Andrew David Maynard PhD

McLean, Virginia
Email: andrew.maynard@wilsoncenter.org
Phone: 202 691 4311 Fax: 202 691 4001

PROFILE

Dr. Andrew Maynard is Chief Science Advisor to the Project on Emerging Nanotechnologies at the Woodrow Wilson International Center for Scholars. A leading scientist and innovative communicator, Andrew is at the forefront of molding global research and policy agendas on the safe and sustainable development of emerging technologies.

Andrew testifies before the U.S. Congress on nanotechnology policy; serves on the Nanotechnology Technical Advisory Group of the U.S. President's Council of Advisors on Science and Technology (PCAST); and is a member of the World Economic Forum Global Agenda Council on the Challenges of Nanotechnology. He is also on the executive committee of the International Council On Nanotechnology (ICON), and has served on panels convened by the National Academies of Science and The Council of Canadian Academies. He was previously a member of the Nanoscale Science, Engineering and Technology (NSET) subcommittee of the US National Science and Technology Council, and was co-chair of the Nanotechnology Health and Environment Implications (NEHI) working group of NSET.

Andrew is an author on over one hundred scientific papers, reports and articles. He frequently appears in print and on television and radio, and writes regularly for the blog "2020science.org". He is on the editorial board of a number of scientific journals, and a member of the advisory board of Chemical & Engineering News. Prior to entering science policy and science communication, he led research teams at the U.K. Health and Safety Executive and the U.S. National Institute for Occupational Safety and Health.

Andrew is a graduate of the University of Birmingham in the UK, and has a Ph.D. in physics from the University of Cambridge, U.K. He lives in Northern Virginia.

EMPLOYMENT

Woodrow Wilson International Center for Scholars 8/15/05 - Present
Chief Science Advisor, Project on Emerging Nanotechnologies

National Institute for Occupational Safety and Health 1/18/00 – 7/8/05
Team Leader – Aerosols Research Team (GS15). (2004 – 2005)
Senior Service Fellow (GS14). (2000 – 2004)

Health and Safety Executive, U.K. 9/21/92 – 1/17/00
Head, Exposure Control Section, Health and Safety Laboratory (1998 – 2000)
Senior Scientific Officer (1994 – 1998)
Higher Scientific Officer (1992 – 1994)

Severn Trent Water Ltd., U.K. 1/10/87 – 1/10/89
Management Trainee.

ACADEMIC POSITIONS

University of Aberdeen, U.K. 2005 - Present
Honorary Senior Lecturer
Department of Environmental and Occupational Medicine

University of Cincinnati 2001 - 2007
Associate Professor (volunteer)
Environmental Health department

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EXECUTIVE & ADVISORY POSITIONS

World Economic Forum 2008 - Present
Member of the World Economic Forum Global Agenda Council on the Challenges of Nanotechnology

President's Council of Advisors on Science and Technology 2006 - Present
Member of the Nanotechnology Technical Advisory Group

Chemical & Engineering News 2008 - 2011
Advisory Board member

Organization for Economic Cooperation and Development 2005 - 2007
Working Party on Manufactured Nanomaterials. Project on Emerging Nanotechnologies representative.

International Council On Nanotechnology (ICON) 2004 - Present
Member of the Executive Committee

International Life Sciences Institute 2004 – Present
Member of the ILSI Health and Environmental Sciences Institute Nanomaterial Safety Subcommittee Project Steering Team.

Annals of Occupational Hygiene 2006 - Present
Advisory board member

GOVERNMENT COMMITTEES

NSET 2004 - 2005
NIOSH representative on the Nanomaterial Science, Engineering and Technology (NSET) subcommittee of the National Science and Technology Council (NSTC).

NEHI 2004 - 2005
Co-chair of the Nanotechnology Environmental and Health (NEHI) interagency working group.

REVIEW PANELS

Environmental Protection Agency 2008
Chair, External Peer Review of the U.S. Environmental Protection Agency Draft Nanomaterial Research Strategy

National Academies of Science 2008
National Academies of Science review panel for the National Nanotechnology Initiative Strategy for Nanotechnology Environmental Health and Safety Research.

Council of Canadian Academies 2007 - 2007
Expert Panel on Nanotechnology Assessment

Environmental Protection Agency 2008
Panel member, Public Meeting on Risk Management Practices for the U.S.Nanoscale Materials Stewardship Program

STANDARDS

International Standards Organization 2001 - 2005
Convener of the International Standards Organization working group TC146/SC2/WG1: Size-selective aerosol sampling and analysis.

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EDITORIAL BOARDS

Nano Today 2006 - Present
Member of the editorial board

Journal of Nanoparticle Research 2006 - Present
Member of the editorial board

Nanotoxicology 2006 - Present
Member of the editorial board

Reviewer for many peer-reviewed journals, including Nature, Nature Nanotechnology, the Journal of Aerosol Science, Aerosol Science and Technology, the Annals of Occupational Hygiene, Journal of the Air and Water Management Association, the Journal of Nanoparticle Research, Environmental Science and Technology, Nanotoxicology, and the Applied Occupational and Environmental Hygiene Journal.

CONFERENCE & WORKSHOP LEADERSHIP

Third International Symposium on Nanotechnology and Occupational Health
Taiwan (2007). Co-chair

Second International Symposium on Nanotechnology and Occupational Health
Minneapolis, USA (2005). Co-chair

Materials Research Society
Symposium: Nanomaterials and the Environment (2005). Co-chair

First International Symposium: Nanotoxocology: Biomedical Aspects
Miami (2005). Organizing committee

American Association for Aerosol Research working group on aerosols and health.
Chair, 2004 - 2005

Developing Experimental Approaches for Evaluation of Toxicological Interactions of Nanoscale Materials
Gainsville Florida (2004) Steering Committee member

First International Symposium on Nanotechnology and Occupational Health
Buxton, UK (2004). Co-chair

"Emerging Issues in Nanoaerosol Science and Technology"
Workshop sponsored by the National Science Foundation and the Environmental Protection Agency (2003).
Panel Member

Royal Society (London)
"Ultrafine Particles in the Atmosphere" (London, 2000). Co-chair

PROFESSIONAL SOCIETIES—POSITIONS

The Aerosol Society, UK. 1998 - 2000
General Secretary. (Editor of The Aerosol Society newsletter, 1997 – 2002)

The Aerosol Society, UK. 1995 - 1998
Committee Member

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AWARDS

NIOSH 2006
Alice Hamilton Award (Biological Sciences)

CDC/ATSD 2006
Shepard Award Nominee

NIOSH 2005
Alice Hamilton Award: Honorable Mention (Engineering and Physical Sciences)

NIOSH 2004
Alice Hamilton Award: Honorable Mention (Engineering and Physical Sciences)

CDC/ATSD 2004
Shepard Award Nominee

NIOSH 2003
Alice Hamilton Award: Honorable Mention (Engineering and Physical Sciences)

CDC/ATSD 2003
Shepard Award Nominee

EDUCATION

University of Birmingham, U.K 1984 - 1987
Physics. B.Sc. (Hons): Iii

University of Cambridge, U.K. 1989 – 1992
Cavendish Laboratory, Microstructural Physics Department. Ph.D. (Aerosol Physics). *Thesis: Ultrafine aerosol particle collection and analysis*

GOVERNMENT TESTIMONY AND BRIEFINGS

Include:

U.S. House of Representatives Committee on Science and Technology.
Hearing on The National Nanotechnology Initiative Amendments Act of 2008. Invited testimony. *April 16 2008.*

U.S. House of Representatives Committee on Science and Technology, Subcommittee on Research and Science Education.
Hearing on Research on Environmental and Safety Impacts of Nanotechnology: Current Status of Planning and Implementation under the National nanotechnology Initiative. Invited testimony. *October 31 2007.*

U.S. House of Representatives Committee on Science.
Hearing on Research on Environmental and Safety Impacts of Nanotechnology: What Are the Federal Agencies Doing? Invited testimony. *September 21 2006.*

President's Council on Science and Technology (PCAST)
Public Meeting on Nanotechnology. Invited briefing. *June 25 2007.*

President's Council on Bioethics.
Nanotechnology. Invited briefing. *June 29 2007.*

Nanoscale Science, Engineering and Technology Subcommittee, National Science and Technology Council, Committee on Technology;

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Research Needs and Priorities Related to the Environmental, Health, and Safety Aspects of Engineered Nanoscale Materials: Public Meeting. Submitted testimony. *January 4 2007.*

Food and Drug Administration (FDA)
Consideration of FDA-Regulated Products That May Contain Nanoscale Materials; Public Meeting. Submitted testimony. *September 9 2008.*

Congressional Nanotechnology Caucus.
General Briefing on Nanotechnology. Chair. *March 3 2007.*

Congressional Nanotechnology Caucus.
Meeting on Nanotechnology and Environment, Health and Safety. Invited briefing. *November 19 2007*

INVITED ADDRESSES

Ten examples from over 200 invited briefings, lectures and presentations.

POLICY

Institute Of Medicine
Forum on Drug Discovery, Development and Translation. Meeting on Science at FDA: Challenges and Opportunities. Invited Address. April 2008.

Bernstein Symposium
University of Michigan. Invited address: *Developing Socially Acceptable Nanotechnologies.* Ann Arbor MI, October 2007.

Cal/EPA Department of Toxic Substances Control.
Invited address: Nanotechnology: Maximizing the Benefits; Minimizing the Risks. Sacramento CA, March 2007.

Japanese Government
Symposium: Exploring the Small World: The Role of Public Research Institutes. Invited address: *Nanotechnology and Human Health Impact—Assessing Potential Risk.* Tokyo, Japan. February 2006.

BUSINESS

U.S. Chamber of Commerce.
Invited comments to the meeting: "Breaking the Barriers: The Big Business of Nanotechnology." Washington DC, November 2007.

North American Agribusiness Advisory Board
Invited address: *Nanotechnology: Why Should You Care?* Carmel Valley, CA. January 2007.

COMMUNICATION & ENGAGEMENT

Australian Government
Community Forum: Big Issues About Small Technologies. Invited address: *Nanotechnology*. Melbourne, Australia. February 2008.

Nanoscale Informal Science Education Network (NISE Net)
Invited keynote address: Please Don't Shout: We're Not Deaf; We're Just Not Interested. San Francisco, CA. November 2007.

ACADEMIC

European Aerosol Conference.
Plenary address: Developing Responsible nanotechnologies. An Aerosol Perspective. Thessaloniki, Greece. August 2008.

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American Industrial Hygiene Conference and Exposition.
Keynote address: Overview and Relevance to Occupational Health. Atlanta, GA. May 2005.

PUBLICATIONS

Ten examples drawn from over 100 papers, reports, books and book chapters.

EDITORIALS

Maynard, A. D. (2008). Setting the nanotech research agenda, in *Bulletin of the Atomic Scientist Online.*

Maynard, A. D. (2007). Weighing nanotechnology's risks, in *International Herald Tribune,* Neuilly-sur-Siene, France.

BOOKS AND BOOK CHAPTERS

Maynard, A. D. and Pui, D. Y. H., eds. (2007). Nanoparticles and Occupational Health. Springer, Dortrecht, Netherlands.

Maynard, A. D. (2007). Nanotoxicology: Laying a firm foundation for sustainable nanotechnologies, in Nanotoxicology. Characterization, Dosing and Health Effects, N. Monteiro-Riviere and C. L. Tran, eds. Informa, New York.

PEER REVIEW PAPERS

Maynard, A. D., R. J. Aitken, T. Butz, V. Colvin, K. Donaldson, G. Oberdörster, M. A. Philbert, J. Ryan, A. Seaton, V. Stone, S. S. Tinkle, L. Tran, N. J. Walker and D. B. Warheit (2006a). Safe handling of nanotechnology. *Nature* 444(16): 267-269.

Poland, C. A., Duffin, R., Kinloch, I., Maynard, A., Wallace, W. A. H., Seaton, A., Stone, V., Brown, S., MacNee, W. and Donaldson, K. (2008). Carbon nanotubes introduced into the abdominal cavity of mice show asbestos-like pathogenicity in a pilot study. *Nature Nanotechnology* 3:423-428.

Hansen, S. F., Maynard, A., Baun, A. and Tickner, J. A. (2008). Late lessons from early warnings for nanotechnology. *Nature Nanotechnology* 3:444-447.

Maynard, A. D. and Aitken, R. J. (2007). Assessing exposure to airborne nanomaterials: Current abilities and future requirements. *Nanotoxicology* 1:26-41.

Maynard, A. D., P. A. Baron, M. Foley, A. A. Shvedova, E. R. Kisin and V. Castranova (2004). Exposure to Carbon Nanotube Material. Aerosol Release During the Handling of Unrefined Single Walled Carbon Nanotube Material. *J. Toxicol. Environ. Health* 67(1), 87-107

Maynard, A. D. (2006). Nanotechnology: A research strategy for addressing risk, PEN 03 Washington DC, Woodrow Wilson International Center for Scholars, Project on Emerging Nanotechnologies.

MEDIA

Ten recent examples drawn from innumerable interviews, quotes and appearances

TELEVISION

Power of Small: Nanotechnology. A series of three Fred Friendly Seminars, airing on PBS stations, 2008. Panelist in the second program of the series: *Clean, Green and Unseen*. (http://powerofsmall.org/topicpages/environment.php, accessed 9/7/08).

ABC7 News San Francisco, July 8 2008. Expert on news article: *Nanotechnology could pose health risks*. (http://abclocal.go.com/kgo/story?section=news/health&id=6253313, accessed 9/7/08).

Science Central News, June 25 2008. Expert on news article: *Nano Hazards?* (http://www.sciencentral.com/articles/view.php3?type=article&article_id=218393122, accessed 9/7/08).

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RADIO

Science Friday, National Public Radio, May 23 2008. Guest on program: *Nanotube Safety*. (http://www.sciencefriday.com/program/archives/200805236, accessed 9/7/08).

Living On Earth, June 27 2008. Lead interview on segment: *Small Technology, Big Questions.* (http://www.loe.org/shows/segments.htm?programID=08-P13-00026&segmentID=5, accessed 9/7/08).

Marketplace, American Public Media, July 26, 2007. Expert on news item: *Nanoparticles in the Regulatory Spotlight.* (http://marketplace.publicradio.org/display/web/2007/07/26/nanoparticles_in_regulatory_spotlight/, accessed 9/7/08).

Morning Edition, National Public Radio, March 13 2006. Lead interview on news item: *Safety of Nano-Cosmetics Questioned.* (http://www.npr.org/templates/story/story.php?storyId=5257306, accessed 9/7/08).

PRINT

New York Times, August 12 2008, Page C-1. *Handle with care.* Cornelia Dean.

The Economist, Nov 22 2007. *A little risky business.*

Washington Post, April 8 2006, Page A-01. *Nanotech raises worker safety questions.* Rick Weiss.

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PUBLICATIONS – COMPLETE LIST

EDITORIALS/OPINION PIECES

Maynard, A. D. (2008). Living with nanoparticles. Nano Today 3:64.

Maynard, A. D. (2008). How Safe Is Nanotech? Materials Australia 41.

Maynard, A. D. (2008). Spending on Nanotech Risk is Too Low, in Discovery Channel: Discovery Tech.

Maynard, A. D. (2008). Setting the nanotech research agenda, in Bulletin of the Atomic Scientist Online.

Maynard, A. D. (2007). Nanotechnology in Context, in Medical Ethics, 6-7.

Maynard, A. D. (2007). Building a Safe Nanotechnology Future, Project Syndicate.

Maynard, A. D. (2007). Weighing nanotechnology's risks, in International Herald Tribune, Neuilly-sur-Siene, France.

Maynard, A. D. (2007). Nanotechnology for Wizards, in *Nanotechnology Now*, www.nanotech-now.com/columns/?article=088.

Maynard, A. (2006). Nanodollars. New Scientist 189 (2540): 25-25.

Maynard, A. D. (2005). "Ultrafine particles, nanotechnology and occupational health." *Dutch Journal of Applied Occupational Sciences*. **2004** (4): 62-63

Maynard, A. D. (2004). Responsible nanotech at work. In *Nanotoday: A Materials Today Supplement*. **December 2004:** 56.

Maynard, A. D. (2004). Nanotechnology - a new occupational health challenge for a new generation? *International Commission on Occupational Health Newsletter*. **2**(3) 4-6.

SCIENTIFIC PUBLICATIONS

Park, J. Y., Raynor, P. C., Maynard, A. D., Eberly, L. E. and Ramachandran, G. (2009). Comparison of two estimation methods for surface area concentration using number concentration and mass concentration of combustion-related ultrafine particles *Atm. Environ.* In Press.

Shvedova, A. A., Kisin, E., Murray, A. R., Johnson, V. J., Gorelik, O., Arepalli, S., Hubbs, A. F., Mercer, R. R., Keohavong, P., Sussman, N., Jin, J., Yin, J., Stone, S., Chen, B. T., Deye, G., Maynard, A., Castranova, V., Baron, P. A. and Kagan, V. E. (2008). Inhalation vs. aspiration of single-walled carbon nanotubes in C57BL/6 mice: inflammation, fibrosis, oxidative stress, and mutagenesis. *Am. J. Physiol.-Lung Cell. Mol. Physiol.* 295:L552-L565.

Pui, D. Y. H., Qi, C., Stanley, N., Oberdörster, G. and Maynard, A. (2008). Recirculating Air Filtration Significantly Reduces Exposure to Airborne Nanoparticles. Environ Health Perspect doi:10.1289/ehp.11169.

Poland, C. A., Duffin, R., Kinloch, I., Maynard, A., Wallace, W. A. H., Seaton, A., Stone, V., Brown, S., MacNee, W. and Donaldson, K. (2008). Carbon nanotubes introduced into the abdominal cavity of mice show asbestos-like pathogenicity in a pilot study. Nature Nanotechnology 3:423-428.

Hansen, S. F., Maynard, A., Baun, A. and Tickner, J. A. (2008). Late lessons from early warnings for nanotechnology. Nature Nanotechnology 3:444-447.

Maynard, A. D. and Pui, D. Y. H. (2007). Nanotechnology and occupational health: New technologies – new challenges. J. Nanopart. Res. 9:1-3.

Maynard, A. D., Ku, B. K., Emery, M., Stolzenburg, M. and McMurry, P. H. (2007). Measuring particle size-dependent physicochemical structure in airborne single walled carbon nanotube agglomerates. J. Nanopart. Res. 9:85-92.

Maynard, A. D. and Aitken, R. J. (2007). Assessing exposure to airborne nanomaterials: Current abilities and future requirements. Nanotoxicology 1:26-41.

Maynard, A., D. (2007). Nanotechnology: The next big thing, or much ado about nothing? Ann. Occup. Hyg. 51:1-12.

Ku, B. K., Maynard, A. D., Baron, P. A. and Deye, G. J. (2007). Observation and measurement of anomalous

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Phone: 202 691 4311 Fax: 202 691 4001

responses in a differential mobility analyzer caused by ultrafine fibrous carbon aerosols. J. Electrostatics 65:542-548.

Kandlikar, M., Ramachandran, G., Maynard, A., Murdock, B. and Toscano, W. A. (2007). Health risk assessment for nanoparticles: A case for using expert judgment. J. Nanopart. Res. 9:137-156.

Balbus, J. M., Maynard, A. D., Colvin, V. L., Castranova, V., Daston, G. P., Denison, R. A., Dreher, K. L., Goering, P. L., Goldberg, A. M., Kulinowski, K. M., Monteiro-Riviere, N. A., Oberdörster, G., Omenn, G. S., Pinkerton, K. E., Ramos, K. S., Rest, K. M., Sass, J. B., Silbergeld, E. K. and Wong, B. A. (2007). Hazard Assessment for Nanoparticles: Report from an Interdisciplinary Workshop. Environ Health Perspect 115:1654-1659.

Ku, B. K., Emery, M. S., Maynard, A. D., Stolzenburg, M. R. and McMurry, P. H. (2006). In situ structure characterization of airborne carbon nanofibres by a tandem mobility-mass analysis. Nanotechnology 17:3613-3621.

Maynard, A. D., R. J. Aitken, T. Butz, V. Colvin, K. Donaldson, G. Oberdörster, M. A. Philbert, J. Ryan, A. Seaton, V. Stone, S. S. Tinkle, L. Tran, N. J. Walker and D. B. Warheit (2006). Safe handling of nanotechnology. Nature 444(16): 267-269.

Wallace, W. E., M. J. Keane, D. K. Murray, W. P. Chisholm, A. D. Maynard and T.-M. Ong (2006). Phospholipid lung surfactant and nanoparticle surface toxicity: Lessons from diesel soots and silicate dusts. J. Nanopart. Res. DOI: 10.1007/s11051-006-9159-5.

Elder, A., R. Gelein, V. Silva, T. Feikert, L. Opanashuk, J. Carter, R. Potter, A. Maynard, Y. Ito, J. Finkelstein and G. Oberdörster (2006). Translocation of Inhaled Ultrafine Manganese Oxide Particles to the Central Nervous System. Environ. Health Perspect. Environ Health Perspect doi:10.1289/ehp.9030.

Ku, B. K. and A. D. Maynard (2006). Generation and investigation of airborne silver nanoparticles with specific size and morphology by homogeneous nucleation, coagulation and sintering. J. Aerosol Sci. 37(4): 452-470.

Maynard, A. D. (2006). Nanotechnology: Managing the risks. Nano Today 1(2): 22-33.

Peters, T., W. A. Heitbrink, E. D. E., S. T. J. and A. D. Maynard (2006). The Mapping of Fine and Ultrafine Particle Concentrations in an Engine Machining and Assembly Facility. Ann. Occup. Hyg. 50(3): 249-257.

Tsuji, J. S., A. D. Maynard, P. C. Howard, J. T. James, C. W. Lam, D. B. Warheit and A. B. Santamaria (2006). Research strategies for safety evaluation of nanomaterials, part IV: Risk assessment of nanoparticles. Toxicological Sciences 89(1): 42-50.

Maynard, A. D. and E. D. Kuempel (2005). Airborne nanostructured particles and occupational health. *J. Nanoparticle Res.* **7:** 587-614**.**

Andresen, P., Ramachandran, G., Pai, P., Lazovich, D. and Maynard, A. (2004). Women's personal and indoor exposure to PM2.5 in Mysore, India: Impact of domestic fuel usage. Atmos. Environ. 39:5500-5508.

Beamer, B. R., S. Shulman, A. D. Maynard, D. Williams and D. Watkins (2005). Evaluation of Misting Controls to Reduce Respirable Silica Exposure for Brick Cutting. Ann. Occup. Hyg. **49**: 503-510.

Jones, A. D., R. J. Aitken, J. F. Fabries, E. Kauffer, G. Liden, A. Maynard, G. Riediger and W. Sahle (2005). Thoracic size-selective sampling of fibres: performance of four types of thoracic sampler in laboratory tests. Ann. Occup. Hyg. **49:** 481-492.

Ku, B. K. and A. D. Maynard (2005). Generation and investigation of airborne silver nanoparticles with specific size and morphology by homogeneous nucleation, coagulation and sintering. *J. Aerosol Sci*. **36**(9):1108-1124**.**

Ku, B. K. and A. D. Maynard (2005). Comparing aerosol surface-area measurement of monodisperse ultrafine silver agglomerates using mobility analysis, transmission electron microscopy and diffusion charging. J. Aerosol Sci. **36**(9), 1108-1124.

Mönkkönen, P., P. Pai, A. D. Maynard, K. Hämeri, P. Rechkemmer, G. Ramachandran, B. Prasad, M. Kulmala (2005). "Fine particle number and mass concentration measurements in urban Indian households." *Science of the Total Environment* **15**(347): 131-147.

Oberdörster, G., A. Maynard, K. Donaldson, V. Castranova, J. Fitzpatrick, K. Ausman, J. Carter, B. Karn, W. Kreyling, D. Lai, S. Olin, N. Monteiro-Riviere, D. Warheit and H. Yang (2005). Principles for characterizing

McLean, Virginia
Email: andrew.maynard@wilsoncenter.org
Phone: 202 691 4311 Fax: 202 691 4001

the potential human health effects from exposure to nanomaterials: elements of a screening strategy. *Part. Fiber Toxicol.* 2(8): **doi:10.1186/1743-8977-2-8.**

Shvedova, A. A., E. R. Kisin, R. Mercer, A. R. Murray, V. J. Johnson, A. I. Potapovich, Y. Y. Tyurina, O. Gorelik, S. Arepalli, D. Schwegler-Berry, A. F. Hubbs, J. Antonini, D. E. Evans, B. K. Ku, D. Ramsey, A. Maynard, V. E. Kagan, V. Castranova and P. Baron (2005). Unusual inflammatory and fibrogenic pulmonary responses to single-walled carbon nanotubes in mice. *Am. J. Physiol.-Lung Cell. Mol. Physiol.* **289**: 698-708.

Chen, B. T., G. A. Feather, A. D. Maynard and C. Y. Rao (2004). Development Of A Personal Sampler For Collecting Fungal Spores. J. Aerosol Sci. **38,** 926-937.

Lee, S.-A., S. A. Grinshpun, A. Adhikari, W. Li, R. McKay, A. D. Maynard and T. Reponen (2004). Laboratory and Field Evaluation of a New Personal Set-up for Assessing the Protection of given by the N95 Filtering-Facepiece Respirators Against Particles. Ann. Occup. Hyg. **49**:245-257.

Maynard, A. D., Y. Ito, I. Arslan, A. T. Zimmer, N. Browning and A. Nicholls (2004). Examining elemental surface enrichment in ultrafine aerosol particles using analytical Scanning Transmission Electron Microscopy. Aerosol Sci. Tech. **38**, 365-381

Maynard, A. D., P. A. Baron, M. Foley, A. A. Shvedova, E. R. Kisin and V. Castranova (2004). Exposure to Carbon Nanotube Material. Aerosol Release During the Handling of Unrefined Single Walled Carbon Nanotube Material. J. Toxicol. Environ. Health **67**(1), 87-107

Pui, D. Y. H., Flagan, R. C., Kaufman, S. L., Maynard, A. D., de la Mora, J. F., Hering, S. V., Jimenez, J. L., Prather, K. A., Wexler, A. S. and Ziemann, P. J. (2004). Experimental methods and instrumentation. Journal Of Nanoparticle Research 6:314-315.

Maynard, A. D. and A. T. Zimmer (2003). Development and validation of a simple numerical model for estimating workplace aerosol size distribution evolution through coagulation. Aerosol Sci. Tech. **37**, 804-817

Maynard, A. D. (2003). Estimating aerosol surface area from number and mass concentration measurements. Ann. Occup. Hyg. **47**(2): 123-144.

Shvedova, A. A., E. R. Kisin, A. R. Murray, V. Z. Gandelsman, A. D. Maynard, P. A. Baron and V. Castranova (2003). Exposure to carbon nanotube material II: Assessment of the biological effects of nanotube materials using human keratinocyte cells. J. Toxicol. Environ. Health **66**(20), 1909-1926.

Shvedova, A. A., Kisin, E. R., Murray, A. R., Schwegler-Berry, D., Gandelsman, V. Z., Baron, P. A., Maynard, A. D., Gunther, M. R. and Castranova, V. (2003). Exposure of carbon nanotubes to human bronchial epithelial cells caused oxidative stress and cytotoxicity, in Oxidative Stress.

Maynard, A. D. (2002). Thoracic size-selection of fibers - dependence of penetration on fiber length for five thoracic sampler types. Ann. Occup. Hyg. **46**(6): 511-522.

Maynard, A. D. (2002). Experimental determination of ultrafine TiO2 de-agglomeration in surrogate pulmonary surfactant – preliminary results. Ann. Occup. Hyg. **46**(Suppl. 1): 197-202.

Maynard, A. D. and R. L. Maynard (2002). A derived association between ambient aerosol surface area and excess mortality using historic time series data. Atmos. Env. **36**: 5561-5567.

Maynard, A. D. and R. L. Maynard (2002). Ambient aerosol exposure-response as a function of particulate surface-area: re-interpretation of historic data using numerical modelling. Ann. Occup. Hyg. **46**(Supp. 1): 444-449.

Maynard, A. D. and A. T. Zimmer (2002). Evaluation of grinding aerosols in terms of alveolar dose: The significance of using mass, surface-area and number metrics. Ann. Occup. Hyg. **46**(Suppl. 1): 320-322.

Zimmer, A. T. and A. D. Maynard (2002). Investigation of the Aerosols Produced by a High-Speed, Hand-Held Grinder Using Various Substrates. Ann. Occup. Hyg. **46**(8): 663-672.

Maynard, A. D. (2000). "Overview of methods for analysing single ultrafine particles." Philosophical Transactions of the Royal Society of London Series a-Mathematical Physical and Engineering Sciences **358**(1775): 2593-2609.

Maynard, A. D. (2000). "A simple model of axial flow cyclone performance under laminar flow conditions." Journal of Aerosol Science **31**(2): 151-167.

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Email: andrew.maynard@wilsoncenter.org
Phone: 202 691 4311 Fax: 202 691 4001

Maynard, A. D., J. Thompson, J. Cain and B. Rajan (2000). "Air movement visualisation in the workplace - Current methods and new approaches." Am. Ind. Hyg. Assoc. J. **61**: 51-55.

Brown, L. M., N. Collings, R. M. Harrison, A. D. Maynard and R. L. Maynard (2000). "Ultrafine particles in the atmosphere: introduction." Philosophical Transactions of the Royal Society of London Series a-Mathematical Physical and Engineering Sciences **358**(1775): 2563-2565.

Maynard, A. D. (1999). "Measurement of aerosol penetration through six personal thoracic samplers under calm air conditions." Journal of Aerosol Science **30**(9): 1227-1242.

Maynard, A. D., L. C. Kenny and P. E. J. Baldwin (1999). "Development of a system to rapidly measure sampler penetration up to 20 µm aerodynamic diameter in calm air, using the aerodynamic particle sizer." Journal of Aerosol Science **30**(9): 1215-1226.

Aitken, R. J., P. E. J. Baldwin, G. C. Beaumont, L. C. Kenny and A. D. Maynard (1999). "Aerosol inhalability in low air movement environments." Journal of Aerosol Science **30**(5): 613-626.

Kenny, L. C., R. J. Aitken, P. E. J. Baldwin, G. C. Beaumont and A. D. Maynard (1999). "The sampling efficiency of personal inhalable aerosol samplers in low air movement environments." Journal of Aerosol Science **30**(5): 627-638.

Baldwin, P. E. J. and A. D. Maynard (1998). "A survey of wind speeds in indoor workplaces." Annals of Occupational Hygiene **42**(5): 303-313.

Maynard, A. D., C. Northage, M. Hemingway and S. D. Bradley (1997). "Measurement of short-term exposure to airborne soluble platinum in the platinum industry." Annals of Occupational Hygiene **41**(1): 77-94.

Maynard, A. D., R. J. Aitken, L. C. Kenny and P. E. J. Baldwin (1997). "Preliminary investigation of aerosol inhalability at very low wind speeds." Ann. Occup. Hyg. **41**(Supplement 1): 695-699.

Baldwin, P. E. J., A. D. Maynard and C. Northage (1997). "An investigation of short-term gravimetric sampling in pig farms and bakeries." Appl. Occup. Environ. Hyg. **12**(10): 662-669.

Maynard, A. D. (1996). "Sampling errors associated with sampling plate-like particles using the Higgins- and Dewell-type personal respirable cyclone." Journal of Aerosol Science **27**(4): 575-585.

Maynard, A. D. (1995). "The Application of Electron-Energy-Loss Spectroscopy to the Analysis of Ultrafine Aerosol-Particles." Journal of Aerosol Science **26**(5): 757-777.

Maynard, A. D. (1995). "The Development of a New Thermophoretic Precipitator For Scanning-Transmission Electron-Microscope Analysis of Ultrafine Aerosol-Particles." Aerosol Science and Technology **23**(4): 521-533.

Maynard, A. D. and L. C. Kenny (1995). "Performance assessment of three personal cyclone models, using an aerodynamic particle sizer." J. Aerosol Sci. **26**(4): 671-684.

McGibbon, A. J., L. M. Brown, et al. (1993). "Microscopy in Solid-State Science." Microscopy Research and Technique **24**(4): 299-315.

BOOKS AND BOOK CHAPTERS

Maynard, A. D. (2008). Engineered Nanomaterials, in Encyclopedia of Quantitative Risk Assessment, John Wiley and Sons Ltd., Chichester.

Maynard, A. D. (2007). Nanotoxicology: Laying a firm foundation for sustainable nanotechnologies, in Nanotoxicology. Characterization, Dosing and Health Effects, N. Monteiro-Riviere and C. L. Tran, eds., Informa, New York.

Maynard, A. D. and Pui, D. Y. H., eds. (2007). Nanoparticles and Occupational Health. Springer, Dortrecht, Netherlands.

Maynard, A. D. (2007). Nanoparticle Safety - A Perspective from the United States, in Nanotechnology. Consequences for Human Health and the Environment. Issues in Environmental Science and Technology, Volume 24, R. E. Hester and R. M. Harrison, eds., The Royal Society of Chemistry, Cambridge, UK.

Maynard, A. D. (2007). Nanotechnologies: Overview and issues, in Nanotechnology - Toxicological issues and environmental safety, P. P. Simeonova and M. Luster, eds., Springer, 1-14.

McLean, Virginia
Email: andrew.maynard@wilsoncenter.org
Phone: 202 691 4311 Fax: 202 691 4001

Maynard, A. D. and P. A. Baron (2005). Aerosols in the Industrial Environment. *Aerosols Handbook. Measurement, Dosimetry and health Effects.* L. Ruzer and N. H. Harley. Boca Raton, CRC Press**:** 225-264.

Maynard, A. D. (2003). Overview of methods for analysing single ultrafine particles. Ultrafine Particles in the Atmosphere. L. M. Brown, N. Collings, R. M. Harrison, A. D. Maynard and R. L. Maynard, Eds. London, UK, Imperial College Press.

Brown, L. M., N. Collings, R. M. Harrison, A. D. Maynard and R. L. Maynard, Eds. (2003). Ultrafine Particles in the Atmosphere. London, UK, Imperial College Press.

Maynard, A. D. (2001). Aerosol Measurement in the Workplace. *Aerosol Measurement, Principles, Techniques and Applications. Second Edition*. P. A. Baron and K. Willeke. New York, Wiley Interscience**:** 779-799.

SELECT ADDITIONAL PUBLICATIONS

Maynard, A. D. (2007). Is engineered nanoparticle exposure a myth?, SAFENANO, Edinburgh, UK.

Lubick, N. and Maynard, A. (2007). Spoonful of caution with NANO HYPE. Environmental Science & Technology 41:2661-2665.

Maynard, A. D. (2006). Nanotechnology: A research strategy for addressing risk, PEN 03 Washington DC, Woodrow Wilson International Center for Scholars, Project on Emerging Nanotechnologies.

Maynard, A. D. (2005). Inventory of Research on the Environmental, Health and Safety Implications of Nanotechnology Woodrow Wilson International Center for Scholars, Project on Emerging Nanotechnologies, Washington DC.

Oberdörster, G., Gelein, R., Opanashuk, L., Elder, A., Silva, V., Carter, J. D., Maynard, A. D., Ito, Y. and Finkelstein, J. (2004). Inhaled ultrafine particles (UFP) can efficiently translocate to the CNS via neuronal pathways, in American Toxicological Society, Orlando, Fl.

Andresen, P., Pai, P., Maynard, A. D., Prasad, B. S. N. and Ramachandran, G. (2003). Respiratory health effects on women due to aerosol exposures from domestic fuel use in India, in International Society for Exposure Analysis Conference, 2003, Stresa, Italy.

Maynard, A. D. (2003). From Nuisance Dusts to Nanoparticles. The Role of Electron Microscopy in Occupational and Environmental Health., in SCANDEM 03, Oslo, Norway.

Maynard, A. D. (2003). Can aerosol surface-area exposure be estimated adequately from measured number and mass concentration?, in Fourth International Colloquium on Particulate Matter, AAAR, Pittsburgh, PA.

Pai, P., Maynard, A. D., Prasad, B. S. N., Belagali, S. L., Andresen, P. and Ramachandran, G. (2003). Real-time exposure measurements of aerosol number, surface-area and mass (PM2.5) concentration in the southern Indian city of Mysore., in Fourth International Colloquium on Particulate Matter, AAAR, Pittsburgh, PA.

Baron, P. A., A. D. Maynard and M. Foley (2002). Evaluation of aerosol release during the handling of unrefined carbon nanotube material. NIOSH Research Report. **DART-02-191**. Cincinnati, OH, NIOSH.

Jones, A. D., R. J. Aitken, et al. (2001). Thoracic sampling of fibres. Norwich, UK, HSE Books.

Jones, A. D., R. Aitken, A. Maynard, G. Riediger, W. Sahle and G. Liden (2000). "Thoracic sampling of fibres." J. Aerosol Sci. **31**(Suppl. 1): S128-S129.

Kenny, L. C., Maynard, A. D., Brown, R. C., Crook, B., Curran, A. and swan, D. J. (1999). A scoping study into ultrafine aerosol research and HSL's ability to respond to current and future research needs, health and Safety Laboratory, UK.

Maynard, A. D. (1998). "Modelling axial flow cyclone performance." J. Aerosol Sci. **29**: S1089-S1090.

Maynard, A. D. (1994). "The generation of micro-machined particle aerosols for characterising aerosol samplers." J. Aerosol Sci. **24**(Suppl. 1): S445-S446.

Maynard, A. D. (1993). "Respirable dust sampler characterisation: Efficiency curve reproducibility." J. Aerosol Sci. **24**(Suppl. 1): S457-S458.

Maynard, A. D. and L. M. Brown (1992). "Electron energy loss spectroscopy of ultrafine aerosol particles in the scanning transmission electron microscope." J. Aerosol Sci. **23**(Suppl. 1): S433-S436.

McLean, Virginia
Email: andrew.maynard@wilsoncenter.org
Phone: 202 691 4311 Fax: 202 691 4001

Maynard, A. D. and L. M. Brown (1991). "The Collection of Ultrafine Aerosol-Particles For Analysis By Transmission Electron-Microscopy, Using a New Thermophoretic Precipitator." Journal of Aerosol Science **22**: S379-S382.

Maynard, A. D. and L. M. Brown (1991). The collection of ultrafine particles for analysis in the TEM/STEM using a new thermophoretic aerosol precipitator. EMAG91, Bristol, IOP Publishing Ltd.

Maynard, A. D., R. C. Brown, B. Crook, A. Curran and D. J. swan (1999). A scoping study into ultrafine aerosol research and HSL's ability to respond to current and future reasearch needs, health and Safety Laboratory, UK**: IR/A/99/03**

Maynard, A. D. (1997). Characterisation of six thoracic aerosol samplers using spherical particles., Health and Safety Laboratory**: IR/A/97/13**

Maynard, A. D. (1997). Performance of a device for classifying airborne fibres by length., Heath and Safety Laboratory**: IR/A/97/06**

Maynard, A. D. (1995). Semiquantitative determination of plate-like particle orientation in a Higgins and Dewell type cyclone, Health and Safety Executive, UK**: IR/L/DS/95/03**

Maynard , A. D. (1995). Short term sampling of dusts. Project summary and recommendations, HSL**: IR/L/DS/95/4**

Kenny, L. C., J. Thompson and A. D. Maynard (1995). Evaluation of two novel cyclone designs, HSL**: IR/L/DS/95/2**

Maynard, A. D. and M. Hemingway (1994). Short term sampling of dusts. 2: Sampling for soluble platinum., Health and Safety Executive, UK**: IR/L/DS/94/14**

Maynard, A. D. and P. Baldwin (1994). Short term sampling of dusts. 3: Sampling on pig farms., Health and Safety Executive, UK**: IR/L/DS/94/15**

Baldwin, P. and A. D. Maynard (1994). Short term sampling of dusts. 1: Sampling in bakeries., Health and Safety Executive, UK**: IR/L/DS/94/13**

Maynard, A. D. (1993). Comparison of personal cyclone sampling characteristics., Health and Safety Executive, UK**: IR/L/DS/93/08**

Maynard, A. D. (1993). The determination of sampling efficiency for three types of personal cyclone., Health and Safety Executive, UK**: IR/L/DS/93/04**

Maynard, A. D. (1993). Personal cyclone sampling efficiency for platey particles - theoretical considerations., Health and Safety Executive, UK**: IR/L/DS/93/10**

Maynard, A. D. (1992). Wall loss effects in personal inhalable dust samplers - a critical review., Health and Safety Executive, UK**: IR/L/DS/92/6**

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McLean, Virginia
Email: andrew.maynard@wilsoncenter.org
Phone: 202 691 4311 Fax: 202 691 4001

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McLean, Virginia
Email: andrew.maynard@wilsoncenter.org
Phone: 202 691 4311 Fax: 202 691 4001

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