

Dr. Romney B. Duffey on His 80th Birthday



Romney B. Duffey

Dr. Romney Duffey is an internationally recognized multi-disciplinary scientist, consultant, manager, speaker, author, and poet. Born on June 26, 1942, and educated in England, Dr. Duffey has over 50 years of unique experience in the UK, U.S., and Canada in nuclear technology development, risk assessment, industrial safety, nuclear-system design, and accident analysis. As an applied physicist, his career has included a wide span of senior power-industry and government positions as researcher,

executive advisor, senior manager, published author, lecturer, and consultant. Dr. Duffey is globally known as a developer of new concepts and designs with innovation advantages and market potential, for contributions to risk management and reliability applications, and to the enhancement of our understanding of the physical world. In addition to working in the U.S., Canada, and the UK his international industrial, laboratory, and technical connections are worldwide.

Dr. Duffey's major technical analyses, interests, and original work are diverse in both topic and scope including:

- risk analysis and reliability, including new learning models and methods;
- thermal hydraulics and two-phase flow in reactor accidents;
- sustainable fuel cycles and nonproliferation;
- software and hardware reliability;
- power-systems restoration prediction;
- financial-system stability;
- hydrogen and nuclear-power impact on climate change;
- viral Covid-19 infection rate predictions;
- medical-implant procedures;
- advanced-reactor and design concepts;
- memory and cognition theory;
- safety management and risk-informed assessment principles; and
- operations research, managing disasters, and predicting rare events.

From 1967 to 1977, at the Berkeley Nuclear Laboratories *Central Electricity Generating Board*, UK, Dr. Duffey developed, defined, and conducted R&D on reactor safety and performance, and on commercial design and bid evaluation assisting in the UK decision to build PWRs. Some of the safety R&D has since

become classic references including fundamental work on quenching. He then moved to become a Senior Program Manager at the *Electric Power Research Institute*, Palo Alto, CA, under Walt Loewenstein, conducting R&D for U.S. utilities for operating and new plant designs. Using major RD&D contracts, the programs under his overall purview for the utilities included the joint industry and U.S. NRC PWR FLECHT, BWR FIST and B&W MIST and LOFT safety test and analysis programs, and major software development including ATHOS for steam generators. With an ANS study team, Dr. Duffey was among the first to visit Chernobyl NPP and assist in the analysis of the accident sequence. A later key contribution was in the establishment of the pioneering CSAU (aka BEPU) analysis methods for defining uncertainties for reactor licensing purposes working with the team headed by NRC's Novak Zuber with Sol Levy, Gerry Lellouche, Ivan Catton, Brent Boyack, Gary Wilson, Wolfgang Wulff, Peter Griffith, and Kumar Rohatgi, and variations of the approach continue to this day.

In 1987, Dr. Duffey became the Deputy Department Manager and Group Manager, Energy and Systems Technology, *EG&G Idaho, Inc.*, Idaho Falls, ID at the then Idaho National Engineering Laboratory, with responsibility for NRC and DOE safety-technology programs and other national initiatives, and development of programs on waste management, regulation, CFD, risk analysis, large computer codes (like RELAP5) and experiments supporting safety decisions. After briefly consulting with Larry Ybarondo's Sciencetech Inc., in 1992, he was appointed Chairman and Senior Advisor, Department of Advanced Technology, *Brookhaven National Laboratory*, Upton, NY. Here he oversaw the development and management of U.S. government technology, energy, and analysis programs (for DOE, DOS, EPA, DoD, and NRC), responsible for all aspects and functioning of large (circa \$120M/annum) technology and research operations. These many and varied activities included the now rediscovered space-rocket propulsion, enhancing the safety of Russian reactors, treatment of wastes from submarine decommissioning, collaborative U.S. non-proliferation programs with IAEA, and custodian of the ENDF cross section library.

After that experience, in 1999, Dr. Duffey became The Principal Scientist for the *Atomic Energy of Canada Limited (AECL)*, Chalk River as a strategic executive advisor under David Torger-son, responsible for advanced and future concepts; new product development; advice on overall R&D directions; analysis of global energy, environmental scenarios; negotiator for international technical-exchange agreements; and reviewer of energy policy, laboratory management, and market competitiveness. He was active in government and international contacts and technical business activities, in public consultations, and was the designated

national technical Expert from the very beginnings of the Generation IV International Forum (GIF). Working with Alistair Miller they developed NuWind as a then new approach to the coproduction of sustainable energy in competitive energy markets. With the GEN IV team at AECL, they also produced conceptual designs for high-efficiency, modular, and inherently safe reactors.

With the break-up of AECL, Dr. Duffey returned to the U.S. in 2011 and has enjoyed becoming simply an Author, occasional Consultant, and full-time Idaho resident among its mountains, hawks, deers, and amazing natural beauty. Having founded DSM Associates Inc. as a registered business vehicle, he pursued activities on comparative risks with the oil and gas industry, including after Deepwater Horizon, nuclear safety research, strategic infrastructure analysis, and countermeasure effectiveness and learning and losses in warfare. His most recent analyses and contributions to wider society examine with Enrico Zio the prediction of the infection risks, rates, waves from the Covid-19 pandemic, and the risk and resilience of critical infrastructures (like the electrical power grid) exposed to natural hazards, and with Francesco D'Auria on modern safety needs. Romney continues to publish technical papers and books on risk and safety for rare events, is working on completing his memoirs, and conducts original research on disasters and societal risk.

Francesco D'Auria notes that he met Romney in 1980 as a thermal hydraulic student at a course in California, where Romney was a teacher, and always kept in contact and met on many occasions. Remarkably, Romney hosted, around the year 2000, fifty students headed from Italy to U.S. and Canada and made possible or facilitated visits to Three Mile Island, Darlington, and Chalk River. Dr. Duffey's capabilities to discuss oil platforms, war, Covid, country energy strategies, politics, and hazards (and more ...) and to frame all those topics into an analytical and rational picture is (simply) surprising. Contacts with Romney imply learning and, needless to say, he met, cooperated with, and somewhat streamlined all progress-makers in the area of thermal hydraulics.

Dr. Duffey has written and published some 450 papers and articles (some in the listings below) with 5500 citations at Google Scholar, with over 37,000 online "reads" and 3500 citations at ResearchGate, and is a coauthor of several original texts on errors and learning in technology. Additional selected highlights and the most significant scientific publications of Dr. R. Duffey are listed in the Appendix at the end of this greeting.

On the occasion of his 80th birthday, on behalf of the Founding and current Journal Boards, his colleagues, and friends all over the world, we wish Dr. Romney Duffey a continuous active life in happiness and good health, and further scientific achievements!

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Appendix

Selected Highlights:

- Member of the ASME Presidential Task Force on Response to Japan Nuclear Power Plant Events and coauthor of the final report;
- Founding member and representative on key GIF Groups (Experts, Economics and Systems);
- Author and coauthor of over 450 published technical papers and reports, and coauthor of multiple Chapters in the *Handbook of Generation IV Nuclear Reactors (2016)*, *Managing Global Warming (2019)*, *Global Warming: Engineering Solutions (2010)*, *Nuclear Engineering Handbook (2009)*, *Beyond Earth (2006)*, etc.
- Coauthor of original texts *Know the Risk* (Elsevier, 2002), *Managing Risk: The Human Element* (Wiley, 2008), and *Learning about Risk* (KDP, 2021) concerning the safety of modern technological systems, accidents, learning, and the role of human error;
- Coauthor of original text *Heat Transfer and Hydraulic Resistance at Supercritical Pressures in Power Engineering Applications* (ASME Press, 2007); and
- Author of *Dreams of Life*, an anthology of poetry (LifeRich, 2014).

Awards and Distinctions

- 1981 Electric Power Research Institute Literary (Best Paper) Award
- 1986 American Nuclear Society Best Paper Award
- 1989 U.S. NRC Certificate of Appreciation
- 1990 EG&G Inc. Best Paper Award
- 1996–2006 ASME/JSME Certificates of Appreciation
- 2000 ASME Best Paper Award
- 2004 Elected ASME Fellow
- 2006 Elected Member International Nuclear Energy Academy
- 2010 ARS Conference Silver Award
- 2011 Innovation Award, AECL
- 2012 ASME President's Certificate
- 2012 ASME NED Distinguished Service Award
- 2015 Innovation Award AECL
- 2016 ASME Nuclear Engineering Division 60th Anniversary Medal

Professional Societies Positions

- 1989–1990 Chair, ANS Thermal-Hydraulics Division
- 1998–2007 Member: Conference Board of Canada Innovation Council
- 2001–2003 Chair, ASME Nuclear Engineering Division
- 2011–2013 Member, ASME President's Task Force on Fukushima
- 2018–2019 Member, CNS Council

Generation IV International Forum

- 2000–2011 Expert Group Member (Canada) and Policy Group Advisor
- 2000–2005 Chair, SCWR System Committee

Organization and Development of Major Conferences and Symposia

- 1990 General Chair, ANS International Conference on Non-commercial Reactors USA
- 1992 Technical Program Co-Chair ANS International Conference on Thermal Hydraulics (NURETH-5) U.S.
- 1996 General Chair, ASME/JSME International Conference On Nuclear Engineering (ICONE-4) U.S.
- 2000–2011 Track Leader, ASME/JSME/ChNS ICONE Conferences

- 2003–2005 Co-General Chair, ICONE 11, Japan and ICONE 13, China
- 2011 Conference Chair, Future of Heavy Water Reactors, Ottawa, ON, Canada
- 2011 General Chair, CNS Conference on Supercritical Reactors, Vancouver, BC, Canada

Recent and Selected Publications

- [1] Pioro, I., Duffey, R. B., Kirillov, P. L., and Pioro, R., 2021, "Pros and Cons of Commercial Reactor Designs, Section 2: Chapter. Part 1. Current Status of Electricity Generation in the World and Selected Countries," *Encyclopedia of Nuclear Energy*, 1st ed., Elsevier, UK, pp. 263–287 (Editor-in-Chief: E. Greenspan, p. 3656).
- [2] Pioro, I., Duffey, R. B., Kirillov, P. L., and Pioro, R., 2021, "Pros and Cons of Commercial Reactor Designs, Section 2: Chapter. Part 2. Current Status and Future Trends in the World Nuclear-Power Industry and Technical Considerations of Nuclear-Power Reactors," *Encyclopedia of Nuclear Energy*, 1st ed., Elsevier, UK, pp. 288–303 (Editor-in-Chief: E. Greenspan, p. 3656).
- [3] Duffey, R. B., Pioro, I., and Pioro, R., 2021, "World Energy Production and the Contribution of PHWRs," *Pressurized Heavy Water Reactors: CANDU*, Vol. 7, ed., J. Riznic, Elsevier, UK, p. 546 (Chapter 1. Introduction, in the book, pp. 1–44).
- [4] Pioro, I., Duffey, R. B., and Pioro, R., 2021, "Overview of Current Status of Nuclear-Power Industry of the World," *Fundamental Issues Critical to the Success of Nuclear Projects*, ed. J. Boucau, Elsevier–Woodhead Publishing (WP), Duxford, UK, Chap. 2, p. 392.
- [5] Duffey, R. B., and Zio, E., 2021, "Old Lessons of Risk Assessment and Management From the COVID-19 Pandemics and Individual Infections Dynamics," *J. Risk Anal. Crisis Response*, **11**(3), pp. 104–128.
- [6] Zio, E., and Duffey, R. B., 2021, "The Risk of the Electrical Power Grid Due to Natural Hazards and Recovery Challenge Following Disasters and Record Floods: What Next?," *Climate Change and Extreme Events*, ed. A. Fares, Elsevier, UK, Chap. 12.
- [7] Duffey, R. B., 2021, "Infection Waves in Pandemics and Risk Prediction: Physical Diffusion Theory and Data Comparisons," *J. Risk Anal. Crisis Response*, **11**(2), pp. 67–74.
- [8] Duffey, R. B., 2021, "Record Flooding Risk and Power Outage Restoration," *J. Civ. Eng. Archit.*, **15**(3), pp. 128–145.
- [9] Duffey, R. B., and Zio, E., 2020, "CoVid-19 Pandemic Trend Modeling and Analysis to Support Resilience Decision-Making," *Biology*, **9**(7), p. 156.
- [10] Pioro, I., Duffey, R. B., Kirillov, P. L., and Dort-Goltz, N., 2020, "Current Status of Reactors Deployment and Small Modular Reactors Development in the World," *ASME J. Nucl. Eng. Radiat. Sci.*, **6**(4), p. 24. (The most read paper in J. NERS in 2020–2022).
- [11] Duffey, R. B., and Zio, E., 2020, "Analyzing Recovery From Pandemics by Learning Theory: The Case of Covid-19," *IEEE Access*, **8**, pp. 110789–110795.
- [12] Duffey, R. B., and D'Auria, F., 2020, "Nuclear Energy and Its History: Past Consequences, Present Inadequacies and a Perspective for Success," *Energy Power Eng.*, **12**(6), pp. 193–236.
- [13] Duffey, R. B., 2020, "Geophysical Research at the Norman Lockyer Observatory: Origins and History," November, privately published.
- [14] Pioro, I., Duffey, R. B., Kirillov, P. L., Pioro, R., Zvorykin, A., and Machraf, R., 2019, "Current Status and Future Developments in Nuclear-Power Industry of the World," *ASME J. Nucl. Eng. Radiat. Sci.*, **5**(2), p. 27 (The most read paper in J. NERS in 2020–2022).
- [15] Duffey, R. B., 2019, "The Risk of Extended Power Loss and the Probability of Emergency Restoration for Severe Events and Nuclear Accidents," *ASME J. Nucl. Eng. Radiat. Sci.*, **5**(3), p. 14.
- [16] Pioro, I., and Duffey, R., 2019, "Current Status of Electricity Generation in the World and Future of Nuclear-Power Industry," *Managing Global Warming, an Interface of Technology and Human Issues*, ed. T. Letcher, Elsevier–Academic Press, London, UK, Chap. 3 (pp. 67–114), p. 804.
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- [22] Pioro, I., and Duffey, R., 2015, "Nuclear Power as a Basis for Future Electricity Generation," *ASME J. Nucl. Eng. Radiat. Sci.*, **1**(1), p. 19 (The 2nd most cited paper in 2020–2022 and the most accessed paper in 2019 in J. NERS; 4000 reads according to <https://www.researchgate.net/>).

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