

Curriculum Vitae et Studiorum

**Adrian Bejan**

J. A. Jones Distinguished Professor  
of Mechanical Engineering

**Current Address:**

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**Education:**

- 1971        B.S., Mechanical Engineering (Honors Course), Massachusetts Institute of Technology.  
1972        M.S., Mechanical Engineering (Honors Course), Massachusetts Institute of Technology.  
1975        Ph.D., Mechanical Engineering, Massachusetts Institute of Technology.

**Professional Experience:**

- 1989 -        :    J.A. Jones Professor of Mechanical Engineering, Duke University, Durham, NC.  
1984 - 1989:    Full Professor with Tenure, Department of Mechanical Engineering and Materials Science, Duke University, Durham, NC.  
1978 - 1984:    Assistant and Associate Professor, Department of Mechanical Engineering, University of Colorado, Boulder, CO.  
1976 - 1978:    Fellow of the Miller Institute of Basic Research in Science, University of California-Berkeley.  
1975 - 1976:    Lecturer and Research Associate, Department of Mechanical Engineering, Massachusetts Institute of Technology.  
1971 - 1974:    Research Assistant, Department of Mechanical Engineering, Massachusetts Institute of Technology.  
1972:        Staff Engineer, Scientific Energy Systems, Inc., Watertown, Massachusetts.

## Honors:

### Society Awards:

Benjamin Franklin Medal 2018.

Lifetime member of the Franklin Institute.

Mexican Academy of Sciences, Corresponding Member, 2017.

Ralph Coats Roe Medal, American Society of Mechanical Engineers, 2017, “For permanent contributions to the public appreciation of the pivotal role of engineering in an advanced society through outstanding accomplishments as an engineering scientist and educator, renowned communicator and prolific writer”.

Top 100 read articles 2015, *Nature Scientific Reports*, 15 April 2016, for the article “Why humans build fires shaped the same way”.

Special Achievement Award, *Alianța Romania – America*, October 7, 2015, Washington, DC.

Editor’s Choice, *Journal of Applied Physics*, 21 August 2015, Morphing tree structures for latent thermal energy storage, S. Ziaei, S. Lorente, A. Bejan, *J. Appl. Phys.*, **117**, 224901 (2015).

Atlas Award 2013, for the book *Design in Nature*, for its role in “building a converging, unified and urgent voice in the Climate Movement.”

Academia Europaea (‘The Academy of Europe’), Member, 2013.

Honorary Chairman, Constructal Law Conference, Nanjing, China, 14-15 October 2013.

75<sup>th</sup> Anniversary Gold Medal of the ASME Heat Transfer Division, 15 July 2013, Minneapolis.

Cover of the *Journal of Applied Physics*, 21 April 2013, Constructal Law of Design and Evolution: Physics, biology, technology and society, by A. Bejan and S. Lorente.

Ranked since 2001 among the 100 most highly cited authors worldwide in engineering (all fields, all countries), the Institute for Scientific Information (<http://isihighlycited.com>).

Associate Fellow, World Academy of Art & Science, elected in Spring 2012.

*The Library Journal* named *Design in Nature* as one of the Best Books 2012 in Science & Technology.

Cover of the *Journal of Applied Physics*, 1 January 2012, Tree-shaped fluid flow and heat storage in a conducting solid, by L. Combelles, S. Lorente, R. Anderson and A. Bejan.

Romanian Academy, Honorary Member, 2011.

Honorary Member of the American Society of Mechanical Engineers, 2011, “for an extraordinary record of creative work, including the unification of thermodynamics and heat transfer; the conceptual development of design as a science that unites all fields; legendary contributions to engineering education; and, since 1996, the discovery and continued development of the constructal law”.

Honorable Mention from the Professional and Scholarly Division of the American Association of Publishers for the book *Design with Constructal Theory*, 5 February 2009.

Traian Vuia Prize from the Romanian Academy, for the Romanian translation of the book *Shape and Structure, from Engineering to Nature*, 24 August 2009.

Donald Q. Kern Award from the American Institute of Chemical Engineers (AIChE), 2008, for “seminal contributions to heat exchange design based on two original methods: entropy generation minimization, and constructal theory.”

Fluid Science Research Award of the Institute of Fluid Science, Tohoku University, Japan, 21 January 2008.

James P. Hartnett Memorial Award, 2007, International Center of Heat and Mass Transfer.

Luikov Medal, 2006, International Heat Transfer Conference, Sydney.

Edward F. Obert Award, 2004, American Society of Mechanical Engineers, for the paper “Thermodynamic Formulation of the Constructal Law” with S. Lorente.

Charles Russ Richards Memorial Award, 2001, American Society of Mechanical Engineers, for “outstanding achievement in mechanical engineering by an engineer twenty years or more following graduation.”

Ralph Coats Roe Award, 2000, American Society of Engineering Education.

Max Jakob Memorial Award, 1999, awarded jointly by the American Institute of Chemical Engineers and the American Society of Mechanical Engineers, “for highly imaginative and inspiring ideas in the thermal science and design of engineering and nature.”

Robert Henry Thurston Lecturer, 1999, American Society of Mechanical Engineers, “Shape and Structure in Engineering and Nature: Constructal Theory.”

Worcester Reed Warner Medal, 1996, of the American Society of Mechanical Engineers, “for originality, challenges to orthodoxy, and impact on engineering thermodynamics and heat transfer, which were made through the first three books: *Entropy Generation Through Heat and Fluid Flow* (1982), *Convection Heat Transfer* (1984), and *Advanced Engineering Thermodynamics* (1988).”

Heat Transfer Memorial Award, 1994, American Society of Mechanical Engineers, science category, “for significant and often unconventional contributions to heat transfer, notably in natural convection, thermodynamic aspects of heat transfer, convection in porous media, thermal tribology, solar energy conversion, cryogenics, and transition to turbulence; and for bringing modern research results and methods into heat transfer education.”

James Harry Potter Gold Medal, 1990, American Society of Mechanical Engineers, for "original and unorthodox ideas, journal articles, textbooks, graphics and lectures demonstrating that *engineering thermodynamics* is an active and often controversial field of research, and for encouraging others to invest their creativity in the future of the field."

Gustus L. Larson Memorial Award, 1988, American Society of Mechanical Engineers, for "demonstrated outstanding achievement in *mechanical engineering* within ten to twenty years following graduation."

Ralph R. Teetor Award, 1980, of the Society of Automotive Engineers.

ASME Distinguished Lecturer, 2002-2005.

Meritorious Service Award, for "outstanding leadership in and contributions to the development of the fields of exergy, energy and environment", received at the International Exergy, Energy and Environment Symposium, Izmir, Turkey, 15 July 2003.

Academy of Sciences of Moldova, Honorary Member, 2001.

Academy of Technical Sciences of Romania, Honorary Member, 2004.

George E. Palade Prize of the Romanian Cultural Foundation, Bucharest, 1996.

The 50<sup>th</sup> Anniversary Jubilee Medal of the University of the Lower Danube, Galati, Romania, 1998.

The Special Prize of the Romanian Society of Thermodynamicists, 1998.

Honorary Citizen, Galati, Romania, 1996.

Fellow of the American Society of Mechanical Engineers, elected in October 1987.

International Academy of Refrigeration, Member, 1999.

*Bejan number* (Be), proposed as name for the dimensionless group  $\Delta P x^2 / (\rho v^2)$  in forced convection (S. Bhattacharjee and W.L. Grosshandler, The formation of a wall jet near a high temperature wall under microgravity environment, ASME HTD-Vol. 96, 1988, pp. 711-716).

*Bejan number* (Be), proposed as name for the dimensionless ratio of fluid friction irreversibility divided by heat transfer irreversibility, in convection (S. Paoletti, F. Rispoli and E. Sciubba, Calculation of exergetic losses in compact heat exchanger passages, ASME AES-Vol. 10-2, 1989, pp. 21-29).

*Bejan number* (Be), proposed as name for the dimensionless group  $\Delta P L^2 / (\mu \alpha)$  in forced convection, electronic cooling, contact melting, and second law analysis of heat transfer (S. Petrescu, Int. J. Heat Mass Transfer, Vol. 37, 1994, p. 1283).

Cover story of *Mechanical Engineering* magazine, ASME, "How Nature Takes Shape," October 1997.

Cover story of *Science & Vie*, “Une Théorie Explique l’Intelligence de la Nature”, November 2003, No. 1034, pp. 1, 44-63.

Cover story of *Ingenieria Mecanica, Tecnologia y Desarrollo*, March 2005, Vol. 1, No. 6.

Cover story of *Duke Magazine*, September-October 2007.

#### **Academic Honors:**

*Doctor of Engineering honoris causa*, University of Pretoria, 23 April 2015.

*Docteur Honoris Causa*, Institut National des Sciences Appliquées, Lyon, France, 3 April 2014.

*Doctor Honoris Causa*, University of Rome I, La Sapienza, Rome, Italy, 13 May 2009.

*Professor Catedrático Convidado*, University of Évora, Portugal, 2009 - present.

*Extraordinary Professor*, University of Pretoria, South Africa, 2007 - present.

*Consulting Professor*, Shanghai Jiaotong University, 2007 - present.

*Doctor Honoris Causa*, Technical University of Varna, Bulgaria, 2006.

*Doctor Honoris Causa*, Technical University of Gabrovo, Bulgaria, 2004.

*Doctor of Science Honoris Causa*, Swiss Federal Institute of Technology (ETH), Zürich, Switzerland, 2003, "for outstanding originality, challenges to conventional thinking, impact on modern thermal sciences, and for his pivotal role as promoter of constructal theory, entropy generation minimization, and European scientific culture."

*Docteur Honoris Causa*, Université Henri Poincaré, Nancy, France, 2001: “Leader scientifique mondial des domaines Energétique-Thermique et Mécanique des fluides. Promoteur de l’Analyse Entropique et de la Théorie Constructale. Profondément attaché aux valeurs humanistes et à la culture européenne.”

*Doctor Honoris Causa*, University of Évora, Portugal, 2003 : “For outstanding contributions to the progress of knowledge in the field of engineering, namely for the development of Constructal Theory, which provides a groundbreaking method that enlightens the generation of shape and structure in both engineering and nature.”

*Doctor Honoris Causa*, Federal University of Parana, Curitiba, Brazil, 2001.

*Doctor Honoris Causa*, Technical University of Moldova, Chisinau, Moldova, 2001.

*Honorary Doctor of Science*, Azerbaijan Technical University, Baku, Azerbaijan, 2000.

*Doctor of Philosophy in Engineering (honoris causa)*, University of Durban-Westville, South Africa, 1999.

*Doctor Honoris Causa*, Odessa State Academy of Refrigeration, Odessa, Ukraine, 1999.

*Doctor Honoris Causa*, Technical University of Civil Engineering, Bucharest, 1999.

*Doctor Honoris Causa*, Gh. Asachi Technical University, Iasi, Romania, 1998.

*Doctor Honoris Causa*, Ovidius University, Constanta, Romania, 1997.

*Doctor Honoris Causa*, University of the Lower Danube, Galati, Romania, 1995.

*Doctor Honoris Causa*, Polytechnic University of Bucharest, 1992.

*The Legacy of Adrian Bejan: Three Generations of Brazilian Scientists*, International Symposium, Pontifical Catholic University of Parana, Curitiba, Brazil, December 12, 1997.

*Bejan's Constructal Theory of Shape and Structure*, International Symposium, University of Evora, Portugal, 31 October, 2003.

Extraordinary Professor, University of Pretoria, South Africa, 2005.

Consulting Professor, Jiao Tong University, Shanghai, 2006

Graduation Speaker, University of Durban-Westville, South Africa, 1999.

Honorary Professor, University of the Lower Danube, Galati, Romania, 1993.

TEPCO Endowed Chair, Keio University, Yokohama, Japan, 1998.

Woodruff Colloquium invited speaker, Georgia Institute of Technology, 1999.

The Gurley Lecture in Mechanics, Rensselaer Polytechnic Institute (1998).

Honorary Diploma, Romanian General Association for Refrigeration (AGFR), 11 November 2000.

The Charles E. Foster Lecture, The University of Oklahoma (1994).

J.A. Jones Chair in Mechanical Engineering, Duke University, April 1989.

F. Mosey Visiting Scholarship of the Faculty of Engineering, University of Western Australia, Nedlands, Western Australia, 1984.

Faculty Fellowship of the University of Colorado, for the academic year 1984-85.

Croft Professorship 1981-82, College of Engineering, University of Colorado.

Post-Doctoral Research Fellowship, Miller Institute for Basic Research in Science, University of California - Berkeley, March 1976.

MIT, Sloan Research Traineeship, June 1971.

MIT, Member of Honors Course, Department of Mechanical Engineering, 1970 - 1972.

MIT, De Florez Award for ingenuity in engineering design, 1969.

### **Company Boards**

Technical Advisory Board of General Compression Co., Newton, MA.

Advisor on Studio 360's "Science and Creativity" series, NPR station New York (WNYC).

### **Editorial Boards:**

Honorary Chief Editor, *International Journal of Mechanical and Aeronautical Engineering*, 2016.

Honorary Editor, *International Journal of Exergy*, 2004

Honorary Editor, *Exergy, An International Journal*, 2001.

Honorary Editor, *International Journal of Applied Thermodynamics*, 1998.

Honorary Editor, *Termotehnica*, 1993.

Honorary Editor, *Journal of Applied and Computational Mechanics*, 2018.

Honorary Editorial Advisory Board, *International Journal of Heat and Mass Transfer*, 1992.

Honorary Editorial Advisory Board, *International Communications in Heat and Mass Transfer*, 1992.

Honorary Editorial Board, *Heat and Fluid Flow*, 2014.

Honorary Editor, *International Journal of Energy and Environmental Engineering*, 2014.

Associate Editor, *International Journal of Thermal Sciences*, 2001.

Associate Editor, *International Journal of Energy & Technology*, 2014.

Editor, *International Journal of Design & Nature and Ecodynamics*, 2009-present

Editor, *Medical Physics*, 2004.

Editorial Board, *Applied Mechanics Reviews*, 2009-present.

Editorial Board, *International Journal of Energy & Technology*, 2009-present.

Editorial Board, *Design & Nature*, 2004 – 2008.

Editorial Board, *Advances in Transport Phenomena* (Elsevier), 2006.

Editorial Board, *International Journal of Ecodynamics*, 2004.

Editorial Board, *International Journal of Energy & Sustainable Systems*, 2008.

Editorial Board, *WIT Transactions*, 2008.

Associate Technical Editor, *ASME Journal of Heat Transfer*, 2000.

Associate Editor, *Energy—The International Journal*, 1997.

Editor, *Heat Transfer Handbook*, Wiley, 2001.

Editorial Board, *Journal of Porous Media*, 1996.

Editorial Board, *Mechanical Engineers' Handbook*, Second Edition, Wiley, 1995.

International Editorial Board, Book series *The Sustainable World*, Wessex Institute of Technology, 2002.

Editorial Advisory Board, *Acta Mechanica*, 2003.

Editorial Advisory Board, *Journal of Green Energy*, 2003.

Editorial Advisory Board, *Engenharia Térmica*, 2001.

Editorial Advisory Board, *International Journal of Heat and Technology* (formerly *Calore e Tecnologia*), 2000.

Editorial Advisory Board, *Heat Transfer—Asian Research*, 1998.

Editorial Advisory Board, *International Journal of Transport Phenomena*, 1997.

Editorial Advisory Board, *Heat Transfer Research* (formerly, *Heat Transfer Soviet Research*), 1997.

Editorial Advisory Board, *Journal of Non-Equilibrium Thermodynamics*, 1996.

Editorial Advisory Board, *Numerical Heat Transfer*, 1995.

International Advisory Board, *Archives of Thermodynamics*, 1997.

International Advisory Board, *Jordan Journal of Mechanical and Industrial Engineering*, 2006.

Board of Editors, *International Journal for Engineering Analysis and Design*, 1992.

Advisory Editor, *Heat Transfer —Japanese Research*, 1990.

Advisory Editor, *International Journal of Heat and Fluid Flow*, 1988-2001.

Member of the Max Jakob Memorial Award Committee, 2003-2006.

Member of the Nusselt-Reynolds Prize Board, 1990-1992.



Member of the Committee on Honors and Awards, ASME Heat Transfer Division, 1997-2000.

Chairman of the Committee on Honors and Awards, ASME Heat Transfer Division, 1999-2000.

International Advisory Board, Suranaree University of Technology, Thailand, 2010-2012.

Member of the Editorial Board, *Frontiers in Heat and Mass Transfer*, 2010.

International Advisory Board, *Journal of Biourbanism*, 2010.

Advisory Editor, *Journal of Mechanics*, 2011.

Advisory Board, *Journal of Research Applications in Mechanical Engineering*, The Thai Society of Mechanical Engineers, 2011.

Editor, *Scientific Reports* (Nature), 2012.

Member of the Advisory Committee, *Proceedings of the Romanian Academy*, 2013.

Member of the International Scientific Board, *Refrigeration Engineering and Technologies*, 2014.

## Chronological List of Publications

### Books:

1. A. Bejan, *Entropy Generation through Heat and Fluid Flow*, John Wiley & Sons, New York, 1982, 264 pages, 139 illustrations, 223 references.
2. A. Bejan, *Convection Heat Transfer*, John Wiley & Sons, New York, 1984, 492 pages, 148 illustrations, 387 references.
3. A. Bejan, *Advanced Engineering Thermodynamics*, John Wiley & Sons, New York, 1988, 782 pages, 277 illustrations, 635 references.  
Romanian translation: A. Bejan, *Termodinamica Tehnica Avansata*, Editura Tehnica, Bucharest, Romania, 1996, 848 pages, 277 illustrations, 635 references.
4. D. A. Nield and A. Bejan, *Convection in Porous Media*, Springer-Verlag, New York, 1992, 425 pages, 149 illustrations, 692 references.
5. A. Bejan, *Heat Transfer*, John Wiley & Sons, New York, 1993, 698 pages, 459 illustrations, 383 references.  
Portuguese translation: A. Bejan, *Transferencia de Calor*, Edgard Blücher, Sao Paulo, Brazil, 1996, 540 pages, 459 illustrations, 383 references.  
Korean translation: A. Bejan, *Heat Transfer*, Cheong Moon Gak, Seoul, Korea, 1996, 744 pages, 459 illustrations, 383 references.

6. A. Bejan, *Convection Heat Transfer*, Second Edition, John Wiley & Sons, New York, 1995, 652 pages, 228 illustrations, 543 references.
7. A. Bejan, *Entropy Generation Minimization*, CRC Press, Boca Raton, FL, 1996, 362 pages, 230 illustrations, 438 references.
8. A. Bejan, G. Tsatsaronis and M. Moran, *Thermal Design and Optimization*, John Wiley & Sons, New York, 1996, 540 pages, 110 illustrations, 189 references.  
  
Indonesian translation: A. Bejan, G. Tsatsaronis and M. Moran, *Desain & Optimalisasi Termal*, Penerbit ITB, Bandung, Indonesia, 2012.
9. A. Bejan, *Advanced Engineering Thermodynamics*, Second Edition, John Wiley & Sons, New York, 1997, 888 pages, 324 illustrations, 612 references.
10. D. A. Nield and A. Bejan, *Convection in Porous Media*, Second Edition, Springer-Verlag, New York, 1999, 546 pages, 164 illustrations, 1600 references.
11. A. Bejan, P. Vadasz and D. G. Kröger, Eds., *Energy and the Environment*, Kluwer Academic Publishers, Dordrecht, The Netherlands, 1999, 276 pages, 129 illustrations, 333 references.
12. A. Bejan and E. Mamut, Eds., *Thermodynamic Optimization of Complex Energy Systems*, Kluwer Academic Publishers, Dordrecht, The Netherlands, 1999, 480 pages, 151 illustrations, 589 references.
13. A. Bejan, *Shape and Structure, from Engineering to Nature*, Cambridge University Press, Cambridge, UK, 2000, 343 pages, 191 illustrations, 311 references.  
  
Romanian translation: A. Bejan, *Forma si Structura, de la Inginerie la Natura*, Editura Academiei, Bucharest, 2005, 330 pages, 191 illustrations, 311 references.
14. A. Bejan and A. D. Kraus, Eds., *Heat Transfer Handbook*, Wiley, New York, 2003, 1479 pages.
15. D. B. Ingham, A. Bejan, E. Mamut and I. Pop, Eds., *Emerging Technologies and Techniques in Porous Media*, Kluwer Academic Publishers, Dordrecht, The Netherlands, 2004, 507 pages, 173 illustrations, 2073 references.
16. A. Bejan, I. Dincer, S. Lorente, A. F. Miguel and A. H. Reis, *Porous and Complex Flow Structures in Modern Technologies*, Springer-Verlag, 2004, 408 pages, 336 illustrations, 577 references.
17. A. Bejan, *Convection Heat Transfer*, Third Edition, John Wiley & Sons, Hoboken, 2004, 694 pages, 207 illustrations, 759 references.
18. A. Bejan and S. Lorente, *La Loi Constructale*, L'Harmattan, Paris, 2005, 110 pages, 25 illustrations, 113 references.
19. D. A. Nield and A. Bejan, *Convection in Porous Media*, Third Edition, Springer-Verlag, New York, 2006, 640 pages, 173 illustrations, 3082 references.

20. A. Bejan, *Advanced Engineering Thermodynamics*, Third Edition, John Wiley & Sons, Hoboken, 2006, 920 pages, 352 illustrations, 764 references.
21. A. Bejan, S. Lorente, A. F. Miguel and A. H. Reis, *Along with Constructal Theory*, UNIL · FGSE Workshop Series No. 1, J. Hernandez and M. Cosinschi, eds., University of Lausanne, Faculty of Geosciences and the Environment, 2006, 204 pages, 96 figures, 184 references.
22. A. Bejan and G. W. Merks, Eds., *Constructal Theory of Social Dynamics*, Springer, New York, 2007, 350 pages, 141 illustrations, 521 references.
23. A. Bejan and S. Lorente, *Design with Constructal Theory*, Wiley, Hoboken, 2008, 551 pages, 322 illustrations, 348 references.  
  
Romanian translation: A. Bejan and S. Lorente, *Teoria Constructală*, Editura AGIR, Bucharest, 2011, 502 pages.
24. A. Bejan, S. Lorente, A. F. Miguel and A. H. Reis, Eds., *Constructal Human Dynamics, Security and Sustainability*, IOS Press, Amsterdam, 2009, 177 pages, 81 illustrations, 250 references.
25. A. Bejan and J. P. Zane, *DESIGN IN NATURE, How the Constructal Law Governs Evolution in Biology, Physics, Technology, and Social Organization*, Doubleday, New York, 2012. Paperback edition: Anchor Books, New York, 2013.  
  
Japanese translation: *Shape and Flow*, Kinokuniya, Tokyo, 23 August 2013.  
  
Romanian translation: *Design in Natură*, AGIR, Bucharest, 21 February 2014.
26. D. A. Nield and A. Bejan, *Convection in Porous Media*, Fourth Edition, Springer, New York, 2013, 778 pages.
27. L. A. O. Rocha, S. Lorente and A. Bejan, eds., *Constructal Law and the Unifying Principle of Design*, Springer, New York, 2013, 328 pages.
28. A. Bejan, *Convection Heat Transfer*, 4<sup>th</sup> ed., Wiley, Hoboken, 2013, 658 pages.
29. A. Bejan, *The Physics of Life: The Evolution of Everything*, St. Martin's Press, New York, 2016, 261 pages.
30. A. Bejan, *Advanced Engineering Thermodynamics*, 4<sup>th</sup> ed., Wiley, Hoboken, 2016, 746 pages.
31. D. A. Nield and A. Bejan, *Convection in Porous Media*, 5<sup>th</sup> ed., Springer, New York, 2017, 1005 pages.

### Edited Volumes:

1. A. Bejan, P. Vadász and D. G. Kröger, eds., *Proceedings of the USA-RSA Bi-National Energy and Environment Workshop*, University of Durban-Westville, South Africa, June 8-12, 1998, 334 pages.
2. A. Bejan, M. Feidt, M. J. Moran and G. Tsatsaronis, eds., *Efficiency, Cost, Optimization, Simulation and Environmental Aspects of Energy Systems and Processes*, Proceedings of the ECOS '98 Congress, University Henri Poincaré, Nancy, France, July 8-10, 1998, two volumes.

3. A. Bejan and E. Mamut, eds., *Thermodynamics and the Optimization of Complex Energy Systems*, Proceedings of the NATO Advanced Study Institute, Neptun, Romania, July 13-24, 1998.
4. A. Bejan, M. Feidt and E. Mamut, eds., *Energy Conversion, Conservation and Environmental Impact*, special issue of the *International Journal of Energy Research*, Vol. 26, No. 7, 2002.
5. A. Bejan, I. Dincer, S. Lorente, A. F. Miguel and A. H. Reis, *Porous and Complex Flow Structures in Modern Technologies*, Course Notes, University of Evora, Evora, Portugal, 2002.
6. H. M. Badr, H. I. Abualhamayel, M. A. I. El-Shaarawi, S. M. Zubair, J. R. Howell and A. Bejan, eds., *Theme Issue on Heat and Fluid Flow*, special issue of *The Arabian Journal of Science and Engineering*, Vol. 27, No. 2C, December 2002.
7. A. Bejan, D. B. Ingham and E. Mamut, eds., *Heat and Mass Transfer in Porous Media*, special issue of the *International Journal of Energy Research*, Vol. 27, No. 10, 2003.
8. A. Bejan, ed., *The Galati-Feidt Symposium*, special issue of the *International Journal of Heat & Technology*, Vol. 22, no. 1, 2004.
9. A. E. Bergles, I. Golobic, C. H. Amon and A. Bejan, eds., *Thermal Sciences 2004*, Proceedings of the ASME-ZSIS International Thermal Science Seminar II, 13-16 June 2004, Bled Slovenia.
10. A. Bejan, H. Heperkan and U. Kesgin, *Thermodynamic Optimization and Constructal Design of Energy Systems*, Special issue of the *International Journal of Energy Research*, Vol. 29, No. 7, 2005.
11. A. E. Bergles, I. Golobic, C. H. Amon and A. Bejan, *Journal of Mechanical Engineering (Strojniški Vestnik)*, Vol. 51, 2005, Nos. 7-8, pp. 363-540.
12. A. Bejan, ed., special issue of *Energy*, Vol. 31, 2006, pp. 551-552.
13. A. Bejan and G. Grazzini, *Shape and Thermodynamics*, International Workshop, Firenze University Press, Florence, 2008.
14. A. Bejan, Special Issue on "Constructal Theory", *International Journal of Design & Nature and Ecodynamics*, Vol. 5, No. 3, 2010.
15. G. Lorenzini, A. Bejan and C. Biserni, Constructal Law & Second Law Conference 2015, *International Journal of Heat and Technology*, Vol. 34, Special Issue 1, January 2016.

#### **Peer-reviewed Publications:**

1. A. Bejan, "Superconductive Field Winding for a 2 MVA Synchronous Generator," S.M. Thesis, Department of Mechanical Engineering, Massachusetts Institute of Technology, May 1972.

2. P. Thullen, A. Bejan, B. Gamble, J.L. Kirtley, Jr. and J.L. Smith, Jr., "MIT-EEI Superconducting Synchronous Machine," *Advances in Cryogenic Engineering*, Vol. 18, 1973, pp. 372-381.
3. A. Bejan, T. A. Keim, J. L. Kirtley, Jr., J. L. Smith, Jr., P. Thullen and G. E. Wilson, "Superconducting Alternator Test Results," *Advances in Cryogenic Engineering*, Vol. 19, pp. 53-58, 1974.
4. A. Bejan and J. L. Smith, Jr., "Thermodynamic Optimization of Mechanical Supports for Cryogenic Apparatus," *Cryogenics*, Vol. 14, March 1974, pp. 158-163.
5. A. Bejan, "Material Selection for the Torque Tubes of Large Superconducting Rotating Machinery," *Cryogenics*, Vol. 14, June 1974, pp. 313-315.
6. A. Bejan, "Improved Thermal Design of the Cryogenic Cooling System for the Rotor of a Superconducting Generator," Ph.D. Thesis, Department of Mechanical Engineering, Massachusetts Institute of Technology, February 1975.
7. P. Thullen, R. W. Stecher, A. Bejan, "Flow Instabilities in Gas-Cooled Cryogenic Current Leads," *IEEE Transactions on Magnetics*, Vol. MAG-11, No. 2, March 1975, pp. 573-575.
8. A. Bejan, "Discrete Cooling of Low Heat Leak Supports to 4.2°K," *Cryogenics*, Vol. 15, pp. 290-292, May 1975.
9. M. O. Hoenig, Y. Iwasa, D. B. Montgomery and A. Bejan, "Cryostabilized Single-Phase Helium Cooled Bundled Conductors for Large High Field Superconducting Magnets," presented at the Sixth Symposium on Engineering Problems of Fusion Research, San Diego, Nov. 18-21, 1975.
10. A. Bejan, "Refrigeration for Rotating Superconducting Windings of Large ac Electric Machines," *Cryogenics*, Vol. 16, No. 3, March 1976, pp. 153-160.
11. M. O. Hoenig, Y. Iwasa, D. B. Montgomery and A. Bejan, "Supercritical Helium Cooled, Cabled, Superconducting Hollow Conductors for Large High Field Magnets," presented at the 6th International Cryogenic Engineering Conference, Grenoble, France, May 11-14, 1976.
12. A. Bejan and J. L. Smith, Jr., "Heat Exchangers for Vapor-Cooled Conducting Supports of Cryostats," *Advances in Cryogenic Engineering*, Vol. 21, pp. 247-256, 1976.
13. A. Bejan and E. M. Cluss, Jr., "Criterion for Burn-Up Conditions in Gas-Cooled Cryogenic Current Leads," *Cryogenics*, Vol. 16, No. 9, pp. 515-518, September 1976.
14. A. Bejan and H. M. Paynter, SOLVED PROBLEMS IN THERMODYNAMICS, Department of Mechanical Engineering, Massachusetts Institute of Technology, Cambridge, Massachusetts, 1976, 178 pages.

15. A. Bejan and M. O. Hoenig, "Method for Estimating the Refrigeration Costs of Supercritical Helium Cooled Cabled Superconductors," *IEEE Transactions on Magnetics*, Vol. MAG-13, No. 1, pp. 686-689, January 1977.
16. A. Bejan and P. Thullen, "Thermal Performance of the Rotor of the MIT-EPRI 3 MVA Superconducting Alternator," *IEEE Transactions on Magnetics*, Vol. MAG-13, No. 1, pp. 763-766, January 1977.
17. A. Bejan, "Refrigerator-Recirculator Systems for Large Forced-Cooled Superconducting Magnets," *Cryogenics*, Vol. 17, No. 2, pp. 97-105, February 1977.
18. A. Bejan, "Graphic Techniques for Teaching Engineering Thermodynamics," *Mechanical Engineering News*, pp. 26-28, May 1977.
19. A. Bejan, "The Concept of Irreversibility in Heat Exchanger Design: Counter-Flow Heat Exchangers for Gas-to-Gas Applications," *Journal of Heat Transfer*, Vol. 99, No. 3, pp. 374-380, August 1977.
20. A. Bejan and C. L. Tien, "Transient Behavior of Normal Zones in One-Dimensional Composite Superconductors," ASME Paper No. 77-HT-74, National Heat Transfer Conference, Salt Lake City, August 15-17, 1977.
21. A. Bejan, "Transient Heat Conduction in Cryogenic Current Cables Following a Loss-of-Coolant Accident," *Journal of Heat Transfer*, Vol. 99, No. 4, pp. 689-691, November 1977.
22. A. Bejan, "General Criterion for Rating Heat Exchanger Performance," *International Journal of Heat and Mass Transfer*, Vol. 21, pp. 655-658, May 1978.
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138. David Levins, *A Kind Voice on Big Ideas & Philosophy*, blogtalkradio.com, 8 June 2014.
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140. Paola Mariano, Brasile o Germania, parla l'esperto <<Favorite squadre con maglie più chiare>>, *Il Messaggero*, 8 July 2014.
141. Tanya Lewis, Survival of the flight test: Airplanes evolve, too, *Live Science*, *Yahoo News*, 23 July 2014.
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171. A. Bejan, Book review – *The Origin of Life Circus: How to Make Life Extravaganza*, by Suzan Mazur, *Astrobiology* magazine, 5 March 2015.
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174. Hannah Osborne, Why we have been building fires the same way since the dawn of time, *International Business Times*, 8 June 2015.
175. Kristina Killgrove, Food, fighting, fun, and 7 other reasons our ancestors used fire, *Forbes*, 8 June 2015.
176. Colin Fernandez, How to build the perfect fire: Structures should be as wide as they are tall to generate the best flow of heat and air, *Daily Mail*, 8 June 2015.
177. Melissa Bryer, How to build the perfect fire, *TreeHugger*, 8 June 2015.
178. Martin Wieweg, Der perfekte Feuerhaufen, *Bild der Wissenschaft*, 8 June 2015.
179. Pancras Dijk, Het perfecte kampvuur, *National Geographic, Nederland-Belgie*, 8 June 2015.
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257. Ken Kingery, Artists draw inspiration from the constructal law, Duke University, Pratt School of Engineering, 12 May 2016.
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263. Paulina Sepúlveda Garrido, Estamos llegando al fin de los récords? *La Tercera*, Santiago, Chile, 9 August 2016.
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265. Brian Resnick, Campfires, explained, *Vox* 10 August 2016.
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267. Matthew Futterman, Rio Games: Why Olympians shatter records in swimming but not track, *The Wall Street Journal*, 12 August 2016.
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276. Jodi Henke, Building the perfect campfire, *livingcountrylife.com*, 7 October 2016.
277. Parag Khanna, Want to understand how Trump happened? Study quantum physics, *Quartz*, 11 November 2016.
278. Hans Wong, Prof. Adrian Bejan predicted Donald Trump will win, Hong Kong Polytechnic University, 11 November 2016, [www.youtube.com/watch?v=-pkwqujBqp8](http://www.youtube.com/watch?v=-pkwqujBqp8).
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281. Ian Johnston, Capitalism inevitably creates a 'sad' unfair world, physicist says I prove, *The Independent*, UK, 29 March 2017.
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285. Trisha Jones, Income disparity and physics: Explaining economic condition of a country with

- the help of laws of physics, Science World Report, 29 March 2017.
286. Wu Li Heron, Physics promotes wealth inequality, The Hip Forums, 29 March 2017.
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  288. Le Scienze, Un modello fisico delle disuguaglianze economiche, 29 marzo 2017.
  289. Jacqueline Charpentier, Une loi physique pour expliquer l' inégalité de la richesse?, Actualité Houssenia Writing, 29 mars 2017.
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  293. [www.econjobrumors.com](http://www.econjobrumors.com), Genius physicist achieves unification of physics and economics! 29 March 2017.
  294. wn.com, Wealth inequality: it's physical and flowing, 28 March 2017.
  295. Michael Byrne, Can physics explain wealth inequality?, Motherboard, 30 March 2017.
  296. Canada Community, Law of physics explains natural drivers of wealth inequality, 30 March 2017.
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  298. Korea: Science Times, 'Inequality of wealth' predicted by physics, 28 March 2017.
  299. Bev, Physis income and wealth inequality prediction: How to change it, The Science Times, 31 March 2017.
  300. De Kennis Van Nu (Current Knowledge in Dutch), Natuurkundige wet als verklaring voor welvaartsongelijkheid, 1 April 2017.
  301. Luis Manuel Silveira, Gostava de conhecer melhor a teoria constructal?, Rotinas Inteligentes, 31 March 2017.
  302. Diómedes Tejada Gómez, La física explica los factores naturales de la desigualdad de la riqueza, Diario Digital RD, 29 March 2017.
  303. Ana María Cervantes, Desigualdad y leyes físicas, Ponlotú, 1 April 2017.
  304. Luis Manuel Silveira, A aprendizagem é um acontecimento rizomático, Rotinas Inteligentes, 2



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  306. Harun Kayar, Fizik yasasi, servet eşitsizliğinin doğal nedenlerini açıkladı, Haber, 3 April 2017.
  307. Zach Graham, Capitalism is killing us and no one seems to care, INQUISITR, 3 April 2017.
  308. ADAM.sk, Nerobte si ilúzie o kapitalizme, nahráva len bohatým. Prečo?, 4 April 2017.
  309. Nicholas Gruen, The living and the dead: government's arteries and capillaries have lost symbiosis, The MANDARIN, 7 April 2017.
  310. NSF News From The Field, The physics of wealth inequality, 28 March 2017.
  311. Las matemáticas ocultas de la desigualdad, *LuKasnet Blog*, 20 May 2017.
  312. Suzan Mazur, PART 2: Ranging conversation with physicist Geoffrey West on life, evolution and US presidential politics, *Huffington Post*, 17 April 2016.
  313. Suzan Mazur, Hell and the West Village: Where is the Next Jan Jacobs?, *Huffington Post*, 6 July 2017.
  314. Jakki Kerubo, Physics can describe how inequality happens—but can it solve the problem?, *Quartz*, 14 July 2017.
  315. Ira Katz, Equality  $\neq$  Equal Quality, LewRockwell.com, 21 July 2017.
  316. Vanessa Hauguel, Réussir son feu de camp grâce à la science!, [www.sympatico.ca](http://www.sympatico.ca), 25 July 2017.
  317. Monica Andrei, Ideiile-mi sunt visurile, *Ziarul Metropolis*, 1 August 2017.
  318. Vladimir Adrian Costea, Interviu/Prof. Adrian Bejan, Universitatea Duke (SUA): “Sumarul organizării sociale prezise de legea consructală e “puțini mari cu mulți mici, curgând în armonie,” [www.europunkt.ro](http://www.europunkt.ro), 1 August 2017.
  319. Radio interview, Hot Tech-Cool Science, KWMR-FM, 24 August 2017.
  320. Simon Devos, Sa vitesse cache une théorie de la masse, *Science & Vie*, October 2017, pp. 75-77.
  321. Ephrat Livni, Everything, including the growing income disparity, can be explained by physics, *Quarz*, 23 September 2017.
  322. Anca Melinte, Primul român distins cu Medalia Benjamin Franklin. Gălățeanul Adrian Bejan, alături de Tesla, Einstein și Bill Gates, *Viața Liberă*, 21 November, 2017.
  323. Mixed Mental Arts, Ep297 – The Physics of Life: Prof. Adrian Bejan enters the Dojo, 22 December 2017.

324. J. Peder Zane, Duke professor's beautiful law of human progress, *The News & Observer*, Raleigh, 10 April 2018.
325. Ephrat Livni, Everything created is predicted by nature: A new video explains the physics of flow, *Quartz*, 26 April 2018.
326. Anca Melinte, Tricolor pentru medalia Benjamin Franklin, decernată profesorului gălățean Adrian Bejan, *Viața Liberă*, 2 May 2018.
327. Philip Perry, This little-known physics law silently controls your life, *Big Think*, 6 May 2018.
328. BBC Mundo, La ley de física que discretamente controla tu vida y puede ayudarte a mejorarla, 13 May 2018.
329. BBC Brasil, A lei de física que controla discretamente sua vida – e pode ajudar a melhorá-la, 20 May 2018.
330. Christelle Gérard, Ce n'est pas grâce à l'altitude que les coureurs éthiopiens et Kenyans sont si forts, *Slate FR*, 1 June 2018.

#### **Invited Short Courses:**

*Current Topics in Heat Transfer*, National Sun Yat-Sen University, Kaohsiung, Taiwan, November 4-8, 1991.

*Thermodynamic Design*, University of Florence, Italy, April 20-22, 1993.

*Entropy Generation Minimization*, Keio University, Yokohama, Japan, May 19-30, 1998.

*Thermodynamic Optimization*, Tokyo A & T University, Tokyo, Japan, August 20, 1998.

*Thermodynamics and Sustainability*, Delft University of Technology, Delft, The Netherlands, Nov. 5, 1998.

*Advanced Thermodynamics*, Universidad Pontificia Bolivariana, Medellin, Colombia, Fall 1999.

*Energy Conversion, Conservation and Environmental Impact*, Ovidius University, Constanta, Romania, July 21-30, 2000.

*Heat Transfer in Porous Media*, Ovidius University, Constanta, Romania, July 25-August 3, 2001.

*Flow and Heat Transfer in Porous Media*, Institut National Polytechnique, Grenoble, France, May 13-17, 2002.

*Porous and Complex Flow Structures in Modern Technologies*, Evora University, Evora, Portugal, June 17-21, 2002.

*Thermodynamic Optimization and Constructal Design*, Yildiz University, Istanbul, Turkey, 19-24 July 2004.

*Along with Constructal Theory (Autour de la Théorie Constructale)*, University of Lausanne, Faculty of Geosciences and the Environment, Switzerland, 25-29 October 2004.

*Constructal Design of Porous and Complex Flow Structures*, Memorial University of Newfoundland, Canada, 21-24 September 2005.

*Constructal Theory and Application*, Shanghai Jiaotong University, P. R. China, 16 October 2006.

*Constructal Theory and Design in Nature and Engineering*, University of Pretoria, South Africa, 1 March 2007.

*Design with Constructal Theory*, International Institute for Water and Environmental Engineering, Ouagadougou, Burkina Faso, 9-10 March 2009.

*Design with Constructal Theory*, International Institute for Water and Environmental Engineering, Ouagadougou, Burkina Faso, 21-22 March 2010.

*Design with Constructal Theory*, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia, 9-10 May 2010.

*Design with Constructal Theory*, University of Pretoria, South Africa, 26-27 September 2011.

*Design with Constructal Theory*, University of Pretoria, South Africa, 17-18 September 2012.

*Design with Constructal Theory*, University of Pretoria, South Africa, 16-17 September 2013.

*Constructal Law & Design in Nature*, Pontifical Catholic University of Chile, Santiago, 18-19 November 2013.

*Design with Constructal Theory*, University of Pretoria, South Africa, 15-16 September 2014.

*Design with Constructal Theory*, Pontifical Catholic University, Santiago, Chile, 9-13 March 2015.

*Design with Constructal Theory*, University of Pretoria, South Africa, 14-15 September 2015.

*Modelos Constructales de Problemas de Ingeniería y Desarrollo Social*, UNAM, National Autonomous University of Mexico, 13-14 March 2017.

*Symposium on Renewable Energies and Thermal Sciences*, University of Guanajuato, Salamanca, Mexico, 15-17 March 2017.

*Life and Death: Mysteries and Meanings*, MOOC, Hong Kong Polytechnic University, November 13, 2017.

### **Keynote and Invited Lectures:**

Keynote Speaker at the 3rd Multi-Phase Flow and Heat Transfer Symposium-Workshop, Miami Beach, FL, April 18-20, 1983: "Second-Law Aspects of Heat Transfer Engineering".

Lecturer, NATO Advanced Study Institute on Natural Convection: Fundamentals and Applications, Izmir, Turkey, July 16-27, 1984.

Keynote Speaker (Invited Opening Address), Second Latin American Congress on Heat and Mass Transfer, Sao Paulo, Brazil, May 12-15, 1986: "Scale Analysis in Convection Heat Transfer Research".

Lecturer, NATO Advanced Study Institute on Solar Energy Utilization Fundamentals and Applications, Izmir, Turkey, June 23 - July 4, 1986.

Invited Speaker, Korea-U.S.A. Heat Transfer Seminar, October 16-22, 1986, Seoul, Korea: "Thermodynamics of Solar Energy Engineering".

Keynote Speaker at the session on Natural Convection in Enclosures, the 2nd ASME-JSME Joint Thermal Engineering Conference, Honolulu, Hawaii, March 22-27, 1987: "Stressing the 'Free' in Free Convection Research: The Basic Scales of Heat and Mass Transfer in Fluids and Fluid Saturated Porous Media", Proceedings of the 1987 ASME•JSME Thermal Engineering Joint Conference, Vol. 2, P.J. Marto and I. Tanasawa, eds., ASME, New York, 1987, pp. 195-202.

Invited Speaker to the U.S.A.-Italy Joint Seminar on Second Law Aspects of Thermal Design, May 25-30, 1987, Rome, Italy: "Thermodynamics of Heat Transfer Devices", Second Law Analysis of Thermal Systems, M. J. Moran and E. Sciubba, eds., ASME, New York, 1987, pp. 1-15.

University Visiting Scholar, The University of Rhode Island, February 1988.

Invited Speaker to the 1988 International Symposium on Geothermal Energy, as guest of the Geothermal Research Society of Japan, November 10-14, Kumamoto and Beppu, Japan: "The Scale Analysis of Convection in Porous Media".

Keynote Speaker, Symposium on Second-Law Analysis in Heat/Mass Transfer and Energy Conversion, Winter Annual Meeting of the ASME, Chicago, IL, Dec. 1, 1988: "Modern Trends in Engineering Thermodynamics".

Lecturer, NATO Advanced Study Institute on Convective Heat and Mass Transfer in Porous Media, Izmir, Turkey, August 6-17, 1990.

Keynote Speaker to the XXII ICHMT International Symposium on Manufacturing and Materials Processing, Dubrovnik, Yugoslavia, August 27-31, 1990: "Analytical Advances on Melting by Natural Convection".

Invited Speaker at the 10th National Heat Transfer Congress of the Italian Thermo-fluid-dynamic Union, Genova, June 25-27, 1992: "Single Correlation for Contact Melting Results in Various Geometries".

Invited Speaker at the session on Significant Questions in Heat Transfer: Fundamental Issues in Small Scale Heat Transfer, Winter Annual Meeting of the ASME, Anaheim, CA, Nov. 9, 1992: "Lubrication by Close-Contact Melting".

Keynote Speaker at the 6th International Symposium on Transport Phenomena in Thermal Engineering (ISTP-6), May 9-13, 1993, Seoul, Korea: "Optimal Geometry of Convection Cooled Electronic Packages".

Invited Lecturer, International Symposium on Heat and Mass Transfer in Energy Systems and Environmental Effects, August 22-25, 1993, Cancun, Mexico: "Power and Refrigeration Plant Models with Heat Transfer Irreversibilities".

Invited Lecturer, International Conference on Comparative Assessments of Solar Power Technologies, Jerusalem, Israel, February 14-18, 1994: "Second Law Aspects of Solar Thermal Energy Conversion".

The Fifth Charles E. Foster Lecture, School of Aerospace and Mechanical Engineering, The University of Oklahoma, March 17, 1994.

Principal Speaker, First Gordon Research Conference on Modern Developments in Thermodynamics, Schwaebisches Bildungszentrum, Irsee, Germany, October 2-7, 1994.

Invited Speaker, Symposium on Thermodynamics and the Design, Analysis, and Improvement of Energy Systems: International Project to Calculate Exergetic Costs, Session AES-7A, International Mechanical Engineering Congress and Exposition, Chicago, Nov. 7, 1994.

Invited Speaker, Panel on Unanswered Questions and Technological Limitations Related to the Characterization of Material Interfaces in Heat Transfer Research and Applications, Session HT-10D, International Mechanical Engineering Congress and Exposition, Chicago, Nov. 7, 1994: "Solid-Fluid Contact," in J. A. C. Humphrey, S. Paolucci and M. M. Yovanovich, eds, ASME Paper No. 94-WA/HT-3.

Invited Speaker, International conference on "Second-Law Analysis of Energy Systems: Towards the 21st Century," Rome, July 5-7, 1995: "Entropy Generation Minimization in Heat Transfer".

Keynote Speaker, International Conference on "Efficiency, Costs, Optimization, Simulation and Environmental Impact of Energy Systems (ECOS '95)," Istanbul, July 11-14, 1995: "Entropy Generation Minimization: The Method of Thermodynamic Optimization of Finite-Size Systems and Finite-Time Processes".

Invited Lecturer, Journées Européennes de Thermodynamique Contemporaine IV, Nancy, September 27-29, 1995: "The Method of Entropy Generation Minimization, or Modeling and Optimization Based on Combined Heat Transfer and Thermodynamics".

Invited Speaker, International Conference on Porous Media and Their Applications in Science, Engineering and Industry, Kona, Hawaii, June 16-21, 1996.

Keynote Lecturer, ICHMT Symposium on "Transient Convective Heat Transfer," Cesme, Turkey, August 19-23, 1996: "Optimization of Pulsating Heating in Natural and Forced Convection".

Invited Participant, Second Gordon Conference on Modern Developments in Thermodynamics, Ventura, CA, Feb. 16-21, 1997.

Keynote Lecturer, International Workshop on Materials and Concepts for Conversion and Storage of Energy, Royal Netherlands Academy of Arts and Sciences, Amsterdam, April 9-11, 1997: "Entropy Generation Minimization: From Design in Engineering to Predicting Macroscopic Organization in Nature".

Keynote Lecturer, Florence World Energy Symposium (FLOWERS'97), Florence, Italy, July 30-August 1, 1997: "Constructal Theory: from Thermodynamic and Geometric Optimization to Predicting Organization in Nature".

Keynote Lecturer, 14th Brazilian Congress of Mechanical Engineering (COBEM 97), Bauru, SP, Brazil, December 8-12, 1997: "Constructal Theory: from Engineering to Shape and Structure in Nature".

Honored Speaker, International Symposium on "The Legacy of Adrian Bejan: Three Generations of Brazilian Scientists", Pontifical Catholic University of Parana, Curitiba, Brazil, December 12, 1997.

Invited Speaker, Engineering Foundation International Symposium on the Mechanics of Plants, Animals and Their Environments: Integrative Perspectives, Santa Barbara, CA, January 11-16, 1998.

Keynote Lecturer, Conference of the Heat Transfer Society of Japan, Nagoya, May 27-29, 1998: "Constructal Theory: Natural Flow Structure as the Result of Thermodynamic Optimization".

Lecturer, U.S.A.-South Africa Workshop on "Energy and the Environment," Durban, South Africa, June 8-12, 1998: "The Method of Entropy Generation Minimization".

Invited Speaker, Conference on "Mathematics in Heat Transfer," Bradford, U.K., June 29-July 1, 1998.

Keynote Lecturer, International Conference on "Efficiency, Costs, Optimization, Simulation and Environmental Aspects of Energy Systems (ECOS'98)," Nancy, France, July 8-10, 1998: "How Nature Takes Shape: Extensions of Constructal Theory".

Lecturer, NATO Advanced Study Institute on "Thermodynamics and the Optimization of Complex Energy Systems," Neptun, Romania, July 13-24, 1998.

Keynote Lecturer, 11th International Heat Transfer Conference, Kyongju, Korea, August 23-28, 1998: "Thermodynamic Optimization in Heat Transfer".

Invited Speaker, Gordon Research Conference on Modern Developments in Thermodynamics, Il Ciocco, Barga, Italy, April 18-23, 1999.

Invited Speaker, Luncheon of the Advanced Energy Systems Division, ASME, International Mechanical Engineering Congress and Exposition, Nashville, TN, Nov. 18, 1999.

Keynote Speaker, Workshop on Energy Conservation in Industrial Applications, King Fahd University of Petroleum and Minerals, Dhahran, Saudi Arabia, February 12-14, 2000.

Keynote Speaker, ASME-ZSITS International Thermal Science Seminar, Bled, Slovenia, June 11-14, 2000: "Entropy Generation Minimization: the Method and Its Applications".

Invited Lecturer, Euro Conference on “Renewable Technologies for Sustainable Development,” Madeira Island, Portugal, June 26-29, 2000: "Constructal Optimization of Tree-Shaped Paths for the Collection and Distribution of Fluid, Electricity, Goods and People".

Keynote Speaker, The 7<sup>th</sup> Australasian Heat and Mass Transfer Conference, Townsville, Australia, July 3-6, 2000: "Constructal Tree Networks for Convection and Conduction Heat Transfer".

Keynote Lecturer, 12<sup>th</sup> International Symposium on Transport Phenomena (ISTP-12), Istanbul, July 16-20, 2000: "Constructal Tree-Shaped Paths for Conduction and Convection".

Keynote Lecturer, 12<sup>th</sup> International Symposium on Transport Phenomena (ISTP-12), Istanbul, July 16-20, 2000: "Thermodynamic Optimization of Geometry in Engineering Flow Systems".

Le Parrain de la Promotion (godfather of the graduating MS class) DESS Energétique et Mécanique, Institut National Polytechnique de Lorraine et University Henri Poincaré, Nancy, France, September 19, 2000; lecture title: “Thermodynamic Optimization of Geometry in Environmental Control Systems for Aircraft.”

Keynote Lecturer, SAChE 2000, 9<sup>th</sup> National Meeting, Secunda, Mpumalanga, South Africa, October 9-12, 2000.

Keynote Lecturer, 9<sup>th</sup> International Flotherm User Conference, Orlando, Florida, October 18-19, 2000.

Keynote Lecturer, Annual Congress of Civil Engineers, Bucharest, Romania, 29 November-3 December, 2000.

Invited Speaker, 2001 ASHRAE Winter Meeting, Seminar on “How Second Law Can Save You Money,” Atlanta, January 28, 2001.

Keynote Lecturer, The XI<sup>th</sup> National Conference on Thermodynamics, Galati, Romania, 17-19 May 2001.

Keynote Lecturer, XIII School-Seminar of Young Scientists and Specialists under the Leadership of Academician Professor A. I. Leontiev “Physical Principles of Experimental Heat and Mass Transfer and Gas Dynamics in Power Plant,” St. Petersburg, Russia, May 20-25, 2001.

Keynote Lecturer, International Conference on “Efficiency, Costs, Optimization, Simulations and Environmental Impact of Energy Systems (ECOS '01), Istanbul, Turkey, July 4-6, 2001.

Keynote Speaker, International Conference on Heat and Powered Cycles, Paris, September 5-7, 2001: "The Generation of Physical Structure in Power and Refrigeration Systems".

Keynote Speaker, Thermal and Fluids Analysis Workshop, NASA Space Flight Center, Huntsville, AL, September 12, 2001: "Constructal Theory and Design: Optimal Geometric Form in Thermal Science and Engineering".

Invited Speaker, 2001 International Mechanical Engineering Congress and Exposition, Panel on "Exergetic Analysis Applied to Aircraft Design", New York, November 15, 2001.

Distinguished Lecturer, Euler Visiting Lecturers Programme, Swiss Federal Institute of Technology, Zurich, "The Generation of Physical Structure Based on Global Thermodynamic Optimization in Power and Refrigeration Systems", December 5, 2001.

Invited Speaker, Department of Anatomy, University of Bern, Bern, "Constructal theory and design: optimal flow architecture, body size and energy efficiency (the 3/4 power law)", December 4, 2001.

Invited Speaker, Federal University of Parana, Curitiba, Brazil, "Constructal Law: Optimal Geometric Form for Heat and Fluid Flow Systems", December 19, 2001.

Keynote Plenary Speaker, 16<sup>th</sup> National Heat and Mass Transfer Conference, and 5<sup>th</sup> ISHMT/ASME Heat and Mass Transfer Conference, Calcutta, 3-5 January 2002.

Invited Lecture on "Exergy Analysis of Complex Systems," Workshop on Exergy Analysis of Hypersonic Flight Vehicles, University of Rome 1, March 20-22, 2002, Rome, Italy.

Keynote Lecturer, First International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics (HEFAT 2002), Skukuza, South Africa, April 8-10, 2002: "Constructal Design of Heat and Fluid Flow Systems."

Keynote Lecturer, First International Conference on Applications of Porous Media, Djerba, Tunisia, 2-8 June, 2002: "Designed Porous Media: Optimal Spacings and Constructal Design".

Keynote Lecturer, The 13<sup>th</sup> International Symposium on Transport Phenomena, Victoria, Canada, July 14-18, 2002: "The Constructal Law: Mechanical Structures and Flow Systems".

Invited Lecturer, NATO Advanced Study Institute on "Emerging Technologies and Techniques in Porous Media", 9-20 June 2003, Neptun, Romania.

Keynote Lecturer, The First International Exergy, Energy and Environment Symposium, 13-17 July 2003, Izmir, Turkey.

Invited speaker, European Workshop on Exergy Analysis for Aerospace Applications, 26-28 August, 2003, Bourges, France.

Keynote paper, Thermal Science Seminar II, "Maximal Heat Transfer Density: Optimal Distribution of Discrete Heat Sources on Vertical Walls in Channels and Enclosures with Natural Convection", 13-16 June 2004, Bled, Slovenia.

Keynote speaker, Union of Italian Thermo-fluid-dynamics Conference (UIT), Constructal Multi-scale Structures for Maximum Heat Transfer Density, 21-23 June 2004, Genova, Italy.

Keynote speaker, Design & Nature II, "Designed porous and multi-scale flow structures", 28-30 June 2004, Rhodes, Greece.



Keynote speaker, The First Cappadocia Mechanical Engineering Symposium, “Constructal Theory of Design in Engineering and Nature”, 14-16 July 2004, Nigde, Turkey.

Invited speaker, Size as a Determinant of Biological Processes, Conference organized by the Journal of Experimental Biology, Centro Monte Verità, Ascona, Switzerland, 10-14 September, 2004: “The Constructal Law: Tree-Shaped Flows, Body Size and Heat Loss”.

Invited Lecturer, A day in memory of Cesare Codegone, Turin Polytechnic, 20 September 2004: “Thermodynamic Optimization and Constructal Design: the Generation of Flow System Configuration”.

Invited Lecturer, Giornata nel ricordo di Cesare Codegone (A day in memory of Prof. Cesare Codegone), Turin Politechnic, Department of Energetics, 20 Sept. 2004: “Thermodynamic Optimization and Constructal Design: the Generation of Energy System Configuration”.

Keynote Speaker, The Seventh Annual Research Laboratory Fellows Awards Banquet, United States Air Force Museum, Dayton, Ohio, 29 Sept. 2004: “The Constructal Law of Shape and Structure, from Engineering to Nature”.

Lead Speaker, Workshop Autour de la theorie constructle (Along with constructal theory), University of Lausanne, 25-29 October 2004.

Invited Speaker, Luncheon of the Process Industries Division, ASME, International Mechanical Engineering Congress and Exposition, Anaheim, CA, Nov. 16, 2004.

Invited Lecturer, Thermodynamics Spring School on Constructal Theory and Thermoeconomics, Pau, France, 6-9 June 2005.

Keynote Speaker, “Constructal theory of energy-system and environment flow configurations”, International Green Energy Conference, Waterloo, Canada, 12-16 June 2005.

Invited Speaker, “Constructal Theory of Pattern Formation”, Thresholds and Pattern Dynamics Conference, University of Western Australia, Perth, 3-8 July 2005.

Invited Speaker on “Constructal theory” at the workshop on *Natural Design: Theory, Observations, Applications*, University of Oxford, 18 November 2005.

Invited Lecturer, “Constructal theory”, *First Spring School on Optimization and Control of Flow and Transfer*, 12-17 March 2006, Aussois, France.

Lead Speaker, “Constructal theory of animal locomotion: flying, running and swimming”, Société Française de Thermique, Symposium on *Multiscale Geometries, Constructal Theory and Exergy*, 16 March 2006, Nancy, France.

Keynote speaker, Second International Green Energy Conference, Oshawa, Ontario, 25-28 June 2006.

Keynote Speaker, 11<sup>th</sup> Latin American Congress of Heat and Mass Transfer, Mexico City, 8 September 2006.

Lead Speaker, First International Workshop on Constructal Theory and Application, Shanghai Jiao Tong University, 16-17 October 2006.

Lead Speaker, *Natural Design: Theory, History, Practice*, Oxford University, Continuing Education, 11 November 2006.

Invited Speaker, NSF Workshop on Frontiers in Transport Phenomena Research and Education, University of Connecticut, 17-18 May 2007.

Keynote Speaker, “The Constructal Law of Design in Nature”, CANCAM 2007, Canadian Congress of Applied Mechanics, Toronto, Canada, 4 June 2007.

Co-Director, Second International Conference on Porous Media, Kauai, Hawaii, 17-21 June 2007.

Honorary Chairman and Keynote Speaker at the *3<sup>rd</sup> International Energy, Exergy and Environment Symposium*, Evora, Portugal, 2-5 July 2007 (Keynote: “Science as an Evolving Flow Architecture”).

Panel speaker, The Entropy Challenge, An International Thermodynamics Symposium In Honor and Memory of Professor Joseph Henry Keenan, MIT 4-5 October 2007.

Invited speaker, International Workshop “Shape and Thermodynamics”, University of Florence, 25-26 September 2008: “The Constructal Law of Design in Nature”.

Technical Keynote Speaker, 2009 ASHRAE Winter Conference, Chicago, 25 January 2009: Why are lungs and river basins tree-shaped? Why are larger animals faster, stronger and less active? Why is there “technology evolution”?

Invited Lecturer, Helsinki University of Technology, 25 September 2009: “Design with Constructal Theory”.

Keynote Lecturer, Japan Society of Mechanical Engineers, Kanazawa, 26 October 2009: “The Constructal Law of Design in Nature”.

Keynote Lecturer, COBEM 2009, Brazilian Congress of Mechanical Engineering, Gramado-RS, Brazil, 15-20 November 2009: “Design with Constructal Theory”.

Keynote Lecturer, The 3<sup>rd</sup> Southern Conference on Computational Modeling, 23-25 November 2009, Rio Grande RS, Brazil: “Design with Constructal Theory: Nature and Engineering”.

Invited paper, “Global Distributed Energy Systems”, *The Ravage of the Planet*, Second International Conference on the Management of Natural Resources, Sustainable Development and Ecological Hazards, 15-17 December 2009, Gordon’s Bay, South Africa.

Invited paper, “Few Large and Many Small: Hierarchy in Movement on Earth”, Fifth International Conference on *Design and Nature 2010*, Pisa, Italy, 28-30 June 2010.

Three Keynote Lectures, International Workshop on Hydrology: Nature & Engineering, 20-21 March 2011, and World Water Day, 22 March 2011, at Sultan Qaboos University, Muscat, Oman: “Designed Porous Media”, “Distributed Energy Systems”, and “The Constructal Law of Design in Nature”.

Keynote speaker, *Constructal Law Conference*, 1 December 2011, Porto Alegre, Brazil.

Keynote speaker, *The 2<sup>nd</sup> Asian-US-European Thermophysics Conference, Thermal Science for Sustainable World*, Hong Kong, 3 January 2012.

TEDx MidAtlantic speaker, Washington, DC, 26 October 2012.

Invited Lecture, Distinguished Scientist Seminar Series, Earth Sciences Division, Lawrence Berkeley National Laboratory, 16 November 2012: “Constructal Law of Design and Evolution in Nature”.

Keynote Speaker, IEEE ITherm Conference 2014, Lake Buena Vista (Orlando), Florida, 29 May 2014, “Sustainability: Its Physics and Natural Constructal Design”.

Plenary Lecture, American Association of Physics Teachers (AAPT) Winter Meeting, San Diego, 4-7 January 2015, “Evolution, Life and Sustainability: What the Constructal Law Is, and How It Gives Us a New Worldwide View”.

Invited Speaker, JUNTO, New York, 3 September 2015, “The Human & Machine Species: Life and Evolution as Physics”.

Keynote Lecture, Academy of Europe 27<sup>th</sup> Annual Meeting, Darmstadt 9 September 2015, “The Human & Machine Species: Life and Evolution as Physics”.

Invited Lecture, Hong Kong Polytechnic University, 14 October 2015, “Life and Evolution as Physics”.

Distinguished Lecture, Jockey Club Institute for Advanced Study, Hong Kong University of Science and Technology, 16 March 2016, “The Physics of Life & Evolution”.

Castle Lecture Series, Durham University, UK, “Life and Evolution, as Physics”, 27 April 2016.

Dinner speaker, NSF Workshop on Biological Collections as a Resource for Technical Innovation, May 10, 2016, Washington, DC: “The Physics of Life & Evolution”.

The Inaugural CBE Design Day Seminar, Rensselaer Polytechnic Institute, May 11, 2016: “Evolutionary Design & the Physics of Life”.

Faculty of Engineering Distinguished Lecture, Chinese University of Hong Kong, 25 May 2016.

Provost’s Lecture Series, Stony Brook University, “Life and Evolution as Physics,” 30 March 2017.

Invited speaker, “Systems,” Applied Brilliance 2017 Conference, Tulum, Mexico, 4-7 April 2017.

Invited speaker, Biomedical/Biotechnology Research Institute, North Carolina Central University, 13 April 2017.

Invited speaker, The Helix Center: “Design in Nature”, New York, 22 April 2017.

Distinguished International Visitor Event: Constructal Law and Physical Geography, Durham University UK, 11 May 2017.

Keynote Lecturer, Conference on Complex Systems, Cancun, Mexico, 21 September 2017: “Constructal Law: Life and Evolution as Physics”.

Invited speaker, Distinguished Lecture Series, Duke Medical Physics Graduate Program, 21 September 2017: “Life and Evolution as Physics”.

Guest Speaker, The 2017 Thermodynamics of Emotion Symposium, Portland, Oregon, 13-15 October 2017: “Constructal Law: Thermodynamics and Emotion”.

Ralph Coats Roe Medal Lecture: “The Evolution of Everything”, International Mechanical Engineering Congress and Exhibition, Tampa, FL, 5 November 2017.

Keynote Lecture, “Constructal Law: The Evolution of Everything”, 26<sup>th</sup> Annual International Conference of Iranian Society of Mechanical Engineers, 24-26 April 2018, Semnan, Iran.

Invited speaker, “Concluding observations, the field and its future”, NSF Workshop – Constructal Theory, Villanova University, April 17-18, 2018.

Invited Speaker, “Thermodynamics, Constructal law, and Evolution as physics”, Franklin Institute Symposium, Constructal Theory: What the Future Holds, April 18, 2018.

Invited Speaker, “Life and Evolution, as Physics”, Evolutionary Studies Program, Binghamton University, The State University of New York, 30 April 2018.

Invited Speaker, Cannes Lions 2018, panel “What AI Teaches Us About Creativity and the Universe”, Cannes, France, 21 June 2018.

**Society Activity:**

Fellow, American Society of Mechanical Engineers (ASME).

Member, American Academy of Mechanics.

Member, American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).

Member, American Society of Engineering Education (ASEE).

Founding Member, International Center for Applied Thermodynamics.

Member of the Scientific Council of the International Centre for Heat and Mass Transfer (ICHMT), 1994-

Member, Pi Tau Sigma (Mechanical Engineering Honor Society).

Member, Tau Beta Pi (Engineering Honor Society).

Member of the Executive Committee, Workshop on Second Law Analysis in Engineering, George Washington University, Washington, D.C., August 1979.

Member of the K-18 Committee (Cryogenic Heat Transfer) of the ASME Heat Transfer Division.

Member of the Systems Analysis Technical Committee of the ASME Advanced Energy Systems Division.

Organizer of the two sessions on "Second Law Aspects of Thermal Design" at the 22nd National Heat Transfer Conference, Niagara Falls, New York, August 5-8, 1984.

Organizer of the session on "Second Law Aspects of Thermal Design" at the 1985 Winter Annual Meeting of the ASME, Miami Beach, Florida, November 17-22, 1985.

Organizer of the session on "Second Law Applications in Fluid Mechanics and Heat Transfer" at the U.S.A.-Italy Joint Seminar on Second Law Aspects of Thermal Design, May 25-30, 1987, Rome, Italy.

Chairman of a session on "Advanced Energy Systems" at the 1987 Winter Annual Meeting of the ASME, Boston, Massachusetts, Dec. 14-18, 1987.

Organizer of the symposium on "Second-Law/Thermodynamics Analysis in Heat/Mass Transfer and Energy Conversion," ASME Winter Annual Meeting, Nov. 28-Dec. 2, 1988, Chicago.

Organizer of a session on "Fundamentals of Systems Analysis" in the Symposium on "The Analysis and Design of Advanced Energy Systems," ASME Winter Annual Meeting, December 10-15, 1989, San Francisco.

Chairman of the session on "Second Law Analysis of Energy Systems," at the Florence World Energy Research Symposium, Florence, Italy, May 28-June 1, 1990.

Chairman of two sessions on "Education in Thermodynamics and Energy Systems," at the ASME Winter Annual Meeting, Nov. 26-30, 1990. Dallas.

Member of the organizing committee of the International Conference on the Analysis of Thermal and Energy Systems, Athens, Greece, June 3-6, 1991.

Chairman of the session on "Cryogenic Heat Transfer," at the National Heat Transfer Conference, July 28-31, 1991, Minneapolis.

Member of the Scientific Committee, International Conference on Energy Systems and Ecology (ENSEC '93), Cracow, Poland, July 5-9, 1993.

Member of the Scientific Committee, International Symposium on Heat and Mass Transfer in Energy Systems and Environmental Effects, August 22-25, 1993, Cancun, Mexico.

Member of the panel discussion on "Extending the Limits of Air Cooling," at the Fourth Intersociety on Thermal Phenomena in Electronic Systems, Washington, DC, May 4-7, 1994.

Member of the Scientific Committee, Florence World Energy Symposium (FLOWERS '94), Florence, Italy, July 6-8, 1994.

Member of the International Advisory Committee, Seventh International Symposium on Transport Phenomena in Manufacturing Processes (ISTP-7), Acapulco, Mexico, August 28-31, 1994.

Member of the Scientific Committee, Session Chairman and Panelist at the International conference on "Second-Law Analysis of Energy Systems: Towards the 21st Century," Rome, July 5-7, 1995.

Member of the Scientific Committee, International Scientific Conference on Efficiency, Costs, Optimization, Simulation and Environmental Impact of Energy Systems (ECOS '95), July 11-14, 1995, Istanbul, Turkey.

Chairman of the Panel on "Future of Teaching Thermal Engineering and Efficient Use of Energy," International Scientific Conference on Efficiency, Costs, Optimization, Simulation and Environmental Impact of Energy Systems (ECOS '95), July 11-14, 1995, Istanbul, Turkey.

Member of the Scientific Committee of the 10th Turkish National Conference on Thermal Sciences with International Participation, September 6-8, 1995, Ankara.

Member of the *E Group* (European working group on energy, exergy, entropy generation minimization, economics and environment), 1995-

Member of the International Scientific Advisory Committee of the Ninth Symposium on Transport Phenomena, Singapore, June 25-28, 1996.

Member of the Scientific Committee, International Scientific Conference on Efficiency, Costs, Optimization, Simulation and Environmental Impact of Energy Systems (ECOS '96), June 25-27, 1996, Stockholm.

Member of the Scientific Committee, "International Symposium on Transient Convective Heat Transfer," Cesme, Turkey, August 19-23, 1996.

Member of the Scientific Committee for the Meeting (Commissions B1, B2, E1 and E2) of the International Institute of Refrigeration, Bucharest, September 10-13, 1996.

Member of the Scientific Committee of the International Conference on Thermodynamic Analysis and Improvement of Energy Systems (TAIES'97), Beijing, China, June 10-13, 1997.

Member of the Scientific Committee, Florence World Energy Symposium (FLOWERS '97), Florence, Italy, July 30-August 1, 1997.

Chairman of the session on "Unconventional Thermodynamics" at the 1997 International Mechanical Engineering Congress & Exposition, of the ASME International, Dallas, TX, November 16-21, 1997.

Co-Director, U.S.A.-South Africa Workshop on "Energy and the Environment," Durban, South Africa, June 8-12, 1998.

Co-Chairman, International Conference on "Efficiency, Costs, Optimization, Simulation and Environmental Aspects of Energy Systems (ECOS '98)," Nancy, France, July 8-10, 1998.

Co-Director, NATO Advanced Study Institute on "Thermodynamics and the Optimization of Complex Energy Systems," Neptun, Constanta, Romania, July 13-24, 1998.

Session Organizer, Gordon Research Conference on Modern Developments in Thermodynamics, Il Ciocco, Barga, Italy, April 18-23, 1999.

Member of the International Scientific Committee, International Workshop on "Non-Compression Refrigeration and Cooling," Odessa, Ukraine, June 7-11, 1999.

Member of the Scientific Committee, International Conference on "Efficiency, Costs, Optimization, Simulation and Environmental Aspects of Energy Systems (ECOS '99)," Tokyo, Japan, June 8-10, 1999.

Member of the Advisory Committee and Discussion Leader, International Workshop on Optimization of Industrial and Living Systems, Leiden, The Netherlands, March 11-14, 2000.

Member of the Advisory Committee, ASME-ZSITS International Thermal Sciences Conference, Bled, Slovenia, June 11-14, 2000.

Member of the Scientific Committee, International Conference on "Efficiency, Costs, Optimization, Simulation and Environmental Aspects of Energy Systems (ECOS 2000)," Twente, The Netherlands, July 5-7, 2000.

Invited Participant, Gordon Conference on Modern Developments in Thermodynamics, Ventura, CA, March 11-16, 2001.

Member of the Technical Scientific Committee, "The 11<sup>th</sup> National Conference on Thermodynamics," Galati, Romania, May 17-19, 2001.

Member of the Scientific Advisory Committee and Session Chairman, XIII School-Seminar on Physical Principles of Experimental and Mathematical Simulation of Heat Transfer and Mass Transfer and Gas Dynamics in Power Plants, St. Petersburg, Russia, 20-25 May, 2001.

Co-chairman, International Conference on "Efficiency, Costs, Optimization, Simulation and Environmental Aspects of Energy Systems (ECOS 2001)," and "First International Conference on Applied Thermodynamics", Istanbul, Turkey, July 4-6, 2001.

Co-Director, International Summer School of "Heat Transfer in Porous Media", Neptun, Romania, July 25-August 3, 2001.

Member of the Scientific and Technical Committee, 2<sup>nd</sup> International Heat Powered Cycles Conference, September 5-7, 2001, Paris.

Member of the International Scientific Committee, International Workshop on "Non-Compression Refrigeration & Cooling", Odessa, Ukraine, October 3-5, 2001.

Member of the Honorary International Advisory Board, International Conference on Computational Heat and Mass Transfer, Federal University of Rio de Janeiro, Brazil, October 22-26, 2001.

Session Organizer, Workshop on Exergy Analysis of Hypersonic Flight Vehicles, University of Rome, March 20-22, 2002, Rome Italy.

Member of the Scientific Advisory Board, Dubrovnik Conference on Sustainable Development of Energy, Water and Environment Systems, June 2-7, 2002, Dubrovnik, Croatia.

Scientific Director, International Summer School on "Porous and Complex Flow Structures in Modern Technologies", University of Evora, Evora, Portugal, 17-21 June 2002.

Member of the Scientific Committee, International Conference on "Efficiency, Costs, Optimization, Simulation and Environmental Aspects of Energy Systems (ECOS'02)", Berlin, Germany, July 3-5, 2002.

Member of the Scientific Committee, Eurotherm Seminar No. 70 on "Physical and Mathematical Modelling of Fires in Enclosures and Fire Protection, Torino, Italy, October 7-8, 2002.

Member of the Scientific Board, International Conference on the occasion of Lars Onsager's 100<sup>th</sup> birthday: "Transport and Dissipation in Complex Systems", June 1-5, 2003, Trondheim, Norway.

Member of the Organizing Committee, NATO Advanced Study Institute on "Emerging Technologies and Techniques in Porous Media", 9-20 June 2003, Neptun, Romania.

Member of the International Scientific Committee, the Second International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics, HEFAT 2003, Victoria Falls, Zambia, 23-25 June 2003.

Member of the Scientific Council, International Conference on "Efficiency, Costs, Optimization, Simulation and Environmental Aspects of Energy Systems (ECOS'03)", Copenhagen, June 30 – July 2, 2003.

Member of the Scientific Committee, "International Symposium on Transient Convective Heat and Mass Transfer in Single and Two-Phase Flows", Cesme, Turkey, 17-22 August 2003.

Honorary Chair and Member of the International Scientific and Advisory Committee, The First International Exergy, Energy and Environment Symposium, 13-17 July 2003, Izmir, Turkey.

Member of the International Advisory Board, "The 5<sup>th</sup> Jordanian Mechanical Engineering Conference", Amman, Jordan, 15-17 December, 2003.

Co-chairman, ASME-ZSIS International Thermal Science Seminar, ITSS II, Bled, Slovenia, 13-16 June 2004.

Member of the International Advisory Committee, 3<sup>rd</sup> International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics, HEFAT 2004, Cape Town, South Africa, 21-24 June 2004.



Member of the International Scientific Advisory Committee, and Session Organizer, Second International Conference on Design & Nature 2004, 28-30 June 2004, Rhodes, Greece.

Member of the Scientific Committee, International Conference on “Efficiency, Costs, Optimization, Simulation and Environmental Impact of Energy and Process Systems”, Guanajuato, Mexico, 7-9 July 2004.

Member of the International Advisory Committee, The First Cappadocia Mechanical Engineering Symposium, 14-16 July 2004, Nigde, Turkey.

Director, International Summer School on “Thermodynamic Optimization and Constructal Design”, 19-24 July 2004, Yildiz University, Istanbul, Turkey.

Member of the International Scientific Advisory Committee, 3<sup>rd</sup> International Conference on Heat Powered Cycles, 11-13 October 2004, Larnaca, Cyprus.

Member of the Scientific Committee, International Conference on “Water and Risks in the Saharan context”, University Amar Telidji, Laghouat, Algeria, 11-12 December 2004.

Director, Workshop on “Constructal Theory of the Generation of Optimal Flow Configurations”, University of Roma I, 16-18 March 2005.

Honorary Chair, Second International Conference on Applied Thermodynamics, 18-20 May 2005, Istanbul.

Member of the Scientific Committee, First International Conference on Thermal Engines and Environmental Engineering, University of Galati, Romania, 3-4 June 2005.

Honorary Chair, International Green Energy Conference, Waterloo, Canada 12-16 June, 2005.

Member of the Scientific Council for ECOS 2005, June 20-23, Trondheim, Norway.

Member of the Scientific Committee, the 14<sup>th</sup> International Conference on Thermal Engineering and Thermogrammetry (THERMO), 22-24 June 2005, Budapest, Hungary.

Member of the Organizing Committee, The Second International Exergy, Energy and Environment Symposium IEEES2, Kos, Greece, 3-7 July 2005.

Member of the Advisory Board, Thermal Theories of Continua: Survey and Developments, 25-30 September 2005, Messina, Italy.

Member of the Scientific Committee, ASME ATI Conference, Milano, Italy, 14-17 May 2006.

Member of the International Scientific Advisory Committee, Third International Conference on Design & Nature 2006, 24-26 May 2006, New Forest, UK.

Honorary Chair, 3<sup>rd</sup> International Conference on Applications of Porous Media, 29 May – 3 June 2006, Marrakesh, Morocco.

Member of the Scientific Committee, Engineering Systems Design and Analysis – ESDA 2006, Torino, Italy, 4-7 July 2006.

Member of the Scientific Committee for ECOS 2006, 12-14 July 2006, Crete, Greece.

Member of the International Scientific Advisory Committee of the 4<sup>th</sup> International Conference on “Urban Regeneration and Sustainability, 17-19 July 2006, Tallin, Estonia.

Honorary Chair, The Third International Energy, Exergy and Environment Symposium, IEEEES-3, Évora, Portugal, 1-5 July 2007.

Vice President, Executive Committee of the International Center of Applied Thermodynamics, 2005-present.

Member of the Scientific Committee, ECOS 2007, Efficiency, Cost, Optimization, Simulation and Environmental Impact of Energy Systems, Padova, Italy, 25-28 June 2007.

Member of the Scientific Committee, 15<sup>th</sup> International Conference on Thermal Engineering and Thermogrammetry (THERMO), 27-29 June 2007, Budapest.

Member of the Scientific Committee, 4<sup>th</sup> International Conference on Applications of Porous Media, 19-24 May 2008, Istanbul.

Member of the Scientific Committee, International Scientific Conference on Efficiency, Costs, Optimization, Simulation and Environmental Impact of Energy Systems (ECOS '08), Krakow, Poland, 2008.

Member of the International Steering Committee, ISTP-19, Reykjavik, Iceland, 17-21 August 2008.

Member of the International Scientific Advisory Committee of the 5<sup>th</sup> International Conference on The Sustainable City 2008, 22-24 September 2008, Skiathos, Greece.

Member of the International Scientific Committee of the 16<sup>th</sup> THERMO Conference, 24-26 June 2009, Budapest.

Member of the Scientific Committee, International Scientific Conference on Efficiency, Costs, Optimization, Simulation and Environmental Impact of Energy Systems (ECOS '09), Foz do Iguacu, Brazil, 2009.

Co-chair, Advisory Committee, The 4<sup>th</sup> International Green Energy Conference, Beijing, China, 20-22 October 2008.

Member of the Honors and Awards Committee of the ASME Heat Transfer Division, July 2008 - June 2011.

Member of the Scientific Committee, the 11<sup>th</sup> UK Heat Transfer Conference, Queen Mary, University of London, September 2009.

Member of International Steering Committee, 20<sup>th</sup> International Symposium on Transport Phenomena (ISTP-20), Victoria, BC, Canada, 7-10 July 2009.

Member of the Scientific Committee, The First International Conference on Optimization using Exergy-based Methods and Computational Fluid Dynamics, 20-23 October 2009, Berlin.

Member of the Scientific Council of ECOS 2010, Efficiency, Cost, Optimization, Simulation and Environmental Impacts of Energy Systems, Lausanne, 14-17 June 2010.

Member of the International Advisory Committee of the 7<sup>th</sup> International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics (HEFAT2008), Antalya, Turkey, June/July 2010.

Member of the International Scientific Committee, Sustainable City 2010 Conference, 14-16 April 2010, A Coruna, Spain.

Member of the International Scientific Committee, Design and Nature 2010, Pisa, Italy, 28-30 June 2010.

Member of the International Organizing Committee, The 1<sup>st</sup> TSME International Conference on Mechanical Engineering (ICoME 2010), Thai Society of Mechanical Engineers, 20-22 October 2010, Ubonratchathani, Thailand.

Member of the International Steering Committee, ISTP-21, International Symposium on Transport Phenomena, Kaohsiung, Taiwan, 2-5 November 2010.

Member of the International Scientific Advisory Committee of Ravage of the Planet III, 13-15 December 2011, Universiti Teknologi Mara, Malaysia.

Member of the International Scientific and Advisory Committee of The 6<sup>th</sup> International Green Energy Conference, Eskisehir, Turkey, 5-9 June 2011.

Member of the Advisory Committee of The Global Conference on Global Warming-2011, Lisbon, 9-14 July 2011.

Member of the International Scientific Committee and the Conference Organizing Committee, *The 2<sup>nd</sup> Asian-US-European Thermophysics Conference, Thermal Science for Sustainable World*, Hong Kong, 3-6 January 2012.

Member of Scientific Advisory Committee, *Sustainable City 2012*, WIT, Ancona, Italy 7-9 May 2012.

Member of the International Scientific Advisory Committee of the Design and Nature 2012 Conference, A Coruna, Spain, 11-13 June 2012.

Member of the International Organizing Committee, the Fourth International Conference on Porous Media and its Applications in Science, Engineering and Industry, Potsdam, Germany, 17-22 June 2012.

Member of the International Advisory Committee, the 5<sup>th</sup> BSME International Conference on Thermal Engineering, Dhaka, 21-23 December 2012.

Member of the Honorary Committee, the 3<sup>rd</sup> International Exergy, Life Cycle Assessment, and Sustainability Conference, Nisyros, Greece, 7-9 July 2013.

Member of the Scientific Advisory Committee, VI<sup>th</sup> InterPore Conference, Milwaukee, 2014.

Member of the International Organizing Committee, the Fifth International Conference on Porous Media and its Applications in Science, Engineering and Industry, Kona, Hawaii, 22-27 June, 2014.

Member of the International Advisory Committee, The 6<sup>th</sup> BSME International Conference on Thermal Engineering, 19-21 December 2014, Dhaka, Bangladesh.

Honorary Board, International Conference on Heat Transfer, Thermodynamics, Energy and Fluid Mechanics, 22-24 December 2014, Istanbul, Turkey.

Member of the Scientific Advisory Committee of “Complex Systems 2015”, New Forest, UK, 12-14 May 2015.

Scientific Co-Chair of the ASME-ATI-UTI Conference on Thermal Energy Systems: Production, Storage, Utilization and the Environment, Napoli (Italy), 17-20 May 2015.

Chairman Scientific Committee, “Constructal Law & Second Law Conference”, 18-19 May 2015, Parma, Italy.

Member of the International Scientific Advisory Committee of “Design and Nature 2016”, New Forest, UK, 13-15 September 2016.

Member of the Scientific Council and Keynote Speaker, International Conference on Cryogenics, Technology and Refrigeration, 12-14 October 2016, Bucharest, Romania.

Member of the Scientific Board for SOLARTR 2016, Istanbul, 6-8 December 2016.

Member of the Scientific Committee, “Constructal Law & Second Law Conference”, 15-16 May 2017, Bucharest.

Member of the Scientific Committee, International Technology Congress, Pune, India, December 28-29, 2017.

Member of the Scientific Committee, Energy Management and Environmental Protection, Belek, Antalya, Turkey, 1-3 February 2018.

Member of the Scientific committee, International Symposium on Naval Architecture and Maritime, Yildiz Technical University, Istanbul, Turkey, 23-25 April 2018.

Member of the advisory board, 26<sup>th</sup> Annual International conference of Iranian Society of Mechanical Engineers (ISME 2018), Semnan, Iran, 24-26 April 2018.

**M.S. Theses Directed by Adrian Bejan:**

1. Experimental Study of High Rayleigh Number Convection in Horizontal Cavity with Different End Temperature, Adnan A. Al-Homoud, 1979.
2. Entropy Generation Criterion Applied to Various Heat Transfer Augmentation Techniques, William R. Ouellette, 1979.
3. Natural Circulation in a Horizontal Duct with Different End-Temperatures, Shigeo Kimura, 1980.
4. Natural Convection on Both Sides of a Vertical Wall Separating Fluids at Different Temperatures, Ren S. Anderson, 1980.
5. Extended Surface Design for Minimum Irreversibility, Dimosthenis Poulikakos, 1980.
6. The Buckling Instability of Capillary Jets, Michael G. Stockman, 1981.
7. Viscous Buckling of Thin Fluid Layers Undergoing End Compression, Kenneth R. Blake, 1982.
8. Natural Convection in Partially Divided Rectangular Enclosures, Nien-Chuan Norman Lin, 1982.
9. Transition to Turbulence in Rivulet Flow between Two Parallel Plates, Anil Anand, 1983.
10. Heat and Mass Transfer by Natural Convection in a Porous-Medium, Khairy R. Khair, 1984.
11. Natural Convection in a Vertical Slot Filled with Water near 4°C, Kurt E. Lankford, 1984.
12. Second Law Analysis of Solar Collectors with Energy Storage Capability, Djamel E. Chelghoum, 1984.
13. Transient Natural Convection in a Large-Diameter Horizontal Cylinder, Pablo S. Beloff, 1986.
14. The Horizontal Spreading of Thermal and Chemical Deposits in a Porous Medium, Zongqin Zhang, May 1987.
15. Transient Natural Convection Heat Transfer between Two Zones in an Insulated Enclosure, Pedro A. Litsek, May 1987.
16. Heat Sinks with Sloped Plate Fins in Natural and Forced Convection, Gustavo A. Ledezma, May 1995.
17. Staggered Multi-Scale Structure for Maximal Heat Transfer Density in Natural Convection, Hsiangmin Yu, 9 December 2005.
18. The Natural Emergence of Vascular Design with Turbulent Flow, Erdal Cetkin, April 2010.
19. Effect of size on ground-coupled heat pump performance, M. Alalaimi, October 2013.

20. The Constructal Evolution of the Cross Sections of Jets toward the Round Shape, S. Ziaei, November 2013.

**Ph.D. Theses Directed by Adrian Bejan:**

1. Buckling of Turbulent Jets, Ren S. Anderson, May 1983.
2. Buckling Flow and Transition to Turbulence in Axisymmetric Plumes, Shigeo Kimura, May 1983.
3. Natural Convection in a Triangular Enclosure Filled with Newtonian Fluid or Fluid Saturated Porous Medium, Dimosthenis Poulikakos, May 1983.
4. Natural Convection by Double Diffusion in Cavities, Osvaldo V. Trevisan, May 1986.
5. Transient Natural Convection Heat Transfer in a Rectangular Enclosure with One Heated Side Wall, John David Hall, May 1987.
6. Convection in the Cavity Formed between Two Cylindrical Rollers, Pedro A. Litsek, May 1989.
7. Melting and Solidification with Natural Convection in a Rectangular Enclosure, Zongqin Zhang, August 1990.
8. Fundamental Aspects of Convection in Enclosed Fluids, Jose L. Lage, May 1991.
9. Thermodynamic and Heat Transfer Optimization of Energy Storage and Extraction Processes, Jong S. Lim, August 1991.
10. Optimal Geometry of Electronic Packages Cooled by Forced Convection, Alexandru M. Morega, August 1993.
11. Fundamental Topics in Heat Transfer through Deformable Two-Phase Media, Alex J. Fowler, December 1993.
12. Combined Heat Transfer and Thermodynamics Problems with Applications in Refrigeration, Jose V. C. Vargas, September 1994.
13. Geometric Optimization of Heat Transfer Devices, Gustavo A. Ledezma, April 1997.
14. Thermodynamics Fundamentals of Energy Conversion, Nicolae Dan, April 1998.
15. Thermodynamic Optimization of Flow Systems with Irreversibilities, Marcelo R. Errera, February 1999.
16. Characteristics and Optimization of Composite Systems with Heat Conduction, Maria Neagu, July 1999.
17. Constructal Optimization of Tree-Shaped Assemblies for Conduction, Majed Almgobel, July 2000.

18. Geometric Optimization of Thermal Systems, Asad Alebrahim, July 2000.
19. Analysis and Optimization of Convection in Channels and Porous Media, Luiz Alberto Oliveira Rocha, March 2002.
20. Two Paths to Study Structures on Complex Systems, Alejandro Rivera Alvarez, September 2002.
21. Integrative Energy-Systems Design: System Structure from Thermodynamic Optimization, Juan Carlos Ordonez, April 2003.
22. Multidisciplinary Optimization of Heat Transfer and Fluid Flow Systems, Louis Gosselin, April 2004.
23. Constructal Multi-Scale Convective Structures, Tunde Bello-Ochende, November 2004.
24. Constructal Dendritic Trees for Heating and Cooling, Wislanuruk Wechsato, February 2005.
25. Constructal Multi-Scale Heat Exchangers, Alexandre K. da Silva, June 2005.
26. Constructal Vascular Composites for Cooling and Heating, Sunwoo Kim, August 2008.
27. Constructal Vascularization for Self-Healing and Self-Cooling, Kuan-Min Wang, August 2008.
28. Constructal Design of Vascular Materials, Jaedal Lee, November 2008.
29. Design with Constructal Theory: Steam Generators, Turbines and Heat Exchangers, Yong Sung Kim, July 2010.
30. Constructal Vascularized Structures for Cooling and Mechanical Strength, Erdal Cetkin, May 2013.
31. Constructal Design of Energy Systems, Mohammad Alalaimi, April 2016.
32. Constructal Design of Latent Heat Storage Systems, Shiva Ziaei, April 2016.
33. The Method of Constructal Design in Heat Exchangers, Abdulrahman Salman Almerbati, May 2018.

**Grants:**

- Office of Naval Research, "Effective Techniques for Augmenting Heat Transfer," \$94,610, 10/1/78-9/30/80.
- National Science Foundation, "Natural Convection Heat Transfer in a Horizontal Rectangular Cavity with Different End Temperatures," \$79,255, 3/1/79-8/31/81.
- Office of Naval Research, "Analytical Prediction of Turbulent Heat Transfer Parameters," \$142,153, 10/1/80-9/30/83.
- National Science Foundation, "Unsteady Natural Convection in a Porous Layer Heated from the Side," \$91,041, 12/1/82-5/31/85.

- National Science Foundation, "Unsteady Natural Convection Experiments in a Horizontal Cylinder," \$15,443, 9/1/84-2/28/87.
- Duke University, University Research Council, "Unsteady Natural Convection Experiments in a Horizontal Cylinder," \$4,000, 7/1/85-6/30/86.
- Lord Foundation of North Carolina, Book on "Advanced Engineering Thermodynamics," \$6,000, summer 1986.
- Electric Power Research Institute, "Natural Convection Melting and Solidification," \$93,242, 9/1/86-8/31/89.
- National Science Foundation, "Judiciously Unconstrained Research on Controversial Topics in Thermal Engineering," \$38,245, 10/1/87-3/31/90.
- Lord Foundation of North Carolina, Book on "Heat Transfer," \$3,000, summer 1989.
- Midwest Research Institute, "Numerical Calculation of Pollutant Transport in Buildings," \$8,000, 8/1/89-8/31/90.
- Electric Power Research Institute, "Natural Convection Melting and Solidification," \$37,422, 1/1/90-12/31/90.
- Lord Foundation of North Carolina, Book on "Heat Transfer," \$3,000, summer 1990.
- Electric Power Research Institute, "Natural Convection Melting and Solidification," \$74,335, 1/1/91-8/31/92.
- IBM, "Optimal Geometry of Electronic Packages Cooled by Forced Convection," \$58,296, 9/1/91-8/31/92.
- Air Force Office of Scientific Research, "The Effect of a Flexible Fiber Cover on Controlling Boundary Layer Flow and Heat Transfer," \$61,000, 2/1/92-1/31/95.
- IBM, "Optimal Geometry of Electronic Packages Cooled by Forced Convection," \$58,296, 9/1/92-8/31/93.
- National Science Foundation, "Optimization of Defrosting Refrigerators and Ice Making Processes," \$110,002, 1/15/94-6/30/96.
- IBM, "Optimal Geometry of Electronic Packages Cooled by Forced Convection," \$29,148, 1/1/94-12/31/94.
- National Science Foundation, "Thermodynamic Optimization of Power Systems with Fluid Flow Irreversibilities," \$152,924, 11/15/95 - 10/31/97.
- National Science Foundation, "Thermodynamic Optimization of Systems with Heat and Fluid Flow Irreversibilities," \$180,000, 9/15/97 - 8/31/2000.
- Air Force Office of Scientific Research, "Optimized Exergy Methodology," \$55,000, 12/1/97 - 11/30/98.
- National Science Foundation, "US-South Africa Workshop: Energy and Environment, Durban, South Africa, June 1998," \$32,043, 3/1/98 - 2/28/99.



- NATO, "Advanced Study Institute on Thermodynamics and the Optimization of Complex Energy Systems, Neptun, Romania, July 1998," \$65,412.
- Air Force Office of Scientific Research, "Optimized Exergy Methodology Project, Phase II," \$201,000, 1/1/99 - 12/31/2001.
- Bechtel BWXT Idaho, LLC (BBWI) "Methane Hydrates in Complex Undersurface Media," \$56,206, 1/19/2000 – 9/30/2000.
- National Science Foundation, "Thermodynamic and Geometric Optimization of Systems with Flow Irreversibilities," \$205,710, 6/1/2000 – 5/31/2003.
- National Science Foundation, "Development of Design Methods for Cooling and Heating Systems Based on Constructal Theory", \$37,200, 9/1/2002 – 8/31/2003.
- National Science Foundation, "New 4<sup>th</sup> Year Undergraduate Course on Constructal Design of Energy-System Configuration", \$74,918, 7/1/2004 – 6/30/2006.
- Air Force Office of Scientific Research, "MURI: Micro-Vascular Autonomic Composites", \$877,792, 5/1/05-4/30/10.
- National Science Foundation, "Constructal Theory of Social Dynamics", \$79,988, 9/15/2005 – 8/31/2007.
- Air Force Office of Scientific Research, "Constructal Technology for Thermal Management of Aircraft", \$248,800, 2/15/06-11/30/08.
- National Science Foundation, "Exploratory Research with Constructal Theory", \$99,998, 07/01/08 - 06/30/2009.
- Air Force Office of Scientific Research, "CTair: Constructal Tree Structures for Mechanical Strength and Cooling of Aircraft", \$317,226.00, 07/01/2010 - 6/30/2013.
- National Renewable Energy Laboratory, "Optimal design of residential energy systems using constructal theory", \$630,772.00, 11/22/2010 – 11/21/2013.
- National Science Foundation, "EAGER: Heat Networks and energy & Environment Design", \$150,000, 1/1/2014 – 12/31/2015.
- Department of Energy, "Geometries of Evaporator/Boiler", \$50,000, 10/13/2014 – 9/30/2015.