel

The decade of the 1980s was a period of transition for the Biomedical Engineering Society (BMES). The initial enthusiasm for establishing a society dedicated to biomedical engineering had subsided; and the biology and chemistry-based upsurge of the field of the 1990s had not yet started. The term “tissue engineering” was not yet invented. Thus, the minutes of the Board meetings indicate a period of consolidation and incremental enhancements.

In 1984-85, Hun Sun, the newly appointed editor of the *Annals of Biomedical Engineering*, started to restore a regular publication schedule for our journal. An updated brochure describing biomedical engineering was published, and a process for providing continuity of experience to the organizers of the Society’s annual meetings was established. Considerable attention was devoted to defining membership categories, resulting in the creation of associate membership.

Performing the relatively routine tasks of running the Society was easy with the help and cooperation of Rita Schaffer. I feel profound sorrow that she is not with us to reminisce.

I recall two exciting opportunities for leadership. I am proud of exercising one and regret missing the other.

I always felt, and still feel, that our organization cannot become the leading professional society for biomedical engineering unless it becomes responsible for the accreditation of undergraduate BME programs under the Accreditation Board for Engineering and Technology (ABET). In 1985, I contacted the Executive Director of ABET to explore the participation of BMES in the accreditation process. As a result of our conversation, the Board voted to have the

Society become affiliated with ABET. I am delighted that this crucial issue is again on the agenda for the Society and that an affiliation has become more realistic than it was 15 years ago.

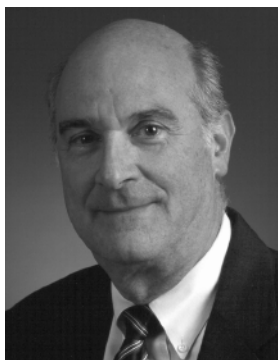
The missed opportunity arose from discussions to move the Society’s annual meetings from FASEB. It was becoming clear that having the BMES meet regularly only with experimental biologists would not serve the field of biomedical engineering well. Thus, the members of the Society were polled to determine whether they wished to meet in 1986 with FASEB, the (then existing) ACEMB, or separately from other societies. The majority of responders indicated that they would attend the FASEB conference anyway. So, the Board voted to meet with that organization in 1986.

In retrospect, this was a missed opportunity since it took another five years before the Society decided, at the urging of Dan Schneck, to hold its own annual conference. I believe that this was the most daring and important decision in the history of the BMES, a decision that has been proven correct by the recent series of exciting, high-quality conferences. I wish I could have had Dan’s courage.

It is humbling for me to compare our struggles in the 1980s with the Society’s current vitality and promise. I feel privileged to have been part of the struggle and to see eventual success. Many thanks to the visionary leaders and dedicated members who made this success possible.

Editor’s Note:

The Society dealt with a wide range of problems and issues as evidenced by Dr. Katona’s comments. Two



others stand out. A subtle, but important step for the Society was to develop a code of ethics and standards. Acting on a suggestion by Leslie Geddes, the Board charged the Education and Public Affairs Committee with developing the document. Second, the Board had a lengthy discussion on getting more Society members to present papers, which meant expanding the BMES meetings. This fact coupled with the growth of the Society meant that considerable pressure to create a stand-alone meeting would emerge.

Within the publishing realm, Dan Schneck resigned as editor of *BMES Bulletin* after nine years. The Publications Board selected Steven Lewis as his replacement for a three year term. Hun Sun reported that the *Annals* was finally coming back on schedule. The approximately 60 week delay in publication would be corrected by August 1985. However, the number of manuscript submissions continued to be low.

The Publications Board, chaired by Lloyd Partridge, undertook to more carefully define the governance of the committee. The Board cycle was five

years yet members were appointed for three years. To more fully utilize their experience, he proposed that members be permitted additional terms. The chair term should also be extended. A revision of the Bylaws would be necessary. The Publications Board would also present a written report on the technical merit of the Society's publications. The report was to be delivered at the annual meeting one year preceding the end of each editor's term. An additional written report on the status of contracts and performance of the publisher was included. It too would be presented at the annual meeting one year preceding the end of the current contract.

The Board of Directors agreed to ask the Constitution and Bylaws Committee to revise the appropriate sections in order to provide "continuity and quality control" for BMES publications.

Another feature of growth was manifested in the permanent creation of a Student Affairs Committee. Originally an ad hoc committee, it was apparent that the Society had a permanent stake in the training of the new practitioners. A permanent committee would monitor the growing number of student chapters.

Richard Skalak, PhD, 1923-1997

President 1986-87

Board of Directors: Neil S. Cherniack, Lee L. Huntsman, Geert W. Schmid-Schoenbein, H.K. Chang, Morton H. Friedman, Jonathan C. Newell, Lloyd D. Partridge, Joseph F. Gross, John W. Clark, William Van Buskirk, Joseph J. DiStefano, Leon E. Farhi

In the early 1980s, the discipline of biomedical engineering was growing rapidly, and many specialty societies were involved with serving constituencies in each specialty area. Richard (Dick) Skalak first served BMES as a Director in 1981-84, and later as a member of the Publications Board during the presidential term of Peter Katona in 1984-85. As one example of the tentative steps toward solidifying the discipline, BMES was considering the negotiation of a block subscription of the *Annals of Biomedical Engineering* with the Biotelemetry Society, and Dick Skalak mediated those discussions for the Publications Board. That particular alliance did not come to fruition, but BMES continued to become the only society wholly dedicated to the discipline of bioengineering and biomedical engineering.

At that time, another priority of BMES was to become more involved as a participating member of ABET, so as to better serve the needs of developing undergraduate programs in biomedical engineering. Peter Katona contacted the Executive Director of ABET and suggested that BMES become a participant in accreditation activities of ABET. This set in motion a process that culminated in a BMES application to become a Participating Body of ABET, authored by Gerald Saidel, then chair of the Long Range Planning Committee, two years later during the presidential term of Dick Skalak in 1986-87. Today, in 2001, 17 years after the initial suggestion by Peter Katona, BMES is indeed committed to involve its members in leadership roles in the ABET accreditation process, thus playing a primary role in defining the discipline.

Dick Skalak served as president of BMES in 1986-87. At the first board meeting of the year in 1986, a major philosophical change regarding organization of annual BMES-sponsored meetings was put in place. It had been noticed that meeting topics and attendance varied quite dramatically from year to year, so a specific change to the Program Committee structure was made, in order to provide a degree of continuity. In the new structure, there were six program committee members, including three members with staggered three-year terms, the president elect, the chair of the affiliations committee, and the editor of the *Annals*. The three at-large members were to be selected to provide input on meeting coverage of three broad areas: mechanics/materials, bioelectricity/ instrumentation/ computing, and transport/systems/ computing. This provision for continuity of BMES meetings (still held at that time in conjunction with other host societies) set the stage for BMES to solidify its own identity by creating its own annual meeting. The next year's long-range planning report, authored by president elect Mort Friedman, was essentially a strategic plan that included the recommendation that BMES should "have a meeting of its own" to establish a leadership role in the discipline of biomedical engineering.

Another theme of that year was the increasing international role of BMES members. At the first Board meeting, there was a call for participation of BMES members in organizing the First World Congress on Biomechanics, to be held in 1990. Y.C. Fung made the request on behalf of the U.S. National Committee on Biomechanics, which Dick Skalak



chaired. In one of his president's messages written for the *BMES Bulletin*, Dick also promoted the development of new international links, listing 30 countries that were actively involved with biomedical engineering activities.

At the second Board meeting of Dick Skalak's presidency, in March 1987, it was announced that BMES had formally applied to become a Participating Body of ABET. The application was prepared and submitted by Gerald Saidel as chair of the Long Range Planning Committee. This was a watershed event for BMES, and had been put in motion, as noted above, by Peter Katona about two years earlier.

The scope of scientific achievements in the new discipline of biomedical engineering was expanding greatly during the decade. Dick Skalak was involved in two major events during the time of his BMES presidency that helped to shape the field's future. From 1985 until 1987, a period spanning his presidency of BMES, Dick co-edited (with Shu Chien) a major new volume entitled *Handbook of Bioengineering* containing 41 authoritative reference chapters by some 65 authors. They intended the Handbook to serve others, mainly "to be useful to students and faculty in departments of biomedical engineering as reference material for lectures and as a starting point for research."

In 1988, Dick co-organized the first major scientific meeting on "Tissue Engineering" at Lake Tahoe. The proceedings of the meeting defined the field, which is now a major part of biomedical engineering activity in academia and in industry.

Dick Skalak's work as an officer of BMES and as a participant in shaping the discipline's scientific directions was marked by a collaborative spirit and an appreciation for the breadth of the discipline, which still remains a major source of its vitality. He once said, in accepting the Poiseuille Medal in 1990 that "We would like to think that one part of our collective achievements has been, in fact, to establish a truly interdisciplinary and cooperative mode of research." That same thought applies to his role in helping to build BMES and to serve the discipline. He once wrote in personal notes that, "Who does the work and who gets credit is secondary. Take care of colleagues and students by being generous. Give ideas freely." The progress of BMES in 1986-87 was clearly a collaborative effort that built on past commitments, depended on the work of others, and led to future services benefiting all members of BMES, including the annual meetings that we enjoy today.

**This entry was written by Thomas Skalak, president of BMES, 2000-2001, and Richard Skalak's son.*

Gerald M. Saidel, PhD

President 1987-88

Board of Directors: H.K. Chang, John W. Clark, Knowles A. Overholser, William Van Buskirk, Leon E. Farhi, Jonathan C. Newell, Lloyd D. Partridge, Rena Bizios, Janie M. Fouke, William A. Hyman, Artin A. Shoukas, Joseph J. DiStefano, Geert W. Schmid-Schoenbein

Looking back at the Presidential column that I wrote for the *BMES Bulletin*, I could review my hopes, concerns, and strategies to promote the Biomedical Engineering Society. “The key and inter-related issues are affiliations, meetings, and membership. It is widely recognized that BMES must broaden its membership to be able to speak on behalf of all biomedical engineers. For this purpose, we must seek affiliations that reach out and enable BMES to serve in various capacities.”

Recognizing the need for increased membership, the BMES Board approved a change in its Bylaws giving BMES student members one year of free membership upon graduation. To show that the BMES was anxious for input from all members, we began sending members a check-off sheet requesting their participation on BMES committees together with the annual request for membership renewal. Furthermore, to assess the membership interests, we asked members to list their specialty fields which were then coded in the BMES Membership Directory. This showed that BMES has the widest representation of engineering and biomedical disciplines. Rita Schaffer, the BMES Executive Director who compiled this information, was a great person to work with on all of our special projects.

One strategy for increasing the stature and recognition of the BMES was to investigate affiliations with other societies. Although possible affiliations with the American Physiological Society (APS) and AAMI (Association for the Advancement of Medical Instrumentation) were considered, the consensus was that the BMES should continue as a distinct entity.

The BMES leadership did agree that “One of the most important potential affiliations is with the Accreditation Board for Engineering and Technology (ABET).” With this in mind, I worked with members, especially William Pickard, to find out how the BMES could become “the recognized lead society in biomedical engineering education.” We sent out questionnaires to members to determine if we could satisfy the criteria for ABET affiliation. Although the BMES could meet most of the criteria, limiting factors were the high annual dues and the need for members to participate in the accreditation process. Even though BMES submitted a preliminary application to ABET, it was not until recently that the BMES was strong enough to become a contributing member of ABET.

Another strategy to enhance the BMES was participating in meetings with other societies. I must admit that I did not believe that the BMES could develop its own annual meeting. Dan Schneck showed that this was possible when he organized the first Annual Fall Meeting of the Biomedical Engineering Society in 1990 at Virginia Tech with 83 registered participants. In 1998, the BMES Annual Fall Meeting in Cleveland had 1364 registrants. During 1987-88, the BMES participated in the Annual Conference on Engineering in Medicine and Biology (ACEMB), the spring meeting of FASEB (now EB) Experimental Biology, and the World Congress on Medical Physics and Biomedical Engineering and the annual meeting of the Association for the Advancement of Medical Instrumentation (AAMI). This strategy of participation at meetings with various societies has continued with the IEEE-Engineering in Medicine & Biology



Society, the US National Committee on Biomechanics, and the North American Society of Biorheology.

In regard to meetings, I suggested: "These interactions would be greatly facilitated if most of the various BME-related societies would hold their annual meetings together in a federation arrangement. This would really help to show the maturity and strength of the BME profession." Indeed, with the formation of the American Institute for Medical and Biological Engineering (AIMBE) in 1992 as an umbrella organization, an annual meeting has resulted in bringing together a wide variety of related fields.

In one of my President's Messages, I advocated a new function for the BMES: "As a professional organization with an obligation to societal well-being, the Biomedical Engineering Society should be involved in questions of public policy on health-related research and healthcare delivery. Not only is this important for the good of the public, but also for the good of biomedical engineers. Consequently, the BMES needs to identify health-related problems whose solutions require a major input by biomedical engineers." This role was really too broad for the BMES, but fact-finding and advocacy in regard to biomedical public policies became the central emphasis for AIMBE.

Because the visibility and stature of the BMES is closely associated with the *Annals of Biomedical Engineering*, I worked with Hun Sun, Editor-in-Chief of the *Annals*, to increase the size of the journal, choose a wider range of associate editors, and encourage manuscript submissions from more sub-fields

including biomaterials and biomechanics. As the *Annals* Editor-in-Chief, Jim Bassingthwaite continued to make major improvements so that the *Annals of Biomedical Engineering* has become the premier journal in the field.

Editor's Note:

Dr. Saidel began his tenure with vitality and a call for increased membership. He challenged the Board and Membership Committee to actively recruit and nominate new members.

Continued negotiations with Pergamon Press brought out lively debate. Pergamon Press wished to increase subscription rates \$5 with the 1988 volume. The Publications Board wanted to delay the increase until 1989 and allow only one increase in the next contract. Of equal impact, Pergamon Press wanted to increase page charges from \$50 to \$75 per page. Concern was raised over whether these charges might discourage authors from submitting. Others thought that this was not an appropriate time considering the delays in publishing the *Annals*.

Bill Van Buskirk echoed Dr. Saidel with his concern about BMES meeting the needs of a wide range of interests in biomedical engineering. The annual meeting with FASEB constituted three invited symposia, four sessions (two slide and two posters). A more appropriate forum was formed to discuss ways of making the Society more responsive to the larger community. A seed was planted for the later independent meeting.

Morton H. Friedman, PhD

President, 1988-1989

Board of Directors: Lloyd D. Partridge, Rena Bizios, Janie M. Fouke, William A. Hyman, Artin A. Shoukas, Robert M. Hochmuth, Carol L. Lucas, Geert W. Schmid-Schoenbein, Joseph J. DiStefano, Leon E. Farhi, Jonathan C. Newell, Robert M. Nerem

The period of my BMES Presidency was one of major transition in our field. In 1988, most practitioners of biomedical engineering had earned their degrees in traditional engineering disciplines and their primary professional identification was with the societies, such as AIChE, ASME, and IEEE, that represented those disciplines. The Biomedical Engineering Society had made few inroads into this population and was predominantly oriented toward systems physiology. For those engineers who were members of BMES, it was often their “second society.” The principal agency uniting engineers interested in biomedical engineering across disciplinary lines was the Alliance for Engineering in Medicine and Biology (AEMB); its Executive Council included representatives from as many as 24 professional societies, including BMES. These societies were the only members of the AEMB, which had no individual members. The principal activity of the AEMB was to organize the Annual Conference on Engineering in Medicine and Biology (ACEMB) each Fall. By 1988, the ACEMB had been financially troubled for several years, in part because the IEEE/EMBS had decided to separate the time and venue of their comparable meeting from that of the ACEMB. I learned this first-hand as General Chair of the 1986 ACEMB, which was the largest since the IEEE/EMBS had gone their separate ways, yet still lost money. Under these pressures, the AEMB held its last—the 41st ACEMB in 1988. As a result, the options for presenting work in our young field were reduced to a collection of meetings organized within each founder society, none of which reflected the full scope of the new discipline.

Early the following year, with support from the National Science Foundation, a small group, of which I was a member, convened in Washington, DC, to begin the process that was to lead to the AEMB’s successor organization, the American Institute for Medical and Biological Engineering (AIMBE). AIMBE’s mission was to unify our field, but the organization explicitly rejected the sponsorship of technical meetings, since these would compete with the meetings already being organized by the professional societies that were among AIMBE’s core constituencies.

This situation provided an opportunity for BMES, as the only society capable of serving biomedical engineering in all its breadth, to provide a replacement for the ACEMB. During the years preceding my Presidency, BMES had one annual meeting, held with the meeting of the Federation of American Societies for Experimental Biology, then called “the Federation Meetings” or “FASEB” and now “Experimental Biology.” Then, as now, we were a Guest Society of the American Physiological Society, one of the members of the Federation (in those years of the “Return of the Jedi,” my children loved all this talk of the Alliance and the Federation). All of our Society business was transacted at FASEB. This affiliation with the experimental biologists reflected the strong systems physiology orientation of BMES at the time.

Yet many members of our group were becoming increasingly aware of the importance of the engineering aspects of biomedical engineering to the field. Engineers as well as mathematically oriented physiologists saw that, for the BMES to become the



full-service society of this new discipline, more overtures to, and increased participation with, the engineering community was necessary. Thus, starting in the mid-1980's, BMES had begun to program sessions at the ACEMB. By 1988, we were major participants in the ACEMB, programming three major symposia at the last one. This participation increased our visibility to traditional engineers working on biomedical applications and increased their membership in our Society.

When I took office in the Spring of 1988, it seemed crucial to me that we find a vehicle to replace the imminently defunct ACEMB, continue to meet the needs of our engineering members, and strengthen our efforts to interact with engineers and recruit them to our Society. I, therefore, formed a committee, with President Elect H.K. Chang as Chair, and charged it to identify a mechanism or mechanisms by which BMES could hold an annual meeting separate from FASEB emphasizing the engineering aspect of our field. The Special Committee on Fall Meetings filed its report in January of the following year, and the first Annual Fall Meeting of BMES was held in Blacksburg Virginia in October 1990. We had only missed one year! The attendance at that first meeting was about 250; at our most recent stand-alone meeting, in Cleveland in 1998, there were 1350 registrants.

No former President can reminisce about his term without thinking of Rita Schaffer. Whatever my accomplishments in the lone year I was President, they could not have happened without the continuity and competence that Rita provided. Her lasting legacy is what our Society—her Society—has become.

One of Rita's important functions was to remind the President when it was time for the next "From the President" message for the *BMES Bulletin*. Only four were due during my term, but it seemed as though one was always due. My February 1989 Column, entitled "the Biomedical Engineering Society or The biomedical engineering society," now seems remarkably—

and happily—prescient. In that message, I wrote about what I saw as the inevitable evolution of BMES from being "everyone's second society" to becoming "the society for all biomedical engineers." Almost precisely ten years later, we learned of the Whitaker Foundation's generous and well-merited award to our Society which recognizes our unique position among professional societies in biomedical engineering, and will improve further the services we are able to provide to our members.

In my view, the most important accomplishments of my administration were: initiation of the process that led to the Annual Fall Meeting of the Society, formulation of a long-range plan to make BMES the society for all persons active in biomedical engineering, emphasizing the inclusion of engineers from the traditional disciplines, and preparing for the future influx of engineers whose first degrees are in BME.

Editor's Note:

The report on the *Annals of Biomedical Engineering* encompassed several points. Volume 16 ran 9% above page budget. The volume included 37 papers, 13 abstracts, and 18 book reviews. The time lapse between acceptance and publication was 6-7 months which editor Hun Sun felt was very competitive compared to other journals. A new section on signal processing and imaging was established with John Semmlow as section editor. Rita Schaffer commissioned a new cover design for the journal with changes in typeface as well.

Dr. Sun's tenure as editor was due to expire. He was unanimously approved for another three year term starting in 1990.

Pergamon Press agreed to increase the page budget from 600 to 650 pages in 1989, but linked this to a subscription increase (\$30 to \$35). Institutional rates were increased from \$205 to \$250 a year.

H.K. Chang, PhD

President - 1989-1990

Board of Directors: Robert M. Hochmuth, Carol L. Lucas, Robert M. Nerem, Geert W. Schmid-Schoenbein, Janie M. Fouke, William A. Hyman, Artin A. Shoukas, William J. Dorson, Mary A. Epstein, Robert J. Roselli, Sheldon Weinbaum, Rena Bizios

It is with a great deal of nostalgia and pleasure that I write this short piece for this special historical publication. Before I talk about what I did as President in 1989-90, I should recollect how I heard about the Society and how I tried earnestly to gain membership in the Society. It dates back to 1968 when I was a Ph.D. student at Northwestern University. One day, quite accidentally, I overheard a conversation between John Jacobs and Lyle Mockros, my thesis supervisor, about the need to create a new society to foster the development of the then relatively new field of Biomedical Engineering. I distinctly heard Dr. Jacobs mention that the society should be a high-caliber one.

After I was promoted to full professor at McGill University in 1980 and after I had been an active member of the American Physiological Society (APS) for a few years, I gathered up enough courage one day to ask Lyle Mockros whether he would be willing to be my sponsor to join the Biomedical Engineering Society. He kindly agreed and I have since then viewed my membership in BMES as an honor.

In 1984, I joined the Department of Biomedical Engineering at the University of Southern California. The person who recruited me, Fred S. Grodins, was not only a famous physiologist but also one of the founders, along with John Jacobs and Lyle Mockros, of BMES. This, plus the fact the office of BMES was located in Los Angeles at that time, probably helped get me nominated for the Board of Directors of BMES. As many people can testify, once you get involved with BMES affairs, you are likely to find the society needing people to work for it and also to find yourself willing to provide that work. This is basically

the story of how I became a candidate for the position of President in 1988.

After serving one compulsory year as President Elect and chairing the Long-Range Planning Committee, I became President in April 1989, at our Annual Meeting in New Orleans. The meeting coincided with that of the Federation of American Societies for Experimental Biology (FASEB) since BMES had for a number of years been the Guest Society of APS, a founding body of FASEB. Even though I was an active member of APS myself, I agreed with a number of our members that biomedical engineering as a field was much broader than physiology and that the needs of many of our members could not be met by the status of a Guest Society at FASEB.

Yet, being an elitist society according to our Constitution and Bylaws, we did not have the critical mass or financial power to organize our own meetings. Indeed, in those days BMES was definitely high on intellectual power but very low on financial power. Worse yet, the conference of which BMES had been a part, the Annual Conference of Engineering in Medicine and Biology (ACEMB) had just been abandoned because of pressure exerted by IEEE Engineering in Medicine and Biology Society (EMBS).

The entire Board of Directors, as I now recall, agreed that we should: (1) step up our membership drive, (2) try to start our own Annual Fall Meetings. We had plenty of talented members and a great deal of ambition, but we lacked the means to enable our talented members to achieve their ambition. Something had to be done. I wrote a column in the November 1989 issue of the *BMES Bulletin* comparing BMES



with IEEE-EMBS and emphasized its quantity and our quality. It was painful to recognize that BMES had not held its own meeting for 14 years.

Just about that moment, several knights in shining armor were riding their white horses toward us.

The first was a nobleperson by the name of Rita Schaffer, who volunteered to reduce her charge for the tremendous amount of work she did for the Society. She at one time even put her sister in Sacramento to work for the Society at no cost. In the years between 1988 and 1990, I would often drive to her office in West Los Angeles to pick up mail or simply chat, giving each other some pep talk about the Society's future. In this connection, it was a small consolation to me that the Society had become a strong one when Rita left us.

The second knight should be called a "chevalier" since he speaks elegant English with a charming French accent. An accomplished scientist and administrator, Dr. Claude Lenfant, the long-time Director of the National Heart, Lung, and Blood Institute, agreed to give the Alza Distinguished Lecture at our 1990 Spring Meeting in Washington DC. Although his lecture was illuminating, what I recall most vividly and with delight was the moment afterward when, as President, I handed him an envelope containing a check for \$2,000 as an honorarium. He returned it to me with a grin and said that Congress had just passed a law prohibiting government officials from accepting honorariums and therefore he would like to donate the check to BMES. Additionally, he required no transportation costs since he was a local.

The third and shiniest knight is now known throughout the biomedical engineering field, but in those days he hid in Harrisburg, Pennsylvania, running a small office with a huge bank account. When he came to our rescue, he was not dressed in shiny armor but in jogging shorts. Miles Gibbons was President of the Whitaker Foundation when he and I decided to jog together in Washington, DC, one spring day in 1989. Camouflaged by my gasping for air during the run, I nervously told him of BMES's predicament and said we could use some help to get our Fall Meeting started. It took no time for the Georgetown-trained former labor lawyer to say that he wanted to see a written proposal. Back to Los Angeles, a buoyed Rita and I quickly whipped up a proposal to ask for a \$15,000 grant for our first Fall Meeting in 1990. Miles' voice was sweeter than an angel's when he phoned up a couple of months later to say that his Board had approved the grant. To this day I wonder what if I had the audacity to ask for \$30,000 instead \$15,000. But I know the tight-lipped executive at the helm of the Whitaker Foundation would not give me a

straight answer even if I asked. So let this point always remain a mystery in the history of our Society.

From 1990, eleven successful BMES Fall Meetings have been held. Although it was IEEE-EMBS that devastated the ACEMB meetings in the late 1980s, I was very glad to see that our 1999 Fall Meeting was held in conjunction with IEEE-EMBS in Atlanta. The field of biomedical engineering has grown tremendously in the past 10 years and so have the scholars grown wiser. I regret not having attended any of the Fall Meetings due to my work in the past ten years, but I have watched them with increasing delight each year. To illustrate how we have all become wiser, I worked very hard to be the General Chair of the 20th IEEE-EMBS International Conference, which was held here in Hong Kong in October 1998. History certainly has its twists and turns.

Finally, I would like to attend at least a few more meetings along with Lyle Mockros who was responsible for my entering our profession as well as our Society. I would also like to dedicate this short article to the memory of Fred Grodins and Rita Schaffer.

Editor's Notes:

The Society continued to reflect the positive self-perception seen in Dr. Chang's remarks. Further specialization of the discipline was evidenced by two new editorial sections added to the *Annals*: 1) Biomechanics and Rehabilitation Engineering, and 2) Bio-materials. The Society also grew in size. Membership increased in students by 18%, 16% in non-student members, and 17% total increase. Peterson's Guide identified 90+ biomedical engineering programs. About one-third had BMES student chapters.

The on-going inquiry on membership in ABET resulted in a detailed report. David D'Argenio, chair of the Education and Public Affairs Committee presented an analysis. In brief, it stated the following:

Reasons for membership:

- Overall objectives of ABET are important to engineering profession in general;
- A large percentage of undergraduate programs in BME have sought and hold ABET accreditation;
- A participating body can have indirect input into policies which can benefit members;
- ABET membership will provide additional visibility and stature to the Society.

Reasons against membership:

- ABET had attempted to micromanage curricula in departments undermining the institutions;
- Members of BMES are already represented in ABET through IEEE, ASME, and AIChE;
- Membership in ABET is no guarantee of influencing policy;

- The financial burden of membership in ABET is too great for current Society resources.

The Long Range Planning Committee presented a lengthy report. The most significant accomplishment was the planning for the first Fall Meeting in October 1990. Ten additional recommendations were made. The maturation of the Society called for reflection on procedure to take full advantage of those who had served. The recommendations were remarkably prescient.

1. Duties for planning the Fall Meeting a permanent responsibility of President Elect. It was also suggested that the meeting be held at the new president's home institution.
2. The Long Range Planning Committee be restructured to comprise the past president as chair and the previous three-four presidents.
3. Program Committee be restructured to four members with two year terms. Two new members would be appointed each year.
4. Increase membership base: a) lessening requirements to join; b) recruit and retain student members; and c) launch a membership campaign.
5. Reconsider a previous suggestion to establish sections or divisions within BMES.
6. The BMES Bulletin be published monthly and have the *Annals* come out monthly as well.
7. BMES pass a resolution pledging full support for the effort to establish a national infrastructure for bioengineering.
8. Address two crucial immediate issues: BMES lost access to a computer system with the demise of the Crump Institute for Medical Engineering at UCLA; the issue of offering Rita Schaffer a full-time permanent position as Executive Director.
9. The issue of becoming an ABET member be tabled since the membership fee of \$10,000 is too high.
10. Avoid comments in BMES career brochure that could offend members of allied professions.

Daniel J. Schneck, PhD

President, 1990-1991

Board of Directors: Robert M. Hochmuth, Carol L. Lucas, Robert M. Nerem, Carl F. Rothe, William J. Dorson, Mary A. Epstein, Robert J. Roselli, Sheldon Weinbaum, Thomas R. Harris, Dov Jaron, Hun H. Sun, Milton Adams

Reflections: I served the Society in several ways, mostly in an editorial fashion. I was Founding Editor and for 9 years edited the *BMES Bulletin* during its earliest development (on my own, with just a typewriter and virtually no funding). I continued these labors on the *Bulletin* Editorial Board after stepping down as editor. In addition, I served on the editorial Board of the *Annals of Biomedical Engineering*, developing the Dissertation Abstracts, Book Reviews, and Software Surveys, as well as reviewing papers. I also was Conference Chair for the very first stand-alone meeting of the Society, which was held at Virginia Tech in 1990.

Editor's Note:

Dr. Schneck's presidency saw considerable refinement of important issues reflecting the maturation of the Society and the discipline. Personnel decisions were a part of this. Rita Schaffer's permanent position as Executive Director was enhanced with fringe benefits. The Publications Board was charged with finding an editor who will work to expand the number of issues of the *Bulletin*. The Board eventually submitted Jerry Collins of Vanderbilt for consideration. The recommendation was approved unanimously and Dr. Collins' term began 1 May 1991. Dr. Schneck was more than aware of the importance of this position since he had edited the *Bulletin* for nine years.

Student Affairs Chair Ken Lutchen reported that 23 student chapters renewed charters, a gain of four. Student membership increased from 562 in 1988 to 650 in 1989. The increase was calculated to be the result of visibility in the *Bulletin* and the availability

of a database of employers. The Student Affairs Committee also produced the Student Chapter Operations Manual to help chapters get started.

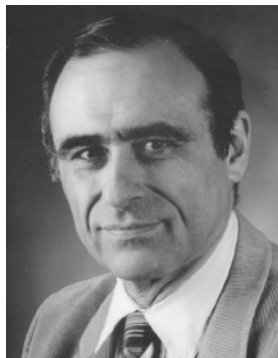
Significantly, work continued on organization of a fall meeting. The previous Board meeting decided that the Society host an independent Fall meeting. Appropriate committees were formed. In a transition effort, it was decided that the Society would meet with FASEB for another 2-3 years.

Membership in ABET was deferred another year. One reason was because of the expense and another was that there was an effort to develop a national infrastructure for bioengineering in NIH.

Further refinement of membership continued into the new decade. Student recruitment was simplified. Only one signature was now required in place of letters of recommendation. Membership was increased through a membership mailing which asked for new nominees.

It was announced that NSF had sponsored a workshop for ABET-accredited program heads on undergraduate engineering curriculum. One result was a council of directors of biomedical engineering programs. This council would next meet at the BMES 1991 Fall Meeting.

The Education and Public Affairs Committee began a regular column in the *Bulletin* on matters of public affairs related to BME. Three areas of concern for future consideration were given: 1) Representation by women and minority groups in BME; 2) examination of methods of federal funding in support of biomedical engineering research; and 3) addressing faculty salaries in biomedical engineering as they relate to comparable salaries in other engineering disciplines.



The Society continued to maintain a steady membership and a constant rate of growth. Still, the concern about students moving from an entry level into full membership remained. The status of the Society relative to other groups and the extent of official interaction in conferences also remained a fixture in board meetings. One area, the *Annals*, had found a firm base. Dr. Sun reported that the 1990 volume totaled 709 pages (43 manuscripts along with reviews, abstracts, and communications). The rate of acceptance was about 50%. The 700 page budget was deemed acceptable at this time and no change was foreseen for at least two years.

Two issues regarding cost of the journal were raised. The first was in subscription rates for institutions. Pergamon Press raised this rate from \$295 to \$345 in order to recover costs from a weak dollar overseas. The second was for members. Current rates of \$30 will go to \$35 in 1992 per an agreement in 1988. Pergamon wished to add another \$10. The Board rejected this newest increase.

Dr. Schneck agreed to edit a Biomedical Engineering Data Handbook for the Institute of Physics Publishing. The publisher asked for the Society to lend its name to the book in return for a royalty. The Publications Board would provide guidance on how to ensure high quality of the articles so as not to compromise the Society.

Perhaps most noteworthy of all the work accomplished during Dr. Schneck's presidential tenure was the continuance of the Annual Fall Meeting. The Long Range Planning Committee announced that Jen-Shih Lee of the University of Virginia agreed to organize the second meeting in 1991, October 12-14, under the title "Technology for Health." Importantly, other members expressed interest in hosting future meetings (Kimberly Ward at University of Kentucky, Rena Bizios at RPI, and Mike Yen at Memphis State University). It was understood that this was a significant step forward for the Society. Equally clear was the financial risk involved. Careful accounting and cost projections had to be a part of meeting policy.

Geert W. Schmid-Schönbein, PhD

President, 1991- 1992

Board of Directors: Milton Adams, Harvey S. Borovetz, William J. Dorson, Mary Farrell Epstein, Thomas R. Harris, Dov Jaron, Jen-Shih Lee, Robert Mates, Robert J. Roselli, Hun H. Sun, Sheldon Weinbaum, Robert S. Langer

When I was asked to serve as President of the Biomedical Engineering Society, I was deeply humbled and asked myself what *really good* I could do for my colleagues and the students in this Society for the young bioengineering discipline. I was advised that one year is short and there are only a finite number of opportunities—both pieces of advice turned out to be quite correct. There was an issue about the annual meeting, about the large student membership, and the optimal service to this large block of membership. For decades, the Biomedical Engineering Society had joined the FASEB Spring meeting, usually as a guest society to the American Physiological Society. This approach had served the Society well but it also became apparent that such a relationship would limit societal growth. So there was the question whether BMES should establish its own independent annual meeting? Were we a large enough organization to launch a major national meeting?

As it turned out, the timing was right. Daniel Schneck, President during the previous term 1990-1991, took the initiative and organized the first self-standing Fall Meeting in Blacksburg with some 109 participants and support from the Whitaker Foundation. This was *the* opportunity to have a free-standing national meeting for BMES. Perhaps the most important step I took, still as President Elect, was to call up my good friends in different Bioengineering Programs across the country and ask them whether they would be interested to organize a Fall Meeting of the Biomedical Engineering Society. Whatever concerns I had, they quickly faded. The enthusiasm was great. The University of Virginia,

Charlottesville, with Jen-Shih Lee as Chair, agreed to organize the 1991 Fall Meeting on short notice. A few days later more commitments were made by Joe Andrade and Ken Horch at the University of Utah, for 1992, by Vince Turitto and Mike Yen at Memphis State University for 1993, and by Eric Guilbeau at Arizona State University, Tempe, for 1994. Shortly afterwards Pennsylvania State with Herb Lipowsky as Chair made a commitment to host the Fall Meeting in 1996. The Society was on a new track and started to flourish in unforeseen ways.

Jen-Shih Lee and his team organized a marvelous meeting and the Whitaker Foundation again came to assist the society with a grant of \$15,000. Finally BMES had a self-standing meeting in which its members could organize a broad range of sessions that were of interest to them, from cell mechanics to orthopedics and quantitative physiology, and from instrumentation to public policy. There were well over 350 registrants for a two-and-a-half day meeting on the campus of the University of Virginia Charlottesville, and all spirits were high. The banquet dinner was served in the famous Jefferson Rotunda. The first Society Board Meeting outside of the Spring FASEB meeting took place during this Fall Meeting.

Still, the participation of BMES at FASEB continued; in fact, the Society Board Meetings took place during the FASEB Spring Conference. The Long Range Planning Committee was negotiating with both the newly-created American Institute for Medical and Biological Engineering (AIMBE) as well as with FASEB. The Board eventually decided to join AIMBE as the new representation of all of bioengineering



activity in the US, while membership in FASEB was too costly and BMES could not yet meet FASEB's minimum membership requirements.

Even so, the Society was rapidly gaining in membership and had arrived at 859 non-student members (up 23% for the year) and 906 student members up from 462 in 1988 with 32 student chapters (the effort of the Student Affairs Committee). With more than half of the membership provided by students, we discussed the possibility that the student membership fees be applied to seek representation on the ABET Board for Engineering Accreditation. There was no representation by a society devoted exclusively to Biomedical Engineering. This again was a matter of the cost involved.

The BMES-sponsored scientific sessions at FASEB continued to be well attended, as has been the case for well over a decade; Rena Bizios had organized a superb program in collaboration with the American Physiological Society. Paul Sung, Richard Skalak, and his student Cheng Dong won the Lamport award for their work on Neutrophil Mechanics. Ten student Chapters received a meritorious Achievement Award and others received an Honorable Mention Certificate. BMES also introduced a *Distinguished Service Award* to reward extraordinary contributions to the Society.

One of the most comforting aspects of the society activities was that under the direction of Hun Sun as Editor in Chief, the *Annals for Biomedical Engineering* were rapidly growing. The publication rate increased, new subdivisions were introduced and plans were made for publication in an 8.5 x 11 inch format, the same size as most comparable journals. The profit for the society increased in some healthy fashion, providing resources for improvement of its infrastructure and operation. Jerry Collins, as newly appointed Editor, greatly improved the looks of the *Bulletin* and expanded its content. Dan Schneck published the *Biomedical Engineering Data Handbook* with IOP Publishing.

Many members worked tirelessly on behalf of the society. Robert Mates drafted a proposal for long-term support of the society awards by the Whitaker Foundation which became a large contribution to the society, and Janie Fouke organized four courses on behalf of BMES for the 1992 Annual Meeting of the Association for the Advancement of Medical Instrumentation.

In summary, the period between 1991 and 1992 was one of continued rapid growth and newly gained independence for BMES. I am grateful for the counsel, commitment, and the endless help from so many individuals, the support from the Whitaker Foundation, and last, but not least, the ceaseless assistance from our late Executive Director, Rita Schaffer.

John H. Linehan, PhD

President April 1992-October 1993

Board of Directors: Geert W. Schmid-Schonbein, Robert M. Hochmuth, Thomas R. Harris, Milton Adams, John M. Tarbell, Dov Jaron, Harvey S. Borovetz, Jen-Shih Lee, Robert E. Mates, Kenneth R. Lutchen, Larry V. McIntire, Hun H. Sun, Robert S. Langer, Aleksander S. Popel, Vincent T. Turitto Paul N. Hale, J. David Hellums, Virginia H. Huxley

Milestones of my presidency include:

- 1992 Annual Spring Meeting at the FASEB meeting in Anaheim, CA (April 1992)
- 1992 Third Annual Fall Meeting at the University of Utah, Salt Lake City
- 1993 Annual Spring Meeting at the EB meeting in New Orleans, LA
- 1993 Fourth Annual Fall Meeting at the University of Memphis, Memphis, TN
- Celebration of the 25th Anniversary of the BMES
- BMES joins AIMBE (American Institute of Medical and Biological Engineering)
- BMES Distinguished Lectureships at the Fall Meeting to Pierre Galletti in 1992 and David Hellums in 1993
- Alza Distinguished Lectureship at the spring meeting in 1993 to Shu Chien
- Change in publisher of the *Annals of Biomedical Engineering* from Pergamon Press to Blackwell Scientific
- Appointment of James Bassingthwaighite as Editor-in-Chief of the *Annals*
- Distinguished Service Awards to Fred Weibell in 1992 and Hun Sun in 1993.

I became President of the Biomedical Engineering Society at the 1992 annual spring meeting held in Anaheim, CA (April, 1992). Although my Chicago birthright was noted by the Board, a proposal to recount the ballots was defeated. At that time, the term of the president ran from spring meeting to spring meeting. The annual BMES business meeting was where the presidential gavel was passed on to the

successor. From 1968 to 1992, the BMES business meeting was convened during the spring scientific meeting at the annual FASEB (Federation of American Societies of Experimental Biology) meeting. BMES participated as a guest society. The FASEB meeting, bringing together the various societies of experimental biology, was huge, with about 15,000 attendees at that time. BMES attendees felt dwarfed by the size of the meeting even though our membership was very welcome. Although the BMES sponsored a couple of symposia, most BME presentations and member participants were scattered among the scientific sessions generally organized by organ, heart, lung, etc. Some of our graduate students presented at that meeting but no undergraduate students attended. The size of the meeting was an impediment to developing a sense of BME collegiality and a scientific identity for the emerging discipline of bioengineering.

In contrast, the first two annual fall meetings were tremendously successful. Although the numbers of participants was modest, the slope of the straight line between the two attendance data points predicted exciting growth for the future. The BMES membership was pleased by the fall event. Meeting on a college campus provided an intimate setting where faculty and especially students could effectively interact both at the technical sessions and meet one another at the social functions. Undergraduate students were most welcome and BMES student chapters sent delegations to the meeting. A palpable sense of BME identity was present and it supported the notion amongst our students that they were part of a real and growing discipline. This motivated the BMES Board



of Directors to decide to focus the attention of the Society on the fall meeting. At the October 1992 board meeting the motion was passed to henceforth convene the annual business meeting at the BMES fall meeting. A corollary to the action was to extend the terms of office of extant officers by an additional six months (which is why I was president for 18 months).

In 1992, the BMES membership voted in a mail ballot to approve accepting the invitation from the newly inaugurated American Institute for Medical and Biological Engineering (AIMBE) to join its Council of Societies. As an umbrella organization, AIMBE was born to coalesce the interests of the various societies with members in the medical and biological engineering fields. Two important goals of AIMBE have been to substantially participate in the formulation of public policy and effectively disseminate information concerning medical and biological engineering to the public. Two notable examples of AIMBE's public policy achievements of importance to BMES members are the successful passage of the bio-materials availability access act in 1998 and the creation of an Institute for Biomedical Imaging and Bioengineering at the National Institutes of Health in 2000. AIMBE also includes a College of Fellows (many BMES members have been elected), an Academic Council (largely consisting of academic programs offering degrees in biomedical engineering and bioengineering), and a Council of Industries.

The parallel growth of AIMBE and BMES during the rest of the 1990s has been linked by the development of bioengineering as a true discipline. The distinction between bioengineering and biomedical engineering is one of application. Many BMES members have served in leadership positions in AIMBE.

During this same period, BMES also explored the possibility of joining FASEB. From its inception, BMES had a long historical association with the annual FASEB meeting. Many academic members of the BMES were also members of the American Physiological Society, belying their scientific interests integrating engineering methods with physiological problems. FASEB has always played a strong role in public policy regarding biomedical science. There had also been a long-time interest in a more formal association with FASEB, particularly in moving from a guest society status at the annual spring meeting to one of the principal programming societies. This change in status was perceived to be advantageous in increased programming opportunities for BMES in the newly renamed Experimental Biology (EB) spring meeting. Negotiations with FASEB proceeded cautiously, in part, because FASEB had recently changed the manner in which the spring meeting was organized.

In the end, after thoughtful consideration, the BMES Directors decided that focusing on the growth and quality of the fall meeting was our highest priority and our recent association with the nascent AIMBE seemed to be a more appropriate focus of efforts for the whole of the membership.

BMES experienced unprecedented growth while I had the privilege to be its president but remained in a financially precarious position—the Society reserves were less than one year's salary of Rita Schaffer. In looking at the Society financial picture, it was clear to me that the long-standing contract with Pergamon Press to publish the *Annals of Biomedical Engineering* needed restructuring. Financially, it existed virtually unchanged from the original contract signed at the birth of the *Annals* in 1972. Basically, the *Annals* was profitable but the proportion of the profit realized by the Society seemed too small. Fortunately, the contract was due to be renewed. I encouraged the chair of the publications board, Tom Harris, to solicit bids not only from Pergamon but other publications as well. Tom was superb in carrying out assertive but prudent negotiations on behalf of the Society. The story of the successful negotiations resulting in the change in publisher is told elsewhere herein (see Tom Harris presidency).

A new format for the *Annals* was also implemented in 1993. The page size increased from a 6.6" x 10" format to 8.5" x 11", bringing the *Annals* in line with other competing journals of similar content. The new journal look was one of Hun Sun's last contributions as editor. During his tenure the journal broadened its scope reflecting changes in biomedical engineering practice. For instance, the increasing activity in biomechanics research produced the largest increase in paper submissions while the area of physiological systems had declined steadily from its position of predominance in the earlier days of the journal. In 1993, BMES formally recognized Hun Sun's many contributions to the *Annals* during his editorship by awarding him the Society's second Distinguished Service award. The first award was made to Fred Weibull in 1992 for his outstanding and long-term contributions to BMES as the Secretary-Treasurer.

With a new format and publisher as underpinnings, Jim Bassingthwaite became the new editor-in-chief. Jim quickly and enthusiastically set up an editorial office at the University of Washington with Rita Jensen as the managing editor. To attract high quality manuscripts to raise the journal quality to new heights, Jim recognized that service to the authors was of paramount importance. His appointment of new Associate Editors and his design of a streamlined service process soon reduced the time of notification to authors to 34 days, putting the *Annals* on a par with the best journals

regarding review. Jim's impact on the *Annals* has been outstanding and was recognized in 1999 by being awarded the Society's Distinguished Service award.

The 1992 Annual Fall (October 16-18) meeting was ably hosted by Joe Andrade and Ken Horsch on the campus of the University of Utah. The theme was "Perspectives and Opportunities in Bioengineering." The attendance reached 410. Pierre Galletti gave the Whitaker Lecture: "The Future of Cell and Tissue Engineering."

In March 1993, the BMES met as a guest society at the Experimental Biology 93 meeting in New

Orleans, LA. A particular highlight of that meeting was the Alza Distinguished Lecture delivered by Shu Chien. The title of his talk was "Endothelial and Blood Cell Mechanics: An Example of Molecular and Cellular Bioengineering."

The 1993 Annual Fall meeting (October 21-24, 1993) was held on the campus of Memphis State University (now the University of Memphis). There were 570 attendees. The hosts were Vince Turitto and Mike Yen. David Hellums gave the distinguished lecture entitled "Biorheology in Thrombosis Research."

Robert M. Hochmuth, PhD

President- 1993-94

Board of Directors: Harvey S. Borovetz, Kenneth R. Lutchen, Larry V. McIntire, Aleksander S. Popel, Vincent T. Turitto, Paul N. Hale Jr., J. David Hellums, Virginia H. Huxley, Robert S. Langer, Robert E. Mates, Michael J. Kallok, Van C. Mow

What I remember best is not my term as president, which was uneventful, but my extraordinary *eighteen-month* term as president elect from April 7, 1992 until October 23, 1993. How we engineered my extra-long term in office as well as those of the President and all other members of the Board of Directors is the story I want to tell. But to tell the story I must go back to a time when our Society had no fall meeting. The story is one of how the fall meeting came into being, gained in importance, and as a consequence, led to our eighteen-month tours of duty.

The date was May 2, 1988 at 6:15 pm and the location was the Las Vegas Hilton. I was a newly elected member of the Board of Directors (BOD) and was a guest at that first meeting of the Board. According to our constitution, the Society must meet once a year at an Annual Business Meeting, which is open to all; and according to our bylaws, the BOD must meet at least twice a year, including a meeting shortly before the Annual Business Meeting and one shortly thereafter. The Annual Business Meeting was to be held tomorrow afternoon and the Board was to have its second meeting right after this business meeting, at which time I would be an official member of the Board. Why were we having so many meetings, three all told, in the spring? We were holding three meetings because that is when we had our annual meeting as part of a much larger meeting of FASEB, the Federation of American Societies for Experimental Biology. We were a guest society of the American Physiological Society (APS), a FASEB member. In order to have our technical sessions at the annual meeting, we had to submit proposals to APS for their approval. We might have six or

seven technical sessions with about 80 of our membership in attendance. Many felt this was undesirable and that we needed our own meeting. In fact at the Board meeting of May 2, Tom Goldstick, Chair of the Program Committee, “urged the Board to consider the future of the BMES Annual Meeting and whether or not it is appropriate for the Society to continue meeting with FASEB.”¹

Now we move forward slightly to May 3, 1988, at 6:17 pm at the next Board meeting with a new President and with our new Directors. It is interesting to note that one of the more important initiatives in our Society’s history was set in motion by a President who was not in attendance because of a family matter. Morton Friedman, *in absentia*, recommended that we “form an ad hoc committee to come up with recommendations within the next few months for a 1989 Fall Meeting.” This committee was to be chaired by H.K. Chang, President Elect.

Almost a year had passed since our last meeting and our Board was meeting in New Orleans on March 20 and 21, 1989. At the second meeting of the Board, H.K. Chang, now the President, made his report.² He gave us three options, with only the third having the slightest promise of an independent, stand-alone meeting for the Society. Thus, the third option: “BMES could join with related societies other than the IEEE/IEMBS (e.g., ASME, AIChE) in co-sponsoring small-scale, federation-type meetings in the fall. Such meetings could be held in a campus setting at a relatively low cost to the Society. The committee recommends that the Society organize such a meeting in the fall of 1990.” The minutes note that “[a] lengthy



discussion was held. Some Board members felt that if BMES aspires to be a truly distinguished society, then we need the visibility of our own meeting. Others felt that the Society is not large enough, and the interests of our members too diverse, to hold a stand-alone meeting at this time.” I worried and wondered how a society with around 600 regular members (not counting student members) and approximately 100 or so active members could support a stand-alone meeting. Eventually, the Board set aside its misgivings and adopted the third option by a vote of nine in favor, one opposed. Now, the Society had just a year and one-half to organize its first stand alone fall meeting.

At present (spring 2000) we have had ten Fall Meetings. The only one I have missed was the first one held at Virginia Polytechnic Institute in Blacksburg in October 1990. This meeting was organized by Dan Schneck and 80 papers were presented there. The second meeting held at the University of Virginia in Charlottesville in the fall of 1991 and organized by Jin-shih Lee is still fresh in my mind. We had wonderful autumn weather on a beautiful campus. We moved easily from classroom to classroom with conference breaks and lunches held on a sun-drenched patio. This was so much nicer than windowless rooms in generic hotels. But, the number of technical offerings was limited. The third meeting in 1992 at the University of Utah offered more technical papers and featured a symposium on “Cell and Tissue Engineering,” which has become one of the important technical tracks at our meetings. The next four meetings also were held on college campuses, but finally, for the 1997 meeting in San Diego, we were forced to move to a large hotel. We had become victims of our own success. But what we lost in ambience, we gained in diversity and quality.

So, I finally arrive at the point of explaining how I served as President Elect for 18 months beginning in the spring of 1992. Even as our fall meetings were growing, we continued to have our two Board meetings and the Annual Business Meeting in the spring at the time of the FASEB meeting. (I note that the FASEB meetings in the early 90s were in the process of being reorganized and renamed Experimental Biology or EB for short.) It became obvious to everyone that we had to move our Annual Business Meeting and the two adjacent BOD meetings to our Fall Meeting. At the end of our first Board meeting on April 6, 1992 in Anaheim, “it was decided that the Long Range Planning Committee would be charged to study the implications of moving the meetings and present its recommendations to the Board in Salt Lake City” in just six months. On April 7, at the Board meeting following the Annual Business Meeting,

I became the President Elect and discovered that the main duty of the President Elect is to chair the Long Range Planning Committee.

The question was not whether we wanted to move our Business Meeting to the time of the Fall Meeting, something we all wanted to do, but whether it would be difficult to do so. This boiled down to the question of can we move the meeting without violating our constitution and bylaws? Article IV of the constitution says the President Elect shall serve one year as such followed by one year as President, and one year as Past President. We simply interpreted “one year” to mean one calendar year. When the Board met once on October 16, 1992, at the time of the fall meeting at the University of Utah,³ I presented the plan to move our Annual Business Meeting and our two Board meetings to the next fall meeting to be held in Memphis. To do this, all members of the BOD had to serve another year in their present positions, after having already served six months. Thus, the eighteen month terms of office. At the same time, we recommended that we still meet one time in the spring at the time of Experimental Biology. Thus, in the spring of 1993 the BOD met once in New Orleans and, of course, now there was no Business Meeting. But we met in the fall in Memphis and had our Annual Business Meeting and two Board meetings and did not violate the constitution even though our Annual Business Meeting was held six months later than usual. I became the President at the Annual Business Meeting and replaced a grateful Jack Linehan who completed an unprecedented eighteen months as President. The meeting in Memphis also was the 25th anniversary of the founding of the Biomedical Engineering Society, so we had a lot to celebrate.

The Society has continued to grow and prosper primarily because of the vision and courage of those who started our Annual Fall Meetings a decade ago. And, as a consequence of the success of the Fall Meeting, some of us were able to serve our Society for an extra six months.

¹All items in quotes are taken from the minutes of the Biomedical Engineering Society.

²The other members of the ad hoc committee were Bill Dorson, Rakesh Jain, Carol Lucas, and Mort Friedman ex officio.

³Enrollment at this, our third meeting, was now 410.

Editor's Note:

Several important issues arose during this exceptional 18 month tenure. Jim Bassingthwaite reported that 70 manuscripts were submitted to the *Annals*. One had been published and 26 accepted and in press. The

rejection rate was at 18.6%. The submission rate was increasing and the journal might consider a page limitation since issues were being devoted to symposia. Cost for pages over the contractual 720 pages was \$100 per page. An additional \$10,000 might be needed. Jim also noted that he donated 30 hours a week to the journal. In the future, the Society might have to actually pay their editors if they wish to continue high quality work.

The ability of a Society to function and provide service to its membership depends on the commitment of its talented personnel. Jim has given the Society decades of service. But even he recognized that the journal and the Society had reached a stage of growth that a greater bureaucratic and monetary obligation was necessary.

Negotiations with Pergamon press released BMES from their contractual obligation. This allowed the Society to complete negotiations with Blackwell Scientific.

Vince Turitto reported that the 1993 fall meeting gained a profit for the Society, the first time this had happened. There were 568 participants at the Memphis meeting up from the 410 who attended in 1992. Planning for the Tempe meeting in October and the Boston meeting in 1995 were already well underway. Festivities and symposia were laid out along with costs. NIH, NSF, and the Whitaker Foundation, along with industrial support, were requested to help with funding for travel.

Jen-Shih Lee, PhD

President 1994-95

Board of Directors: James B. Grotberg, Eric J. Guilbeau, Paul N. Hale Jr., J. David Hellums, Virginia H. Huxley, Roger D. Kamm, Douglas A. Lauffenburger, Linda C. Lucas, Kenneth R. Lutchen, Van C. Mow, Aleksander S. Popel, Vincent T. Turrito

I began my service for the Biomedical Engineering Society (BMES) when Geert Schmid-Schonbein, the BMES president in 1991, asked me to organize the 1991 Fall Meeting. Geert conveyed to me that the Board was anxious to have a successful scientific meeting that could also be productive. After discussion with the biomedical engineering faculty at the University of Virginia (UVA), we all agreed that we could organize a meeting to provide the utmost opportunities for scientific exchange and discussion. I proposed to the Board a meeting consisting of seven tracks, thirty oral presentation sessions, three hundred abstracts, and a budget of about \$45,000. With a personal assurance to produce a surplus, I could see the enthusiasm expressed by the Board on this “ambitious” plan and was delighted to have it adopted.

The seven tracks of the meeting were: BME education and technology, cardiopulmonary engineering, neural engineering, medical imaging, cellular and tissue engineering, orthopedic engineering, and rehabilitation engineering. The theme of the meeting was technology for health with sessions balanced for distribution in basic studies and technology development. We were grateful for the generous support from the Whitaker Foundation, National Science Foundation, and the University of Virginia. We encouraged national attendance by students and the BMES student chapter at UVA put in significant effort to host the visiting students. Two banquets were organized for this two and a half day meeting at the historic setting of the UVA Rotunda. We are delighted that the Fall Meeting is now firmly a tradition of BMES.

Following this meeting, I was invited by Jack Linehan (the BMES president in 1993) to serve as the Chair of BMES Program Committee in 1992. Jack asked me to develop a document setting our interest to have a small to medium size meeting that could provide ample discussion opportunities for the attendees and to solicit formal meeting proposals from universities. The program committee received seven excellent proposals from universities planning to organize the 1997 and 1998 Fall Meeting. Taking into consideration a desire for geological balance, the program committee ranked these proposals and the Board selected the University of California San Diego (UCSD) as the primary host for the 1997 meeting and Case Western Reserve University for the 1998 meeting.

As I was voted in as the president elect in 1993, Bob Hochmuth called on me to represent the BMES in the first Consensus Meeting organized by the Federation of American Societies for Experimental Biology (FASEB) in Bethesda, MD. During this meeting, they developed a consensus report highlighting the contributions made by the scientific community to the health and economy of the nation and advocating the need for more support to health science research. At that time, FASEB had nine member societies with total individual memberships of about 70,000. The dues from member societies provide a lion's share of the operation cost of FASEB. These large memberships, together with the outstanding leadership of the FASEB, demonstrated their powerful influence on the way the government should support our nation's research enterprise.



During my 1994-95 term as the BMES President, I appreciated greatly the chance to work with the chairs of the committees. They were Vincent T. Turrito, Program Committee; Robert A. Peattie, Finance Committee; Gerard L. Cote, Student Affairs Committee; Robert M. Nerem, Awards Committee; Yong I. Kim, Membership Committee; Stanley E. Rittgers, Education and Public Affairs Committee; Knowles A. Overholser, Constitution and Bylaws Committee; Arthur T. Johnson, Affiliation Committee, and Michael E. Drues and Kevin C. Warnke, Interface with Industry Committee. A working document was made available detailing the charges assigned to these committees. Many thanks to these chairs and their committee members who volunteered their service to the BMES. I also want to acknowledge our former Executive Director Rita Schaffer in helping me carry out my responsibilities.

It was a great honor for me to preside over the 1995 Fall Meeting at Boston University. By this time, the presentations doubled in number over what we had in the 1991 Fall Meeting. Throughout the meeting, I was impressed with the effort made by the biomedical engineering students of Boston University in helping the faculty and staff run this meeting and in interacting with students from other universities. I want to repeat here my thanks to the organizers Herb Voigt and Kenneth Lutchen for the success of this Fall Meeting.

Through my positions in BMES, I was involved in the organization of the 1994 Summit Meeting of the Council of Societies of the American Institute for Medical and Biological Engineering (AIMBE) at Wintergreen, Virginia. At that time, the Council of Societies had 12 member societies. Some thirty key officials of these societies and AIMBE attended this meeting. With 32,000 individual memberships for these societies in mind, we had several brainstorming sessions aiming to address these questions: (1) what does your society want the collective AIMBE to do? (2) what resources does your society have that AIMBE could draw upon? (3) what roles does your society want the Council of Societies to play? (4) how best to strengthen AIMBE's public influence and to implement its charges.

As the Chair of the Council of Societies, I organized the 1996 Summit Meeting in Minneapolis to

specifically address two questions. The first is how best to improve the communication between AIMBE and the individual memberships through their affiliated societies. The second question is how to involve these members in AIMBE's role to advise Congress and the Federal Government in creating biomedical engineering policy that will benefit the health and economy of our nation. The attendees recommended AIMBE establish an office to enhance the communication with the member societies and their constituents and their involvement in AIMBE affairs. Discussions on such topics are ongoing in the Council of Societies and AIMBE.

In recent years, the National Institutes of Health (NIH) has documented government support in bioengineering research. NIH considered the establishment of an Institute for Biomedical Imaging and Engineering (ultimately set up by Congress). The Congress also doubled NIH's funding of bioengineering research. These progresses reflect clearly the influence of AIMBE on our policy makers in Washington DC. I am convinced that AIMBE will have a greater impact on our nation when the entire bioengineering community is involved in the advocacy goal of AIMBE.

In summary, bioengineering is an exciting, multi-disciplinary profession. Many professional societies are working together to promote the bioengineering profession. The nation appreciates the technology advances for health made by biomedical engineers. The public, the Congress, and the government recognize our voices. These activities are the mission of biomedical engineers to advance our nation in this Biotech Century.

Editor's Note:

The concern over the state of the Society journal prompted further discussion. The Publications Board expressed disappointment with the performance of Blackwell in subscription development. The Board recommended that the Blackwell contract be ended. The Board was actively seeking other publishing alternatives.

Lastly, total membership numbered above 2000 because of a 5.7% membership increase as reported by Yong Kim of the Membership Committee. An addition of five student chapters was reported by Gerard Cote of the Students Affair Committee.

Larry V. McIntire, PhD

President 1995-96

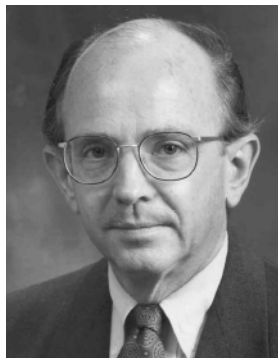
Board of Directors: Van C. Mow, Linda C. Lucas, James B. Grotberg, Helen M. Buettner, Herbert H. Lipowsky, Herbert F. Voigt, Paul N. Hale Jr., J. David Hellums, Virginia H. Huxley, Eric J. Guilbeau, Roger D. Kamm, Jeffrey A. Hubbell

Dr. McIntire's presidency focused on long-range issues regarding meetings and publications. The continued success of the Fall Meeting forced refinement in the selection process. The Program Committee utilized four criteria in selecting Georgia Institute of Technology for the 1999 meeting and the University of Washington for the 2000 fall meeting. They were: 1) facilities and resources of the host institution; 2) experience of the organizers in managing a meeting with 600 plus participants; 3) events actually planned for the evening meeting activities; 4) geographical location with recognition that there was a desire to alternate between East and West (but not a formal requirement). The 1996 meeting at Pennsylvania State University was already well-planned and organized by Herb Lipowsky and other members of the Bioengineering Program at Penn State. A detailed program, housing, and entertainment agenda with carefully calculated financial breakdown was given to the Board. The Annual Meeting planning had taken a decided step forward. A similar plan was put forward for the 1997 meeting in San Diego. This meeting, hosted by the University of California, San Diego, represented further evidence of growth. The fall conference had grown to a point where host institutions could not easily accommodate such numbers. The UCSD meeting was held at the Hyatt Islandia Hotel on Mission Bay.

The status of the *Annals* continued to play a central role in the conduct of the Society along with the annual meeting. The contract with Blackwell Science, publisher of the *Annals*, was due to expire at the end of December 1997. The Publications Board solicited proposals from Blackwell, FASEB, Allen Press, Springer-Verlag, and MIT Press.

The journal continued to grow and improve its standing within the larger scientific community. A total of 849 pages were published in 1995 of which 393 were symposia. The review process was smooth and on schedule. However, increases in the number of submissions placed pressure on the page limitations in the current contract. Blackwell required payment beyond the agreed upon 720 pages. Therefore, the Society had to buy the additional pages at a cost of \$8,000 (\$72 @ page). There were 171 manuscripts (up from the 148 in 1994). None were invited but the journal continued to grow in status.

Editor-in-chief Jim Bassingthwaight presented a financial breakdown of the professional and efficient editorial office. This careful accounting of costs and process parallels similar changes in preparation for the annual meeting. The Society had greatly professionalized its procedures and made it easier to plan both in an organizational sense but also in a financial manner as well.



Douglas A. Lauffenburger, PhD

President 1996-97

Board of Directors: Eric J. Guilbeau, Roger D. Kamm, Linda C. Lucas, James B. Grotberg, Helen M. Buettner, Jeffrey A. Hubbell, Herbert F. Voigt, Jerry C. Collins, Thomas C. Skalak, Eugene C. Eckstein, Rakesh K. Jain, Murray B. Sachs

The most important internal Biomedical Engineering Society (BMES) development during this period, in my view, was a definitive decision to aim toward being the flag-ship society of the biomedical engineering profession. This decision began to be manifested in a number of tangible forms. One was to move the BMES Annual Meeting from being held entirely on a university campus with a local orientation to being held in a city hotel/conference center with a broader orientation including substantial industry participation.

Correspondingly, a definitive decision was made to emphasize the singular role of the BMES journal, the *Annals of Biomedical Engineering*, in representing the core intellectual content of the biomedical profession with as wide visibility and deep impact as possible. A change to the new publisher was accomplished, with heroic effort by the *Annals* Editor Jim Bassingthwaite and the Publications Board Vince Turitto, Chair, Jack Linehan, Tom Harris, Shu Chien), and the *Annals* has rapidly grown in size and content.

Also correspondingly, a definitive decision was made to put the Society on a firmer financial footing. The chief method for achieving this fairly obvious goal was to require that the Annual Meeting budget provide for a reserve fund, which could then be applied to the Society afterward. This seems to have brought a substantial improvement in the BMES financial stability.

In terms of the intellectual progress within the profession, I believe that recognition increased during this period of the crucial nature of fundamental molecular and cellular biology to the way biomedical

engineering technology, research, and education should be pursued. Moreover, a very important discussion began regarding defining terms related to our profession more precisely so that we can more effectively communicate what we are capable of doing. Although there remains disagreement and debate across our community, in my view there is a growing notion that we will be best off defining Biomedical Engineering as a field of application in which principles and approaches from a spectrum of engineering disciplines are used to solve problems motivated by medicine and human health; in contrast, Bioengineering as, in fact, a new engineering discipline based on the fundamental science of mechanistic—i.e., molecular and cellular—biology. That is, the components and tools of bioengineering are biomolecular and cellular in nature, whereas the components and tools of the “traditional” engineering disciplines are predominantly non-biological physics and chemistry. Bioengineering will thus join the other engineering disciplines (e.g., Mechanical Engineering, Electrical Engineering, Chemical Engineering) as a partner discipline capable of advancing the application field of Biomedical Engineering. At the same time, Bioengineering should also be the main engineering discipline that helps advance the application field of Biotechnology, to solve wider societal problems in areas such as environment, manufacturing, defense, and so forth. I firmly believe that this clarity is critical to understanding our various missions and offering compelling explanations to lay people in society about these missions.



Editor's Note:

Substantial student involvement in BMES was reported for the year. Student membership as of September 1997 was 1,017. Seven new student chapters had joined in the last year bringing the total to 34. However, several had not renewed their charters. Suggestions were made to collaborate with AIMBE and IEEE-EMBS on joint chapters as a possible solution.

The San Diego annual meeting was financially successful for the Society: over 700 registrants with 48% students. The latter figure was up 40% from the previous year's meeting. The meeting at Penn State in 1996 also contributed a significant amount to the Society. The primary source of income remained dues and subscriptions. The *Annals* was the second means followed by Whitaker Foundation Awards. *Bulletin* ads, interest, and gifts also provided income. However, it was evident that the annual meeting was a significant source.

The Membership Committee, always charged with increasing membership, recommended that BMES set up a booth at a wider array of meetings, e.g., IEEE and Biomaterials Society. An increased budget would make this possible.

The report on the *Annals* revealed a slow but steady growth. Circulation had risen 3%. But costs arising from reprints, page charge write-offs, increased postage, etc., did not result in any increase in royalties. But the journal increased its ranking. The

Journal Citation Reports for *Annals*' articles rose from 19 to 14 in 1994.

Consistency in editorship was high on the list of concerns for the *Annals*. Jim Bassingthwaight's term as editor was due to expire in June 1998. The consensus was that the journal had improved significantly. The number of pages was up and the position of the journal within the field had improved. Jim had also found additional funding sources to augment the journal. The Publications Board gave unanimous recommendation for a second term. Jim was reappointed by the Board for a second term of three years.

The contract with Blackwell Science was due to terminate at the end of the year 1997. An evaluation committee, consisting of Jim Bassingthwaight, Jack Linehan, and Vince Turitto, presented a list of proposals from several publishers. Key issues considered were: number of page and issues per year, number of institutional subscriptions per year, improvement of journal ranking, reduction of cost to libraries, reduction of cost to authors, and revenue to the Society. Allen Press, American Institute of Physics, Blackwell Science, FASEB, and Springer-Verlag were the publishers under consideration. President Lauffenburger asked a summary with pro and con for each publisher be submitted by the evaluation team to the Publications Board. This board will then make a recommendation to the Board of Directors.

Herbert H. Lipowsky, PhD

President 1997-98

Board of Directors: Helen Buettner, Jeffrey A. Hubbell, Herbert F. Voigt, Eugene C. Eckstein, Jerry C. Collins, Murray B. Sachs, Gilda A. Barabino, John A. Frangos, Steven A. Goldstein, Rakesh K. Jain, Thomas C. Skalak, Salvatore P. Sutura

Reflections on the Year that Was. To reflect upon my term of president requires that I set the stage with a brief account of how I got to this point. As a retired aerospace engineer, I, probably like many of my colleagues, looked to the Biomedical Engineering Society (BMES) as a guiding beacon that would point the way toward a new career. In this capacity, the most important role that the BMES played in my transition was to offer a glimmer of hope in the form of a student membership. As a Ph.D. student in 1975, I thought that the membership card I had received, no matter how unadorned it was with frills and symbols, heralded the way toward a legitimate profession that awaited my graduation. I didn't realize at the time that the BMES was just a fledgling organization that was also looking for a future. Although the society was visible at various scientific meetings, and had its own journal, it really didn't measure up to the level of societies I was accustomed to in my previous career. It was not until 1989 when I became Head of the Bioengineering Program at Penn State that I realized that I needed a full service society; not only for myself, but also for the students that I was about to train. At that point I realized that I had failed to convert my precious student membership to full member, and quickly corrected my 14 year delinquency. Two years later, I attended the second annual Fall BMES meeting in 1991 at UVA, and based upon the tremendous success of that meeting, I shortly thereafter volunteered to host a subsequent meeting. That is when the fun began.

With the aim of hosting the 1996 Annual Fall meeting, I started to attend the Board of Directors' meetings to gain familiarity with the process of

organizing the meeting and to study the reports of past meeting organizers. Unfortunately, I spent so much time with the Board and the Program Committee that I fell victim to one of the late Rita Schaffer's infamous telephone calls that relayed an invitation by the nominating committee to run for a seat on the Board. Thus, it was in 1995 that I joined the Board and learned who was the BMES: it was Rita. As I wrote in her obituary in 1998, "Rita provided the necessary continuity, hindsight and wisdom for each new slate of officers. A frown, a cringe or a sigh was usually all it took from Rita to turn a headstrong full professor back toward the right path; and a smile, a giggle, or a laugh was equally sufficient to motivate the least skilled manager to chart a proper course for the Society." The growth of our Society was largely due to the organizational skills she exhibited in facilitating communication amongst the officers of the Society and arbitrating their disagreements. She was exceptionally skilled at defining the line between "divinity and tenure." It was difficult to say no to Rita, especially when she called in the summer of 1996 with another infamous invitation; this time to run for President of the BMES. Hence, I hastily put together a platform and biographical sketch which started a strange journey from glad to sad.

In preparation for the election, I wrote that it is "...the BMES alone that has the potential for representing the unique interests of biomedical engineers because of its strong emphasis on life science education and its growing academic base of accredited BME undergraduate programs and BMES student chapters. The BMES is in a strategic position to build



upon these strengths by fostering greater communication among its diverse membership through its symposia and forums, and facilitating greater communication between academia and industry. Toward these goals, I propose to enhance our visibility at national meetings, play a greater role in coordination of academic programs in Bioengineering, standardize our annual fall meeting in a format that serves the broadest spectrum of its membership, establish stronger industrial ties through establishment of an industrial advisory committee to the Society, institution of job fairs at our meetings, expansion of our society's journal, and development of a national lectureship forum through an electronic network of video links among universities and industry." With this platform beneath my feet I looked forward to taking office in the Fall of 1997, and put my imprint upon the future of bioengineering.

Needless to say, events didn't follow as expected. In the Fall of 1996, during and immediately following our BMES meeting at Penn State, Rita became mysteriously ill. She missed our annual meeting, and was in and out of the hospital prior to and following the meeting. At the time I took office in October, 1997 at the San Diego meeting, Rita just barely made it to our Board meeting. To me, not having Rita's assistance and guidance during this transition compounded the difficulty I was facing in recovering from organizing the '96 meeting. Lots of things had piled up during the previous year and I was late in getting my presidency off the ground. By March of '98, however, I was catching my second wind and we were all set to go to work and shape the future of the BMES. In April '98 we had our Spring Board meeting at the Experimental Biology meeting in San Francisco. This event was one of the saddest experiences I have ever encountered. Unbeknown to all of us, Rita had checked herself out of the hospital to attend this Board meeting. When I met her in the hotel lobby the evening before the meeting I was in shock. She was extremely frail, wobbled on her feet, and struggled to muster up enough energy to speak. How she managed to get through the meeting the following day was a mystery. Almost everyone in the room was taken aback by her sorry state and all eyes constantly glanced a peek at her every few minutes to see what was going on. Compared to previous meetings, this one was relatively subdued and painfully dragged on. During the following few weeks many of us frequently tried to call Rita but were unsuccessful. By mid-May, the officers of the Society were in a panic, and we convened a conference call to determine what to do next. I was selected to begin the hunt for Rita, and called the police where she lived. They were very nice, drove by her apartment and knocked her

door down, but found no sign of her. In the meantime, our Secretary-Treasurer Fred Weibell tracked down her family and learned that she was in the hospital. On Friday, I telephoned her in the hospital. She sounded weak and appreciative of our concern about her well being. She promised to call me as soon as she got out of the hospital early the following week. That call never came. She passed away a few days later; on May 19, 1998, at the age of 41, a victim of ovarian cancer and a medical system that could not save her.

At this point my struggles really began. Faced with the task of keeping the Society going, I grasped for any help that was available. Many people came to our rescue, either through valuable advice or good deeds. Friends and acquaintances of Rita volunteered their time and energy to help us through this difficult period. Our true savior, however, was John Peery; Rita's close friend. With access to her apartment, he was able to copy important data files from the disk in her computer and transfer them to CD-ROM. I rapidly became a quick study on how to use a relational database and transferred the membership files into Access. From then on I became the acting-Executive Director of the Society and attempted to keep the society going. I began to initiate the transition from a society that was run in a home office to one that had the beginnings of a real full service Society for the bioengineering profession. Fortunately, I had some excellent help from Eric Guilbeau, our president elect at the time, and Fred Weibell, our treasurer. As president, Eric administered the hiring of Pat Horner as our new Executive Director, and our troubles abated rapidly. Pat was a godsend with a vast amount of experience running professional societies and, most importantly, a long association with many members of our society.

I never did get to do many of the things I proposed in my presidential campaign. But, during the six months following Rita's passing I managed to fool a lot of people by doing things almost exactly as Rita had done, and taught us to do, such as mailing out notices and collecting dues, sending out bulk mailings, preparing the awards for our next Fall meeting, and conducting the election of officers for the following year. To make the operation of the society more efficient, I put up a list-server for sending e-mail to our membership. This latter project aroused the ire of some of our members, as it spit out multiple copies of e-mail messages until I figured out how to do it properly. I got one or two irate e-mails from members who complained and threatened to cancel their membership. One of them was even a past-president of the BMES who never knew what was going on.

The greatest satisfaction I received from all of this turmoil came not as president, but past-president.

With Eric's help I managed to contribute as best I could during his subsequent administration and enjoyed working with him as he hired Pat and set up the society office in Washington, DC. Then president-elect Herb Voigt was also a bright note who carried the ball to seek support from the Whitaker Foundation for a grand vision of the BMES as a full-service society for the bioengineering profession. I am particularly grateful to Eric and Herb for their support and the Special Presidential Award bestowed upon me during the Fall meeting in Atlanta, in 1999. It really was a surprise!

As for the future, I see that the Society is in good hands. Many of our dreams are being implemented by these capable and talented leaders, such as increasing our visibility at national meetings, serving the academic community, and strengthening our ties with industry. These are very exciting times for the field of bioengineering. We will all benefit from the future growth and prosperity of the BMES. Although little can match the excitement of my term of office, and being a retired statesman is boring, being a card carrying member of the BMES and the profession it represents sounds very good.

Editor's Note:

The Long Range Planning report reflected significant effort on the part of President Lipowsky and John

Peery. Thirteen items were listed of which nine reflected the growth of the Society and how leadership perceived its greater responsibilities:

1. Move the BMES Office to Washington, DC.
2. Evaluate how best to continue to provide high quality editorial support for the *Annals*. Determine whether the editorial office should be moved to headquarters in Washington, DC.
3. Secure a grant from the Whitaker Foundation to expand operations of BMES.
4. Increase membership by 10%.
5. Develop strategies to ease transition from student membership to full membership.
6. Institutionalize and expand student and industry participation in Annual Job Fair at Fall Meeting.
7. Evaluate whether BMES should develop plans for annual regional student conferences hosted by BMES student chapters.
8. Develop plans for a BMES sponsored Continuing Education Program for industrial members.
9. Evaluate whether BMES should develop plans for local chapters to better meet needs of BMES students working in industry.

As President Lipowsky had wished, the Society was in a position to be a full-service Society with a position of leadership.

Eric J. Guilbeau, PhD

President 1998–1999

Board of Directors: Jerry C. Collins, Rakesh K. Jain, Murray B. Sachs, Thomas C. Skalak, Gilda A. Barabino, John A. Frangos, Steven A. Goldstein, Salvatore P. Sutera, Kimberly Ward Anderson, Cynthia Sung, Robert T. Tranquillo, George A. Truskey

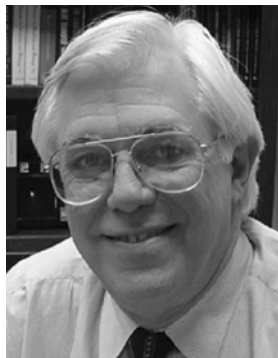
With the hard work of the BMES Board, Executive Staff, and Committees, the following accomplishments and events occurred during my tenure as President.

- A new, full-time Executive Director, Patricia Horner, was hired to oversee BMES operations.
- The staff of the BMES National Office was expanded. Denise Silver was hired as the society's first Associate Director.
- The BMES National Office was moved from Culver City, California, to the Washington, D.C., metropolitan area.
- The Society obtained a \$1,000,000 grant from the Whitaker Foundation to expand BMES operations and to help transition the Society to the "Full-Service Society for Bioengineering and Biomedical Engineering."
- Actions were initiated to move the editorial office of the *Annals of Biomedical Engineering* from the University of Washington to the newly established BMES National Office in Washington, D.C.
- A bylaws change was passed that eased the transition of students to full membership allowing student members to become full members immediately upon graduation.
- The Annual Job Fair became a continuing activity at the Annual Fall Meeting.
- A bylaws change was passed that changed the membership of the program committee to include past Fall BMES meeting organizers.
- Three issues of the BMES Bulletin were published following an interruption in its publication after the death of Executive Director and *Bulletin* Managing Editor, Rita Schaffer.

- A new edition of the BMES Membership Directory was published.
- The National Office of Alpha Eta Mu Beta, the Biomedical Engineering Honor Society, was moved to the National Office of the BMES.
- The BMES Board approved BMES becoming a "Cooperating Society" of the Accreditation Board for Engineering and Technology (ABET).

My year as President of the Biomedical Engineering Society was a year filled with emotion, uncertainty, and great challenge. As I sit reflecting on that year, I find myself once again filled with emotion and perhaps this is the reason that it has taken me over 18 months to begin the task.

It was a beautiful California morning in San Diego when Rita Schaffer told me that I had been elected president elect of BMES in a very close election. I had received only a handful of votes more than Herb Voigt who I had expected to win. Rita and I had worked closely together planning the 1994 Annual Fall meeting that was held at Arizona State University and subsequently afterwards during my service on the BMES Board. I always looked forward to Rita's phone calls because we enjoyed joking about some of the "difficult personalities" within our profession. Rita was fun to talk with and when we spoke in San Diego, I was happy that her health seemed to be returning following a long illness (presumably Crohn's Disease) that had caused her to miss the Annual Fall Meeting the year before at Penn State. Immediately following the conversation with Rita, Herb Lipowsky, the incoming president, congratulated me on my election,



and I recall asking him whether or not condolences might be more appropriate! I had expected to lose the election and had second thoughts about whether or not I was qualified to lead the society. Herb laughed and said, “Don’t you know that the office of President is the easiest office of all? All you have to do is make decisions—everyone else does all the work!” Of course we both knew this was not true, but we laughed and it helped us to feel good about the uncertainty that we both faced. Little did we know how profoundly wrong Herb’s prediction would be, especially for Herb!

In April of that year, I attended the Spring Board meeting in San Francisco and learned that Rita was gravely ill. We were all terribly sad to see her so weak and frail. Rita and I sat next to each other during the Board meeting and at one point during the meeting I asked if she was feeling okay and she responded, “They tell me I have Cancer.” I whispered, “Why are you here,” and although I cannot remember her exact words she let me know with a smile and a scolding frown that the BMES Board meeting was where she most wanted to be. I was devastated and recall very little of what happened during the rest of the meeting. In early May, I received a phone call from Herb telling me of his unsuccessful efforts to contact Rita by phone. With the help of the police and our long-time secretary-treasurer Fred Weibell, Herb learned that Rita was in the hospital and was able to speak briefly with her before she died on May 19, 1998. Although all of this happened prior to my year as president, I feel it was important to explain the sequence of events that set the stage for the challenges the officers of the society faced during this critical period for BMES.

My first official duty as a newly elected officer of BMES came after I received a phone call in which Herb asked if I would represent BMES at Rita’s funeral. Several days later I found myself filled with emotion sitting on a pew near the front of Rita’s childhood church listening to Jerry Collins and Geert Schmid-Schonbein give moving eulogies in her memory to a gathering of her family and friends. At a reception afterwards, I learned from her family and friends many of the details of Rita’s personal life and that nothing was more important to her than BMES. I learned that she had left the hospital against her Doctor’s wishes to attend that last Spring Board Meeting in San Francisco. I learned that she had left her entire estate to the Biomedical Engineering Society. I learned that the BMES National Office was in fact a post office box in Culver City, California, and that Rita looked after our society with love and care in an office on the upper floor of her Torrance, California, condo. I learned that Rita and BMES was very nearly one and the same thing. On the airplane

home, I resolved to make sure that all of Rita’s hard work for our society was not lost with her death.

During the remainder of that year, Herb Lipowsky did the hard work of running the day-to-day operations of the society with such efficiency that most of the members did not realize how seriously damaged were the operations of the society. Herb Lipowsky, Fred Weibell, John Perry, and I, with the help of the long-range planning committee under the leadership of Herb Voigt, began to develop a strategy for the future of the society. Under Herb’s leadership, we began to believe that it was possible to transition BMES from the small society run out of Rita’s condo to a “Full Service Society for the Profession of Biomedical Engineering.”

In preparation for the Annual Fall Meeting in Cleveland that would officially begin my year as president, I decided that a bold plan was needed if the society was to recover from Rita’s death. In my long-range planning committee report and at the Business meeting I presented thirteen goals that I wanted to achieve during my year as president:

1. Move the BMES National office to Washington D.C.
2. Evaluate how best to continue to provide high quality editorial support for the *Annals*. Evaluate whether the *Annals* editorial office should be moved to the BMES National Office in Washington, D.C.
3. Secure a grant from the Whitaker Foundation to expand the operations of the BMES to insure that we continue to provide a high quality Annual Fall Meeting and Journal for the membership, and better meet the needs of student members and industrial members.
4. Increase membership by 10%.
5. Develop strategies to ease the transition of student members to full membership.
6. Institutionalize and expand student and industry participation in an Annual Job Fair held in conjunction with the Annual Fall Meeting
7. Evaluate whether BMES should develop plans for annual regional student conferences hosted by BMES student Chapters on university campuses.
8. Develop plans for a BMES sponsored Continuing Education Program for industrial members.
9. Evaluate whether BMES should develop plans for local Chapters to better meet the needs of BME students working in industry.
10. Restructure the membership of the Program Committee.
11. Revise the Bylaws as needed.
12. Reactivate the Bulletin and insure that quarterly issues are published.

13. Begin the process of publishing an updated Membership Directory

I also announced that appropriate committees would be charged with helping to achieve each of these goals.

I was delighted that the Board approved relocating the national office to Washington, D.C., hiring a full-time executive director, and authorized the preparation of a grant to the Whitaker Foundation to obtain funds to help transition the society to the full-service society for bioengineering and biomedical engineering. Then the real work began. I asked Herb Lipowsky, Herb Voigt, and Fred Weibell to act as an executive committee and we developed a plan to temporarily locate the office in space at the Washington, D.C., offices of the American Institute for Medical and Biological Engineering (AIMBE). Kevin O'Connor prepared the necessary contract that was approved by the AIMBE Board. John Perry, with the help of Fred Weibell, began the process of packing the Society's records with the full intent of shipping them from California to the AIMBE office.

Knowing that most of my time would be consumed with the process of hiring a new executive director, I asked Herb Voigt, the new president elect and chair of the Long-Range Planning Committee to assume the task of writing the proposal to the Whitaker Foundation. Not thinking that it was really possible, I told Herb that the proposal must be written, approved by the BMES Board, and sent to the Whitaker Foundation in time for the January meeting of the Whitaker Board of Directors. Herb had only six weeks to write the proposal. I then went about the business of looking for a new executive director.

Several members had suggested hiring a search firm to identify candidates. Kevin O'Connor told me that a list of firms could be found on the American Society of Association Executives web page. So, late one evening feeling very alone and a little depressed in my office, I looked at the web page and found instead the list of firms and also a listing of advertisements from organizations looking for executive directors. An ad seeking a new executive director for the Society of Vascular Technology caught my eye. The ad referred applicants to Mrs. Patricia Horner. I had known Pat from the days of the Alliance and immediately picked up the phone and called the number in the ad. It was about 8:00 pm in Arizona and 11 PM on the east coast. To my surprise, Pat answered the phone and remembered me from the time when I was a young faculty member at Louisiana Tech. After a lengthy explanation of the task before me, Pat explained that she was retiring from the Society of Vascular Technology, which was located just outside of

Washington, D.C., and searching for a new director for that organization. To my surprise she expressed a very strong interest in becoming the new BMES Executive Director. As fate would have it, Pat was scheduled to be in Phoenix the next week and we agreed to meet so she could learn more about the opportunity. I recall hanging up the phone and thinking that Rita must have been looking over my shoulder when I looked at that web site. Who other than Rita shares a love for our society as strong as Pat Horner?

The board rapidly approved Pat's appointment, and I notified the membership of her appointment on January 27, 1999. Within weeks Pat was looking for a national office location in the Washington, D.C., suburbs. Pat signed the lease on the new office in May of 1999 and quickly furnished it. With John Peery's help the Society's records found their way to their new home in the Washington suburbs just in time to be announced at the Fall Meeting in Atlanta. Pat hired Denise Silver as the society's first Associate Director. The contract with AIMBE, although approved and signed by both organizations, was never implemented.

To my surprise when in late November or early December I received an 85-page proposal from Herb Voigt titled, "A Grand Vision for a Full-Service Professional Society for Biomedical Engineering." Herb had been quietly working with Jim Bassingthwaite and Paul Hale to produce a masterfully crafted proposal asking the Foundation for \$967,804 to help BMES transition to the Full-Service Society for Bioengineering and Biomedical Engineering. I sent the proposal to the Whitaker Foundation on December 9, 1998. It is hard to describe the excitement that I felt when I received a letter dated January 15, 1999, from Peter Katona, the President of the Whitaker Foundation informing me that the Foundation had approved a grant to BMES in the amount of \$1,000,000. Our Society owes a great debt to Herb Voigt. No single action by an individual has had or likely will have as much impact on the future of the society as the sacrifice he made during the fall of 1998 writing this proposal.

A great many positive things happened during 1998-1999 as a result of the hard work of our members. Alpha Eta Mu Beta, the Biomedical Engineering Honor Society, voted to move its national office to the BMES National Office. Bob Nerem and Janie Fouke organized the first joint meeting of the BMES and IEEE/EMBS in Atlanta. The meeting was the biggest ever and a great success. In the last minutes of my last Board meeting in Atlanta, I argued that the society should change its logo to reflect our new vision for the future. I was gratified that the Board voted to approve the change and add the phrase, "The Full-Service

Professional Society for Bioengineering & Biomedical Engineering” to the BMES logo. I felt at that moment and I continue to feel that the future of the society is secure. At the Business Meeting in Atlanta, I recall how proud I was to announce that all but a few of the goals that I had set forth at the beginning of the year had been accomplished by the various committees and officers of the society. I felt that we truly were on a path to becoming The Professional Society for Bioengineering and Biomedical Engineering. Jim Bassingthwaighe received a distinguished service award for his contributions to the society.

I ended the meeting filled with the same emotion that I had felt during Rita’s funeral as I presented with a quavering voice the Society’s first Presidential Award to Herb Lipowsky and a Certificate of

Appreciation to John Peery for their work to preserve the history of the society and to keep the society running following Rita’s death.

It was a year filled with emotion, uncertainty, and great challenge. It was also a year filled with the joy of joint accomplishment resulting from the hard work of many BMES members. I owe many members of our society a great debt of thanks for their help during this difficult year, but none more than Herb Lipowsky, Herb Voigt, Fred Weibell, John Peery, Jerry Collins, and especially Pat Horner. Pat’s energy, enthusiasm, and love for our profession and society are remarkable and deep. I think Rita is happy to know that Pat is now looking after the Society she loved so dearly with the same care and affection she provided for most of our history.

Herbert F. Voigt, PhD

President 1999-2000

Board of Directors: George A. Truskey, Cheng Dong, Francis A. Spelman, Gilda A. Barabino, John A. Frangos, Steven A. Goldstein, Salvatore P. Suter, Kimberly W. Anderson, Cynthia Sung, Robert T. Tranquillo, Linda G. Griffith, Kevin C. Warnke

The Coming Millennium

It seems somewhat strange to me to be contributing to this special “historical publication” having just served as Past president of the Biomedical Engineering Society (BMES). So in addition to writing about my year as BMES President, perhaps I can take the liberty of describing what led me to the BMES in the first place.

My first serious involvement with the BMES began in 1992, the year I became chair of the Biomedical Engineering department at Boston University. I had not intended to be department chair; in fact, I was originally scheduled to be on sabbatical in Jerusalem that year on a Lady Davis Fellowship. I found myself, instead, negotiating with Charles DeLisi, Dean of the College of Engineering, on the terms under which I would serve as chair. During these meetings I laid out a series of departmental goals. One of these goals was to bring a major biomedical engineering meeting to Boston University. I really didn't have a clue which meeting we might host, but I felt an important need to try to showcase my home department. It wasn't long before I found myself at the 1992 fall BMES meeting in Salt Lake City. Ken Lutchen, a colleague of mine at Boston University, was a member of the BMES Board of Directors and mentioned to me that the original meeting hosts for the 1995 meeting had withdrawn their invitation. I immediately suggested to Ken that he discretely inquire with the Board whether or not Boston University might host the meeting instead. Before the end of the Salt Lake City BMES meeting, I was certain that our request to host the 1995 BMES Fall meeting would be accepted.

By the time the 1995 BMES meeting was held in

Boston and hosted by my department, I was no longer chair; my three-year commitment had expired. Just before stepping down as chair, however, I was asked to stand for election to the BMES Board. Fortunately, I was elected and for the next three years I continued to meet the leaders of the biomedical engineering community from all over the country. I learned much about the issues facing the profession, a continuation of what I learned as a member of the Council of Chairs of Undergraduate Bioengineering and Biomedical Engineering programs, but on a larger scale. Most disconcerting, however, was the fact that Rita Schaffer, our Executive Director, began to show signs of her illness. The BMES was ill prepared to face the future without Rita—she was responsible for many aspects of our well being. No one, however, really knew just how ill she was.

My primary duty on the BMES Board was to chair the National Program Committee. The role of this committee was to assist the local hosts of the Annual Fall meeting with tracks that were difficult for the local organizers to handle. We were also responsible for soliciting proposals from potential hosts for future meetings and recommending these to the BMES Board for final approval. During this time, we developed a special form that allowed individuals to suggest to the National Program Committee inclusion of special member initiated sessions at the annual fall meeting. This was an attempt to allow those members, who didn't have access to track chairs, an opportunity to contribute to the construction of the meeting. I still believe this has great potential, although it probably has had only



limited success so far.

I stood for the office of President elect twice. I was honored when asked to run the first time, but made the mistake of not asking who my opponent was before accepting the nomination. As it turned out, Eric Guilbeau of Arizona State University was my worthy opponent. Eric and I had become good friends as a result of his role in the 1994 Tempe meeting and mine in the 1995 Boston meeting. His guidance through that period of time was invaluable. Eric won the election and went on to have a distinguished year steering the BMES toward understanding its obligation to become a "full service professional society for biomedical engineering." We had long discussions about what the BMES was and what it could and should become. He and Banu Onaral, the President of the Engineering in Medicine and Biology Society (EMBS) of IEEE, had a now famous dinner together during which they imagined one Society for all Biomedical Engineers. For Eric this simply meant that the EMBS would split from IEEE and join forces with the BMES. Of course nothing could be that simple. EMBS and BMES began talks, however, that led to several joint projects including the 2nd Joint meeting in 2002 in Houston.

The following year I asked past president Doug Lauffenburger about the policy of standing for a second term on the Board. My term on the board was ending and I wanted to remain involved at the national level. Doug, as chair of the nominating committee, however, asked me to give serious consideration to running for President elect again. I was very nervous about the stigma of losing a second time. How would I be able to show my face at future BMES meetings if I lost again? In the end, however, I felt that it was better to run for election than stay on the sidelines. There was much to do and if I were elected I would do my best for this field I have been thinking about since I was in high school. I was elected President elect that year, several months after Rita Schaffer's death. I believe my election statement clearly summarizes the state of my thinking at the time.

"Two recent events have shaped my thoughts regarding the viability/future of our BMES. First, the unexpected passing of our Executive Director has shown me that our Society's infrastructure is fragile. The current leadership is moving rapidly to address this issue, but at the core, we are a volunteer organization, and our success depends on you. Second, I discovered that IEEE is listed as the professional society submitting to ABET "program criteria" for bioengineering programs. BMES is not even listed as a supporting society in this effort. I feel strongly that if we are to emerge in the 21st century as a viable entity

representing Biomedical Engineering in this country we need to make some changes regarding our educational, membership, and industrial policies.

- 1. We need to be fully engaged in defining the program criteria for biomedical engineering. We can work with other Societies, like IEEE, but we cannot relegate our responsibilities to other traditional engineering societies, and still profess that we are the Biomedical Engineering Society.*
- 2. Biomedical Engineering is an immensely exciting field, appealing to some of the most talented young men and women attending university today. Students have told me, however, there is little value in becoming BMES members. I would initiate a study of what needs to change so that our students join and remain participating members after graduation.*
- 3. BMES needs to provide leadership in ensuring that industry recognizes the strength and resiliency of our curricula and graduates. We must educate industry leaders so that they seek our students. Coupling our Annual Meetings with Job Fairs is only a first step. Membership in our Society must provide benefits to our members. Perhaps the same is true for companies. I would like to establish a "Corporate Member" status for Biomedical Engineering Companies. This will begin the task of bringing industry directly into the structure and fabric of our Society. Our profession's future lies with the success of our industry.*
- 4. Finally, our reserve funds are not what they should be at the threshold of the new millennium. I would set a goal to double our reserve funds by 2001. This will free the leadership of money concerns when facing future challenges.*

It would be an honor to assist the Biomedical Engineering Society to achieve these goals, and help bring some of our profession's promises to fruition."

My first task, upon becoming president elect, was writing a grant proposal to the Whitaker Foundation that would at once set the BMES on a course that would culminate in its becoming the full-service professional society for biomedical engineers and insure its financial solvency. With little more than a month before the Whitaker deadline, I pulled together a plan that addressed many of the themes that were bouncing around the BMES Board meetings, i.e., relocation of the National Office to the Washington D.C. area; participating at the ABET accreditation table; enhancing Industry's participation at our Annual Fall meeting; continuing the Awards Program; creating a membership drive, promoting BME Day on College campuses;

initiating Society/Society workshops; creating web-based clearing houses for internship opportunities, for BME companies, and for BME faculty and consultants, etc. Jim Bassingthwaighe, Editor of the *Annals of Biomedical Engineering*, contributed a major section on expanding the *Annals* to 12 issues per year and keeping it on-line. Shu Chien, Publications Board Chair, and Carol Lucas, Publications Committee member, contributed to this section as well. Paul Hale laid out the blueprint for the BMES becoming a contributing society of ABET. This was considered the first step in becoming the Lead Society in ABET for Bioengineering and Biomedical Engineering programs. I asked Paul Fagette to contribute to the historical component of the proposal. I felt strongly that with time passing, we would lose access to some of the early leaders in the field and that it is appropriate for the BMES to try to capture valuable information about the start of our field in the words of these pioneers.

Also in the document was a promise to initiate fund-raising activities for the purpose of doubling our reserve fund, which was considerably less than a years operating budget. Thanks to numerous discussions with Eric Guilbeau, Paul Hale, Jim Bassingthwaighe, Herb Lipowsky, and Jerry Collins, the proposal practically wrote itself.

Early in 1999 we heard that the Whitaker Foundation would support the BMES' proposal with a maximum \$1,000,000 grant over the next five years. The Whitaker Foundation's generous support is making it possible for the BMES to achieve considerable milestones toward becoming relevant to its constituencies—academic biomedical engineers, industrial biomedical engineers and their companies, and biomedical engineering students. We are now in the third year of the award period and already there are signs that the BMES is in a stronger state than ever before. Membership levels were never higher. Some 2,842 members (including students) are listed in the current BMES directory. This represents a 43% increase in membership since 1997. Student member numbers rose from 1017 in 1997 to 1449 in 2000, a 42% increase. The quality of our Annual Fall meeting is very high and consistently financially successful. The Career Fair and Industrial Exhibitions at our Fall meetings still need work, but are consistently present at our Annual Fall meetings. The *Annals of Biomedical Engineering* published 11 issues in 2000, and the time between acceptance of a paper and its appearance in the journal is a remarkably short two months! The fund-raising activities started in 2000 have raised \$54,255 so far (our goal was to raise \$50,000 from members and 50,000 from Industry; the industry component was never activated because our

database of industrial contacts is not yet developed for such an outreach). Our reserve fund, however, has been doubled at least. Many former BMES presidents and board members have stepped up to the fund-raising challenge. A total of 33 members gave or pledged \$500 each. The Lee family made a very generous donation of \$40,000 to establish a new International Distinguished lectureship.

I transitioned from President elect to President at the 1999 Joint Meeting of the BMES and the EMBS in Atlanta. Several years ago we had agreed to this joint meeting as an experiment. Future joint meetings would depend on the success of the Atlanta meeting. With Bob Nerem and Janie Fouke heading up the organizing committee we were in pretty good hands. In Atlanta I found myself under pressure to have BMES agree to a second joint meeting in Houston in 2002. I was determined not to commit to a second joint meeting until some evaluation of the first Joint meeting was conducted and we had an opportunity to reflect on this experiment. The meeting organizers did not provide for a survey of the attendees, which, at the time, was normal, so the Board decided to conduct one itself. Working through the National Program Committee and the National Office a series of questions was formulated and put up on the web so that BMES members could provide feedback to the Board. Several problems with the first Joint meeting were identified and these formed the bases for negotiating with EMBS for a better future joint meeting. It was clear that a majority of BMES members liked the idea of joint meetings, but these were not to be exclusively with EMBS—sometimes we should meet with other Societies. We discovered that the member-initiated session forms were not handled properly and that there was a disconnect between the Session Chairs and the Central Organizers. The coherence of some of the sessions was not as high as it might have been. In general, however, the people who attended the meeting liked it. The experiment was a success and opposition to holding a second Joint session was fading provided the two Societies were equal partners in the joint endeavor. The 1999 meeting was highly successful both in terms of the scientific content and also in terms of the finances. The return to the BMES was in excess of \$70,000.

I was very pleased to oversee the renaming of the BMES Young Investigator award to the Rita Schaffer Young Investigator award during my term. This was a real tribute to our young and dynamic Executive Director who cared so much for the BMES' young scientists and engineers. I recall being stunned by the news that Rita had left her entire estate to the BMES with instructions that it be used to support the young people. What better way to honor her than to rename

our principal award for young investigators in her honor? To go one step further, we established an undergraduate award to go to an undergraduate in each of the 23 ABET accredited BME undergraduate programs in the country. The faculty in each program will select the student. As new BME programs become accredited, we expect to include them in this awards program. The first of these awards were distributed last spring. I can think of no better way to perpetuate the memory of Rita and recognize her generosity to such an appropriate audience.

One final initiative that I undertook while President of the BMES was bringing Alpha Eta Mu Beta, the National Biomedical Engineering Honor Society, under the protective wing and administrative oversight of the BMES. The BME Honor Society represents the best of the best. I was very pleased when the BMES Board approved a motion to provide travel funds for two Officers in each of the ten chapters of the Honor Society to attend the Annual BMES Fall in Seattle in 2000 and also attend the very first meeting of the Honor Society, where national student officers were elected. Brian Williams gave a very moving talk about his medical condition at this luncheon meeting (see his story in the *BMES Bulletin* Vol. 24, No 4. pg 15-18). One action taken at that meeting was a resolution that Alpha Eta Mu Beta would meet again at the 2001 BMES Meeting in Durham.

Of course, the best stroke of fortune for the BMES occurred the day Pat Horner, our Executive Director, came to work for us. She is a remarkable woman with a tremendous affection for the individuals that make up the Society. Pat has guided the Society from the brink of disaster in a logical and orderly way. She oversaw the relocation of the National Office first to temporary quarters within AIMBE, and then to Landover, Maryland where we are now. She brought back the BMES directory and the BMES Bulletin, which had not been published since Rita's death. She oversaw the creation of the membership database and got the website updated—although she would be the first to admit it still needs work. She is wrapping her capable arms around the Fall meeting, the career fair, and the industrial

exhibits. She is overseeing the move of the Editorial Office of ABME to the Landover Office and overseeing the financial records of the BMES by introducing modern accounting software and official audits of our business affairs. We owe our Pat Horner a big expression of thanks for all she has done to move the BMES forward; it would have been a much tougher job without her. Now that I have stepped into the past president's position, I can tell you I miss those weekly Friday afternoon phone chats with Pat discussing the various actions of the previous week or plans for the coming weeks.

The real financial challenges to the BMES began when Whitaker's contributions to support the programs identified in the Whitaker proposal dropped to 66% and the BMES' increased to 33%. The following year Whitaker's component dropped to 45%, while the BMES' component increased to 55%. And in the final year, Whitaker will provide only 22% of the funds required for the programs. By then the BMES must be very well along with increasing substantially the revenue streams that have been identified. This will be a major undertaking of the Society, but if successful, the BMES will be a remarkably strong Society serving the needs of biomedical engineers without support from the Whitaker Foundation, which is scheduled to sunset in 2006.

The dawn of the new Millennium provides us with an opportunity to stop and reflect on our activities, both personal and professional. Challenges remain for the BMES, but never before in the history of this organization do we stand to make a greater difference for BMEs all over the country, if not the world. We have our work cut out for us for sure—we are not yet at the ABET table; we have not yet made adequate inroads into industry. The value of our undergraduate degree is still not universally accepted by Industry, even though the brightest of the engineers seem to be flocking to BME undergraduate programs and 50% of these are women. As I said to the BMES Board at the last meeting I chaired: be as active as you can both in your professional society and in your home communities. We engineers are needed; we can make a difference.

Thomas C. Skalak, PhD

President 2000-2001

Board of Directors: Kimberly W. Anderson, Cynthia Sung, Robert T. Tranquillo, George A. Truskey, Cheng Dong, Linda G. Griffith, Francis A. Spelman, Kevin C. Warnke, Dawn R. Applegate, Kyriacos A. Athanasiou, Kristina M. Ropella, Wolf W. von Maltzahn

During the years I served as President elect, President, and past President, my greatest hope was to help encourage new students, new corporate members, and new colleagues to feel a sense of belonging—to consider the Biomedical Engineering Society (BMES) their home society. I mean “home” in the sense that the Biomedical Engineering Society is a place where the work of the BME discipline gets done and where a series of memorable and life-changing events are possible. BMES is a place where students first venture out to present their work to professional colleagues, exchange experiences with other students from across the nation, and compare their career goals and aspirations. BMES is a place where the best practicing biomedical engineers and scientists present their ideas and results in both research and education. BMES is a place where companies come to recruit the best young talent, to see the research base for new technologies, and to obtain continuing education for their engineers and scientists. Ralph Waldo Emerson said, “A chief event of life is the day in which we have encountered a mind that startled us.” At BMES meetings, each new speaker and each new encounter offers the chance for students and colleagues to experience just such a life-changing event.

The Biomedical Engineering Society is the only professional society dedicated wholly to biomedical engineering and bioengineering. We are “The Full Service Professional Society for Bioengineering and Biomedical Engineering,” a term coined by past president Eric Guilbeau. Founded in 1968 to promote the increase of biomedical engineering knowledge and its utilization, BMES today is the pre-eminent

biomedical engineering society, and its visionary goals remain steadfast - while the world at large is now recognizing the extraordinary impact of this unique discipline. It is one of the most important disciplines of the new millennium—with impact on health, population control, environmental sustainability, prosperity, and human dignity.

To help insure that BMES serves the discipline well, we pursued a number of objectives in 2000-2001, including the start of a \$10 million capital campaign, submission of a proposal to become the Lead Society for ABET accreditation, delivery of continuing education courses for industry members, the first introduction of a national student representative at the Board meetings, construction of a blueprint for BMES meetings of the future, and input to the newly formed National Institute for Biomedical Imaging and Bioengineering at the National Institutes of Health (NIH).

When I assumed office as President in the fall of 2000, I felt these were truly halcyon days for biomedical engineering and for BMES. The fall meetings were becoming recognized as the preferred meeting venue for the latest research results from top laboratories from a range of universities and companies. Student events were growing very lively, student chapters were becoming active at an unprecedented number of universities, and our national office was in fine condition due to the work of a number of BMES officers over the past few years. Funding from the Whitaker Foundation and NIH, among other important benefactors, was helping to create growing opportunities for the discipline and its chief goal of improving human health.



Great dreams take time to fulfill. But we are advancing toward implementation of some of the greatest dreams of bioengineers with each new discovery and each new design. The same is true of BMES, which was founded with a great mission, and it is valuable to remember that we all stand on the shoulders of others. We are closer to our goals today because of the dedication and effort of our members, meeting organizers, society officers and board members, committee chairs, national office staff, and financial support from many. As part of my opening address to the society, it was a great pleasure for me to thank past president Herb Voigt, on behalf of BMES, for a very productive two years as president elect and as president. Herb was the author of the Whitaker Foundation award proposal that supported many new activities in BMES—for example, the expansion of the *Annals* to 12 issues per year and the student honor society meeting at the Seattle Fall Meeting—and presided over a second major agreement with EMBS to hold a joint BMES/EMBS meeting in Houston in 2002. Thank you again, Herb, for your leadership.

It is impossible to recognize all the BMES community members who helped BMES to solidify our base and energize our meetings just prior to my term, but I would like to mention a few. Eric Guilbeau and his immediate predecessor as president, Herb Lipowsky, did critical work in lifting the society to its current state as a professionally-managed organization. A big part of that change has been made possible by our current Executive Director, Pat Horner, a woman of exceptional vision, integrity, and energy who truly knows the field of biomedical engineering and is dedicated to its goals. In 1997, then-president Doug Lauffenburger observed in the BMES Bulletin that “engineers can arise in two flavors—technologists (inventors or designers) and scientists (discoverers, perhaps)—because engineering rests on two complementary pillars of synthesis and analysis.” Certainly, a strength of BMES and a major source of its vitality is exactly its recognition of this diversity that is essential in our discipline.

While it is natural to recognize those immediately preceding one’s term in office, good ideas often originate much further back in time, and one’s service often—ideally, in fact—continues well after one’s term is ended. As an example, in 1984, the year I received my doctoral degree from the University of California, San Diego, Peter Katona, who was then President of BMES and today serves as President of the Whitaker Foundation, began the process of BMES involvement with ABET as a fundamental and lasting way to contribute to designing the educational template for future biomedical engineers. Seventeen years

later, in 2001, BMES applied to ABET to become the Lead Society for ABET accreditation. What strikes me now is the remarkable continuum of people serving people that BMES embodies. The real joy of serving in such a society is to give one’s time for others, in a cause that remains as vital today as when the society was founded.

A significant commitment of BMES during 2000-2001 was to initiate a major private fund-raising campaign, with a target goal of \$10 million. For individual donors seeking a worthwhile and fulfilling societal mission, this is the most direct way to truly make a difference in bringing the remarkable advances in biology and genomics to patient care and to biomedical engineered products that improve human health. Using the society’s first fund-raising brochure designed to address private philanthropy, we began to seek private philanthropic support for innovative symposia at annual BMES meetings. For a donor to permanently provide for our students to interact with the greatest minds of each generation is one of the greatest gifts—the gift of time itself. This campaign for BMES is still in the silent phase and is developing momentum as of this writing. Our Finance Chair, Kyriacos Athanasiou, developed a clear financial plan for growing the society. President Linda Lucas formed several task forces in 2002, including one on funding, to accelerate this aspect of BMES activities. Our hope is that future BMES leaders and members will be able to implement important services and innovative ideas to keep pace with a continually changing scientific and educational environment, using the support of a permanent endowment.

In the area of BME education, we enjoyed a historic and useful event—a visionary Biomedical Engineering Educational Summit meeting held near Washington, D.C., in December, 2000 with the leadership of Jack Linehan and the Whitaker Foundation. As part of this effort, a tremendous educational resource was put in place by the Whitaker Foundation—a web-accessible database of course syllabi from all BME programs. This resource alone will be valuable to educators designing new courses and new departments. BMES would very much like to assume stewardship of this resource in the future. A BME education should teach creative engineering design and synthesis, problem formulation ability, and appreciation for analysis and discovery as integral parts of biomedical engineering. A BME education should also teach personal integrity, curiosity, critical thinking, and respect for the work of others. In addressing the multiple challenges inherent in teaching, Albert Einstein said, “It is the supreme art of the teacher to awaken joy in creative expression and knowledge.”

It was a pleasure for me to serve BMES during the course of two outstanding national meetings, in Seattle and in Durham. Sandy Spelman (Meeting Chair, University of Washington) and Nitish Thakor (Program Chair, Johns Hopkins University) should be remembered for a superb 2000 Annual Fall Meeting of BMES in Seattle. It was clear that the range of technical sessions, educational events, and student meetings represented the best that bioengineering had to offer nationwide. The diversity of innovative new session topics alongside traditional strengths in integrative and systems bioengineering was particularly striking. New sessions included Genetic Networks, Molecular Arrays, and Integrative Modeling of the Cell. A moving tribute to Rita Schaffer was led by Jerry Collins, and we were reminded of Rita's practical and spiritual leadership of the BMES community. Rita's commitment to students was well-served by past-President Herb Voigt's organization of the first-ever meeting of the national biomedical engineering honor society, Alpha Eta Mu Beta, at a BMES meeting. George Truskey (Meeting Chair, Duke University) and Bob Hochmuth and Monty Reichert (Program Co-Chairs, Duke University) organized an outstanding 2001 Annual Fall Meeting in Durham the following year. Again, traditional sessions were blended with the new. An important accomplishment of the 2001 Meeting was the offering of mini-courses for industry and student members in three areas: Cell-based Functional Assay Technologies, Materials for Tissue Engineering, and Micropatterning Technology. Our hope is to grow this beginning into a major service for industry members year-round. The first two of the courses were delivered to excellent reviews. The third was cancelled due to travel problems associated with the events of September 11, 2001 in New York, Washington, and Pennsylvania. The fall meeting began with a minute of silence in memory of those who were lost and those affected most closely in that national tragedy.

Improving industry interactions and service was a major concern in 2000-2001. One of our primary BMES goals is to continuously increase the frequency and quality of our interactions with the biomedical engineering industry. This really means that we must serve the people who practice biomedical engineering, in ways that enhance their ability to create and develop new products and services that improve human health. One of the most common requests from our industry colleagues is for short courses or tutorials that provide an up-to-date introduction, review, or advanced treatment of some fundamental body of knowledge which underpins their development of new products. Kevin Warnke, a BMES Board Member from 1999-2002, chair of the Interface with Industry

Committee, and Senior Scientist at Abbott Laboratories, articulated and championed this avenue for industry interaction. Examples included:

- A course on bioreactor design, supporting various aspects of tissue engineering and drug/gene therapy,
- A tutorial on whole blood fluid mechanics, supporting development of point-of-care diagnostic microsystems, cell-sorting processes, or drug delivery strategies,
- A tutorial on micropatterning, supporting tissue engineering or microsensor development,
- An introduction to analysis of gene circuits, useful for bioinformatics software development, drug discovery, or gene therapy, and
- A course on molecular functional imaging, supporting imaging technology design, neurological research, and drug development.

Our commitment is to develop a broad palette of tutorials, designed and delivered by BMES members, that serves this need. It is one of the things we do best, and it is a natural way for academic biomedical engineers to help knowledge flow to the site of practice, where and when it is needed. We had not, however, been very active as a society in this regard, although many privately-run short courses existed throughout the country. If one wants different results, one ought to do something differently. In 2000-2001, we took a radically different approach to developing tutorials at the BMES Fall Meeting. At the heart of our strategy was an initial query to industry practitioners regarding their desire for a particular topic. For 2001, we focused on the Research Triangle Park area of North Carolina, so that tutorials at our 2001 Annual Fall Meeting in that area best served that constituency. At the same time, we invited input from all our industry members, potential members, and practitioners nationwide, so that the Annual Meeting tutorials will eventually serve all our constituents. This is a version of an approach advocated by one of the founders of Genzyme and experienced venture capitalist, Sheridan Snyder, who asserted a time-tested rule for any proposed new venture: "Interview at least forty potential customers (attendees) and find out their needs."

In turn, industry leaders gave their time and wisdom to our BMES students at the Annual Meeting in North Carolina in the form of student Lunches with Leaders. This program started at the Atlanta meeting two years earlier, and is being expanded each year with enthusiastic help from the active student groups of the host universities. There will be more choices each year for students who want to know "What's out there for me in the real world of BME?"

BMES was very active in articulating a vision for the discipline to national federal agencies in 2001. A historic event occurred regarding NIH organization, as a new Institute for Biomedical Imaging and Bioengineering was formed by mandate of the last piece of legislation signed into law by President Bill Clinton. At the same time, recognizing the enlarging scope of the discipline, NIH and NSF were beginning to communicate more closely on desired training programs for future biomedical engineers. BMES is a member of the American Institute for Medical and Biological Engineering (AIMBE), and this organization together with the Academy of Radiology Research (ARR) played a major role in the signing by President Clinton of the National Institute of Biomedical Imaging and Bioengineering Establishment Act (HR 1795) in December, 2000. This law created a new NIH Institute, and BMES strongly supported the actions of AIMBE in accomplishing this final outcome. The NIBIB budget was about \$40 million in 2001-02, based on NIH's total budget of \$23 billion. In 2002-03, the projected NIBIB budget grew to about \$120 million, and the expectation is that it can grow rapidly to the size of an average institute, perhaps \$1 billion over a period of time, based upon continuing success in its mission. Our aim, and that of AIMBE as articulated at that time by AIMBE President and BMES member Shu Chien, is to insure that ongoing bioengineering activities in existing Institutes are continued, while the new Institute focuses additional resources on activities that cut across institute boundaries. In January, 2001, representatives of AIMBE and ARR met with Dr. Ruth Kirschstein, acting director of NIH, and several other NIH leaders to address this important issue. There was a very encouraging consensus to keep bioengineering activities in the existing Institutes where they are most relevant, and focus the new Institute on cross-cutting, non-disease specific research and training. It is imperative that the new Institute be additive, enhancing, and integrative, rather than substitutive for existing activities. One of bioengineering's strengths is the interdisciplinary collaboration that leads to new understanding and approaches to disease prevention and therapy. It is essential to maintain the close association of such efforts with other disease-centered or basic science approaches within each Institute, rather than isolated from those approaches.

BMES offered more specific counsel on thematic areas as well. Input from BMES was initially provided in 2001 to Donna Dean, then acting director of NIBIB, and in 2002 to Dr. Rod Pettigrew of Emory University, named as the first permanent director of NIBIB. BMES input included many of the 53

professional interest codes listed in the BMES Directory, ranging across artificial organs, cellular and molecular engineering, biofluid mechanics, bioinstrumentation, medical imaging, sensory systems, bioelectric systems, therapeutic devices, and tissue engineering. There was also innovative input suggesting that a smaller number of integrated topic areas that capture the substance of the field as an "underpinning discipline" be supported, including, but not limited to: multiscale computational modeling and experimental testing of intracellular gene circuitry and cell/cell interactions, multicellular assemblies and function, improved biophysical and molecular basis for diagnostic imaging technologies, improved understanding of cell-substrate interactions to provide a rational basis for tissue engineering and in vivo remodeling, nano and micro-scale device/materials design for in vivo sensing, actuation, and drug delivery, field equations for tissue properties that integrate mechano/electric/biochemical effects quantitatively, and quantitative systems analysis of organs and diseases based on molecular/genomic information (an engineering branch of functional genomics/computational biology).

A joint workshop of NSF and NIH with a panel of academic leaders from around the country produced a report in 2001 detailing needs for new training grants in bioengineering, medical engineering, and bioinformatics. The report highlighted the need for training at all levels that incorporates quantitative biology and integrative systems modeling, interactions with industry, and infrastructure support. Linda Griffith (MIT), a 2001 BMES Board member, chaired the panel on bioengineering on which I served, and Murray Sachs (Johns Hopkins), a past BMES Board member and chair of Biomedical Engineering at Johns Hopkins, chaired the Medical Engineering Panel. In a separate NIH-sponsored Bioengineering Consortium (BECN) event entitled "Reparative Medicine" in June, 2001, many BMES members provided counsel on promising directions in bioengineering of in vivo and in vitro tissue remodeling methods that may form the basis for future regenerative medical practice.

On July 30, 2001, BMES submitted a proposal to ABET to become the Lead Society and a Participating Body in ABET for accreditation of biomedical/bioengineering programs. The proposal was remarkable for the breadth and depth of support provided, in an appendix containing 37 letters, by national leaders in ideas and national leaders in practice. A panoply of U.S. academic and industry leaders and practitioners warmly and convincingly supported the proposed new role of BMES as Lead Society for the growing discipline of biomedical engineering. We owe our sincere thanks to Dr. Paul Hale, who worked tirelessly to

develop this outstanding proposal. Paul, Pat Horner, and I delivered the proposal to ABET in a meeting with George Peterson, ABET Director, at their national headquarters at the Inner Harbor in Baltimore. Overlooking the expansive harbor, high in the summer sky, one could not feel anything but the highest hopes for the future stewardship of biomedical engineering education.

ABET is the national accreditation body for engineering education. For several decades, the biomedical engineering discipline has been developing, and we felt it was time that the leading society that is wholly dedicated to the profession becomes the lead society responsible for educational accreditation activities. BMES is the major society to which undergraduate students have allegiance (we had 86 student chapters nationwide in 2001), and thus is the natural point of responsibility for undergraduate educational accreditation. BMES has the breadth of membership and of professional interests to do this job, and we view it as our responsibility to the profession.

The support of a large group of practicing biomedical engineers representing the full spectrum of the discipline—in academic organizations, in health care organizations, in federal agencies, in private foundations, in large established corporations, and in small start-up companies—were essential to achieve success in the ABET endeavor. Obviously, many of us in the discipline belong to multiple organizations or have multiple professional skills, ranging across traditional engineering disciplines such as electrical engineering and chemical engineering to MBA and legal degrees to medicine. The process of becoming the Lead Society will not discourage any of those additional affiliations that we naturally have in this interdisciplinary field, but will simply achieve the goal of having a society dedicated to biomedical engineering is responsible for leading educational accreditation.

Other notable progress in 2000-2001 included a new BMES website operated out of the national office. Members can now access BMES historical information, current career opportunities, purchase BMES shirts and apparel for local chapters and faculty in the BMES shop all year round, look up member addresses on line, or read the latest issues of the Bulletin. In the future, we hope to place a substantial database of BME curricular materials on our site. Student chapters will compete to place photos or activities in prominent locations, encouraging national interaction among our students and their prospective employers who use the site. Bob Nerem and Linda Lucas co-chaired a special ad-hoc committee that wrote new guidelines for selection of the BMES annual fall meeting location and hosts, with the goal of insuring that future meetings are fully open to

input from the membership and serve our entire growing constituency.

The *Annals of Biomedical Engineering* was placed in the capable hands of our new Editor, Dr. Larry McIntire of Rice University in 2001. Thank you, on behalf of BMES, to Larry for embarking on an ambitious road that will certainly enhance the discipline. Larry plans to add substantial sections of the journal covering molecular, cell, and tissue engineering, among other areas. This development was a quiet one, but also one that may produce tremendous impact to the discipline and to BMES in coming years.

One of the real pleasures of the outgoing president of BMES is to present a number of awards to members who have provided distinguished service or made singular contributions to the society. It was my privilege to present Distinguished Service Awards to Shu Chien, for his role as publications board chair leading to the naming of Larry McIntire as the new *Annals* editor, for hosting a previous national meeting in San Diego, and for his leadership in AIMBE on behalf of BMES; to Bob Hochmuth, for serving as President, on the Board, and as Program co-chair of the 2001 meeting in Durham; and to Dan Schneck, for a range of contributions including serving as President, hosting the first annual fall meeting in Blacksburg, serving as editor of the Bulletin and on the Board, and advising his local student chapter. Finally, it was an honor to present the Presidential Award to Paul Hale, who played the primary role in achieving our BMES application to ABET as Lead Society. Paul worked tirelessly behind the scenes to insure that our effort would come to fruition, and we owe him a great debt of gratitude.

In such a memorable year, several things stand out as developments that may meet the test of time. The first is the ABET proposal to become the Lead Society. In this capacity, BMES will have the privilege and responsibility to guide future generations of students in their formative years. Of particular importance will be the interpretation and teaching of “design experience” as the nature of biomedical engineering itself changes. The second is the introduction of an official student representative to the national Board of Directors. The first student representative, Shayn Peirce, now a Ph.D. graduate, brought student perspectives directly to the Board beginning with the Spring, 2001 Board meeting. Working with Kristina Ropella of Marquette University, our Student Affairs committee chair, Shayn also helped put in place a national election system for future student representatives. This should insure the vitality and responsiveness of BMES connections to its most important stakeholders, the students of this discipline. The third

is a campaign for BMES that ought to free us of our financial constraints within five years. The fourth is that BMES welcomed its very first woman President, Linda Lucas, when she assumed office in October, 2001. This is a sign that BMES is embracing the diversity of the members who make up the society, and welcoming their skills and contributions. One goal is to help guide BMES members into alternative career paths, including top management positions, so that key decisions on hiring and strategic investments will be informed by BME education and training. We will draw strength from this in the future.

A major reason I was able to enjoy my years as president elect and president was the presence, talent, irrepressible charm, world-class memory, and dedication of Pat Horner. I still find it amazing that Pat is able to recall, on a moment's notice, the names and activities of past members of boards and committees not only of BMES, but of other societies of which she has been a part over a 40 year period. She has experienced the formative years of the discipline, personally chasing instrumented wood thrushes through the vast wheat fields of Illinois, meeting Dr. Michael DeBakey on the occasion of the first heart transplants, facilitating biomedical engineering consultations with NASA during early years of the Space Shuttle program, and helping to found AIMBE. An important aspect of her work has been her ability to surround herself with good people, the BMES staff, and I most thoroughly enjoyed working with Diane Solomon and Denise Silver as well. At every BMES meeting, Pat is ultimately responsible for every detail of organization, including the proper number of lunches for all attendees each day, but still has a smile for everyone in the "war room" behind whose doors she runs the meeting's details, and also the energy to speak incisively with such important delegates as Ms. Sue Van of the Coulter Foundation. For presidents and other officers, she prepares and helps us to negotiate a complex schedule of meetings and events, while preserving some of our time to interact with students and colleagues in the poster rooms and lecture halls of the meeting. She has greatly improved the appearance and content of the Bulletin over the past three years, personally writing much of the new coverage. It was, and remains, a pleasure to work with Pat.

In the course of things, what usually remains in the mind's eye are a handful of experiences that surround and give shape to our professional efforts. From the year 2000-2001, there are several images that remain strong and influential for me. I remember waiting for the ferry ride across Puget Sound in October in Seattle with Linda Lucas (president-elect) and George Truskey (2001 annual meeting chair), huddled in a

bay-side café drinking cold beer for refreshment despite the grey fog descending on the dock. I learned some of the ways in which Linda balanced family life with serving as Dean of a major engineering school, and how George was developing event plans for the next year's meeting in North Carolina. It was a restful punctuation to an energetic day of science and society business, and the three of us would speak together about BMES affairs often over the next year. On April 15, 2001 my proudest experience of the year occurred with the birth of our son, Scott Hawkins Skalak, to my wife Susan and me. He has been a joy to us, and of course we've shared his progress with Pat, Diane, and Denise in the BMES office. He has since been joined by a little sister, Linden Eleanor Skalak, on November 26, 2003. During the following hot summer, I remember navigating the streets of downtown Baltimore in mid-morning with Pat Horner and Paul Hale, on our way to deliver the ABET Proposal to ABET headquarters atop a tall building overlooking the Inner Harbor. Upon delivering the packet and departing the city together by car, we felt a palpable sense of setting the wheels in motion for a long-term association that would require much attention, but would serve students well.

Finally, we have a tradition in my own laboratory group of setting aside one night for dinner together when attending national meetings. I recall very fine meals at a downtown Seattle seafood restaurant called the Brooklyn in 2000 and at a Chapel Hill Italian establishment called Aurora in 2001, both selected after intensive research by students. At these gatherings, it is also a tradition for any student who is attending a meeting for the first time to present a story to the group, on any subject whatever that carries some personal meaning. This tradition is mentioned to the unsuspecting student at the latest possible moment, usually between the main course and dessert, leaving only a short time to prepare the story. (Any students reading this will have a head start, but it won't make the experience any less memorable.) Many students express their appreciation for the mentorship and friendship of their peers, for the opportunity to attend the meeting, and so on. On occasion, a student will share an imaginative parable or a heartfelt personal experience that has shaped their approach to life and work. Inevitably, the group is drawn closer together, and what remains is a shared sense of experience and of working toward a common goal. Through the eyes and experience of each individual, we are reminded that commitment, creativity, hard work, and simply doing things on the behalf of others really do make a difference. It reminds us of exactly what our society hopes to do for future generations of students, who will make a difference for human health.

Linda C. Lucas, PhD

President 2001–2002

Board of Directors: Cheng Dong, Linda G. Griffith, Francis A. Spelman, Kevin C. Warnke, Dawn R. Applegate, Kyriacos A. Athanasiou, Kristina M. Ropella, Wolf W. von Maltzahn, Sonya S. Clemmons, Andrew D. McCulloch, Richard E. Waugh, Frank C.P. Yin

During my year as President of the Biomedical Engineering Society, we embarked on a strategic planning effort. To start this effort, we asked BMES members to provide a listing of the areas that they think are the most critical for the continued development of our Society. While the responses to this request were numerous, there were five areas that were consistently stated as the ones with the highest priority: membership development, the journal, image, funding, and the annual meeting. On June 21–22, 2002, BMES members and staff gathered in Washington DC to work on a strategic plan. Mr. Mark Levin served as a program facilitator for the planning process. Using the pre-meeting input, we targeted our discussions and developed the following objectives for each priority:

- **Membership:** To increase membership in all targeted categories
- **Journal:** To be the leading publisher of cutting edge research in biomedical engineering and to be a source of income for BMES
- **Image:** To gain increased recognition for biomedical engineering as a discipline by industry, government, and academia
- **Funding:** To fund BMES at the highest possible levels (outside of membership dues)
- **Annual Meeting:** To be the preeminent event in the BME field

After establishing a broad objective for each of our targeted areas, we developed measurement criteria and suggested strategies for achieving our stated objec-

tives. At the end of the day, with the able guidance of Mark Levin, we had accomplished a lot, but it was clear that there was still much to do before a true strategic plan was in place.

After our June meeting, we developed five different task forces and asked BMES officers and members to serve as Task Force Leaders to follow up on the different areas. Our task leaders were: Kris Ropella (membership), Larry McIntire (journal), John Tarbell (image), Tom Skalak (funding) and Herb Voigt (annual meeting). Each task force prioritized the list of strategies defined at our June meeting. They determined which strategies addressed the greatest needs of BMES, which ones provided the greatest benefit, and which ones were the most cost beneficial. From this exercise, they determined strategies to pursue in the near-term and which ones are more long-term strategies.

It was exciting to think that BMES will have a Strategic Plan for the next five years. However, with any Strategic Plan, this is a living document that will be modified, updated, and changed as our Society continues to move toward its goal of being a “Full-Service Professional Society for Biomedical Engineering.” Herb Voigt and others defined a path for us in 1999; it is my hope that this strategic planning process will provide the path for the next five years and beyond. I want to thank all of the members and officers who have provided input and effort on the strategic planning effort and I especially want to encourage you to continue working with this wonderful organization that truly represents biomedical engineering and bioengineering.



John M. Tarbell, PhD

President 2002-2003

Board of Directors: Dawn R. Applegate, Kristina M. Ropella, Wolf W. von Maltzahn, Kevin C. Warnke, Sonya S. Clemmons, Andrew D. McCulloch, Richard E. Waugh, Frank CP Yin, Paul N. Hale Jr., Gabriele G. Niederauer, Melody A. Swartz, George A. Truskey.

One of the initiatives that I undertook as President of BMES was to institute an annual report on the state of our society. The purpose of the report was to inform our membership and other interested parties of recent developments across the broad spectrum of our society's activities.

The State of the Biomedical Engineering Society

The Biomedical Engineering Society (BMES) is an interdisciplinary society established on February 1, 1968 in response to a manifest need to provide a society that would represent both biomedical and engineering interests. The ongoing vision of the Society is "to be recognized as the preeminent full service professional society for biomedical engineering and bioengineering." The Society's mission is "to provide value to its members and other constituencies by promoting the increase and utilization of biomedical engineering and bioengineering knowledge, and by working for the advancement of the profession." These vision and mission statements were developed as part of a strategic planning process completed during the summer of 2002.

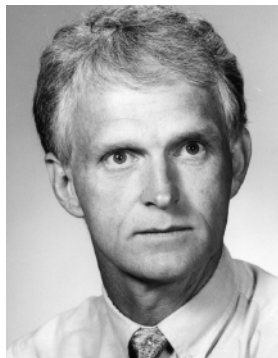
As we approach the 35th anniversary of the founding of BMES, the Board of Directors felt that a concise report on the status of BMES would serve not only to place our achievements in historical perspective, but also to provide an overview of the society for new members and potential partners in achieving our mission. This report highlights our status and recent developments in the promotion of scientific and technical innovation through: a diverse membership, comprehensive educational opportunities, cutting edge

publications, a dynamic annual meeting, prestigious awards, and broad interface with industry.

Membership: From its humble beginnings with 171 founding members in 1968, BMES now boasts 3,142 members. Membership in the Society has been growing at a rate ranging from 8% to 27% per year over the last three years. Our members come from all reaches of the profession including academia, industry, government, and students who constitute a large member category. Retention of students as full Society members after graduation is a challenge for the continued robust growth of the Society.

A new "Corporate Member" category, with two sub-categories – Silver and Gold – has also been established to provide incentives for industrial membership. Silver is designated for focused, small businesses while Gold is offered to substantial corporations of broad scope. An attractive benefits package is available for each of these corporate member categories. The BMES membership directory is now available (for members only) online at our website www.bmes.org. An aggressive membership campaign was initiated in the Spring of 2003 as we strive to continue increasing our membership by 10-20% every year.

Education: The Biomedical Engineering Society is poised to become an ABET (Accreditation Board for Engineering and Technology) Participating Body and Lead Society for Bioengineering and Biomedical Engineering Programs. We expect that this leading role in the formal accreditation of Bioengineering and Biomedical Engineering Departments at Universities



will be undertaken by BMES in fall of 2003. BMES will then provide the evaluators for Bioengineering and Biomedical Engineering Departments and will assume the leadership role in accrediting Bioengineering and Biomedical Engineering education in the United States.

Continuing education is also an important part of the BMES mission. During the 2002 Annual Meeting in Houston, BMES offered five workshops dealing with Real World Biomedical Modeling Techniques Through Case Studies, Biomedical Engineering Design Instruction, Point-of-Care Medical Device Communications (2 sessions), and Introduction to TeleHealth. In addition, a professional workshop on funding opportunities for BME researchers was presented by representatives from NIH, NSF, and the Whitaker Foundation. We plan to continue this series of workshops at our upcoming 2003 annual fall meeting scheduled October 1-4, 2003 in Nashville.

Publications: *The Annals of Biomedical Engineering* (ABME) is an interdisciplinary, international journal of high quality that is published as the official journal of the Society. The journal publishes original articles in the major fields of bioengineering and biomedical engineering. The editor-in-chief, Larry V. McIntire, of Rice University is a distinguished biomedical engineer and member of the National Academy of Engineering. Our 20 Associate Editors and 7 Review Board members comprise an additional group of distinguished bioengineers with expertise covering the breadth of the field. The journal publishes about 125 manuscripts per year. Review articles and special topic issues along with contributed papers constitute the journal's offerings. The journal is available in hard copy and online at <http://ojps.aip.org/abme/>. We are now in a position to ensure that ABME becomes one of the premier journals in the field of biomedical engineering.

The *BMES Bulletin* is published quarterly by the Society and is sent to all members. The Bulletin provides members with information about developments in BMES, accomplishments of society members, stories describing recent trends in this industry, upcoming events and meetings, advertisements for employment, a topical editorial, and review articles describing an area of biomedical engineering written for a general BMES reader.

Annual Meeting: The BMES Annual Fall Meeting for 2002 was held jointly with the Engineering in Medicine and Biology Society of IEEE, October 23-26 in Houston, TX. This joint meeting attracted 1,899 attendees. The 2002 annual meeting was organized around the theme "Bioengineering – Integrative

Methodologies, New Technologies" and featured 11 special topic mini-symposia sponsored by the National Institutes of Health, the National Science Foundation, and the Whitaker Foundation. More than 1,400 technical papers were submitted and presented in platform and poster sessions. The meeting also included 33 industrial exhibits and several pre-conference and conference workshops.

This meeting showcased the broad scope of biomedical engineering research designed to: (1) understand and manipulate biological function at levels of organization from the genome, to the cell, tissue and whole organism, using bioinformatics, molecular and cellular engineering, cell and tissue biomechanics, tissue engineering, cardiovascular and pulmonary engineering, and neural engineering; (2) diagnose the condition of biological systems and their components through imaging, medical visualization, nanotechnology, bioMEMs, sensors and signal processing; and (3) treat disease and disability by applying gene therapy and drug delivery technology, lasers, robotics and rehabilitation engineering, telemedicine and clinical engineering. If you did not have the opportunity to attend the meeting, you can still obtain an overview of the events and technical program by visiting the conference website at www.embs-bmes2002.org/. The 2003 BMES Annual Fall Meeting will be held at the Renaissance Nashville Hotel and Nashville Convention Center in Nashville, October 1-4, and will focus on the theme "Research, Education and Industry in Biomedical Engineering: Closing the Loop." Celebration of the 35th Anniversary of our Society will make the 2003 annual meeting an eagerly anticipated event.

Awards: BMES, with support from the Whitaker Foundation, the Wallace Coulter Foundation, and individual donors, sponsors a full slate of awards recognizing excellence in biomedical engineering. The following awards are given each year and presented at the Annual Meeting: BMES Distinguished Lecturer, BME International Distinguished Lecturer, Rita Schaffer Young Investigator, Graduate Student Research Awards (5), Undergraduate Student Design and Research Awards (5), BMES Student Chapter Awards (6), BMES Distinguished Service Awards, Annual Conference Awards, Annals of Biomedical Engineering Best Paper Award, and Annual Reviews Best Poster Award. In addition, Student Travel Awards support student attendance at the Annual Meeting.

Interface with Industry: An enhanced interface with industry is one of the new strategic initiatives developed by the Image Task Force created as part of

our new strategic planning process. Goals approved for Society implementation include instituting a plenary lecture from industry at future annual meetings, highlighting major BMES research areas that are of immediate interest to the industrial sector at annual meetings, continuing to provide continuing education and workshops at the annual meeting, pursuing industry sponsored research awards at all levels (student, young investigator, and senior investigator), and maintaining a BMES relationship with the Alliance for Industrial Internships.

Other recent Society developments were the creation of a new corporate membership category, several elected positions on the BMES Board of Directors going to industry members, and a new registry of BMES companies on our web site in the fall of 2002.

The Future

BMES has grown to become a central resource in our

profession during the past 35 years. The quality and talent of our volunteer leadership is a very significant component of the success of the Society. We were extremely pleased to learn that three of our current board members and two other Society members were appointed to the new ten member Advisory Council of the National Institute of Biomedical Imaging and Bioengineering (NIBIB).

The Society's Board of Directors is committed to continuing support of a wide range of programs and services that will assist members in their professional development. To maintain this commitment to our members, the Board is developing strategies to ensure the Society's financial stability and continuity into the foreseeable future. If you are already a BMES member or supporter, we encourage you to continue participation in the important activities of BMES. If you are not yet involved, we invite you to join our mission.

Annals of Biomedical Engineering



Editors

F. Eugene Yates, 1971-1974

John Lyman, 1971-1976

Donald Marsh, 1975-1978

James Meindl, 1977-1978

Peter Abbrecht, 1979-1984

Hun H. Sun, 1984-1993

James B. Bassingthwaight, 1993-2001

Larry V. McIntire, 2001-Present

Publication Board Chairs

John Lyman, 1977-78

Donald Gann, 1978-79

Wilson, 1979-80

Dudley Childress, 1980-81

F. Eugene Yates, 1981-82

F. Terry Hambrecht, 1982-83

Eugene F. Murphy, 1983-84

Lloyd Partridge, 1984-85

Richard Skalak, 1985-86

Thomas Goldstick, 1986-87

Bert L. Zuber, 1987-90

Artin Shoukas, 1990-92

Thomas Harris, 1992-94

Irving Miller, 1994-96

Vincent Turitto, 1996-98

Shu Chien, 1999-2001

Carol Lucas, 2001-2003

Roger D. Kamm, 2003-Present

Annals of Biomedical Engineering: A Historical Review

James B. Bassingthwaighte, MD, PhD
Editor, 1993-2001

Highlights:

- 1971:** Journal founded by F. Eugene Yates, MD, with John Lyman, PhD, as Co-Editors, Academic Press was the publisher. The initial number of issues per year was four, page size: 6.6 inches x 10 inches.
- 1978:** BMES became co-owner of *ABME* with Pergamon Press, succeeding Academic Press.
- 1979:** Issues increased from four to six per year, and 300 to 400 pages per year (Table 2).
- 1993:** Page size enlarged to 8 1/2 inches x 11 inches.
- 1993:** BMES became sole owner of *ABME* when Pergamon Press agreed to relinquish the journal publication. Blackwell Scientific contracted to produce the journal, but was not a co-owner.
- 1994:** Time for reviewing reduced to less than thirty days.
- 1994:** *Annals* presents contents, titles, and abstracts online at its website ([http:// nsr.bioeng.washington.edu/ABME/annals.html](http://nsr.bioeng.washington.edu/ABME/annals.html)).
- 1995:** The numbers of pages increased to 849.
- 1997:** Pages restricted to 720 per year due to lack of funding.
- 1997:** Whitaker Foundation's support of *ABME* allows printing of 1,100 pages.
- 1999:** *ABME* goes online with complete articles available for free downloading from the AIP website (<http://www.aip.org>).
- 2000:** Number of issues per year increased to twelve. Number of pages reaches 1,418.
- April 2000:**
ABME begins charging \$15 Per article downloaded from the AIP website.
- May 1 2001:**
ABME introduces Online Submission and Review. (Service provided by Scholar One.)

Editors:

- F. Eugene Yates, Biomedical Engineering, Univ. of Southern Calif., 1971-1974
- John Lyman, Engineering and Psychology, UCLA 1971-1976
- Donald Marsh, Bioengineering, Univ. of Southern Calif., 1975-1978
- James Meindl, Electrical Engineering, Stanford Univ. 1977-1978
- Peter Abbrecht, Physiology, Univ. of Southern Calif., 1979-1984
- Hun H. Sun, Electrical Engineering and Bioengineering, Drexel University, 1984-1993
- James B. Bassingthwaighte, Bioengineering, University of Washington, 1993-2001
- Larry V. McIntire, Bioengineering, Rice University, 2001-

Editorial Assistants:

- Kay Lyou, UCLA, 1971-1976
- Sarah Marsh, Univ. of Southern Calif., 1976-1978
- Anne Abbrecht, Univ. of Southern Calif.,
- Angela Kaake, Univ. of Washington, 1993-1995
- Nancy Oswald, Univ. of Washington, 1995-1998
- Renata Chmielowski, Univ. of Washington, 1999-2001

Managing Editors:

- Rita Jensen, Univ. of Washington, 1993-1998
- James Eric Lawson, University of Washington, 1999-2001

Publishers:

- Academic Press: 1971-1978
- Pergamon Press: 1979-1993
- Blackwell Scientific: 1994-1997
- American Institute of Physics: 1997-Present

Annals Manuscript Flow:

Year	Manuscripts Submitted	Articles Published	Book Reviews Published	Year	Manuscripts Submitted	Articles Published	Book Reviews Published	Year	Manuscripts Submitted	Articles Published	Book Reviews Published
1972	*	22	0	1982	*	17	0	1992	*	46	10
1973	42	14	1	1983	*	36	0	1993	*	63	13
1974	45	34	1	1984	*	43	0	1994	148	67	0
1975	62	30	1	1985	*	42	5	1995	171	62	13
1976	58	28	0	1986	*	37	12	1996	180	51	9
1977	*	31	2	1987	*	44	0	1997	156	86	6
1978	*	34	0	1988	*	37	18	1998	175	103	12
1979	*	28	0	1989	*	43	11	1999	175	79	14
1980	*	40	0	1990	*	41	1	2000	224	140	5
1981	*	42	0	1991	*	37	6				

*Exact figures on manuscript submissions for each year are not contained in the Society Board minutes. However, each editor reported on the ratio of approval/rejection. This ratio was very consistent throughout all the editors: rejection was always around 50% plus/minus a percent at most. Therefore, the reader can extrapolate a close approximation of manuscript submission by doubling the number of articles published.

Science Citation Ratings:

Year	Impact Factor*	Number of Pages Published	Year	Impact Factor*	Number of Pages Published
1972	N.A.	497	1995	0.750	849
1977	0.600	422	1996	1.230	720
1982	0.325	294	1997	1.197	1100
1987	0.787	626	1998	1.377	1125
1991	0.554	769	1999	1.190	854
1992	.0.855	735	2000	N.A.	1418
1993	0.802	751	2001	N.A.	~1300
1994	0.709	711			

*The Impact Factor is a broadly used, standardized measure designed to indicate the impact a given article or journal has had, as reflected by the frequency of their citation in a given time period. It is the number of citations recorded in the year preceding the reporting year on those articles published in *ABME* during the two years preceding the year in which the citations appeared, normalized by dividing by the number of articles published in those same two years. For example, the Impact Factor for 2000 is the number of times an article published in 1997 or 1998 was cited in the 1999 world literature.

A historical summary: Recent development in the *Annals*:

The *Annals of Biomedical Engineering (ABME)* was started in 1971, with the first volume appearing in 1972 under the leadership of John Yates and John Lyman. It grew slowly, for many of the society's members submitted their publications elsewhere to stay within their own original communities. See Table 1 for numbers of articles submitted and published each year.

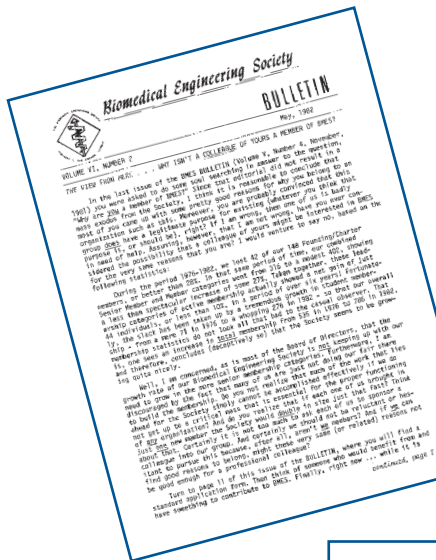
Academic Press decided in 1978 to end its role in producing the *ABME*. Though Academic Press actually owned the title to the journal, they were happy to relinquish ownership and the end result is that it was taken over by Pergamon Press who held joint ownership of the title (the *Annals of Biomedical Engineering*) with BMES. This proved to be a blessing in later years. In the early '90s, Pergamon was bought out by Elsevier. Their interest in the *Annals* was probably sincere, but the duality of work done by Pergamon was not up to scratch, and we ended the contract with them at the end of 1993. I came on as Editor of the journal in July 1993, on the basis of contracting with a new publisher. I had hoped that we would team up with a not-for-profit publisher, of which there are a few around the U.S. But Blackwell Scientific made an offer that the Board of Directors could not resist, as they offered more profit to the Society than we had ever had from Pergamon, and it was secure. Blackwell thus became the publisher on behalf of BMES, but this time BMES was the sole owner of the journal. Blackwell, though a fine

publisher in their own right for books and other periodicals was not really suited for the *Annals of Biomedical Engineering*. We terminated that contract at the end of 1997. Since then the American Institute of Physics, a not-for-profit producer of a fairly large number of journals mainly in the field of physics has produced the journal with excellent results.

The recent steps of enlarging the page size (1993), increasing the number of pages published per year (1995 onward), and increasing, by a little bit, the pressure on authors to reduce their article length and the numbers of references, has allowed a continual increment in the number of articles published per year. There was actually one year, 1996, in which the cost of publication with Blackwell Science restricted the publication of more than 720 pages, so quite a backlog built up for publication in 1998. Since 1994, the acceptance rate has hovered between 40-50%; that is, the rejection rate is about 55%. What allows this high rejection in comparison with earlier years is the fact that there are more articles, and better quality articles, being submitted to the *Annals* than in earlier times. The field is really beginning to be recognized. The increase in the number of issues per year has reduced the time between acceptance and publication, again allowing for an author's work to appear faster in print, and encouraging submissions. At twelve issues per year, rather than six, more pages can be published, and sooner.

The review system implemented in 1993 has facilitated the process of review and made it simpler for the Associate Editors. The burden, however, is taken up by the main editorial office. Here the Editorial Assistant, rather than the Associate Editor, contacts all of the potential reviewers and nags them for their prompt reviews. This has reduced review time to a month or less, but there are still some exceptions. The Online Submission and Review, begun May 2001, should speed up this process still further. Online review and decision-making will save the Society money only if all of the authors, reviewers, and Associate Editors make it work well. To keep things moving, nothing can replace a few minutes per day from a conscientious Associate Editor.

BMES Bulletin



Editors

Daniel Schneck, 1976-1985
Steven M. Lewis, 1985-1991
Jerry C. Collins, 1991-2001
Steven M. Slack, 2002-Present

Bioengineering Science News Editor

Geert Schmid-Schoenbein, 1990-1993

Science News Editors

Rena Bizios, 1993-1994
Steven M. Slack, 1995-2002

A Short History of the Biomedical Engineering Society *Bulletin*

Daniel J. Schneck, PhD

Editor 1977-1985

and

Jerry C. Collins, PhD

Editor 1991-2001

According to the BMES History page in our directory, the Biomedical Engineering Society (BMES) was incorporated in Illinois on February 1, 1968. However, it was not until February 1977 that the first issue of the BMES *Bulletin* was published. That first issue was edited by then-president John Urquhart, and contained a want-ad: “Editor needed,” said the ad. “The duties of the editor will be to gather appropriate news, format it, and send it along to the Society office for reproduction and mailing. Cost reimbursement will be for stamps only, so the applicant will have to be pretty dedicated!”

The first “dedicated” editor to be appointed by the Publications Board of BMES was Dan Schneck, who took over starting with the August, 1977 issue, Volume 1, Number 2. “Formatting” and layout was produced on an IBM Selectric typewriter, itself an historical item now. Schneck’s wife Judi (an accomplished professional violinist pursuing her own active career as well) actually did all of the typing and layout work, changing fonts by hand with different typewriter elements when necessary. The format was 5-1/2 by 8-1/2 inches, so that a single 8-1/2 by 11 sheet sufficed for four printed pages. The first issues of the *Bulletin* were four pages in length. As its availability became more well known to the scientific community, and progressively more and more contributions to the *Bulletin* were submitted, pages were added in increments of four, starting with an 8-page issue in November, 1977 (Volume 1, Number 3), then a 12-page issue in May, 1980 (Volume 4, Number 2), and finally, a 16-page issue in November, 1982 (Volume 6, Number 4)—all still in a 5-1/2 by 8-1/2 Format, and all still being diligently laid-out and typed by Dan’s wife, Judi, who worked nights and weekends to get the publication out in a timely manner

In May of 1985, Dan wrote his last editorial for the *Bulletin*, “All Good Things Can Only Get Better,” in which he announced that he was stepping down as editor, “passing the relay baton” to Steven M. Lewis. As Steve took over the editor’s job, so, too, did Rita Schaffer, then Executive Director of the BMES (and its only employee), assume “Judi’s” position of Production Editor as she began publishing the *Bulletin*

from the BMES office in her home. Quarterly publication of the *Bulletin* then continued with Steve’s first issue as editor, Volume 9, Number 3, August, 1985. Adoption of Adobe PageMaker as the publishing software environment enabled the *Bulletin* to be presented in its current, attractive, more versatile, 8-1/2 by 11-inch page size. Still averaging 12 pages per issue, however, the *Bulletin* now turned into an information-packed publication that really promoted Biomedical Engineering, in general, and the Biomedical Engineering Society, in particular. Each issue now routinely contained a President’s Column, an Editorial, Student Chapter News, lots of Society News, Employment Opportunities, Letters to the Editor, a Calendar of Events and forthcoming Conferences, Meetings, Workshops, etc., and News and Current Events in the field of Biomedical Engineering.

During Lewis’s tenure as editor, the position of Science News Editor was established. Geert W. Schmid-Schönbein was the first to hold this position. His tenure was followed by those of Rena Bizios and then of Steven Slack. This important development allowed the inclusion of an article relevant to the bio-engineering profession and written at a scientific level and style that would appeal to student and non-specialist readers. The first Bioengineering Science News article, “Tissue Engineering: A Future for Bioengineers,” was written by Richard Skalak, and appeared in the November, 1990 edition of the *Bulletin*, Volume 14, Number 4—at which point this publication increased to 16 pages!

Volume 15, Number 1, February, 1991, included Lewis’s last editorial, “Passing the Torch,” in which he announced that Jerry C. Collins would now be taking over as the new editor of the *Bulletin*. Also during 1991, an improved “glossy” paper started to be used, and *Bulletin* page-numbering went to a consecutive (rather than a “per-issue”) style, which produced 68 total pages for the four issues of Volume 15. Collins’s tenure as editor was interrupted by the untimely death of Rita Schaffer. During 1998, the *Bulletin* was not published—there is no “Volume 22” of the *Bulletin*—a silent tribute to Rita’s distinction and prominence

not only as the long-time Executive Director of BMES, but, also, of her significant role and dedication as Production Editor of the Bulletin. The Society struggled in many ways after Schaffer's death until current BMES Executive Director and Bulletin Managing Editor Pat Horner was identified.

The Bulletin resumed publication with the 8-page, Volume 23, Number 1, 1999 edition. Under Pat's leadership, and the now-new editor, Steven Slack, who took

over for Jerry Collins in 2001, the format of the *Bulletin* has continued to evolve and improve, returning to its average 20 pages per issue, and now including multi-color publishing with continued evolution of sections and columns. Perhaps when it becomes appropriate at some time in the future, publication frequency may go to bi-monthly and, eventually, to monthly. There is certainly plenty of material to write and report about as the field of Biomedical Engineering continues to grow and mature.

My Association with BMES

Fred J. Weibell, PhD

Secretary-Treasurer, 1979-present

My earliest involvement with the Biomedical Engineering Society was through John Lyman back in 1974. I was still in my PhD Program at UCLA and John was my faculty advisor. Since my dissertation dealt with microshock as applied to electrical safety in the hospital, John asked me to write a survey article on “Electrical Safety in the Hospital – 1974” for the *Annals*. In 1979, after I had received my PhD, John, who had been serving as Secretary-Treasurer, was elected President of BMES and needed someone to take his place as Secretary-Treasurer. So he asked me if I would consider serving in the position. I accepted, and have been in that position ever since.

At that time, Kay Lyou, who was John’s Administrative Assistant at UCLA, was Executive Director of BMES. I remember going to Kay’s home on several occasions to count ballots or to create a financial report and budget for the year. Kay’s living room was the BMES Office and the Society’s files were kept wherever Kay had space in her home.

Because of Kay’s many involvements, it soon came necessary for her to hire an assistant, a young lady named Rita Schaffer. Rita caught on quickly, and soon was doing most of the Society’s work. In the early 1980s, Kay turned everything over to Rita, who became Executive Director and served in that capacity until her untimely death in 1998. Before long, when Rita needed to get together for ballot counting, preparing financial reports, or setting up a budget, she would either drive out to my office at the VA Medical Center in the San Fernando Valley, or I would go to her condo in Torrance. I was always impressed by Rita’s dedication to the BMES and the countless hours she would

spend in running the “office,” preparing materials for meetings and keeping up with correspondence for the Society. Her unexpected death brought about a sudden crisis for the BMES. Through the efforts of Rita’s parents, who regularly picked up the Society’s mail at our Post Office Box, John Peery, who was able to extract information from her computer in a usable fashion, Herb Lipowsky, who was able to set up the membership data base on his computer, and many others, we somehow made it through the gap until Pat Horner came aboard.

It was indeed a miracle that Pat was available at this crucial time to take over the Executive Director function and get the BMES going again. Without her unique experience in managing professional societies such as ours, and her willingness to tackle such a difficult task, the recovery process would have been much more lengthy and painful than it was. Not only did Pat know the business, but she seemed to know almost everyone in the field from her long years at AEMB and other organizations. I had the privilege of working with Pat when I was Program Chair for the ACEMB both times it was held in Los Angeles.

It has been interesting and exciting to follow the growth of the BMES. In 1979, the BMES was still a small upstart organization, primarily aimed at academia, and focused much in the areas of physiology and biomechanics. Our meetings consisted of a few sessions at the FASEB meeting, often presented jointly with other societies. The *Annals*, though much smaller than it is now, had already become a respectable Journal. Its production over the years has involved many publishers, including Academic Press,



Pergamon Press, Blackwell, and the BMES itself in conjunction with students participating in a growing number of student chapters.

In my years with the BMES, the Society has experienced what I consider to be two quantum leaps. The first was the inception of our annual Fall Meeting in 1990, which gave BMES its own meeting. Starting in a rather small way, held originally on college campuses, I have been privileged to watch the Fall Meeting become so successful that it can no longer be held on a campus. The challenge today is to accommodate the growth without losing the campus connection or compromising the benefit to our student members.

The second great step forward began more recently with the receipt of the grant from the Whitaker Foundation, which is enabling the BMES to expand its service to biomedical engineering to become the professional society for all aspects of biomedical

engineering. Such measures as expanding the *Annals* from six to twelve issues per year and revitalizing the Alpha Eta Mu Beta honor society have already been achieved. Becoming the lead society for biomedical engineering in ABET appears very promising.

Being a part of all of this growth and progress is all very exciting, but I think the main reason I have stayed on as Secretary-Treasurer throughout all of these years is the opportunity to get to know and associate with so many great, dedicated people. The Executive Directors, Kay Lyou, Rita Schaffer, and now Pat Horner, have each put heart and soul into the building up of the Society. The list of Presidents I have had the privilege of serving under reads like a "Who's Who" of biomedical engineering greats. Each president has done his part along the way to move the Society forward. What a wonderful opportunity it has been to work with each of them!!

BMES Secretary-Treasurers

John E. Jacobs, 1968-69

Hans Wessel, 1972-74

John Lyman, 1974-79

Fred J. Weibell, 1979-Present

The Biomedical Engineering Society and Its Journal - The Early Years

Kay Lyou

Editorial Assistant, Annals of Biomedical Engineering, 1971-1976

Executive Assistant, Biomedical Engineering Society, 1974-1981

I want to start this, “Once upon a time, long, long ago... “ because it seems that it was a long time ago that John Lyman, who ran the Biotechnology Laboratory at UCLA, and who was my boss, called me into his office and said that he had been asked to be a founding editor of a new journal for the Biomedical Engineering Society. He needed an editorial assistant, and I was to be that person. The year was 1971.

The Biomedical Engineering Society was incorporated as a nonprofit organization in Illinois on February 1, 1968. The first Open Meeting of the Society was held in conjunction with the Federation of American Societies for Experimental Biology (FASEB) in the Belmont Room of the Ritz-Carlton Hotel in Atlantic City, New Jersey, on April 17, 1968, and the first Annual Meeting was held in Houston, Texas, November 18-20, 1968, in conjunction with the 21st Annual Conference on Engineering in Medicine and Biology, later to become the Alliance for Engineering in Medicine and Biology. At the Atlantic City meeting, caretaker officers were installed: Otto H. Schmitt as President, and John E. Jacobs as Secretary-Treasurer. At the Houston meeting, the first regular officers were installed: Robert Rushmer as President and John E. Jacobs as Secretary-Treasurer. There were 83 Founding Members and 178 Charter Members. Hans U. Wessel became the Society’s Secretary in 1969, and took over as Secretary-Treasurer in 1972. The Alza Lecture, a vehicle for distinguished lecturers to present their work at the Society’s Annual Meeting, was established in 1971.

Academic Press, then located in New York, was the first publisher of the *Annals of Biomedical*

Engineering, and John Lyman and F. Eugene Yates were its Founding Managing Editors. What a delightful learning experience it was to begin a journal from scratch. The editors had been involved with other professional journals, and taught me the processes of peer-reviewed journals, so I was able to develop a procedure for handling our manuscripts. There were no forms; we developed our own. I visited the editors at Academic Press in New York, and learned first hand a lot that I needed to know.

Huge rolls of butcher paper were spread out across John Lyman’s living room floor to record the pros and cons of how things needed to be established. Once we had worked out the details, we met regularly at the Lyman home. We gathered around John’s dining room table after our regular work days: John Lyman was a Professor of Engineering and of Psychology at UCLA, and Head of the Biotechnology Laboratory in the School of Engineering and Applied Sciences; Gene Yates was a Professor of Biomedical Engineering at USC and had his own laboratory; and I was still employed full time as an editor in the Biotechnology Laboratory. (Fortunately, John is a gourmet cook, or we might not have managed the *Annals* at all.) The editors would discuss who the reviewers should be and dictate the necessary letters and, because they were both interested in everything, and both loved to tell stories about their professional experiences and their travels, lots of the subjects were explored as we consumed whatever John had cooked up for the evening. We managed to complete the work at hand, and had an incredibly good time. The experience of working on a journal from its beginning is simply irreplaceable.



Donald J. Marsh took over Gene Yates' editorial position in 1974, the year Yates was President of the Society. I left the editorial assistantship to work on my master's degree in 1976, and Don's wife, Sarah Marsh, became editorial assistant. She served through 1978, and was succeeded by Anne Abbrecht. In 1974, John Lyman became Secretary-Treasurer for BMES, and I got another of those calls into the office. I soon became Executive Assistant for the Biomedical Engineering Society.

Somewhere early on, I realized I needed some help with the work of the journal and the Society, and my daughter and her friends told me about a high school classmate, Rita Schaffer. Rita was an excellent typist, reliable, a quick learner, and a delightful young lady with an incredibly fine dry wit. By the way, during her school years she was also an outstanding gymnast. Even as a high school student, Rita had more just plain common sense than the average individual, and I came to consider this wonderful person as part of my family. She worked with me until she completed her college degree. For many years, Rita came by for Thanksgiving after-dinner coffee with us on the way home from her family dinner. I was privileged to get to know members of Rita's family over the years, and am grateful that my work with the Society and the journal created this opportunity in my life.

Rita helped me with every facet of the journal and the Society. We typed everything on an IBM Selectric II typewriter, including the *BMES Directory* and the *BMES Bulletin*. I believe our first formal *BMES Directory* was printed in 1975, and our first *BMES Bulletin* was sent to the members in February, 1977. It is not well known that Rita had a fondness for Godzilla on TV, but everyone in my family knew it.

She would work with me every Saturday; when the chores were of the stuffing-envelopes sort, there was always Godzilla.

Incidentally, it was either late in 1976 or early in 1977 that the UCLA Student Chapter of BMES, sponsored by Thelma Estrin and John Lyman, was the first to be granted a charter by the Society. John Lyman retired as Secretary-Treasurer in 1979, and Fred Weibell took over that position.

I held the post of Executive Assistant to the Society until Rita Schaffer carried boxes of history of the Society and its journal from my house to hers in 1981. There were 785 members of the Society that year. Rita had attended the Annual Meeting of the Society with me, and the Board had agreed that she would be the appropriate person to take over as Executive Assistant upon my retirement from that position. The Board of Directors assured me of a lifetime membership in the Society, for which I am most grateful.

Rita was of the age of computers, and soon the *Directory* and the *Bulletin* took on a new, slick, updated look. The format for the *Annals of Biomedical Engineering* changed as well. As the Society matured, Rita devoted her considerable talents and remarkable intelligence to improving the Society's stature and its image. I am incredibly proud to have been the person to introduce Rita Schaffer to the Biomedical Engineering Society, and more sad than I can express at the loss of my friend. I am glad that Pat Homer, whom I have known for more years than either of us wishes to recall, has agreed to take over the management of the Society; her experience and background is exactly right for where BMES is now, and I feel certain that the Society will continue to grow under her care.

Tributes to
Rita M. Schaffer, 1957-1998
BMES Executive Director 1981-1998

Herbert H. Lipowsky
President, 1997-98

From the *Annals of Biomedical Engineering*,
Vol. 26, No. 5, 741-742, 1998

The Biomedical Engineering Society (BMES) mourns the loss of Rita M. Schaffer, Executive Director, who tragically passed away in Torrance, California, on May 19, 1998 at the age of 41. Born and raised in Culver City, California, her high school interests in gymnastics spurred her interest in exercise physiology which led her toward her associations with the Society's founders. While a high school student in the seventies, she worked part time as a secretarial assistant to Kay Lyou, the first Executive Director of BMES. Rita attended California State University at Northridge and majored in communications. She began her career with the BMES in 1981, when she served as secretary to Eugene F. Yates, former BMES President (1974) and at that time Chair of the Publications Committee and Co-Editor of the Annals with John Lyman. Yates was the first director of the Crump Institute for Medical Engineering at UCLA (now the Crump Institute for Biological Imaging) and hired Rita to assist in the publication of the Annals and a book he was writing. Rita quickly became a valuable partner: "She was a natural," states Dr. Yates, who had the highest praise for her "editorial gifts." She renewed her association with Kay Lyou, still the Executive Director, and worked with determination and enthusiasm for the BMES. In a few short years she took on

the responsibilities of Executive Director of the Society. Rita refined the position as she steered the Society through a period of growth and prosperity during which its membership grew almost tenfold along with the field of bioengineering.

Rita was a strong advocate for student participation in the affairs of the Society and focused her efforts toward stimulating the growth and activities of student chapters. She encouraged students' competition for the Society's Meritorious and Commendable Achievement Awards. Rita's database of student members enabled her to track them from year to year to ensure that they had every opportunity to become regular members upon graduation. This effort reflected one of her many talents that served the Society well: that of data analysis. She maintained a relational database that tracked over 2000 members of the Society, and used it effectively to publish the Society's annual directory. Rita was skilled in the arts of desktop publishing and graphics art design, and designed the covers of the society directory each year. She personally typeset the Society's Bulletin and oversaw the details of its production.

While the Society changes its elected officials annually, Rita provided the continuity for the Society, conveying her insight and wisdom for each new slate of officers as they assumed their positions. This may have been her most important contribution, steering the officers of the Society to focus on the critical needs of the BMES. A frown, a cringe, or a sigh was usually all it took from Rita to turn a headstrong full professor back toward the right path, and a smile, a giggle, or a laugh was equally sufficient to motivate



the least skilled manager to chart a proper course for the Society. The officers depended on Rita to remind them of the timelines for the annual events. When it came to conducting the Annual Fall Meeting of the Society, Rita's input greatly reduced the burden on the local meeting organizers. The growth of this annual event, from about 100 scientific papers in 1990, to over 750 papers in 1998, was in large part due to the organizational skills that Rita exhibited in facilitating communication amongst the officers of the society and arbitrating their disagreements. She was exceptionally skilled at defining the line between "divinity and tenure."

To Rita, the Society was more than just a group of academicians, scientists, and engineers seeking to improve the quality. To her it was life itself. She immersed herself in its day to day operations and it became her life. It is a remarkable indication of her commitment to the Society that she signed herself out of the hospital the month before her death so that she could attend the Spring meeting of the Board of Directors in San Francisco and provides us with her advice and counsel as we planned for the future. It was a source of inspiration to us all to learn that Rita left the bulk of her estate to the Society, so that we may use the fruits of her labors to enhance the organization that she cherished to the end.

Rita leaves behind her parents, George and Mary Schaffer of Culver City, California, and her brothers John, Robert, and Paul Schaffer and sisters Mary Walter and Teresa Edmonds. In addition, she leaves behind her cherished friend, John Peery, who has made an effort to ensure that the affairs of the Society will continue uninterrupted during this transition. On behalf of the Society, I offer our sincerest sympathies to them and a heartfelt thank you for sharing Rita with us all these years. She shall be greatly missed.

Jerry C. Collins
Bulletin Editor

Editorial, BMES Bulletin, Vol. 23, No. 1, 1999

We celebrate the life and mourn the passing of Rita Schaffer, executive director of the Biomedical Engineering Society. I worked with Rita for almost eight years as editor of the Bulletin. My working relationship with her at the time of her death was the longest continuous one of any member of the Society with the exception of Fred Weibell. Editing the Bulletin was a relatively easy task because of the leadership Rita exercised in putting the Bulletin together.

She assumed the responsibility of soliciting Bulletin columns, gently at first and then more forcefully, assembling and coordinating the other components of Bulletin content, formulating camera-ready copy of each page, and taking the final copy to the printer for printing and to the mailer for mailing. It was my responsibility to write or solicit an editorial column, to help edit the scientific articles for readability, and to proofread the final copy. Maintaining Bulletin throughout, given busy schedules and the tyranny of the urgent, was undoubtedly frustrating to Rita, but despite the stress I don't recall an angry word from her to me. I was perplexed that recent issues of the Bulletin seemed to take longer to be formulated in Rita's office. I understand reasons for the delays now.

Rita separated her personal and professional life to a great extent. As a single female and the only employee of a 2000-member society, the membership of which is largely male, it was wise of her to do so. Several of us BMES members were able to attend Rita's memorial service and to meet her family and friends. We learned several things about Rita Schaffer that you should know.

First, Rita was much more ill and for a much longer time than most of us in the Society realized. She was in and out of hospital and therapy for much of the last two years of her life. Most of us were not aware of the extent of her illness. There were times when the BMES phone would ring and Rita would be there, too ill to answer. It amazes me that she was able to function at any level.

Second, her family recognizes BMES members as her extended family. The admiration and respect they had for Rita was obvious. However, they also wanted to meet people with whom Rita had worked. As her sister Teresa said, the BMES was the focus of Rita's life.

Third, the BMES is Rita's principal beneficiary. Although others may have remembered the BMES in their wills, I don't know of anyone else who has left the majority of his/her estate to the BMES.

Fourth, I have come to realize how close BMES member and special friend John Peery was to Rita, and how much he did and continues to do for the BMES. He set up much of the computing and communication Rita used in her office. He has continued to serve the BMES by identifying and distributing Rita's office and computer files and helping Fred Weibell, Eric Guilbeau, Herb Lipowsky, Herb Voigt, and others make sense of the flow of the Society's business. He has done this at great personal cost and with a heavy heart, as he has traveled many weekends from a demanding job hundreds of miles away.

One person who can speak with conviction about Rita is Steven Slack, Science Editor of the Bulletin.

He writes:

"I first met Rita Schaffer in October 1993 at the BMES Annual Meeting, hosted that year by the University of Memphis and the University of Tennessee, Memphis. Our busy schedules allowed only brief conversations at that meeting, and so I didn't come to really know Rita until November 1995 when I accepted the position of Science Editor for the BMES Bulletin. For the next two years we communicated on a weekly basis, working to promote the quality and reputation of the Bulletin. Along with Jerry Collins, Rita suggested we establish a web page for the Bulletin, and that we did soon thereafter. She frequently mentioned that students, both undergraduate and graduate, constituted a significant portion of the Bulletin readers, and that electronic access to the Bulletin would benefit them greatly. Indeed, Rita worked very hard to involve students in the BMES, and credited them for their contributions, insisting, for instance, that the names of students maintaining the web page be published in each issue of the Bulletin. Considering the time of day I sometimes called her, it was clear that Rita worked very long hours on behalf of the Society. She was truly dedicated to promoting the cause of biomedical engineering, through enhancement of the Bulletin, through formation of student chapters, and through meticulous organization of

the affairs of the Society. I think the impact of her passing has yet to be fully felt in our organization. Rita and I very quickly developed a strong rapport. We would discuss many issues, BMES related or not, and always with the periodic whirring and beeping of her aging fax machine in the background. Rita possesses a wry sense of humor, a gift she used, I believe, to cope with life's frustrations and setbacks. Along with the many other people whose lives she touched, I do and will miss her greatly."

We live, we are told, in a time of fragile self-esteem, which leads to psychological and emotional ills and antisocial behavior. The popular press is inundated with methods and ideas of how to build self-esteem in others and ourselves. Viktor Frankl once wrote that genuine self-esteem comes when we recognize that those whom we have loved appreciate us. Rita loves us and we knew it. It is frustrating no longer to be able to express directly to Rita our appreciation of her love for us. However, it is appropriate that student members, as they receive awards and scholarships in her name, will be able to recognize and honor this remarkable woman who loved us all intensely but them especially. It is also appropriate for the rest of us, as the Society matures and flowers, to remember and honor Rita, whose passion continues to give us life.

The BMES National Headquarters

Patricia I. Horner

Executive Director, 1998-Present

My association with biomedical engineering began in 1965 as Executive Assistant for the BioInstrumentation Advisory Council (BIAC) at the American Institute of Biological Sciences (AIBS). It was as a member of the BIAC Council that I first met Otto Schmitt, the founding president of the Biomedical Engineering Society (BMES). Lester Goodman was also a member of the BIAC Council and later the founding president of the Alliance for Engineering in Medicine and Biology (AEMB), a consortium of professional associations that shared an interest and participation in the interaction between engineering and the physical sciences and medicine and the biological sciences, including BMES. BIAC assisted with the founding of the AEMB and management of the Annual Conference on Engineering in Medicine and Biology (ACEMB) and John Busser and I subsequently left AIBS to open the AEMB office.

During my tenure at the AEMB, I met many of the BMES past presidents as they served on the AEMB Council and its committees, including Bob Rushmer, Don Gann, Dick Johns, Bob Plonsey, Larry Katz, Peter Katona, Jerry Saidel, and Jack Linehan. John Lyman and Mort Friedman served as general chairs of Annual Conferences on Engineering in Medicine and Biology and Dick Johns and Fred Weibell served as program chairs for the ACEMB. Fred Weibell actually served as program chair for two Annual Conferences on Engineering in Medicine and Biology and Kay Lyou assisted with the details of the ACEMB when John Lyman was chair. I had the pleasure of meeting Rita Schaffer at both the ACEMB and Experimental Biology meetings. Bob Plonsey also served as Treasurer of the AEMB.

My association with the Biomedical Engineering Society (BMES) began with its founding meeting in Atlantic City. At the time I was Assistant Director of the AEMB and we offered to host the BMES meeting during the ACEMB in Houston. Later I became Administrative Director and then Executive Director of the AEMB and we subsequently closed the AEMB and founded the American Institute for Medical and Biological Engineering (AIMBE). The 41st and last ACEMB was held in conjunction with the World Congress on Medical Physics and Biomedical Engineering in Houston in 1988 with Bob Nerem and Gary Fullerton as Co-Chairs of the meeting. Bob Nerem also chaired the 34th ACEMB in Houston in 1981.

It was during the time of the Alliance for Engineering in Medicine and Biology that Dan Reneau from Louisiana Tech and treasurer of the AEMB, founded the national biomedical engineering honor society, Alpha Eta Mu Beta, which used the same acronym as the AEMB. BMES offered a home to Alpha Eta Mu Beta in 1999 and Herb Voigt, BMES past president, currently serves as AEMB National President.

The Alliance for Engineering in Medicine and Biology offered management services to other associations and so at the same time I served as Executive Director of several other related organizations including the American Medical Informatics Association (AMIA), RESNA Rehabilitation Engineering & Assistive Technology Society, Society of Prospective Medicine (SPM), and as newsletter editor and conference manager for the Engineering in Medicine and Biology Society (EMBS) of IEEE.

I also provided management for the Second International meeting of the International Society for Artificial Internal Organs (ISAIO). BMES past president Jim Reswick and I met when he was a keynote speaker at an ACEMB and again when I was Executive Director of RESNA. We voted to move the AEMB and related organizations to the association management company of Smith Bucklin & Associates where I also served as executive director of the American Association for Continuity of Care, Society of Vascular Technology, and Society for Cardiovascular Management.

The National Science Foundation provided a grant to the Alliance for Engineering in Medicine and Biology to develop an infrastructure for bioengineering in the United States in 1989. The project was sponsored by the AEMB and the U.S. National Committee on Biomechanics and the steering committee consisted of Bob Nerem, Art Johnson, Dov Jaron, Savio Woo, Jerry Schultz, Cliff Brubaker, Win Phillips. Principals in biomedical engineering and bioengineering were invited and several workshops were held. As a result of the recommendations from these workshops, the American Institute for Medical and Biological Engineering (AIMBE) was founded. The members of the AEMB voted to close and to turn over the AEMB assets, including their 501(c)3 status, to AIMBE. I have the privilege of being a founding member of AIMBE.

After AIMBE began operation, I began to move away from biomedical engineering, but still within the healthcare field. I left Smith, Bucklin in 1994 as executive director of the Society of Vascular Technology (now the Society for Vascular Ultrasound). I had given 2 years notice that I would retire from SVT in December 1998 when I received a call from Eric Guilbeau, BMES past president. Eric said BMES had lost Rita Schaffer, their executive director, and they wanted to move to the Washington, D.C. area and asked if I might be able to assist them. I worked part-time for BMES from October to December 1998 and began full-time in January 1999 at the AIMBE office in Washington, D.C. BMES received a grant from the Whitaker Foundation in February 1999, and after the Board meeting at the Experimental Biology meeting, we opened our first office in May 1999 in Landover, Maryland.

We had a number of challenges to overcome as we opened the new offices. Herb Lipowsky was president at the time of Rita's death and he served as the office until we could begin operations; he began by providing us with the BMES database and records he

had available. John Peery was in the process of packing Rita's office in California, but those records did not arrive until July. Prior to the 1999 joint meeting in Atlanta we were able to publish the Bulletin and a new membership directory and to purchase furniture and a computer system for the office. We assumed partial management of the BMES Annual Fall Meeting in 2000 and began provision of full conference management with the meeting in North Carolina. BMES now has a staff of six, including Mike Hamm, deputy executive director; Denise Silver, director information systems and membership; Diane Solomon, office manager and meetings coordinator; Dionne Harley, membership assistant; and Regina Conwell, accounting assistant.

Over the years I have seen many Presidents and Boards of Directors come and go, our membership grow, conferences with over 1,000 attendees, and our activities grow. But that's not what BMES is all about. BMES is not just an association, it's people—wonderful people, and I have measured my time with BMES in terms of people. I can't possibly thank all of you for your support and for your friendship, but I would like to acknowledge just a few of the special people who contributed to my professional and personal growth along the way.

Several people share the responsibility for my tenure with BMES: Eric Guilbeau for remembering me from the AEMB; Herb Lipowsky who shared the transition; Fred Weibell for being such a great friend; Herb Voigt with whom I served my first full year with BMES; George Truskey who shared the first BMES sponsored conference I managed; and, most importantly, to Tom Skalak because of his faith in me and in my ability to do what was always in BMES' best interests. Several others hold a special place in my heart—Jerry Collins for his work on the Bulletin, Shu Chien for his devotion to the journal, and Paul Hale for his efforts on behalf of BMES with ABET, and thanks also to Linda Lucas and John Tarbell, BMES past presidents. Finally, thanks to Bob Nerem and Kerry Athanasiou for their trust and unfailing support over the years.

We have accomplished much in a few short years, but there is still much to do. For me, joining BMES has been like coming home again. It has been a real joy and honor for me to have served as your director and to watch you grow, and I am grateful to you for allowing me that privilege. I look forward to many more years with BMES, and many more Presidents, conferences, and friends.

BMES SCIENTIFIC AWARDS

BMES Distinguished Lecturer Award

Alza Distinguished Lecturer, 1971-1993

The Alza Distinguished Lectureship was awarded to encourage the theory and practice of biomedical engineering. Sponsored by the Alza Corporation from 1971-1993.

- 1971 - Richard E. Bellman
- 1972 - Arthur C. Guyton
- 1973 - Norman G. Anderson
- 1974 - Walter Rosenblith
- 1975 - Arthur S. Iberall, General Technical Services, Inc.
- 1976 - George Bugliarello, Carnegie-Mellon University, *Biofluidmechanics: Quo Vadimus?*
- 1977 - Max Anliker
- 1978 - Earl H. Wood, *Evolution of instrumentation and techniques for the study of cardiovascular dynamics from the thirties to 1980*
- 1979 - Robert Rushmer
- 1980 - Robert W. Mann, Massachusetts Institute of Technology, *Rehabilitation engineering*
- 1981 - Gerson Weltman
- 1982 - Madison S. Spach
- 1983 - Richard Skalak, Columbia University, *Biomechanics at the cellular level*
- 1984 - Laurence Young, Massachusetts Institute of Technology, *BME in space: Adaptation to weightlessness*
- 1985 - Eugene Garfield, Institute for Scientific Information, *Mapping the world of biomedicine*
- 1986 - James Bassingthwaighe, University of Washington, *Into the microcirculatory maze with machete, molecule, & minicomputer*
- 1987 - Van C. Mow, Columbia University, *In-vivo effects of mechanical loading on diarthrodial joints*
- 1988 - Robert Plonsey, Duke University, *Bioelectric sources arising in excitable tissues*
- 1989 - Yuan-Cheng B. Fung, University of California, San Diego, *What are residual stresses doing in our bodies? How do they respond to external Load? How fast do they change?*
- 1990 - Claude Lenfant, National Heart, Lung, & Blood Institute, *Implants, transplants, & other parts of medicine of the future*
- 1991 - Robert M. Nerem, Georgia Institute of Technology, *Cellular engineering*
- 1992 - Larry V. McIntire, Rice University, *Bioengineering and vascular biology*
- 1993 - Shu Chien, University of California San Diego, *Endothelial & blood cell biomechanics: An example of molecular & cellular bioengineering*

BMES Distinguished Lecturer, 1991-2004

The BMES Distinguished Lectureship, sponsored by The Whitaker Foundation, was founded in 1991 to recognize outstanding achievements in biomedical engineering.

- 1991 - Thomas Harris, Vanderbilt University
- 1992 - Pierre Galletti, Brown University, *The future of cell and tissue engineering*
- 1993 - J. David Hellums, Rice University, *Biorheology in thrombosis research*
- 1994 - Robert S. Langer, Massachusetts Institute of Technology, *Biomaterials for drug delivery & tissue engineering*
- 1995 - Rakesh K. Jain, Harvard Medical School, *Delivery of molecules & cells to solid tumors*
- 1996 - Marcos Intaglietta, University of California, San Diego, *Microcirculation, biomedical engineering & the design of artificial blood*
- 1997 - Sheldon Weinbaum, City College of New York, *Models to solve mysteries in biomechanics at the cellular level: A new view of fiber matrix layers*

BMES Distinguished Lecturer, 1991-2004

Continued

- 1998 - Jen-Shih Lee, University of Virginia, *Biomechanics of the microcirculation, an integrative and therapeutic perspective*
- 1999 - John H. Linehan, Whitaker Foundation, *Imag(in)ing the Lung*
- 2000 - Murray B. Sachs, Johns Hopkins University, *The biological basis of hearing aid design*
- 2001 - Yoram Rudy, Case Western Reserve University, *Computational biology in the integration from genetics to function: Examples from rhythm disorders of the heart*
- 2002 - Gerald Pollack, University of Washington, *Cells, gels and the engines of life: A fresh paradigm for cell function*
- 2003 - Douglas A. Lauffenburger, Massachusetts Institute of Technology, *Bioengineering & systems biology*

BMES International BME Lecturer Award

Established in 2000, the Biomedical Engineering (BME) International Lecturer Award is to be awarded to individuals in a university, industry, or government to recognize his/her contributions to the advancement of biomedical engineering. The award is intended to honor the worldwide effort of promoting biomedical engineering as a profession with the aim to improve people's health. This award is made possible by a gift from the Lee family, including Jen-shih and Lian-pin Lee, Grace T. Lee and David Ludena, Albert L. Lee, Frank and Ting Lee, Joseph and Doris Cheng, Ta-Fang and Alice Fang, and Eric and Rena Lee. The recipient delivers a plenary lecture at the BMES Annual Fall Meeting and publishes the text of the lecture in the Annals of Biomedical Engineering. A very important purpose of the lecture is to review critically a field of biomedical engineering and to offer a vision on the challenges and opportunities in biomedical engineering.

- 2001 - Guenter Rau, Aachen University of Technology & Helmholtz-Institute for Biomedical Engineering, *We all become older: How will mobility & independence be enhanced by biomedical engineering*
- 2002 - Marcos Intaglietta, University of California, San Diego, *Smart blood substitutes: Engineering and medical perspectives*
- 2003 - John Abele, Boston Scientific Corporation, *Innovation, design, and entrepreneurship*

BMES Young Investigator Award

Harold Lamport Young Investigator, 1982-1992

BMES established the Harold Lamport Award for a Young Investigator, co-sponsored by the Lamport Foundation, in order to stimulate research careers in biomedical by recognizing young investigators.

- 1982 - Neil E. Fearnot
- 1983 - Chi-San Poon, North Dakota State University, *Characteristics of VA/∂ distributions recovered from inert gas elimination data*
- 1984 - Jose G. Venegas, Massachusetts General Hospital, *Equivalent circuit analysis of high frequency ventilators including a new high impedance flow interrupting ventilator*
- 1985 - Cynthia Sung, MIT, *An immobilized enzyme reactor for treatment of severe neonatal jaundice*
- 1986 - Benjie Ovaryn, Case Western Reserve University, *Evaluation of double exposure holographic interferometry for biomechanical measurements in vitro*
- 1987 - Bassel Tawfik, University of Southern California and Kimberly A. Ward-Hartley, Carnegie Mellon University
- 1988 - Kevin DiGregorio, West Virginia University, *A kinetic model of superoxide production from single pulmonary alveolar macrophages*

Harold Lampert Young Investigator, 1982-1992

Continued

- 1989 - Skrikanth R. Chary, Carnegie Mellon University, *Direct measurement of fluid flow & macromolecular diffusion in the interstitial space of tissues by fluorescence photobleaching*
1990 - Eric N. Kaufman, Carnegie Mellon University, *Quantification of transport & binding parameters using FRAP: Potential for in vivo applications*
1991 - Cheng Zhu, Georgia Institute of Technology, *A model of transient processes in cell adhesion*
1992 - Cheng Dong, National Institutes of Health, *Cytoplasmic rheology of passive neutrophils*

BMES Young Investigator, 1993-1998

From 1993 until 1998, the Whitaker Foundation supported the BMES Young Investigator Award. The award is offered in recognition of a high level of originality and ingenuity in a scientific work in biomedical engineering.

- 1993 - Paul A. DiMilla, Carnegie Mellon University
1994 - Antonios G. Mikos, Rice University, *Prevascularization of Porous Biodegradable Polymers*
1995 - Daniel M. Merfeld, R.S. Dow Neurological Sciences Institute
1996 - Jeffrey M. Hausdorff, Harvard University
1997 - Catherine Galbraith, Duke University
1998 - Kay C. Dee, Tulane University, *Design & function of novel osteoblast-adhesive peptides for chemical modification of biomaterials*

Rita Schaffer Young Investigator Award, 2000-Present

In honor of Rita Schaffer, former BMES Executive Director, the Society established the Rita Schaffer Young Investigator Award in 2000. The award includes presentation of the Rita Schaffer Memorial Lecture. Rita's gift of her estate, along with contributions from her family, friends, and associates, has enabled BMES to create this award.

- 2000 - David V. Schaffer, University of California, Berkeley, *Vector unpacking as a potential barrier for receptor-mediated polyplex gene delivery*
2001 - Melody A. Swartz, Northwestern University, *The interstitial environment: Cooperative stress management by cell 'societies'*
2002 - Thomas J. Webster, Purdue University, *The use of nanostructured materials to improve implant efficacy*
2003 - Melissa J. Mahoney, University of Colorado, *Synthetic microenvironments for neural transplantation*

Graduate Student Research Awards

These awards, first presented in 1993, recognize graduate students who come to the BMES Annual Fall Meeting to present papers. First called the Whitaker Graduate Student Awards and later BMES Graduate Student Research Awards, the awards have been supported by the Whitaker Foundation from their inception. Papers are judged on the basis of their scientific merit, originality, and quality of the written presentation.

1993: Anthony G. Harris, University of Virginia; Robert S. Keynton, University of Akron; Prabhas Moghe, University of Minnesota; Ranga Sampath, Rice University; Theodore F. Wiesner, Georgia Institute of Technology
1994: Steven George, University of Washington; Signe Varner, Georgia Institute of Technology; Chen Yi, Case Western Reserve University; Juan-Carlos Maymir, Penn State University; Konstantinos Konstantopoulos, Rice University

1995: Huicong Wang, University of Cincinnati; Saurabh N. Patel, Johns Hopkins University; Mauricio Barahona, Harvard-MIT; Bing Mei Fu, New York University; Sarah M. Wells, University of Toronto

1996: Jin-Yu Shao, Duke University; Maria Papadaki, Rice University; Daehwan Shin, University of Texas; Sangeeta Bhatia, Harvard-MIT; Tony Passerini, University of Akron

Graduate Student Research Awards

Continued

1997: Scott Chesla, Aaron Goldstein, Rohit Kashyap, D. P. Pioletti, Brian R. Stoll

1998: Andrew J. Putnam, University of Michigan, *Microtubule assembly is regulated by external strain*

Ping-fai Sidney Sit, Case Western Reserve University, *Substrate-dependent changes in human fibrinogen conformations studied by atomic force microscopy*

James Spiker, University of Maryland Baltimore County, *Study of fiber optic treatment of optimization of protein C biosensor*

Peter Butler, City College of New York, *Endothelial dependent shear induced vasodilation is rate sensitive*

Rafael Carbutaru, Case Western Reserve University, *Toroidal coil design for efficient transcutaneous magnetic stimulation of nerves*

1999: Rajan Marriapan, University of Texas SW Medical Center, *Comparison of contractile force generated by isolated & paired fibroblasts in vitro*

Anshu Bagga Mathur, Duke University, *Integration of total internal reflection & atomic force microscopy (TIRFM-AFM) to study stress transduction mechanisms in endothelial cells*

Barclay Morrison III, University of Pennsylvania, *Differential genomic expression after in vitro mechanical injury of organo-type brain slice cultures*

Natalie Wisniewski, Duke University, *Characterization of analyte transport over time through implantable biosensor membranes using microdialysis*

Wang Zhan, Tsinghua University, Beijing, China, *A new high-resolution EEG technique based on finite resistance network model*

2000: Zoe N. Demou, Rice University, *Automated 3D tracking of cancer cells in collagen gels: Quantification of cell migration & invasion at the cellular level*

Dan E. Meyer, Duke University, *Elastin-like polypeptides as thermally targeted drug carriers*

Mihrimah Ozkan, UC-San Diego, *Electrokinetic patterning of cells & beads in microfabricated arrays*

Robert Padera, MIT, *Biomaterial-induced vascularization, vascular permeability factor, & mass transport*

Jenny Zilberberg, Penn State University, *Quantification of permeability & fluid filtration in autoperfused venules*

2001: Jamaica L. Prince, University of Florida, Gainesville, *Measuring the role of polysaccharide-induced forces in staphylococcus attachment*

Margaret J. Slattey, Penn State University, *Leukocytes influence melanoma extravasation under flow conditions*

Jan P. Stegemann, Georgia Institute of Technology, *Combined biochemical, & mechanical stimulation of tissue engineered blood vessels*

Andrew Tsourkas, Georgia Institute of Technology, *Dual-FRET molecular beacons & their hybridization kinetics*

Yingxiao Wang, UC-San Diego, *Shear stress & VEGF share F1k-1/Cb1/Akt signaling pathway in regulating IKK activity*

2002: Dirk R. Albrecht, UC-San Diego, *Dielectrophoretic cell patterning within tissue engineering scaffolds*

James Blanchette, Purdue University, *Oral administration of chemotherapeutic agents using complexation hydrogels*

Jonathan T. Butcher, Georgia Institute of Technology, *Morphological differences between aortic & aortic valve endothelial cells in static & fluid flow conditions*

Alicia Lacy, University of Texas Austin, *Near real-time in vivo confocal imaging of mouse mammary tumors*

William L. Murphy, University of Michigan, *A combination approach to engineering bone regeneration: Biomaterial presentation and induced angiogenesis*

2003: Rachel Price, Purdue University, *The effects of nanometer fiber dimensions on osteoblast & fibroblast adhesion*

Eun Jung Lee, Columbia University, *Remodeling of engineered tissues in response to altered boundary conditions*

Krishna Sarangapani, Georgia Institute of Technology, *Molecular elasticity of selectins*

Jessica Winter, University of Texas at Austin, *Quantum dot—Neuron interfaces*

Rahul G. Thakar, UC-Berkeley, *Organization & regulation of vascular smooth muscle cells by micropatterning*

Undergraduate Student Research and Design Awards

First presented in 1993, these awards recognize undergraduate students who present papers at the BMES Annual Fall Meeting. First called the Whitaker Undergraduate Student Research and Design Awards and later the BMES Undergraduate Student Research and Design Awards, the awards have been supported by the Whitaker Foundation from their inception. Designs are judged on the basis of originality, significance, thoroughness of design analysis and performance evaluation.

1994: Anthony DeNegro and Gary March, University of Delaware; Shilpa Choudhari, Victor Farmiga, Stephanie Means, Robert Allen, University of Delaware

1995: Kumaran Koilandaivelu, Harvard-MIT; D. Brown, K. Clark, C. Coning, D. Kennard, J. Webb, Wright State University

1996: Joseph E. Katuin, Angela K. Slaughter, Donna Jo Therrien, Jeanne L. Uy, Wayne State University, *Prosthetic robotic hand with electric motors & force/position sensors*

Michael P. Bellew, Christopher M. Izzo, Jeffrey M. Willis, University of Florida, Gainesville, *A design to model erythrocyte membrane viscoelastic response via oscillatory flow in a cone-and-plate viscometer*

1997: Rodel Cruz-Herrera, David Huber, University of Southern California

A. Sieminski, T. Blunk, L. F. Langer, G. Vunjak-Novakovic, Massachusetts Institute of Technology

1998: Johnny Chao, Johns Hopkins University, *L-Arginine enhanced nitric oxide production facilitated cerebral electrical recovery after transient global ischemia*

Roni Dattani, University of Toronto, *Monitoring PDT-induced tissue damage using bioelectrical impedance measurements*

Mark Ebdon, University of Toronto, *Mapping the brain with positron emission tomography*

Emanuel Gottlieb, Jimmy Vu, Louis Margerum, Catholic University of America, *Bathtub lift usability study*

Mark Lehmkuhle, Kelvin Wu, Ben Burke, Case Western Reserve University, *Active optical correction of acquired pendular nystagmus*

1999: Mahesh Shenai, Anshul Thakral, Manan Atit, Johns Hopkins University, *The Gryoscan 2000: An integrated EEG Scanning System*

Louis Nervegna, Harvard-MIT, *A neuromorphic hybrid VLSI implementation of calcium dynamics for learning & memory in a Hebbian synapse*

Emanuel Gottlieb, Jimmy Vu, Catholic University, *Home healthcare wireless physiological monitoring: Systems integration & human factors evaluation*

Emanuel Gottlieb, Louis Margerum, Jimmy Vu, Catholic University, *Hands free walker*

James G. Klosterboer, Charles Platt, Stephanie Taylor, Wright State University, *Automated can opener*

2000: Brian J. Fill, Robert G. Svitek, Thomas E. Robey, William R. Wagner, University of Pittsburgh, *Novel surface modification strategy for commercial polymeric biomaterials*

2001: Alan Batac, Latosha Marshall, Meghan Nickerson, Theresa Smith, University of Maryland, *Glucagon: Auto-injection device for glucagons administration*

Amy Bierce, Travis Pelo, Adam Renner, Jeremiah Stikeleather, Wright State University, *Pedestrian child headform*

Eugene J. Koay, Rice University, *Development of a novel method for creep indentation of single chondrocytes*

Andrew M. Smith, Georgia Institute of Technology, *Genetically engineered fibroblasts as a substitute for endothelial cells on vascular grafts*

Nicholas Sorvillo, Mike Faust, Sean Krause, Western New England College, *The effects of whole-body vibration and noise on the inflammatory response in rats*

2002: Patricia S. Arauz, Saint Louis University, *Effect of hydrogel physical properties on osteoblast proliferation*

Luke G. Gutwein, Purdue University, *Osteoblast response to alumina and titania nanometer wear debris*

Sarah E. Stabenfeldt, Saint Louis University, *Design of a polymeric NGF delivery scaffold*

Robert D. Vanya, Louisiana Tech University, *Platform movement detection latencies in young adults, elders with peripheral neuropathy, & non-diabetic elders*

2003: Catherine Cheng, Jennifer Park, University of California, Berkeley, *Mechanical regulation of mesenchymal stem cell differentiation*

Lucas Burton, Amir Durrani, Benjamin Hoagland, Santosh Tumkur, Vanderbilt University, *Devices to improve coronary artery bypass surgery*

Undergraduate Student Research and Design Awards

Continued

Seth Pantanelli, G. Yoon, T.M. Jeong, S. MacRae, University of Rochester, Large dynamic range Shack-Hartmann wavefront sensor for highly aberrated eyes

Cathy E. Stanecki, A.M. Hannibal, A. Watts, K.H. Driggers, M.J. McShane, Louisiana Tech University, A novel biosensor for on-line dialysis monitoring

Aaron Conovaloff, Brandon L. Seal, Alyssa Panitch, Arizona State University, A biomimetic peptide-based anticoagulant

Marianne Bergquist, Rupert Davies, Joseph Andrade, University of Utah, A glutathione assay based on bacterial bioluminescence: Dry reagent development & miniaturization

BMES SERVICE AWARDS

BMES Distinguished Service Awards

The BMES Distinguished Service Award was created to recognize members who have made extraordinary contributions to the Biomedical Engineering Society.

- 1992:** Fred J. Weibell
1993: Hun H. Sun
1999: James B. Bassingthwaite
2000: Kay Lyou, John Lyman, F. Eugene Yates
2001: Jerry Collins, Robert Hochmuth, Daniel Schneck, Steven Slack, Shu Chien
2002: James Dickson, Jen-shih Lee, John Linehan, Herbert Lipowsky, Gerald Saidel
2003: Peter Katona, Larry McIntire, Morton Friedman, Y.C. Fung, Paul Hale, Jr

BMES Presidential Award

The Presidential Award was established in 1999 to enable each BMES President to recognize outstanding contributions to BMES during their tenure as president.

- 1999** – Herbert Lipowsky
2000 – Kyriacos Athanasiou
2001 – Paul N. Hale, Jr.
2002 – Eric Guilbeau and Herbert F. Voigt
2003 – Larry V. McIntire

BMES Conference Awards

These conference awards were established in 1999 to recognize the contributions of BMES Annual Meeting conference chairs and scientific program chairs.

- 1999** – Robert A. Nerem and Janie M. Fouke, Conference Co-Chairs; Ajit P. Yoganathan and Susan P. Blanchard, Program Co-Chairs
2000 – Francis A. Spelman, Conference Chair; Nitish V. Thakor, Program Chair
2001 – George A. Truskey, Conference Chair; Robert M. Hochmuth and William M. Reichert, Program Co-Chairs
2002 – Larry V. McIntire and John W. Clark, Conference Co-Chairs; Antonios G. Mikos and Periklis Y. Ktonas, Program Co-Chairs
2003 – Robert J. Roselli, Conference Chair; John P. Wikswo, Program Chair

BMES Certificates of Appreciation

This award was created to recognize service on behalf of BMES by members and nonmembers.

- 1999** – John Peery
2001 – Jason Haga
2002 – Artin Shoukas and Shayn Peirce
2003 – Kay Kinard, Ellen Ray, and Susan Meng

BMES Student Chapter Awards

Meritorious Achievement Awards

BMES student chapters may compete for this award based on the activities and programs described in the chapter's annual development report. Guidelines are highlighted in the development section of the BMES Student Chapter Operations Manual. Those chapters that demonstrate exemplary participation and interest in BMES are awarded engraved plaques at the BMES Annual Fall Meeting. Those chapters with a commendable record or honorable mention are presented certificates.

1990: Boston University, Drexel University, Johns Hopkins University, Marquette University, Northwestern University, Tulane University, University of Akron, University of Alabama at Birmingham, University of Virginia
1991: Boston University, Drexel University, Louisiana Tech University, Marquette University, Pennsylvania State University, University of Akron, University of Virginia
1992: Arizona State University, Boston University, Drexel University, Louisiana Tech University, Pennsylvania State University, Tulane University, University of Akron, University of Kentucky, University of Texas at Austin, University of Virginia
1993: Boston University, Drexel University, Louisiana Tech University, Marquette University, Pennsylvania State University, University of Akron
1994: Arizona State University, Louisiana Tech University, University of Akron
1996: Arizona State University, Louisiana Tech University, University of Akron, University of Virginia
1997: Arizona State University, Texas A&M University, University of Akron
1998: University of Akron, Marquette University, University of Virginia, University of Kentucky
1999: University of Akron, University of Alabama at Birmingham, University of Kentucky
2000: University of Virginia
2001: University of Wisconsin
2002: University of Wisconsin Madison
2003: University of Wisconsin Madison, University of Virginia, Rensselaer Polytechnic Institute

Commendable Achievement Awards

1993: Catholic University, Hofstra University, Tulane University, University of Texas at Austin, University of Virginia, Vanderbilt University
1994: Drexel University, Marquette University, Pennsylvania State University, University of Virginia
1996: Marquette University, University of Alabama at Birmingham, University of Florida
1997: Louisiana Tech University, Marquette University, University of Alabama at Birmingham, University of Texas at Austin, University of Virginia
1998: Arizona State University, Boston University, Louisiana Tech University, University of Alabama at Birmingham
1999: Arizona State University, Louisiana Tech University, Marquette University, University of Virginia
2000: Louisiana Tech University, University of Akron
2002: University of Akron, University of Virginia
2003: Case Western Reserve University, Virginia Commonwealth University

Honorable Mention Awards

1992: Catholic University, Johns Hopkins University, Marquette University, North Carolina State University, University of Texas at Arlington
2001: City College of New York, Rice University
2002: Rice University, State University of New York at Stony Brook, University of Alabama Birmingham

Fleetest Feet Award

Conceived by the Arizona State University BMES Student Chapter in 1992 to promote and expand student participation in the BMES Annual Fall Meeting, the Fleetest Feet Award is given at the meeting to the BMES student chapter that is represented at the meeting by the most students having traveled the most miles. A 10% bonus in mileage is granted to chapters that drive to the meeting instead of flying. The winning chapter keeps the plaque for the year and then brings it to the following year's conference. The rules are listed in the BMES Student Chapter Operations Manual, but in summary it is the chapter that has the highest number of students multiplied by the mileage.

1993 – University of Akron

1994 – University of Utah

1996 – University of Alabama at Birmingham

BMES Student Chapters and Year Chartered

Arizona State University, 1981	Tulane University, 1977
Boston University, 1979	University of Akron, 1987
Brigham Young University, 1999	University of Alabama at Birmingham, 1983
Brown University, 1983	University of Arizona, 2000
Bucknell University, 2003	University of California at Los Angeles, 1977
Carnegie Mellon University, 1987	University of California at San Diego, 1979
Case Western Reserve University, 1982	University of California Davis, 2003
Catholic University of America, 1990	University of Florida, 1994
City College of New York, 1995	University of Illinois at Chicago, 1989
Colorado State University, 2001	University of Kentucky, 1991
Columbia University, 1991	University of Maryland College Park, 2000
Devry Institute of Technology, 2001	University of Memphis, 1993
Drexel University, 1987	University of Miami, 1979
Duke University, 1979	University of Michigan, 1997
Florida International University, 1994	University of Minnesota Twin Cities, 1990
Florida State University, 2002	University of Missouri-Columbia, 2003
Georgia Institute of Technology, 1994	University of Nebraska-Lincoln, 2002
Hofstra University, 1992	University of New Mexico, 2000
Illinois Institute of Technology, 2003	University of North Carolina, 1981
Iowa State University, 1991	University of Oklahoma, Norman, 2001
John Hopkins University, 1983	University of Pennsylvania, 1981
Louisiana Technological University, 1978	University of Pittsburgh, 1995
Marquette University, 1989	University of Rochester, 1997
Massachusetts Institute of Technology, 1984	University of South Florida, 1999
Michigan State University, 2001	University of Southern California, 1985
Michigan Technological University, 1982	University of Texas at Arlington, 1980
Milwaukee School of Engineering, 1992	University of Texas at Austin, 1987
New Jersey Institute of Technology, 2001	University of Toledo, 1997
Northwestern University, 1984	University of Toronto, xxxx
Ohio State University, 1989	University of Utah, 1978
Oregon State University, 2003	University of Virginia, 1981
Pennsylvania State University, 1989	University of Washington, 1982
Purdue University, 2002	University of Wisconsin, Madison, 2000
Rensselaer Polytechnic Institute, 1979	University of Wyoming, 2001
Rice University, 2000	Vanderbilt University, 1987
Rose-Hulman Institute of Technology, 2001	Virginia Commonwealth University, 1987
Rutgers University, 1988	Virginia Polytech Institute & State University, 1977
Saint Louis University, 1997	Washington University, 1997
State University of New York at Stony Brook, 1997	Wayne State University, 2000
Syracuse University, 1990	Western New England College, 1997
Tel Aviv University, 1999	Wright State University, 2003
Texas A&M University, 1980	Yale University, 2002

BMES Annual Fall Meetings

- October 21-24, 1990** - Virginia Polytechnic Institute, Blacksburg, VA
Biomedical Engineering: Opening New Doors
Hosted by Virginia Polytechnic Institute; Daniel J. Schneck, Chair
- October 12-14, 1991** - University of Virginia, Charlottesville, VA
Technology for Health
Hosted by University of Virginia; Jen-Shih Lee, Chair
- October 16-18, 1992** - University of Utah, Salt Lake City, UT
Perspectives & Opportunities in Bioengineering
Hosted by University of Utah; Joseph D. Andrade and Kenneth W. Horch, Co-Chairs
- October 21-23, 1993** - University of Memphis, Memphis, TN
25th Anniversary Celebration
Hosted by Memphis State University and University of Tennessee-Memphis; Vincent J. Turitto, Michael Yen, F. DiBianca, Eugene Eckstein, Co-Chairs
- October 14-16, 1994** - Arizona State University, Tempe, AZ
Frontiers in Biomedical Engineering
Hosted by Arizona State University; Eric J. Guilbeau, Chair
- October 6-9, 1995** - Boston University, Boston, MA
Hosted by Boston University; Kenneth Lutchen and Herbert F. Voigt, Co-Chairs
- October 3-6, 1996** - Pennsylvania State University, State College, PA
A Celebration of Creation & Creativity in Nature & Engineering
Hosted by Penn State University; Herbert H. Lipowsky and James S. Ultman, Co-Chairs
- October 2-5, 1997** – Hyatt Islandia, San Diego, CA
New Horizons & Innovations in Bioengineering
Hosted by University of California, San Diego; Shu Chien and Richard Skalak, Co-Chairs
- October 10-13, 1998** – Renaissance Cleveland Hotel, Cleveland, Ohio
Relating Biomedical Engineering Research to Clinical & Commercial Applications
Hosted by Case Western Reserve University, Cleveland Clinic Foundation, and University of Akron; Gerald M. Saidel, J. Frederick Cornhill, and Daniel B. Sheffer, Co-Chairs
- October 13-16, 1999** – 1st BMES-EMBS Joint Meeting
Hyatt Regency Atlanta, Atlanta, GA
Serving Humanity Advancing Technology
Hosted by Georgia Institute of Technology and Emory University; Robert M. Nerem and Janie M. Fouke, Co-Chairs
- October 12-14, 2000** – DoubleTree Hotel-Seattle Airport, Seattle, WA
Biomedical Engineering: The Millennial Frontier
Hosted by University of Washington, Seattle, WA; Sandy Spelman, Chair
- October 4-7, 2001** – Sheraton Imperial, Durham, NC
Celebrating the Adventure of Discovery & Advance in Biomedical Engineering
Hosted by Duke University, University of North Carolina, and North Carolina State University; George A. Truskey, Chair

October 23-26, 2002 – 2nd EMBS-BMES Joint Meeting

Westin Galleria & Oaks Hotel, Houston, TX

Bioengineering—Integrative Methodologies, New Technologies

Hosted by Rice University; Larry V. McIntire and John W. Clark, Co-Chairs

October 1-4, 2003 – Renaissance Hotel & Nashville Convention Center, Nashville, TN

Research, Education & Industry in Biomedical Engineering: Closing the Loop

Hosted by Vanderbilt University; Robert J. Roselli, Chair

October 13-16, 2004 – Wyndham Philadelphia at Franklin Plaza, Philadelphia, PA

Biomedical Engineering: New Challenges for the Future

Hosted by University of Pennsylvania and Drexel University; Daniel A. Hammer and Banu Onaral, Co-Chairs

September 28-October 1, 2005 – Hyatt Regency Baltimore, Baltimore, MD

Hosted by Johns Hopkins University, Murray B. Sachs, Chair

October 2006 – Hyatt Regency Chicago, Chicago, IL

Hosted by Northwestern University, Illinois Institute of Technology, and

University of Illinois Chicago, Robert Linsenmeier, Chair

October 2007 – Los Angeles, CA

Hosted by University of Southern California, Kirk Shung, Chair

photos: question...where to get them

BMES and Systems Physiology

Larry Young, PhD

To say that the face of biomedical engineering has changed in the 21 years since I was BMES President is to say that the child has grown up and now has its own adult character. Some of the promising new approaches of the seventies are now so totally woven into the fabric of modern devices as to make one wonder about life without them. (At MIT at that time we established an NIH-sponsored Biomedical Engineering Center to incorporate microprocessors into medical instruments. Would anyone attempt to do without them today? Medical imaging has been expanding our vision beyond X-rays and PET scanning so far that patients expect or demand an MRI (which sounds so much nicer than NMR). However, this explosive growth has taken a peculiar path in one important field over the past 40 years, the role of *systems theory in physiology*.

Control theory and feedback systems were developed as an engineering technique, as opposed to a branch of applied mathematics, during and following World War II, in response to the need to guide guns, airplanes, and later missiles. Stability and control, which allowed a device to follow commands in the face of disturbances, quickly found post-war application in fields as diverse as economics and physiology. Wiener popularized the idea that the human machine could be regarded as a collection of servomechanisms.^{11,12} Myriad engineers rediscovered *The Wisdom of the Body*, in which Cannon explained how the body regulated everything from blood pressure to temperature through homeostasis.² Rutstein and Eden claimed “homeostasis was useful as a principle that could replace teleological reasoning in the explanation of the interaction of functioning physiological subsystems, in much the same way that the concept of natural selection replaces the value judgments implicit in such statements as ‘the survival of the fittest.’”⁹ By the 1960s linear control systems, and stability calculations based on Nyquist diagrams and Bode plots, seemed ubiquitous as tools for explaining physiology and even pathology. Parkinson’s disease, intentional tremor, and Cheyne-Stokes breathing all seemed more comprehensible when explained by closed loop stability of a feedback system with time delay. Even loosely coupled oscillators, like the respiration and the cardiovascular system seemed explainable by mathematical models. While “modern control theory,” with

its matrix algebra and optimization, was still over the mathematical horizon in the fifties, by the next decade we believed that the slightly more complex system regulation problems, like diabetes, were only a loop or two away.

Many of us in the BMES were like happy beachcombers on the island of physiology, picking up one feedback system after another and showing how we could predict its system properties. Larry Stark, fresh from his success in explaining oscillations in the pupil reflex to light, came to MIT’s Servomechanisms Laboratory to tackle eye movements and hand control.¹⁰ Derek Fender³ at Cal Tech, David Robinson at Johns Hopkins, along with Geoffrey Melvill-Jones and John Milsum⁶ at McGill, joined in the development of control models of eye movements. Textbooks with numerous examples of linear system models of physiological systems appeared like crocuses in this Biological Control Systems spring. Gone was the arcane biomathematics of Rashevsky⁷ and his colleagues. Milsum,⁶ Milhorn,⁵ Grodins,⁴ Riggs,⁸ Stark¹⁰ and others all had their influence on a generation of engineers who saw a way to contribute to physiology without getting any blood on their hands. Eventually the success of these models led to their inclusion in the teaching of physiology and even in some courses in pathophysiology. And yet something was missing. These “non-rational-parameter” models rarely had offered new insights into the underlying biological mechanisms. At best, they hinted that a neural function must exist somewhere in the brain’s circuitry, or that some overarching adaptive loop must be present, but they remained non-reductionist in the extreme. Eventually, a kind of discipline *ennui* overtook the field, as the search for basic cellular and molecular mechanisms supplanted the delight with systems models. Scientific meetings in the eighties began to have fewer and fewer systems model sessions, and “real science” moved from the macro to the microscopic. The glamour of biomedical engineering was overshadowed by the glitz of biotechnology.

And yet, it seems clear, something important is missing in the purely reductionist-synthesis approach to physiology. Can one ever hope to create a level of understanding on the basis of molecular descriptions alone, or even when combined with detailed anatomy? Knowing the electronic components and their wiring

diagram doesn't lead to the function of a circuit, nor does an undocumented computer code tell us much about the purpose and capabilities of a program. And knowing a particular gene sequence is only useful if the function associated with it is also known.

The earliest hints to me of a return to the recognition for an organized systems approach to "integrative physiology" came with the interest in Neural Networks, particularly in the eighties and nineties. By allowing the learning capabilities of a neural net with hidden units to recreate the complex behavior of a real system, certain "emergent properties" came forth. In many cases these hidden units served a function implemented by real neurons in the nervous system, and justified the search for their physiological counterparts. Now we await a new systems engineering applicable to the new biology. Boyd and Noble have pointed out how our knowledge of components of a physiological system must be integrated in order to understand their function.¹ I don't know what form the next theoretical development will take, but I remain convinced that without a guiding systems-theoretical map of the physiological forest we will continue to be lost among the molecular trees.

References:

1. Boyd, C. A. R., and D. Noble. *The Logic of Life*. New York: Oxford University Press, 1993.
2. Cannon, W. B. *The Wisdom of the Body*. London: Kegan Paul, 1932.
3. Fender, D. H. Techniques of systems-analysis applied to feedback pathways in the control of eye movements. *Symp. Soc. Exp. Biol.* 18:401-19.
4. Grodins, F. S. *Control Theory and Biological Systems*. New York: Columbia University Press, 1963.
5. Milhorn, H. T. *The Application of Control Theory to Physiological Systems*. Philadelphia, PA: W. B. Saunders Co., 1966.
6. Milsum, J. H. *Biological Control Systems Analysis*. New York: McGraw-Hill, 1966.
7. Rashevsky, N. *Mathematical Biophysics: Physico-Mathematical Foundations of Biology*. 3rd rev. ed. Vol. 2. New York: Dover Publications, 1960.
8. Riggs, D. S. *Control Theory and Physiological Feedback Mechanisms*. Baltimore, MD: Williams and Wilkins, Co., 1970.
9. Rutstein, D., and M. Eden. *Engineering and Living Systems: Interfaces and Opportunities*. Cambridge, MA: The MIT Press, 1970, pp. 21-22.
10. Stark, L. *Neurological Control Systems: Studies in Bioengineering*. New York: Plenum Press, 1968.
11. Wiener, N. *Cybernetics*. New York: Wiley, 1958.
12. Wiener, N. *Human Use of Human Beings*. Boston: Houghton Mifflin, 1950.