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John B. Heywood

*Professor of Mechanical Engineering
Sun Jae Professor, Emeritus*

Room 3-340
Massachusetts Institute of Technology
77 Massachusetts Avenue
Cambridge MA 02139-4307
Phone: 617-253-2243
Fax: 617-324-1553
Email: jheywood@mit.edu



[Curriculum Vitae](#)

Administrative Contact:

Karla Stryker-Currier
Room 31-153
Phone: 617-253-2203
Email: kstryker@mit.edu

Research Interests

Internal Combustion Engines; Automotive Technology; Energy and Transportation; Air Pollution; Combustion

Educational Background

Ph.D., Massachusetts Institute of Technology, Mechanical Engineering., 1964
Sc.D., Cambridge University, 1983

MIT Service

Research Associate, 1964-1965
Assistant Professor, 1968-1970
Associate Professor, 1970-1976
Director, Sloan Automotive Laboratory, 1972-present
Professor, 1976-1992
Leaders for Manufacturing Professor, 1989-1991
Acting Co-Director, Leaders for Manufacturing Program, 1991-1993
Sun Jae Professor of Mechanical Engineering, 1992-present

Department & Institute Committees:

Energy Laboratory, Internal Advisory Committee 1992-present
Chair, Mechanical Engineering Curriculum Development Committee 1995-1997

Professional Service:

NRC Committee for a Study on Transportation and a Sustainable Environment
1996-1997
NRC Committee to Review the Research Program of the Partnership for a New
1998-present
Generation of Vehicles



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Principal Publications (last 5 years)

Books:

1. Heywood, J.B., Internal Combustion Engine Fundamentals, McGraw-Hill, 1988.
2. Heywood, J.B., and Sher, E., The Two-Stroke Cycle Engine: Its Development, Operation, and Design, 451 pages, Taylor and Francis, 1999.

Technical Papers:

1. Meyer, R., Yilmaz, E., and Heywood, J.B., "Liquid Fuel Flow in the Vicinity of the Intake Valve of a Port-Injected SI Engine," SAE paper 982471, presented at the SAE International Fall Fuels and Lubricants Meeting and Exposition, San Francisco, CA, Oct. 19-22, SAE Trans., Vol. 107, 1998.
2. Meyer, R., and Heywood, J.B., "Evaporation of In-Cylinder Liquid Fuel Droplets in an SI Engine: A Diagnostic-Based Modeling Study," SAE paper 1999-01-0567, presented at the 1999 SAE International Congress and Exposition, Detroit, MI, March 1-4, 1999.
3. Rublewski, M., and J.B. Heywood, "Modeling NO Formation in Spark Ignition Engines with a Layered Adiabatic Core and Combustion Inefficiency Routine," SAE paper 2001-01-1011, presented at the SAE 2001 World Congress, Detroit, MI, March 5-8, 2001.
4. Chon, D.M., and Heywood, J.B., "Performance Scaling of Spark-Ignition Engines: Correlation and Historical Analysis of Production Engine Data," SAE paper no. 2000-01-0565, presented at 2000 SAE World Congress & Exposition, Cobo Center, Detroit, MI, March 6-9, 2000.
5. AuYeung, F., Heywood, J.B., and Schafer, A., "Future Light-Duty Vehicles: Predicting their Fuel Consumption and Carbon-Reduction Potential," SAE paper 2001-01-1081, presented at the SAE 2001 World Congress, Detroit, MI, March 5-8, 2001.
6. Hallgren, B.E., and Heywood, J.B. "Effects of Oxygenated Fuels on DI Diesel Combustion and Emissions," SAE paper 2001-01-0648, presented at the SAE 2001 World Congress, Detroit, MI, March 5-8, 2001.
7. Sandoval, D., and Heywood, J.B., "An Improved Friction Model for Spark-Ignition Engines," SAE paper no. 2003-01-0725, SAE 2003 World Congress, Detroit, MI, March 3-6, 2003; also in Transactions, Vol. 112, Journal of Engines, 2003.
8. Tanaka, S., Ayala, F., Keck, J.C., and Heywood, J.B., "Two-Stage Ignition in HCCI Combustion and HCCI Control by Fuels and Additives," Combustion & Flame, 132, pp. 219-239, 2003.
9. Hallgren, B.E., and Heywood, J.B., "Effects of Substantial Spark Retard on SI Engine Combustion and Hydrocarbon Emissions," SAE paper no. 2003-01-3237, 2003 Powertrain & Fluid Systems Conference, October 29, 2003; also in Transactions, Vol. 112, Journal of Fuels and Lubricants, 2003.
10. Topinka, J.A., Gerty, M., Heywood, J.B., and Keck, J.C., "Knock Behavior of a Lean-Burn, H₂ and CO Enhanced, SI Gasoline Engine Concept," SAE paper 2004-01-0975, SAE Transactions, Vol. 113, Journal of Engines, SAE 2004 World Congress & Exhibition, Detroit, MI, March 1-5, 2004.
11. Heywood, J.B., Weiss, M.A., Schafer, A., Bassene, S.A., and Natarajan, V.K., "The Performance of Future ICE and Fuel Cell Powered Vehicles and Their Potential Fleet Impact," SAE paper 2004-01-1011, SAE 2004 World Congress & Exhibition, Detroit, MI, March 1-5, 2004.
12. Yilmaz, E., Tian, T., Wong, V., and Heywood, J.B., "The Contribution of Different Oil Consumption Sources to Total Oil Consumption in a Spark Ignition Engine," SAE Paper 2004-01-2909, Proceedings of SAE Powertrain & Fluid Systems Conference & Exhibition, Tampa Florida, October 25-28, 2004.
13. Goldwitz, J.A., and Heywood, J.B., "Combustion Optimization in a Hydrogen-Enhanced Lean-Burn SI Engine," SAE Paper 2005-01-0251, SAE Transactions, Vol. 114, Journal of Engines, presented at the 2005 SAE World Congress,

Detroit, MI, April 11-14, 2005.

14. Costanzo, V.S., and Heywood, J.B., "Mixture Preparation Mechanisms in a Port Fuel Injected Engine," SAE paper 2005-01-2080, presented at the SAE Fuels and Lubricants Meeting, Rio de Janeiro, Brazil, May 11-13, 2005.

15. Gerty, M.D., and Heywood, J.B., "An Investigation of Gasoline Engine Knock Limited Performance and the Effects of Hydrogen Enhancement," SAE paper 2006-01-0228, presented at the SAE 2006 World Congress, Detroit, MI, April 3-6, 2006.

16. Ayala, F.A., Gerty, M.D., and Heywood, J. B., "Effects of Combustion Phasing, Relative Air-Fuel Ratio, Compression Ratio, and Load on SI Engine Efficiency," SAE paper 2006-01-0229, presented at the SAE 2006 World Congress, Detroit, MI, April 3-6, 2006.

17. Ivanic, Z., and Heywood, J.B., "Predicting the Behavior of a Hydrogen-Enhanced Lean-Burn SI Engine Concept," SAE paper 2006-01-1106, presented at the SAE 2006 World Congress, Detroit, MI, April 3-6, 2006.

18. Bandivadekar, A., and Heywood, J.B., "Coordinated Policy Measures for Reducing the Fuel Use of the U.S. Light Duty Vehicle Fleet," in Sperling, D. and J. Cunniff (editors) Driving Climate Change: Cutting Carbon from Transportation, Elsevier, Burlington, MA, 2006.

Scientific and Professional Societies

American Institute of Aero & Astro Associate Fellow 1973-present
American Society of Mechanical Engineers Member 1965-present
The Combustion Institute Member 1968-present
Institution of Mechanical Engineers Fellow 1975-present
Society of Automotive Engineers Fellow 1968-present

Honors and Awards

National Award for the Advancement of Motor Vehicle Research and Development, 1996 US Department of Transportation
George Stephenson Lecturer, Institution of Mechanical Engineers, UK, 1997
Elected Member National Academy of Engineering, 1998
Doctor of Technology honoris causa, Chalmers University of Technology, 1999
University of Technology, Sweden Soichiro Honda Medal, 1999,
American Society of Mechanical Engineers, 1999
Doctor of Science honoris causa, City University, UK, 2004

Other Experience:

Lecturer, Northeastern 1962-1965
Research Staff, Group Leader, Central Electricity Generating Board 1965-1968
Research Laboratory

Consulting & Patents:

Industrial and Government consulting over 30 years: long-time consultant to Ford Motor Company, Mobil Oil Co.

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