

May, 2013

CURRICULUM VITAE OF GEORGES BELFORT

H-Index 46

belfog@rpi.edu and www.rpi.edu/dept/chem-eng/WWW/faculty/belfort/

Work Address

Howard P. Isermann Department of Chemical and Biological Engineering
Center for Biotechnology and Interdisciplinary Sciences
Rensselaer Polytechnic Institute
Troy, NY 12180-3590, USA
Married, 3 sons

Home Address

162 Font Grove Road
Slingerlands, NY 12159
USA

Education

1972 Ph.D. Engineering, University of California at Irvine, Irvine, California,
Advisors: Dr. J. Scherfig, University of California at Irvine, Irvine
California and Dr. K. Sam Spiegler, University of California at Berkeley, Berkeley,
California. PhD Thesis: "The role of water in porous glass desalination membranes".
1969 MS. Engineering, University of California at Irvine, Irvine, California,
1963 B.Sc. Chemical Engineering, University of Cape Town, Cape Town, South Africa

Professional Experience

2011 to date Institute Professor (highest level of endowed professor)
2003 to 2010 Russell Sage Professor (Endowed chair) of Chemical and Biological Engineering, Howard
P. Isermann Department of Chemical and Biological Engineering, Rensselaer Polytechnic
Institute, Troy, New York, 12180-3590.
1982 to 2002 Professor of Chemical Engineering, Howard P. Isermann Department of Chemical
Engineering, Rensselaer Polytechnic Institute, Troy, New York, 12180-3590.
1978 to 82 Associate Professor, Chemical Engineering and Environmental Engineering, Rensselaer
Polytechnic Institute.
1973 to 77 Senior Lecturer (approximate U.S. equivalent associate Professor), Human Environmental
Health Sciences, School of Applied Science & Technol., Hebrew University, Jerusalem,
Israel.
1972 Visiting Lecturer, Chemical Engineering Department, University of Cape Town, Cape
Town, SA
1971 to 72 Acting Instructor, University of California at Irvine., Irvine, California.
1964 to 70 Research Chemical Engineer, Astropower Laboratory, McDonnell Douglas Corp.,
Newport Beach, California.

Sabbatical Leave

2013 Chemical Engineering Department, MIT, Cambridge, MA (Host: Robert Langer), two and
half months.
2005 Chemical Engineering Department, MIT, Cambridge, MA (Host: Robert Langer), six
months.
1996 Chemistry Department and Chemical Engineering Department, University of
California, Berkeley, CA (Hosts: Ken Raymond and Harvey Blanch), one term.
1988 Chemical Engineering Department, Yale University, New Haven, Connecticut (Host:
Csaba Horvath), three months.
Mechanical Engineering Department, MIT, Cambridge, Massachusetts (Host: Ron
Probstein) three months.
Chemical Engineering Department, CALTECH, Pasadena, California (Host: Jay
Bailey), three months
1977 Environmental Health Engineering, Civil Engineering Department, The Technological
Institute, Northwestern University, Evanston, Illinois (Host: Herman Cember), one year.

Honors and Awards

Awards and Honors

- Appointed Member of the Scientific Advisory Board, Max Planck Institute for Dynamic Complex Technical Systems, Magdeburg, Germany, March 15th 2012- (6 years)
- Inducted as Foreign Corresponding Member of the Accademia delle Scienze dell'Istituto di Bologna, Classe di Scienze Fisiche, Sezione Scienze Tecniche. (Academy of Sciences of Bologna Institute, Class of Physical Sciences, Section of Technical Sciences) - in existence for over 300 years, March 15th 2012
- Winner of the 2011 Alan S. Michaels Award "Recovery of Biological Molecules" ACS BIOT Div. Award, Anaheim, CA March 2011
- Appointed "Institute Professor" (one of two) at Rensselaer Polytechnic Institute, January 1st, 2011.
- Elected member of the US National Academy of Engineering, February 2003
- Chosen as one of the "100 Chemical Engineers of the Modern Era" as part of the AIChE Centennial Celebration, *Chemical Engineering Progress*, October 2008, 78.
- Winner of the American Chemical Society's Award for 2008: *ACS E. V. Murphree Award in Industrial and Engineering Chemistry* sponsored by the Exxon Mobil Research and Engineering Co. The Award was presented at the ACS National Meeting in New Orleans, LA in April, 2008 and the Award Lecture in Philadelphia, PA, 2008 with a check for \$5,000 and a plaque.
- 2007 Outstanding Alumnus Award, Engineering, University of California, Irvine, in May 2006
- "William H. Wiley, 1866 Distinguished Faculty Award", Rensselaer Polytechnic Institute, May 22, 2005 (for "excellence in teaching, productive research, and interest in the totality of the education process") – Top research award from RPI (\$8,000).
- Awarded the Rensselaer Polytechnic Institute's School of Engineering "Research Excellence Award" for 2005, April 2005 – Top research award from the School of Engineering, RPI (\$1,000).
- Honored at the North American Membrane Society's 2005 Annual meeting as a "Founder" of the Society, May, 2005..
- Appointed endowed Russell Sage Chair of Chemical and Biological Engineering, RPI, January 2003.
- Winner of the American Institute of Chemical Engineers Separations Division Award for 2000: *Clarence G Gerhold Award in Separations Science & Technology* sponsored by UOP. The Award was presented at the AIChE Annual National Meeting in Los Angeles, 15 November, 2000, and received a
- Fellow of the Japanese Society for the Promotion of Science, 15-day lecture tour of Japan, August 16-31, 1996
- Winner of the American Chemical Society's Award for 1995: *ACS Award in Separations Science & Technology* sponsored by Rohm and Haas Co. Presented the Award Lecture at the ACS National Meeting in Anaheim, 6 April, 1995, and received a check for \$5,000 and a plaque.
- Awarded Japanese Society for the Promotion of Science Fellowship, presented six lectures in two weeks in Japan, 1981.

National Service

- Appointed head of the Scientific Advisory Board for Asahi Kasei Bioprocessing (USA), Nov. 2009-
- Selection Committee for the SBE "Bailey Award", July, 2009-.
- Search Committee for new Editor for AIChE Biotechnology Progress, 2009-2010
- Appointed to the Scientific Advisory Board for the Juvenile Diabetes Research Foundation Research Grant of Robert Langer and Daniel Anderson, MIT, April, 2008-2010.
- Governing Board of the Society of Biological Engineers, AIChE, January, 2006-
- Selection Committee, Draper Award, National Academy of Engineering, 10/2003-10/06.
- Selection Committee, New President and Council, National Academy of Engineering, 11/2005-9/06.
- Board of Scientific Advisors, Intermolecular, Inc, San Jose CA, March 2005-.
- Invited by NSF to organize and lecture in a Separations Session at the Tripartite Israel-Turkey-USA Eastern Mediterranean Chemical Engineering Meeting, The Technion, Haifa, Israel, March 9-11, 1999.
- Appointed to Board of Scientific Advisors, Danish Sep. Systems, Nakskov, Denmark, Sept., 1998.

- Chair for the Gordon Conference on "Membranes: Materials and Processes", August, 1997.
- Past President, North American Membrane Society, May 1995-96.
- Appointed chair of AIChE Committee on Membrane-Based Separations, 1994.
- Appointed to AIChE Committee on Membrane-Based Separations, 1991.
- Elected to board of North American Membrane Society, 1990, 1992, 1997, 1999.
- Appointed to subcommittee on Treatment Technologies, Water Science & Techn. Board, National Research Council, 1986-1990.
- Organized a session on "New Separations Process Applications for Membranes", Gordon Research Conference on Synthetic Membranes, New London, NH, June 22-26, 1986.
- Participated as one of eight invited US academics in an NSF sponsored US-Japan Bioreactor Workshop, Kyoto, Japan, December 11-14, 1985.
- Advisor for the Desalination Research Program of the Republic of South Africa and lectured at three universities, March-April, 1982.
- Board of Advisors for Desalting for National Council for Research and Development, Prime Minister's Office, Israel, 1976-78

Honorary lectureships

- Keynote and invited lectures

- 2013 ICBE Meeting Hyatt Regency, Ft Lauderdale FL, Jan 14-16, 2013
- Plenary, First International Conference on Membrane Desalination, Stiges, Spain, April 7-10, 2013
 - CHME. Dept. Seminar, University of Notre Dame, South Bend, Feb, 29, 2013
 - CHME. Dept. Seminar, University of Wisconsin, March 5th 2013
 - CHME. Dept. Seminar, Tufts University, April 17th 2013
 - CHME. Dept. Seminar, MIT, April 26th 2013
 - Seminar, MIT Center for Clean Water and Clean Energy, May 3rd 2013
- 2012 Invited speaker, DuPont CR&D – Biochemical Science & Engineering, Wilmington, DE, 12/14/2012.
- Invited speaker, Gordon Research Conference on “Membranes: Materials & Processes”, Colby-Sawyer College, New London, NH, August 2, 2012.
 - Keynote, International Conference on Bioinspired and Biobased Chemistry & Materials, Nice, France, 10/3-5/2012.
 - Invited speaker, 7th Chemical Engineering Conference for Collaborative Research in the Eastern Mediterranean Countries (EMCC7), Corfu, Greece, 4/27-5/1/2012
 - Invited speaker, Max-Planck-Forschungsstelle für Enzymologie der Proteinfaltung, Halle, Germany, 3/16/2012
 - Invited speaker, as part of the induction as a foreign corresponding member of the Accademia delle Scienze dell’Istituto di Bologna, Classe di Scienze Fisiche, Sezione Scienze Tecniche. (Academy of Sciences of Bologna Institute, Class of Physical Sciences, Section of Technical Sciences), Bologna, Italy, 3/12/2012
 - Invited speaker, Dipartimento di Ingegneria Chimica, Mineraria e delle Tecnologie Ambientali, Bologna, Italy, 3/12/2012
 - Invited speaker, School of Chemical and Biomolecular Engineering, GATECH, Atlanta, GA, 2/15/2012
 - Invited speaker at the 20th Annual Suddath Symposium – *Prions and Protein Misfolding*, Institute for Bioengineering & Bioscience (IBB) at Georgia Tech. Talk entitled “Insight into the Kinetics of Oligomer Formation During Amyloidosis”, 2/16-17/2012.
 - Invited speaker, Chemical and Biomolecular Engineering, Vanderbilt University, Nashville, TN, 2/6/2012.
- 2011-Invited speaker for the Naff Symposium on Biochemistry at Interfaces, The Department of Chemistry at the University of Kentucky organizes an annual Symposium on Chemistry and Molecular Biology, April 8th 2011.

- Invited Alan S. Michaels Award lecture entitled "Recovery of Biological Products Research: Interplay between Science and Technology" ACS BIOT Div., Anaheim, CA March 27th, 2011.
- Invited by Graduate Students to present the Annual Symposium Keynote Lecture, Chemical Engineering, Carnegie Mellon University, Oct 1 & 2, 2009.
- Plenary presentation at the "Macromolecular Science and Engineering's 31st Annual Symposium, University of Michigan, Ann Arbor, MI, October 25th, 2007.
- Invited main talk, "Recovery of Biological Products XII", ACS-BIOT, Wigwam Resort, Phoenix AZ, April 2-7, 2006.
- Invited Sectional Award Lecture for Section 15d (Biotechnology), AIChE, Austin, Nov 13, 04
- Invited Plenary Lecture at the Symposium in Honor of the 80th Birthday of Prof Ora Kedem, Weizmann Institute of Science, Rehovot, Israel, Oct. 17, 2004.
- Invited lecture, "Fouling and Critical Flux: Theory and Applications" Workshop, Lappeenranta University of Technology, Lappeenranta, Finland, June 16-18, 2004.
- Invited lecture, Advanced Membrane Technology II, Irsee, Germany, May 24-28, 2004,
- Invited lecture "Membrane Filtration for Biotechnology", American Association of Pharmaceutical Scientists, Boston, MA, May 19, 2004.
- Plenary lecture, Gordon Research Conference on Synthetic Membranes, Plymouth, NH, August 1-6, 2004
- Invited Hikal Award Lecture at the CHEMCON - Indian Institute of Chemical Engineers, Hyderabad, India, Dec 21-23, 2002.
- Invited Professore a Contrare (Contract or External Professor), U. Bologna, Bologna, Italy, Chemical Engineering, Host Giulio Sarti, taught 10 hour short course "Molecular Separations for Biotechnology", May 25-31, 2002.
- Invited main talk, "Recovery of Biological Products X", ACS-BIOT, Cancun, Mexico, June 4th 2001.
- ACS – special session in honor of Csaba Horvath, ACS National Mtg, San Diego, CA, April, 5th, 01.
- Invited Lecturer (with David Wood, PhD student), International Workshop on "New Production Concepts for Life Science Industry", Vaalsbroek, The Netherlands, March 20-22, 2000
- Separations Division Gerhold Award, AIChE Annual Meeting, Nov 15, 2000.
- Plenary Lecturer, Scandinavian Membrane Workshop, SINTEF, Oslo, Norway, Nov. 2.
- Main Lecturer for the Recovery of Biologicals Meeting, Cancun, Mexico, June 3-8, 2001.
- Plenary Lecturer, International Conference on Bioseparation Engineering "Recovery and Recycle of Resources to Protect the Global Environment", Nikko, Japan, July 4-7, 1999
- Plenary Lecturer, Aachener Membran Kolloquium, March 9-11, 1999, Aachen, Germany
- Invited lecture, Recovery of Biological Products, Whistler, Canada, May 23-28, 1999
- Invited lecture tour of The Technion, Weizmann Institute and Ben Gurion University of the Negev, Israel, host Professor Ora Kedem, June 4-12, 1998.
- Invited to deliver a lecture entitled, "Orientation and Enzyme Activity During Adsorption or Crowding Forces One to Stand" as part of the Warren McCabe Lecture Series, North Carolina State University, November 21, 1988.
- Plenary Lecture, North American Membrane Society's 2nd Annual Meeting, Syracuse University, June 1, 1988.
- Invited speaker at the Edwin N. Lightfoot Retirement Symposium, University of Wisconsin, Chemical Engineering Department, Madison, WI, November 10, 1996.
- Invited lecture by The Swedish National Committee for Chemistry, Swedish Academy of Sciences, for the EUChem conference "Surface Forces in Science and Technology", Skytteholm, Sweden, 15-18 June, 1995.
- Lectured at the invitation of Professor Marianne Nystrom, Seminar on Membrane Fouling, Finish Academy, Finland, July, 1994.
- Presented an invited review lecture entitled, "Bioseparations and Biocatalysis with Synthetic Membranes: Recent Developments", at 21st Aharon, Katzir-Katchalsky Conference: Workshop on "Applications of Membranes to Industry", Weizmann Institute,

- Rehovot, Israel, September 5-7, 1993.
- Presented a Main Lecture entitled, "Membrane Processes in Well-Defined Fluid Instabilities in a Scalable Module Design" at the 1993 International Congress on Membranes and Membrane Processes, Heidelberg, Germany, August 30 - September 3, 1993.
 - Plenary Lecture entitled "Enhanced Performance for Pressure-Driven Membrane Processes: The Argument for Fluid Instabilities" at the "International Membrane Science & Technology Conference" (IMSTEC'92) Sydney, Australia, November 10-12, 1992,
 - Presented Plenary Lecture entitled "Membranes and Biotechnology: Realities and Possibilities" at the Annual Meeting of Korea Society for Membranes, Hanyang University, Seoul, South Korea, on Friday November 6th 1992.
 - Invited after dinner lecture on "Membrane Bioreactors: Where to Now?" at a Deutsche Forschungs Gemeinschaft meeting on Biotechnology, Lambrecht, West Germany, June 7, 1990.
 - Delivered an invited overview lecture on "Synthetic Membranes in Biotechnology: Realities and Possibilities" at 5th European Congress on Biotechnology, Copenhagen, Denmark, July 10, 1990.

Editorial and Review Responsibilities

- Member of the editorial board of Biotechnology Progress (from 2000-)
- International editor, Chemical Engineering Journal of Japan, (from 1996-)
- Member of the editorial board of Bioseparation (from 1991-1999)
- Member of the editorial board of Solid Liquid Flow, France (1990-1995)
- Member of the editorial board of Separations Science & Technology (1996-2005)
- Member of the editorial board of Journal of Membrane Science (from 1987-)
- Member of the editorial board of Journal of Biotechnology (1987-1997)
- Member of the editorial board of International Journal Desalination (from 1975-)

Manuscript reviewer for AIChE (from 1980), J. Colloid Sci (from 1980), Biotechnol. Bioengr. (from 1985), Biotechnology Progress (from 1989), Canadian J. Chem. Engr. (from 1989), Chem. Engr. Commun. (from 1990), Chem. Engr. Sci. (from 1982), J. Fluid Mechanics (from 1986), J. Membrane Science (from 1980), J. Industrial Biotechnology (from 1990), Langmuir (from 1989), J. Separation Science & Technology (from 1996), Science (from 1999).
Grant reviewer for NSF (from 1985), DOE (from 1990), NIH (from 1989).

Teaching Experience

(University)

- Advanced Fluid Mechanics (transport phenomena) (Graduate core course), annually, Spring (1999-).
- Advanced Membrane Concepts (Graduate and Undergraduate), biennially (1980-).
- Downstream Processing In Biochemical Engineering (Graduate and Underg.) biennially (1990-).
- Molecular Separations Engineering (Undergraduate and Graduate) (new F'2001, F'2004, S'2006; F'2010; F'2012)
- Engineering aspects of sustainable energy (both Grad and UG), Spring 2009 (with Patrick Underhill)
- Introduction to Molecular Separations and Recovery Engineering (January term 20 hour course while on Sabbatical leave at MIT, 2005)
- Scaled-down Separations for Biotechnology (Genomics and Proteomics) (Graduate; U of Bologna, 2003; Merck & Co., 2003)
- Separations and Recovery Engineering (Undergraduate and Graduate), biennially (up to 2000).
- Introduction to Thermodynamics (Undergraduate).
- Water and Wastewater Treatment (Graduate)
- Engineering Mathematics (Graduate)
- Desalination Methods (Graduate)

(Non-University)

- - Short Course (with Andrew Zydney) at Amgen Pharmaceuticals, Tarrytown, NY on “Membrane Technology for Biotechnology”, Jan. 7 & 8, 2013.
- - Short Course (with Andrew Zydney) at Merck & Co, Rahway NJ on “Membrane Technology for Biotechnology”, Dec 12 & 13, 2011.
- Short Course, W.L. Gore and Associates, Elkton, MD on “Membrane Technology for Biotechnology”, October 23 & 24th 2012
- Short Course (with Andrew Zydney) at GE Global Research Labs, Schenectady, NY on “Membrane Technology for Biotechnology”, May 16 & 17th 2012.
- Short Course (with Andrew Zydney) at Merck & Co, West Point, PA on “Membrane Technology for Biotechnology”, Dec 12 & 13, 2011.
- Short Course (with Andrew Zydney) Membrane Fouling for Biotechnology, Asahi Kasei Bioprocess Inc, Glenview IL, January 18 & 19, 2010.
- Short Course (with Andrew Zydney) at Merck & Co, West Point, PA on “Membrane Technology for Biotechnology”, Nov 2 & 3, 2006.
- Short Course (with Andrew Zydney) Membrane Fouling for Biotechnology, Sanofi Pasteur, Paris France, September (2004).
- Short Course (with Andrew Zydney) Membrane Fouling for Biotechnology, Novo Nordisk, Copenhagen, Denmark September (2004).
- Short Course, "Molecular Separations Engineering", University of Bologna, Italy (2002), Merck & Co., West Point (2002).
- Short Course (with Andrew Zydney) Membrane Fouling for Biotechnology, Hyatt Hotel, Cambridge, MA, November-December 2,000.
- Short Course (with Andrew Zydney) Membrane Fouling for Biotechnology, Amersham Pharmacia Biotech, Uppsala, Sweden, May 2,000.
- Short Course (with Andrew Zydney) Membrane Fouling for Biotechnology, DSM, Geleen, The Netherlands, May, 2,000.
- Short Course (with Andrew Zydney) Membrane Fouling for Biotechnology, Merck & Co., Inc, West Point, PA, June, 1998.
- Short Course (with Andrew Zydney) Membrane Fouling for Biotechnology, Novo-Nordisk, Copenhagen Denmark, January, 1996.
- Presented an invited 2 h lecture on “Membrane Technology in Biotechnology”, Chemical Engr. Department, UC Berkeley (10/30/96).
- Presented informal lectures to Professor Ken Raymond’s and Professors Harvey Blanch and Clay Radke’s groups, Chemical Engineering Department, UC Berkeley (10/9/96 & 11/5/96).
- North American Membrane Society, Short Course on Membrane Fouling (with Andrew Zydney), Portland, OR (1995).
- North American Membrane Society, Short Course on Membrane Fouling (with Andrew Zydney), Breckenridge, CO (1994).
- ACS Short Course on "Recovery of Biologicals", San Diego, CA, 27 September, 1994.
- ASME Workshop "Bioprocess Separations Technology", San Diego, 30 October, 1994.
- Texas A&M University, Workshop "Separations in Biotechnology & Pharmaceutical Industries, Pearl River, NY, 17 October.
- Taught three courses at the NATO "Advanced Study Institute on Membrane Processes in Separation and Purification", Curia, Portugal (March 1993).
- European Membrane Society, Summer School, Zvinogorod, Russia (September 1991).
- North American Membrane Society, Short Course on Membrane Fouling, Cincinnati, OH (May 1986).
- Taught in the workshop on Engineering Aspects of Membrane Processes by the European Membrane Society, Aarhus, Denmark, (June 1986).
- Short course entitled, "Protein Separations: Principles and Processes" with

- James E. Bailey (organizer), Maria-Regina Kula, and David Ollis at Chicago (3/27-28/1987); and UC, Berkeley (6/13-14/1988) & (4/17-18/1989).
- North American Membrane Society, Short Course on Membranes in Biotechnology (with Steven L. Matson), Chicago, IL (1990).
 - Presented three invited Pedagogical lectures on (i) Fundamentals of membrane technology, (ii) Module design and fluid management, and (iii) Membrane applications in biotechnology, at the Pre-conference Workshop of IMSTEC'92, Sydney Australia (11/9/92).

Former Graduate Students/Post-Docs/Visitors

- Y. Rotem, MS, 1975, The Netherlands.
- D. Mahlab, PhD, 1977, Research Engineer, Solar Energy Co., Yavne, Israel.
- R. Yadidia, MS, 1977, Israel.
- G. Alexandrowich, Post-doc, 1977, Israel.
- E. Almagor. MS, 1978, Israel.
- N. Sinai, Post-doc, 1978, Israel
- G. Green, MS, 1980, Engineer/Stock broker, Haifa, Israel.
- A. Paluszek, A., MS, 1980, deceased.
- P. Chin, MS, 1982, USA.
- D. M. Dziejwski, Post-doc, 1982, Biotechnologist, Troy, NY
- R. Reed, MS, 1982, Environmental Engineer, FL.
- F. W. Altena, Post-doc, 1982, Researcher, Phillips, The Netherlands.
- M. K. Thallam, Post-doc, 1983.
- C. P. Feerick, Jr., MS, 1984, Environmental Engineer TX.
- K. L. Woodfield, MS, 1984, Environmental Engineer, NY State, Albany, NY.
- J. Otis, MS, 1985, USA.
- R. Weigand, MS, 1985, Engineer, Union Carbide, NY.
- J. Nicoletti, MS, 1985, Engineer, IBM, NY.
- R. Kuriel, MS, 1986, Engineer, Millipore Corp., MA.
- M. Kortenbusch, Diplom Thesis at RPI, 1986, PhD at Institut fur Verfahrenstechnik, Rheinisch Westfaelische Technische, Hochschule, Aachen, Germany, 1991.
- G. Altshuler, PhD, 1986, Research scientist, 3M Corporation, St. Paul, MN.
- Y. M. Lee, Post-doc, Chairman, Assoc. Prof., Industrial Chemistry Dept., Hanyang University, Seoul, Korea, 1987-1988.
- J. Schonberg, PhD, 1987, Research Engineer, Chemical Engineering Department, RPI, Troy, NY, (NATO Scholar, at Dept. of Applied Mathematics and Theoretical Physics, Cambridge University, England, 1988).
- D. Bourgeois, MS, 1988, Engineer, GE, Selkirk, NY.
- N. Nagata, MS, 1988, Engineer, Unitika Co., Kyoto, Japan.
- C. S. Lee, PhD, 1988, Professor, Biochemical Engineering Department, University of Maryland, Baltimore Campus, Baltimore, MD, National Science Foundation Young Investigator, 1992.
- R. Mellis, Diplom Thesis at RPI, 1989, PhD at Institute fur Verfahrenstechnik, Rheinisch Westfaelische Technische, Hochschule, Aachen, Germany, 1991.
- Michael Kremsner, *Dipl.-Ing. Dr. techn.*, Post-Doc, Managing Director, K&C Kremsner and Associates, Germany and Austria, 1989
- C. Heath, PhD, 1989, Assistant professor, Biochemical Engineering, Dartmouth College Hanover, NH, Young Presidential Investigator, 1991.
- W.K.Y. Chan, PhD, 1990, University of California at Berkeley, Law School.
- J. Tschesche, Diplom Thesis at RPI, 1990, from Institut fur Verfahrenstechnik, Rheinisch Westfaelische Technische, Hochschule, Aachen, Germany, 1991.
- F. Linz, Post-doc, 1990, Marketing, Sartorius A/G Germany.

- P. Mikulasek, Post-doc, 1991, Assistant Professor, Institute of Chemical Technology, Pardubice, Czechoslovakia.
- A. Lefferts, MS Practicum at RPI, 1991, from Department of Food Sciences, Wageningen Agricultural University, Wageningen, The Netherlands.
- H. Huang, Post-doc, 1991, (from Chemical Engineering Department, SUNY Buffalo).
- H. Yamagishi, Post-doc, 1991, (from Chemical Engineering Department, The University of Tokyo, Tokyo, Japan).
- J. Leo Gaddis, 1991, Professor, Mechanical Engineering, Clemson University, Clemson, SC.
- H. Winzeler, 1991, Professor, Chemical Engineering, Winterthur Technology Institute Winterthur, Switzerland.
- I. Gede Wenten, PhD Practicum, 1991, from Institute for Kemiteknik, Technical University of Denmark, Lyngby, Denmark.
- F. Pincet, 1990-1991, Visiting Doctoral Student, from Laboratoire de Physique Statistique, Ecole Normale Supérieure, Paris, France.
- Dauh-rung Wu, PhD, 1992, (with S. Cramer) Research Engineer, PQ Corporation, MA
- Kun Yong Chung, PhD, 1992, Assoc Prof., Seoul Inst Technol, Seoul, Korea.
- Gonzalo (Al) Serafica, MS, 1992, Research Engineer, Amicon Corp., Danvers, MA.
- Katherine McKinney, PhD, 1993, Post-doctoral candidate, ETH, Zurich, Switzerland.
- Mathias Ulbricht, Post-doc, 1993, Fachbereich Chemie, Institut für Organische und Bioorganische Chemie, Humboldt-Universität, Berlin, Germany.
- Hiroshi Yokoi, Ph.D., 1993, Research Engineer, Unitika Co., Chiba, Kyoto, Japan
- Cristiana Boi, Ph.D., 1994, Ingegneria Chimica, University of Bologna, Bologna, Italy.
- Eberhard Staude, Professor, 1994, University Essen, Chemistry Dept., Essen, Germany.
- Sven Hoffmann, Diplom Thesis at RPI, 1994, (from Institut für Verfahrenstechnik, Rheinisch Westfälische Technische Hochschule, Aachen, Germany, 1994).
- Meike Schmidt, Diplom Thesis at RPI, 1995, (from Institut für Verfahrenstechnik, Rheinisch Westfälische Technische Hochschule, Aachen, Germany, 1995).
- Nathalie Lacoma, MS, 1995, Doctoral student at Boston University, Boston, MA.
- Johan Venters, MS Practicum at RPI, 1996 (from Department of Food Sciences, Wageningen Agricultural University, Wageningen, The Netherlands).
- Reudiger Jud, Diplom Thesis at RPI, 1996, (from Institut für Verfahrenstechnik, Rheinisch Westfälische Technische Hochschule, Aachen, Germany, 1995).
- Peter Boehme, Post-doc., 1996, Free University, Berlin and GKSS-Teltow, Germany
- Kwang, Hyun Lee, Post-doc., 1996, Dong Eui University of Pusan, Chemical Engineering Department, Pusan, Korea.
- Jeffrey A. Koehler, PhD., 1997, Nanostream, CA
- Susana Luque, Post-doc., 1997, from the University of Oviedo, Chemical Engineering Department, Oviedo Spain.
- Gunther Gehlert, Studienarbeit, 1997, Arbeitsbereich Apparatebau, Technische Universität Hamburg-Harburg, Germany
- Hanuman Mallubhotla, Ph.D., 1997, Research Engineer at Millipore Corp., MA.
- Hua Chen, Visiting Scientist, 1997, from Membrane Engineering Laboratory, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, Dalian, China
- Tanja Kluge, Diplom Thesis, 1997, Arbeitsbereich Apparatebau, Technische Universität Hamburg Harburg, Germany
- Maarten Schutyser, Diplom Thesis, 1999, (from Department of Food Sciences, Wageningen Agricultural University, Wageningen, The Netherlands).
- Sivasegaram Manimaaran, PhD., Visiting Scientist, 1999, Imperial College, London, England, UK.
- Thomas R. Baekmark, PhD., Visiting Scientist, 2000, Technical University, München, Germany.
- David Wood, PhD., 2000, Assistant Professor, Princeton University, Princeton, NJ
- John P. Pieracci, 2001, PhD, Research Engineer, IDEC, San Diego, CA

- Emiko Tanaka, BS, Visiting Scientist, 2001-2002, Kobe University, Japan
- Masahide Taniguchi, MS, Visiting Scientist, 2001-2002, Toray Company Inc, Otsu, Japan
- Brian Frank, PhD., Scientist/Engineer, 2002, ENCON, NY State, Albany, NY
- Gautam Baruah, PhD, 2004, Research Scientist, Abbott Labs, Abbottville, IL
- Ananthkrishnan Sethuraman, PhD, 2005, Research Scientist, Amgen Inc, CA
- Ravindra Kumar, MS, 2005, Millipore Corp., Research Engineer, Bedford MA
- Jun Miao, MS, 2005, Research Engineer, Marin Biotechnology, Marin County, CA
- Chao Zhu, PhD, Post-doc, 2003-2004, Research Sci, Biotechn., U. of Maryland, Silver Springs, MD
- Antoine Bouchoux, PhD, Post-Doc, 2005-2006; UMR STLO, INRA Agrocampus, Rennes, France
- Ashish Sharma, MS, 2006. Research Scientist, Millipore Corp. MA.
- Hongwei Liu, PhD, Post-Doc, 2005-2007.
- Aditya Bengali, MS., 12/2007, Research Scientist, Bristol Myers Squibb. NY.
- Arpan Nayak, PhD, 12/2007, Research Scientist, Human Genome Science. MA
- Mirco Sorci, Post-Doc, 11/2008 (rehired by GB June 2009).
- Brian Pereira, PhD, (with Shekhar Garde and Marlene Belfort) May 2009, Post-doc MIT, Cambridge, MA
- Adith Venkiteswaran, PhD, May 2009, Research Scientist, Eli Lilly & Co., Indianapolis, ID
- Amit Dutta, PhD, May 2010, Post-Doctoral Associate, NIST-NIH, Washington, DC.
- Gaurav Anand, PhD, May 2010, Research Scientist, Intel, Seattle, WA.
- Philip S. Yune, PhD, December 2011, Medical School.
- Minghao Gu, PhD, September, 2012, Research Engineer, Rhodia-Solvay, Shanghai, China

Research Awards and Grants (since 1979)

Principal Investigator Status

- | | |
|-------------|---|
| 1979 - 1982 | EPA: Prediction of Preferential Selectivity for Activated Carbon Adsorption/Trace Organics Contaminant, \$159,310. |
| 1979 - 1981 | NSF: Gas Chromatograph/Mass Spectrometer System, \$37,000. |
| 1979 - 1981 | NSF: Concentration of Viruses from Water Using Polarizing Fields, \$120,450. |
| 1980 - 1982 | NSF: Engineering Equipment Grant Request: High Performance Liquid Chromatography System, \$12,000. |
| 1982 - 1984 | EPA: Prediction of Preferential Selectivity for Activated Carbon Adsorption/Trace Organics Contaminant, \$98,374. |
| 1983 - 1985 | Westvaco Corp.: Development of a Novel, Inexpensive, Versatile, and Rapid Diagnostic Tool to Characterize Activated Carbon Adsorption of Organics from Water, \$84,000. |
| 1984 - 1984 | W. R. Grace Corp: Continuous Hybridoma Growth and Antibody Production and Separation, \$20,000. |
| 1984 - 1987 | NSF: Particle Fluid Mechanics as Applied to Membrane Fouling, \$194,415. |
| 1984 - 1985 | Societe Lyonnaise Des Eaux et de L'Eclairage: Pervaporation of Dilute Chloroform/Water Solutions, \$25,000. |
| 1985 - 1986 | NSF: Engineering Research Equipment Grant: Surface Force Apparatus System, \$56,087. |
| 1985 - 1990 | NY State ERDA: Sorption and Modeling for Pervaporation of Ethanol/Water Solutions, \$124,776. |
| 1988 - 1990 | NY State STF: Magnetic Resonance Imaging and Modeling of Mass in Entrapped Cell Bioreactors, \$40,000. |
| 1989 - 1992 | Dow Chemical Company: Investigation into Instabilities of Viscous Fluid Flows in Curved Channels: Possibilities for New Membrane Design, \$143,939. |
| 1989 - 1990 | Mixing Equipment Co.: Development of a Perfusion Rotating Annular Bioreactor, \$112,574. |
| 1989 - 1991 | NSF: Immobilized Metal Affinity (IMA) Membranes, \$30,303. |
| 1989 - 1992 | US Navy: Construction and Evaluation of a Metal Ion Biosensor, \$143,880. |

1990 - 1993 US DOE: Chemical Interactions Between Protein Molecules and Polymer Membrane Materials, \$225,000.

1992 - 1993 Lightinin (Mixing Equipment Co.): Development of a Perfusion Rotating Annular Bioreactor, \$123,094.

1992 - 1993 Pall Corp: Surface Modification and Performance Evaluation of Polyethersulfone Membranes, \$82,754.

1992 - 1995 US Navy: Direct Measurements of the Intermolecular Forces between Polysaccharide Exopolymers from Marine Bacteria and Solid Substrates, \$143,093 for the first year.

1993-1994 NSF: Biocatalytic membranes with catalytic antibodies, \$37,500, SGER, one-year grant.

1994-1996 US DOE: Chemical Interactions Between Protein Molecules and Polymer Membrane Materials, \$225,000.

1995 Baxter Travenol, Chicago, Ill, \$25,000 (gift for research).

1994-1996 NWRI: Dean Vortex Instabilities for Tubular Membrane Module Design, \$242,000.

1995-1998 NSF: Surface Modification of Polymeric Membranes For Low Protein Fouling, \$210,000.

1996-1999 US DOE: Chemical Interactions between Protein Molecules and Polymer Membrane Materials, \$276,000.

1996-1997 Millipore Corp., Bedford MA. Dean Vortex Instabilities for Hollow Fiber Membrane Module Design,, \$60,000

1977-1998 Millipore Corp. Bedford MA. Surface Modification of Polysulfone Membranes, Confidential. Millipore Corp., Bedford MA. Dean Vortex Instabilities for Hollow Fiber Membrane Module Design,, \$60,000

1998-1999 Bureau of Reclamation, Denver, CO., Membrane Fouling: Influence of Natural Organic Matter Properties and Membrane Surface Treatment on Adhesion and Flux Decline, \$120,000 (with Chip Kilduff).

- 1998-1999 Merck & Co., Imaging and Intermolecular Force Measurements between Pneumococcal Polysaccharides, \$50,000.

2000-2001 Danish Separation Systems, A/.S., Surface Photo-oxidation of Synthetic Membranes, \$15,000.

2000-2003 US DOE: Chemical Interactions between Protein Molecules and Polymer Membrane Materials, \$335,000.

2000-2001 NSF: Surface Modification of Polymeric Membranes For Low Protein Fouling, \$50,000.

- Genzyme Transgenics, Framingham, MA, Vortex Microfiltration for Improved Protein Recovery from Whole Goat's Milk, \$20,000

2001-2004 NSF: Photoinduced Grafting of Filtration Membranes: Principles and Applications, \$273,683.

2001-2003 Genzyme Transgenics, Framingham, MA, Vortex Microfiltration for Improved Protein Recovery from Whole Goat's Milk, \$150,000

2002-2006 RPI's Internal Research Initiative from the VP of Research: Linking Quantum and Classical Molecular Models with Molecular Genetics: Application to an Innovative Single-step Bioseparations Technique (with Shekhar Garde, Saroj Nayak, Chemical Engineering and Physics Depts. and Marlene Belfort and Victoria Derbyshire. Wadsworth Center, New York State Department of Health, and School of Public Health, State University of New York at Albany, Albany), \$50,000.

2003-2006 US DOE: Chemical Interactions between Protein Molecules and Polymer Membrane Materials, GB PI; Co-PI Ravi Kane, \$411,000

2003-2006	US EPA: Developing modified nanofiltration membranes for NOM treatment; PI- Chip Kilduff, GB- CoPI; \$130 k/year.
2003-2007	NSF NIRT Grant: Inteins as Nanoswitches for Biotechnology: Linking Molecular Modeling with Physical and Genetic Methods. PI: GB, and Co-PIs: Shekhar Garde, Saroj Nayak (both at RPI), Marlene Belfort and Vicky Derbyshire (both at the Wadsworth Center); \$1,200,000.
2004-2007	Novo Nordisk: Grant "Recovery of Inclusion Bodies from Disrupted <i>E. coli</i> Fermentation Broth Using Crossflow Microfiltration"; GB PI; \$278,000 for 3 yrs.
2004-2008	NIH Nanoscience and Nanotechnology in Biology and Medicine (BECON) (with Rockefeller U) Grant: "Virtual Gating Machines: A New Technology for Protein Purification"; GB CoPI; \$74,000/year for GB.
2004-2009	NIH Training Grant \$783,644 [21 total faculty (5 from Wadsworth Center)]
2005-2008	New DOE Materials Grant (with Sanat Kumar), "Influence of Surface Chemistry and Folding Free Energy on Protein Adsorption", July 2005 (2PI) \$574,000 for three years.
2006-2008	US DOE Renewal: Chemical Interactions between Protein Molecules and Polymer Membrane Materials, GB PI; Co-PI Ravi Kane, \$238,000, two years.
2006-2010	US-Israel Binational Fund, "Amyloids and Nanoparticles" (Israel partner: Dr Shlomo Margel, Bar Ilan University, Israel, \$12,000, three years.
2007-2010	NSF Grant: Enhanced Performance Membranes by High Throughput Modification, GB PI; \$75 K/yr; three years.
2009-2012	US DOE Renewal, Combinatorial and High Throughput Membrane Synthesis and Testing: Tailoring Membrane Surfaces to Applications, GB PI, \$497,000, three years.
2010-2011	Asahi Kasei Bioprocessing, Improving protein selectivity with precise pH and ionic strength, Gift to GB Group: \$25,000. Negotiating for a 2 nd gift.
2011-2012	US NSF, "EAGER: Enhanced Performance Membranes by Scalable High Throughput Modification ", GB PI, \$99,000, one year.
2012-2012	GE Global Research, Schenectady, NY, "Smart Membranes", GB PI, \$50,000, one year.
2010-2014	NIH Nanoscience and Nanotechnology in Biology and Medicine (BECON) (with Rockefeller U) Grant: "Virtual Gating Machines: A New Technology for Protein Purification"; GB CoPI; \$140,000/year for GB.
2011-2014	US DOE, Optimizing immobilized enzyme performance in cell-free environments to produce liquid fuels GB PI, \$437,467, three years.
2012-2015	US DOE, "Combinatorial and High Throughput Membrane Synthesis and Testing: Tailoring Membrane Surfaces to Applications (Renewal)", GB PI, \$485,000, three years
2012-2013	US NSF, "EAGER: Interfacial Disruption of Supported Lipid Bilayers by Invading Peptides", GB PI, \$99,000, one year.
2013-2013	NYCAP Research Alliance (P.I.: Paul Agris, UAlbany; Co-PI: Belfort) "Aptamer-based sensor for early detection of alzheimer's disease", -\$36,000 for one yr, direct costs only

Patents Disclosure/Application/Awarded

1. Curved Channel Membrane Filtration, Application number H26-030 US; Filed on 9/21/92 (with Mary Brewster and Kun-Yong Chung), Issued: 4/20/93, Patent number: 5,204,002.
2. Low Fouling Ultrafiltration and Microfiltration Aryl Polysulfone, Application Number H26-034 US, Filed on 12/22/93 (with Jim Crivello and Hideyuki Yamagishi) Issued: 11/21/95, Patent Number #5,468,390.
3. Coiled Membrane Filtration System, Application number H26-039 US; Issued on 5/6/97 (US Patent #. 5,626,758), Reissue Application filed April 22, 1999 (SN: 09/298,519).
4. Coiled Membrane Filtration System, Patent Awarded in Canada, China, Japan, Europe, 2000.
5. Modification of Porous and Non Porous Materials Using Self-Assembled Monolayers, (with Peter Boehme), Issued US Patent #5,852,127, December 22, 1998.
6. "Coiled Membrane Filtration System", G. Belfort, Issued US Patent #RE 37,759, June 25 th, 2002.

7. "Photo-processing and cleaning of PES and PSF Membranes", Masahide Taniguchi and Georges Belfort, International patent application #: WO 03/078506 A3, 25 September 2003.
8. Isolation of a controllable intein derivative (with M. Belfort, V. Derbyshire, D. Wood and W. Wu), US patent # US 6,933,362; Issued on 08/23/2005.
9. UV assisted grafting of PES and PSF membranes", (with M. Taniguchi and J. Pieracci), US patent 6,852,769, issued Feb 8, 2005.
10. "Improved method using photo-induced grafting for modifying poly (ether sulfone) (PES) and poly (aryl Sulfone) (PSf) Membranes" (with J. Pieracci and M. Taniguchi), Awarded, 3-2007, Germany.
11. "Coiled membrane filtration system", European Patent #: EPO0784502, Date of filing: March 7th 2007.
12. UV assisted grafting of PES and PSF membranes", (with M. Taniguchi and J. Pieracci), Canadian patent 2,422,738, issued June 26, 2007.

Committee/Boards

- Managing Board of the Society of Biological Engineers, AIChE, 2006-
- Selection Committee for President, Councilors and other positions, NAE, 2005-2006.
- Selection Committee for the Draper Prize, NAE, 2003-2006.
- Board of Scientific Advisors, Intermolecular Inc., Palo Alto, CA, Feb. 2005.
- Board of the Rensselaer Foundation for Biological Meetings, 11/2000-2004.
- Board of Scientific Advisors, Danish Sep. System., Nakskov, Denmark, Sept., 1998-2005.
- Ph.D. Thesis Committees: GB has served on about 5 Ph.D. Committees outside RPI at MIT, Lund and Uppsala University, Sweden, Twente University, and Wageningen University, The Netherlands.

Research Interests

Areas	Membrane filtration, Transport phenomena (Nature-inspired selective transport through the Nuclear Pore Complex; synthetic membranes), surface science and engineering (grafting and polymerization, high throughput), interfacial phenomena and rheology (single molecule (protein and polymer) force spectroscopy, protein-protein interactions at surfaces, surface rheology), membrane separation processes (cross-flow filtration, fouling, module design, affinity adsorption, membrane surface modification, NMR flow imaging); adsorption processes (proteins and polysaccharides from solution onto solid substrates); biocatalysis (bioreactor design for cells and enzymes); bioseparations and sensors (using inteins as gene-fusion proteins), and protein misfolding and aggregation (insulin/ABeta amyloid oligomer and fibril formation).
Fundamentals	Molecular separation processes (fluid mechanics, mass transfer, applied mathematics, numerical analysis, synthetic polymer chemistry, photochemical reactions, low and atmospheric temperature plasma); adsorption processes (intermolecular forces, kinetics, surface rheology); biocatalysis (immobilized enzymes, structure and stability, NMR) and bioseparations/sensors (intein linkers for fusion proteins, genetic engineering).
Collaborators	Marlene Belfort, Wadsworth Center, Albany NY (genetics), Shekhar Garde, CHME (molecular simulations) and Saroj Nayak, Physics at RPI (quantum mechanical modeling), Brian Chait, Laboratory of Mass Spectrometry and Gaseous Ion Chemistry, and Michael Rout, Molecular and Cellular Biology, Rockefeller University (nuclear pore membrane transport), Chip Kilduff, Civil and Environmental Engineering, RPI (low fouling nanofiltration membranes), Robert L. Langer and Dan Anderson, Chemical Engineering, MIT (high throughput synthesis and screening of modified surfaces), Gregory McCrae, Chemical Engineering, MIT (modeling nucleation and growth of proteins), Guilio Sarti, Chemical Engineering Department, University of Bologna, Bologna, Italy (affinity membrane separations), and Shlomo Margel Chemistry, Bar Ilan University, Israel (amyloidosis with nano particles).

Consulting

Consult to the following companies involved in bioseparations, bioreactor, membrane and sorption technology:

1980 to 2011	Air Products & Chemicals, Inc., PA	Liquid Air Products, Inc., CA
	Ahlstrom Machinery, Inc, NY	Lyonnais des Eaux (France)
	Amersham-Pharmacia Biotech, Sweden	Merck and Co., PA
	Amgen, WA	Millipore Corp., MA
	Amicon Corp., MA	Mixing Equipment Co., NY
	Anotec Separations Ltd. (UK)	Neose Inc, PA
	Baxter Healthcare Corp., CA	PTI, Inc, CA
	Biogen Inc., MA	Pandex, IL
	DSS A/S (formally DDS Corp.) (Denmark)	Pharmacia, NJ (Sweden)
	Eli Lilly, IN	Sartorius, NY (Germany)
	Dow Chemical Co., MI (& Filmtec Corp., MN)	Sky Co., NJ
	Genetech, Inc., CA	Unitika Co. (Japan)
	Genzyme-Medix Biotech, CA	US Filter (Vivendi), MA
	Genzyme (GTC Biotherapeutics), MA	Westvaco, SC
	Gore, DE	Leveen & Assoc., CA
	W. R. Grace Corp., MD.	APC Inc, Des Moines, IO
	IBM, NY	Biogen-Idec, La Jolla, CA
	Novo Nordisk, Denmark	Sanofi-Aventis, France & USA
	Asahi Kasei Bioprocessing, Chicago/Japan	Leydig, Voit & Mayer, Ltd., IL (Pall)

Peer-Reviewed Publications

Books and Monographs

- 1) Belfort, G. (1977), Pressure Driven Membrane Processes and Wastewater Renovation, Chapter 6, pp. 129-189, in Water Renovation and Reuse (ed. H. I. Shuval), Academic Press, New York.
- 2) Belfort, G., and Sinai, N. (1980) Chap. 19 entitled, "Relaxation Studies of Adsorbed Water on Porous Glass: Varying Temperature and Pore Size at Constant Coverages", pp. 323-346, in Water in Polymers, ACS Symp. Series No. 127.
- 3) Belfort, G., Baltutis, T. F., and Blatt, W. F. (1980) "Automated Hollow Fiber Ultrafiltration: Pyrogen Removal and Phase Recovery From Water", in Ultrafiltration Membranes and Applications (ed. Anthony Cooper), Plenum Publishing Corporation, pp. 439-474.
- 4) Mahlab, D. Ben Yosef, N. Belfort, G. (1981) "Intrinsic Membrane Compaction and Aqueous Solute Studies of Hyperfiltration (Reverse Osmosis) Membrane Using Interferometry", pp. 147-158 in Synthetic Membranes Vol. 1, Desalination (ed. A. F. Turak) ACS Symposium Series 153, ACS Washington, DC.
- 5) Belfort, G. (1981) "Selective Adsorption of Organic Homologues Onto Activated Carbon from Dilute Aqueous Solutions. Solvophobic Interaction Approach - II Development and Test of Theory", published in Chemistry in Water Reuse, Vol. 2, (ed. W. J. Cooper), Ann Arbor Science Publ. Inc., Ann Arbor, MI.
- 6) Belfort, G. and Dziewulski, D. (1982) "Concentration of Viruses from Aqueous Environments: A Review of the Methodology", Chapt. 29 publication in Water Reuse (ed. E. J. Middlebrooks), Ann Arbor Science Publ. Inc., Ann Arbor, MI.
- 7) Altshuler, G., and Belfort, G. (1983) "Selective Adsorption of Aqueous Solutions. Solvophobic Interaction Approach - III Branching and Predictions", pp. 29-62 in Treatment of Water by Activated Carbons, ACS Advances in Chemistry Series 202 (ed. M. J. McGuire and I. H. Suffet) ACS, Washington, DC.

- 8) Belfort, G. (1984), (editor, author of 2 chapters, and co-author of one chapter). Synthetic Membrane Processes: Fundamentals and Water Applications Academic Press, New York.
- 9) Belfort, G., Altshuler, G. L., Thallam, K. K. , Feerick, C. P., Jr., and Woodfield, K. L. (1984), (editor with Alan L. Myers and author of a chapter) in Fundamentals of Adsorption, AIChE Press, New York.
- 10) Belfort, G., Weigand, R. J. and Mahar, J. T. (1985) "Particle Membrane Fouling and Recent Developments in Fluid Mechanics of Dilute Suspensions" ACS Symposium Series, No. 281, Reverse Osmosis and Ultrafiltration, (eds., S. Sourirajan and T. Matsuura) ACS, Washington, DC.
- 11) Belfort, G., (1986), "Fluid Mechanics and Cross-Flow Membrane Filtration", Advances in Solid-Liquid Separation, (ed. H. S. Muralidhara), Battelle Press, Columbia, Ohio.
- 12) Belfort, G., (1987), (editor with H. Bungay III, author of 2 chapters: "Membrane Separation Technology: An Overview" and "Challenges and Opportunities in Product Recovery") Advanced Biochemical Engineering, John Wiley, NY.
- 13) Heath, C. and Belfort, G., (1987), "Modeling of Substrate Mass Transfer and Uptake in Hollow Fiber and Microcapsule Bioreactors", in Biochemical Engineering, A Challenge for Interdisciplinary Cooperation, Gustav-Fischer Verlag, Stuttgart, West Germany.
- 14) Heath, C. and Belfort, G. (1991), "Diffusion and Convection in Membrane Bioreactors", Animal Cell Bioreactors (eds. C. S. Ho and D.I.C. Wang), Heath, Stoneham, MA.
- 15) Belfort, G. (1994), "Membrane Processes in Biotechnology: An Introduction", in Membrane Processes in Separation and Purification (eds. J. G. Crespo and K. W. Boddeker), Kluwer Academic Publishers, The Netherlands.
- 16) Belfort, G. and Heath, C. A. (1994), "New Developments in Membrane Bioreactors", in Membrane Processes in Separation and Purification (eds. J. G. Crespo and K. W. Boddeker), Kluwer Academic Publishers, The Netherlands.
- 17) Belfort, G. and Heath, C. A. (1994), "Biotechnology Processes: Membranes, Materials, Modules and Process Design", in Membrane Processes in Separation and Purification (eds. J. G. Crespo and K. W. Boddeker), Kluwer Academic Publishers, The Netherlands.
- 18) McKinney, K. L. and Belfort, G. (1995), "Use of Flow Cytometry for Monitoring Antibody Productivity and Isolating High-Secreting Hybridoma Cells", chapter 2, pp 17-37, for book entitled Hybridomas and Monoclonal Antibody Production, (eds. Al-Rubeai and A. N. Emery) Marcel Dekker, Inc., New York.
- 19) Belfort, G. and Zydney, A. L. (1998) "Interactions of proteins with polymeric synthetic membranes" in Interfacial Behavior of Biopolymers, (Martin Malmsted, Editor) Marcel Dekker, Inc. New York.
- 20) Belfort, G. (2000) "Recent advances in membrane technology that could improve resource recovery and recycle: Fluid mechanics, surface science and bioaffinity" in Bioseparations Engineering, (I Endo, T. Nagamune, S. Katoh, and T. Yonemoto, Editors) Elsevier, Amsterdam.
- 21) Belfort, G. and Zydney, A. L. (2003) "Interactions of proteins with polymeric synthetic membranes" in Biopolymers at Interfaces, 2nd Edition, (Martin Malmsten, Editor) Marcel Dekker, Inc. New York.

- 22) Wood, D. W., Harcum, S., and Belfort, G (2005) "Industrial Applications of Intein Technology" in Homing Endonucleases and Inteins (Editors: Marlene Belfort, Vicky Derbyshire, Barry Stoddard and David Wood), *Nucleic Acids and Molecular Biology*, Vol 16, Springer Verlag, Berlin Heidelberg.
- 23) Sorci, M. and Belfort, G. (2013) Insulin oligomers: Detection, characterization and quantification using different analytical methods (Chapter 8 of Part 2. Polymorphism of protein misfolded and aggregated species), in TEXT (Eds. V. Uversky and Y. Lyubchenko) in Bionanoimaging: Protein Misfolding & Aggregation, Elsevier/Academic Press, Waltham, MA. In press.

Peer-Reviewed Papers

1. Belfort, G. and Guter, G. A., (1968), An electrical analogue for electrodialysis, *Desalination*, 5, 267-291.
2. Belfort, G. and Daly, J. A., (1970), Optimization of an electrodialysis plant, *Desalination*, 8, 1963-1966.
3. Belfort, G. and Guter, G. A. (1972), Electrodialysis Hydrodynamics, *Desalination*, 10, 221-262.
4. Belfort, G., Littman, F. and Bishop, H. (1972), A new concept in reverse osmosis design, *Desalination*, 11, 17-30.
5. Belfort, G. (1972), Magnetic relaxation in a porous glass desalination membrane as a function of external salt concentration, *Nature Physical Science*, 273, 60.
6. Belfort, G. and Chomse, K. D. (1973), Peak sulfur dioxide concentrations in urban Cape Town, *Public Health (South Africa)*, 73.
7. Belfort, G. and Scherfig, J. (1973), The role of water in porous glass desalination membranes, *Proc. Fourth International Symposium on fresh Water from the Sea*, 3, 69-79.
8. Belfort, G., Littman, F. and Bishop, H. K. (1973), Wastewater reclamation using the regenerable reverse osmosis concept, *Water Research*, 7, 1545-1559.
9. Belfort, G. (1974), Structure of water in porous glass, *Nature*, 249, 593.
10. Belfort, G. (1974), Interfacing newly developed technology within present wastewater trains, an example: pressure-driven membrane processes, *J.A.W.W.A.*, August, 504-5.
11. Belfort, G., Scherfig, J. and Seevers, D. O. (1974), Nuclear magnetic resonance relaxation studies of adsorbed water on porous glass of varying pore size, *J. Colloid and Interface Science*, 47, 106-116.
12. Belfort, G., Rotem, Y. and Katzenelson, E. (1975), Virus concentration using hollow fiber membranes, *Water Research*, 9, 79-85.
13. Belfort, G. (1976), Cleaning of reverse osmosis membranes in wastewater renovation, in *Water 75*, published by *AIChE*, NY, 76-81.
14. Belfort, G. and Scherfig, J. (1976), Porous glass desalination membranes: Phenomenological transport coefficients and fixed charge salt exclusion, *Desalination*, 18, 43-58.
15. Belfort, G., Rotem, Y. and Katzenelson, E. (1976), Virus concentration using hollow fiber membranes, II, *Water Research*, 10, 279-284.

16. Belfort, G. (1976), A molecular friction model or transport of uncharged solutes in neutral hyperfiltration and ultrafiltration membranes containing bound water, *Desalination*, 18, 3, 259-281.
17. Mahlab, D., Ben Joseph, N. and Belfort, G. (1976), The interaction between the concentration polarization profile for dissolved and non-dissolved species in batch reverse osmosis systems: The dissolved system, *Proc. Fifth Int. Symposium on Fresh Water from the Sea*, 249-250.
18. Belfort, G., Alexandrowicz, G. and Marx, G. (1976), Artificial particulate fouling of hyperfiltration membranes *Desalination*, 19, 127-138.
19. Miller, S., Abeliovich, A., and Belfort, G. (1977), The effect of high organic loading on mixed photosynthetic wastewater treatment, *J. of WPC Federation*, 49 (3), Part 1, 436-440.
20. Belfort, G. (1977), Pretreatment and cleaning of hyperfiltration (reverse osmosis) membranes in municipal wastewater renovation, *Desalination*, 21, 285-300.
21. Yadidia, R., Abeliovich, A., and Belfort, G. (1977), Algal removal using high gradient magnetic filtration, *Env. Sci. and Tech.*, 11, (9), 913-916.
22. Belfort, G., Rotem-Borensztajn, Y. and Katzenelson, E. (1978), Virus concentration by hollow fibers: where to now? *Progress in Water Technology*, 10, (1/2), 357-364.
23. Mahlab, D., Ben Yosef, N., and Belfort, G. (1978), Concentration polarization profile for dissolved species in unstirred batch hyperfiltration (reverse osmosis) - II Transient Case, *Desalination*, 24, 297-303.
24. Almagor, E. and Belfort, G. (1978), Relaxation studies of adsorbed water on porous glass 1. Varying coverages and pore size at constant temperature, *J. Col. and Int. Sci.* 66 (1), 146-151.
25. Belfort, G. and Marx, B. (1979), Artificial particulate fouling of hyperfiltration membranes - II, Analysis and protection from fouling, *Desalination*, 28, 13-30.
26. Rotem-Borensztajn, Y., Katzenelson, E., and Belfort, G. (1979), Virus concentration by ultrafiltration, *Journal of the Environmental Engineering Div., ASCE*, 105, (EE2), 401-407.
27. Belfort, G. (1979), Selective adsorption of organic homologs from dilute aqueous solutions: The solvophobic interaction approach and correlations of molar adsorptivity with physicochemical parameters, *Environ. Sci. and Tech.*, 13, 939-949.
28. Mahlab, D., Ben Joseph, N., and Belfort, G. (1980), Interferometric measurement of concentration polarization profile for dissolved species in unstirred batch hyperfiltration (reverse osmosis), *Chem. Eng. Commun.* 6, pp. 225-243.
29. Belfort, G. (1980), Artificial particulate fouling of hyperfiltration membranes IV: Dynamic protection from fouling, *Desalination*, 34, 159-169.
30. Green G. and Belfort, G. (1980), Fouling of ultrafiltration membranes: Lateral migration and the particle trajectory model, *Desalination*, 35, 129-147.
31. Belfort, G. (1981), Similarity of the ideal adsorbed solution and potential theories for adsorption from a bulk phase onto a solid surface, *AIChE J.*, 27, (6), 1021.

32. Belfort, G., Paluszek, A., and Sturman, L. S. (1982), Enterovirus concentration using automated hollow fiber ultrafiltration, *Wat. Sci. Tech.* 14, 257-272.
33. Reed, R. H. and Belfort, G. (1982), "Characterization of fouling potential for pressure-driven membrane processes: A new simulated flow cell", *Wat. Sci. Tech.* 14, 499-552.
34. Belfort, G., Chin, P. and Dziewulski, D. M. (1982), A new gel-polarization model incorporating lateral migration for membrane fouling, *Proc. of World Filtration Congress III*, Vol. II, 548-555.
35. Dziewulski, D. M. and Belfort, G. (1983), Virus concentration from water using high-rate tangential flow hollow fiber ultrafiltration, *Wat. Sci. Tech.*, 15, 75-89.
36. Altena, F. W., Belfort, G., Otis, J., Fiessinger, F., Rovel, J. M., and Nicoletti, J. (1983), Particle motion in a laminar slit flow: a fundamental fouling study, *Desalination*, 47, 221-232.
37. Belfort, G. and Altena, F. W. (1983), Toward an inductive understanding of membrane fouling, *Desalination*, 47, 105-127.
38. Altena, F. W. and Belfort, G. (1984), Lateral migration of spherical particles in porous channels: application to membrane filtration, *Chem. Eng. Sci.*, 39, (2), 343-355.
39. Belfort, G., Altshuler, G. L., Thallman, K. K., Feerick, C. P., Jr., and Woodfield, K. L. (1984), Selective adsorption of organic homologues onto activated carbon from dilute aqueous solutions, solvophobic interaction approach - IV The effect of simple structural modifications with aliphatics, *AIChE J*, 30, (2), 197-207.
40. Altena, F., Weigand, R. J., and Belfort, G. (1985), Lateral migration of spherical particles in laminar porous tube flows: Application to membrane filtration, *Physico. Chem. Hydrodyn.*, 6, (4), 393-413.
41. Belfort, G. and Nagata, N. (1985), Fluid mechanics and cross-flow filtration: Some thoughts, *Desalination*, 53, 57-79.
42. Bicknell, E. A., Dziewulski, D. M., Sturman, L. S., and Belfort, G. (1985), Concentrations of seeded and naturally occurring enteroviruses from waters of varying quality by hollow fiber ultrafiltration, *Wat. Sci. Tech.*, 17, 47-62.
43. Belfort, G. (1985), A course in separations and recovery processes, *Chem. Engr. Education*, XIX, (4), 172-217.
44. Otis, J. R., Altena, F. W., Mahar, J. J., and Belfort, G. (1986), Measurement of single spherical particle trajectories with lateral migration in a slit with one porous wall under laminar flow conditions, *Experiments in Fluids*, 4, 1-10.
45. Altshuler, G. L., Dziewulski, D. M., Soweck, J. A., and Belfort, G. (1986), Continuous hybridoma growth and monoclonal antibody production in hollow fiber reactor/separators, *Biotechnol. Bioeng.*, 28, 646-658.
46. Chatterjee, S. G. and Belfort, G. (1986), Fluid flow in an idealized spiral wound membrane module, *J. Membrane Science*, 28, 191-208.
47. Schonberg, J. A., Drew, D. A., and Belfort, G. (1986), Viscous interactions of many neutrally buoyant spheres in Poiseuille flow, *J. Fluid Mech.*, 167, 415-426.

48. Belfort, G. and Altshuler, G. L. (1986), Scale-up of monoclonal production, *Chemie Industrie*, 109 (7), 585-588.
49. Myers, A. L., Belfort, G., and Suzuki, M. (1986), Some discussion on adsorption technology: Equilibrium on the basis of adsorption energy, *Chem. Eng. (Japan)*, 50, No. 3, pp. 151-155.
50. Altshuler, G. L., Dilwith, R., Soweck, J., and Belfort, G. (1986), Hybridoma analysis at the cellular level, *Biotechnology and Bioengineering Symp.*, No. 17, John Wiley, NY.
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