Mark Nelson

Dr. Mark Nelson is a founding director of the Institute of Ecotechnics and has worked for several decades in closed ecological system research, ecological engineering, the restoration of damaged ecosystems, desert agriculture and orchardry and wastewater recycling. He is Chairman and CEO of the Institute of Ecotechnics (www.ecotechnics.edu), a U.K. and U.S. non-profit organization, which consults to several demonstration projects working in challenging biomes around the world; Vice Chairman of Global Ecotechnics Corp. (www.globalecotechnics.com), head of Wastewater Gardens International (www.wastewatergardens.com).

Mark has helped pioneer a new ecological approach to sewage treatment, "Wastewater Gardens®" which are constructed subsurface flow wetlands with high biodiversity and has created over 90 such systems in Mexico, Belize, Bali & Sulawesi, Indonesia, West Australia, France, Spain, Portugal, Poland, the Bahamas, the Philippines, Algeria and the United States since 1996 (www.wastewatergardens.com).

He served as Director of Space and Environmental Applications for Space Biospheres Ventures, which created and operated Biosphere 2, the 3.15 acre materially closed facility near Tucson, Arizona, the world's first laboratory for global ecology (www.biospheres.com). Dr. Nelson was a member of the eight person "biospherian" crew for the first two year closure experiment, 1991-1993. His research inside included litterfall/decomposition in the tropical biomes, population dynamics and biomass increase, sustainable agricultural system, and constructed wetland sewage treatment system.

Beginning in the 1970s, Mark worked in the high desert grassland south of Santa Fe, New Mexico where he made hundreds of tons of compost, planted over a thousand fruit and windbreak trees, creating an oasis in previously overgrazed and eroding country. Since 1978 Mark has worked in the semi-arid tropical savannah of West Australia where he helped start Savannah Systems P/L a project centered on the pasture regeneration and enrichment of a 5000 acre property in the Kimberley region.

Publications include "Pushing Our Limits: Insights from Biosphere 2" (University of Arizona, February 2018), "The Wastewater Gardener: Preserving the Planet One Flush at a Time" (Synergetic Press, 2014), co-authoring "Life Under Glass" and "Space Biospheres", editing "Biological Life Support Technologies: Commercial Opportunities" and numerous chapters in books on space life support systems. His research papers include ones on ecological hierarchy, wastewater recycling through the use of constructed wetlands, and applications of closed ecological systems. Dr. Nelson was a Contributing Editor of the journal, Life Support and Biosphere Science from 1993-2002, Vice Chairman of the life science sessions on Closed Ecological Systems for COSPAR (the International Committee on Space Research of the ICSU) and an Associate Editor for the journal, Advances in Space Research, 2000-2013, and is currently an Associate Editor of Life Sciences in Space Research.

Mark's educational background includes a Ph.D. in Environmental Engineering Sciences from the University of Florida. His dissertation involved the creation of experimental Wastewater Gardens® for protection of groundwater quality and coral reef health along the coast of Yucatan, Mexico. His M.S. was in the School of Renewable Natural Resources, University of Arizona; and his B.A. in Philosophy/Pre-Med Sciences was from Dartmouth College, Hanover, New Hampshire. Mark was a summa cum laude graduate from Dartmouth, Phi Beta Kappa and is a member of Phi Kappa Phi, the honors engineering society. Mark was awarded the Yuri Gagarin Jubilee Medal, 1993 for outstanding service to international cooperation in space and the environment by the Russian Cosmonautics Federation; and elected a Fellow of the Explorers Club (1994) and a Fellow of the Royal Geographical Society (2001).

Mark Nelson

CURRICULUM VITAE

b. 29 May, 1947
Brooklyn, New York

Professional Positions:

2005 – present. Head, Biospheric Design Division, Global Ecotechnics Corporation, direct research and development on modular biospheres, and the Laboratory Biosphere closed system facility, Santa Fe. NM

2005 – present. Director/Founder, Wastewater Gardens International, Santa Fe, NM, International consulting and project implementation of ecological solutions for wastewater treatment and recycling; regional representatives in Indonesia, Mexico, West Australia, Spain/North Africa and Poland. Over 150 completed projects in 14 countries.

2004 – present. Co-Principal Investigator for sustainable forestry research funded by Earthwatch at the Las Casas de la Selva rainforest project in Puerto Rico, one of the biomic projects consulted to by the Institute of Ecotechnics.

2010- present: Manager of the Synergia Ranch Organic Fruits and Vegetables intensive gardens at Synergia Ranch, Santa Fe, NM. This vegetable operation produces over 12,000 lbs of organic produce per year on 1/3 of an acre.

1995 – 2004. V.P. for Ecological Wastewater Treatment Systems, Planetary Coral Reef Foundation. Design, construction and research on constructed wetlands for sewage treatment in Mexico and the Caribbean, Australia. SE Asia and the U.S.

2002 – 2005 Director of Research for Laboratory Biosphere facility, Santa Fe, NM

1994 – Vice Chairman, Global Ecotechnics Corporation, Santa Fe, NM

1991-1993 Crew member, first Biosphere 2 closure experiment (1991-1993)

1985 -1994 Director of Environmental and Space Applications, Space Biospheres Ventures, Oracle, Arizona. Responsible for environmental and space applications and spinoff technologies from the Biosphere 2 project, a three acre materially closed ecological system containing tropical rainforest, savannah marsh, marine, desert, intensive agriculture and human habitat biomes.

1981 - present Chairman of the Board and CEO, Institute of Ecotechnics London, a U.K. company limited by guarantee. International ecological consulting and development institute.

1981-1994 Director, Decisions Team Ltd., Hong Kong, Decisions Team, Inc. USA (1984), International ecological projects design, implementation and management company.

1980 – present. Director, Savannah Systems, Pty. Ltd. /Birdwood Downs Company, Ecological development company focusing on drought-resistant grasses/legumes for the dry tropics; horse and cattle program, eco-tourism, environmental technologies and sustainable development of the semi-arid tropical savannah.

1982 –present. Principal, Establishment of five acre micro-catchment fruit orchard, utilizing rain run-off as sole irrigation, New Mexico.

1978 -1980 Managing Director, Savannah Systems Pty. Ltd., Derby, West Australia. Development of a 5000 acre seed production farm and dry tropical pasture regeneration systems, including improved legumes, fodder trees, orchardry and grazing rotation.

1976 Agriculture studies of traditional Hopi desert farming techniques, Arizona, and Hebrew University (Jerusalem) project to reconstruct ancient Nabatean low water use agriculture in the Negev Desert, Israel.

1975 -1978 Managing Director, Principal, Gardenworks, Santa Fe, New Mexico. Landscaping and nursery company focusing on low water usage plants, organic agriculture, composting and water conservation.

1975 -1978 Vice-President, Synergetic Operations Corporation, Santa Fe, New Mexico. Landscaping for a construction company which focused on adobe architecture, water and energy conserving design.

1974 Principal, Establishment of demonstration high desert fruit orchards, Santa Fe, New Mexico. Five acre, deep-composted, drip irrigation fruit plantation.
1973 -1980 Co-founder and Director, Institute of Ecotechnics Inc., a New Mexico corporation.

Education

1998 Ph.D., Dept. of Environmental Engineering Sciences /Center for Wetlands University of Florida.
Ph.D. committee H.T. Odum (chair), M.T. Brown, D. Spangler, K.R. Reddy, C.L. Montague. Dissertation on wetland wastewater treatment systems implemented and researched along the Yucatan coast, Mexico.
Phi Kappa Phi, Honors Engineering Society.

1995 M. S. in Watershed Management, School of Renewable Natural Resources, University of Arizona. Thesis committee: L. Gay (chair), G. McPherson, M. Karpisack. Thesis: Design of Zero Discharge and Safe Discharge Biological Wastewater Treatment Systems Using Fast-Growing Trees

1964 -1968 B.A. Dartmouth College, Hanover, New Hampshire. Summa Cum Laude, High Honors in Philosophy, Phi Beta Kappa. Daniel Webster Scholar. Major: Philosophy and Pre-medical program in Sciences

Fall 1966 - Exchange student at Fisk University, a black college in Nashville, Tennessee.

Journal and scientific editor positions:

2012- Associate editor of the journal, Life Sciences in Space Research, Elsevier

2008- 2012 Associate Editor of the journal, Advances in Space Research, Elsevier.

2004-2012: Elected for 2 terms as Vice Chairman of COSPAR (Committee on Space Research) F4 Section, Space Life Sciences dealing with Natural and Artificial Ecosystems

2000- –Guest Scientific Editor for COSPAR (Committee on Space Research) Session on Closed Ecosystems, Space and Earth Applications, COSPAR General Assemblies held in Warsaw, Poland (2000) Houston (2002) Paris (2004), Beijing (2006)

1994 – 2002 Contributing Editor for Earth Applications, Journal of Life Support and Biosphere Science.

Professional honors

Yuri Gagarin Jubilee Medal, 1993, awarded for outstanding service to international cooperation in space and the environment by the Russian Cosmonautics Federation; elected Fellow of the World Academy of Arts and Sciences (2008); Fellow of the Explorer's Club, New York in 1994, Fellow of the Royal Geographical Society, 2000. Honorary member, International Association for Advanced Life Support, University of Alabama at Huntsville; 1991-listing, Marquis Who's Who in Science and Engineering, elected to Phi Kappa Phi, the Honors Engineering Society, 1998. Phi Beta Kappa. Dartmouth College.

Conferences, Papers and Publications:

Books – Authored or co-authored

Mark Nelson, 2018. "**Pushing Our Limits: Insights from Biosphere 2**", University of Arizona Press, 2018. Winner, Living Now Evergreen Silver Medal for Nature Conservation (Independent Publisher awards).

Mark Nelson, 2014. **The Wastewater Gardener: Preserving the Planet One Flush at a Time**, Synergetic Press, Santa Fe, NM. Awards: 2014 Living Now Book Awards, Independent Publishers Association Gold award; 2015 Ben Franklin Silver Award (Independent Book Publishers Association); Foreword Reviews' 2014 INDIEFAB Book of the Year Silver Award Winner for Ecology and Environment; 2014 New Mexico Publishers Association Award Finalist

Abigail Alling and Mark Nelson. 1993. **Life Under Glass: The Inside Story of Biosphere 2,** Biosphere Press, Tucson, 1993. 370 pp., published also in Dutch (1993) and Japanese (Kdansha Press, 1997)

John Allen and Mark Nelson, 1989**. Space Biospheres**, Synergetic Press, Tucson, 1986 and revised second edition, 1989. Hardback edition by Orbit Books, Malabar Florida, 1987. Russian translation by Progress Publishers, Moscow (1990), German translation by Sphinx Publishers, Basel (1990).

Book Chapters and Books Edited

Contributing Editor, **The Biosphere Catalogue** (ed. T. Parrish Snyder), Synergetic Press, London and Tucson, 1985. Russian translation by MYSL publishers, Moscow (1990). German translation by Sphinx Publishers, Basel (1990).

Nelson, M.: The Biotechnology of Space Biospheres, presented at Space Life Science Symposium, Yokohama City University, Yokohama, Japan. Published in **Fundamentals of Space Biology** (ed. M. Asahima and G.M. Malacinski), pp. 185-200, Japan Scientific Society Press, Tokyo, and Springer-Verlag, Berlin, 1990.

Nelson, M., G. Soffen, (ed.): **Workshop on Biological Life Support Technologies: Commercial Opportunities**, NASA Conference Publication, NASA Office of Management, Scientific and Technical Information Division, Washington D.C. 1990. Also published as Biological Life Support Systems, Proceedings of the Workshop on Biological Life Support Technologies: Commercial Opportunities, (ed.) Mark Nelson and Gerald Soffen, Synergetic Press, Tucson, 1990.

Alling, A., M. Nelson, L. Leigh, T. MacCallum, N. Alvarez-Romo, J. Allen and R. Frye. 1993. Experiments on the closed ecological system in the Biosphere 2 test module. Appendix chapter, pp 463-469 in R.J. Beyers and H.T. Odum, eds. **Ecological Microcosms**, Springer-Verlag, New York.

Nelson, M., E. Bass, and L. Leigh. 1993. Biosphere 2 and the study of human/ecosystem dynamics, pp. 280-296, In M. J. McDonnell and S. T. Pickett, eds. **Humans as Components of Ecosystems: The Ecology of Subtle Human Effects and Populated Areas**, Springer-Verlag, N.Y. xxii, 364 pp.

McKay, C. P., Meyer, T. R., Boston, P. J., Nelson, M., MacCallum, T., & Gwynne, O. (1993). Utilizing martian resources for life support. Resources of near-earth space, 1, 819, University of Arizona Press, Tucson.

Nelson, M., 1995. **Design of Zero Discharge and Safe Discharge Biological Wastewater Treatment Systems Using Fast-Growing Trees**, M.S. Thesis, School of Renewable Natural Resources, University of Arizona, Tucson, pp. 142.

Nelson, M and W.F.Dempster,1996, Living In Space: results from Biosphere 2's initial closure, an early testbed for closed ecological systems on Mars,pp.363-390 in **Strategies for Mars: a guide to human exploration** ed.C.R.Stoker & C.Emment, Vol.86 AAS Publication, San Diego CA.

Nelson, M, 1997. Bioregenerative Life Support Systems for Space Habitation and Extended Planetary Missions, pp. 315-336, In: **Fundamentals of Space Life Sciences** (ed. Susanne Churchill), Orbit Books, Malabar, FL.

Nelson, M., 1998. **Limestone mesocosm for recycling saline wastewater in coastal Yucatan, Mexico**, Ph.D. dissertation, Dept. of Environmental Engineering Sciences, University of Florida, Gainesville, pp. 329.

Nelson, M (Ed.), 2001. Closed Ecological Systems: Earth and Space Applications, ***Advances in Space Research,* Vol. 27, Number 9**. Papers from the COSPAR General Scientific Assembly, Warsaw, Poland in 2000. Published by Elsevier Science Ltd., Pergamon. pp. 1495-1617

Nelson, M., Pechurkin, N.S., Dempster, W.F., Somova, L.A., and M.A. Shea (Eds.), 2003. Space Life Sciences: Closed Artificial Ecosystems and Life Support Systems, ***Advances in Space Research, Vol. 31, Number 7***:1627-1847.

M. Nelson, N.S. Pechurkin, J.P. Allen, L.A. Somova and J.I. Gitelson, 2010. Bioengineering of Closed Ecological Systems for Ecological Research, Space Life Support and the Science of Biospherics, chapter 11 in Volume 10, 2010, DOI: 10.1007/978-1-60327-140-0 ENVIRONMENTAL BIOTECHNOLOGY in the Handbook of Environmental Engineering series, Editors: Lawrence K. Wang, Volodymyr Ivanov and Joo-Hwa Tay, The Humana Press, Inc., Totowa, NJ

L.A. Somova , N.S. Pechurkin and M. Nelson, 2010. Microbial Ecology of Isolated Life Support Systems (LSS), Chapter 6 In Volume 10, ***ENVIRONMENTAL BIOTECHNOLOGY* in the *Handbook of Environmental Engineering*** series, The Humana Press, Inc., Totowa, NJ

M. Nelson (ed.), Space Life Sciences: **Closed Ecological Systems, Earth and Space Applications,** ***Advances in Space Research*** **Vol. 35 (9)**: 1503-1664 2005. Collection of papers presented at the COSPAR General Scientific Assembly, Paris, July 2004.

M. Nelson (ed.), Space Life Sciences: Closed Ecological Systems, Earth and Space Applications, ***Advances in Space Research*** **Vol. 41(5)**: 675-828, 2008. Collection of papers presented at the COSPAR General Scientific Assembly, Beijing, China, July 2006.

T. Vakil, M. Nelson, N. Greenhawk, contributors to Chapter 5, Citizen Monitoring of Tropical Rainforests in: GOFC-GOLD (2017) A Sourcebook of Methods and Procedures for Monitoring Essential Biodiversity Variables in Tropical Forests with Remote Sensing. Eds: GOFC-GOLD & GEO BON. Report version UNCBD COP-13, GOFC-GOLD Land Cover Project Office, Wageningen University, The Netherlands. ISSN: 2542-6729.

Conferences Chaired and Organized

Chair, Institute of Ecotechnics Galactic Conference, Aix-en-Provence, France, 1981.

Chair, Seminar on North American Succulents, Desert Dome Conservatory, Fort Worth, Texas, 1983.

Chair, Biospheres Conference, Space Biospheres Ventures, Tucson, 1984.

Chair, Genetics, Conditioning and Power Conference, Institute of Ecotechnics, Aix-en Provence, France, 1985.
Chair, Biosphere 2 Conference, Space Biospheres Ventures, Tucson, 1985.

Chair, The Agenda: Possibilities, Tasks and Groups Conference, Institute of Ecotechnics, Aix-en-Provence, France, 1986.

Chair, First International Review of the History, Current Work and Future of Closed Ecological Systems conference, organized by the Institute of Ecotechnics, sponsored by Space Biospheres Ventures and held at the Royal Society in London at the invitation of Professor Keith Runcorn, fellow of the Royal Society and member, SBV Review Committee, 1987.

Co-chair, Bio-Astronautics: Yesterday, Today and Tomorrow, panel with Academician Oleg Gazenko, Space Future Forum, USSR Academy of Sciences, Moscow, 1987.
Chair, Institute of Ecotechnics Conference on The Revolution: Information, Genes and Artificial Intelligence, Aix-en-Provence, France, 1988.

Section chair, Space Manufacturing 7: Space Resources to Improve Life on Earth, 9th Princeton/AIAA/ Space Studies Institute conference, Princeton. Workshop section on Space Biospheres. Published in Space Manufacturing 7: Space Resources to improve Life on Earth, proceedings of the 9th Princeton/AlAA/Space Studies Institute, (ed. G. Maryniak), American Institute of Aeronautics and Astronautics, Washington D.C., 1989.

Section chair, Space Manufacturing, 8, 10th Princeton/AIAA/Space Studies Institute conference, Princeton. Workshop section on ;Space Biospheres. Biosphere 2 Update Published in Space Manufacturing 8, proceedings of the 10th Princeton AlAA/Space Studies Institute, (ed. Greg Maryniak), American Institute of Aeronautics and Astronautics, Washington D.C. 1991.

Co-chair, Second International Review of the History, Current Work and Future of Closed Ecological Systems conference, co-sponsored by the Institute of Biophysics (USSR), Space Biospheres Ventures and the Institute of Ecotechnics, held in Krasnoyarsk, Siberia. Conference chair: Professor I.I. Gitelson, Director of the Institute of Biophysics, USSR Academy of Sciences, Siberian Branch, and Director, BIOS-3 Project, Krasnoyarsk. Co-chairs: Mark Nelson, SBV, and Dr. G.M. Lisovsky, Vice-Director, Institute of Biophysics, USSR, 1989.

Chair, Biological Life Support Systems: Commercial Opportunities, a workshop sponsored by the NASA Office of Commercial Programs (Technology Utilization) and hosted by Space Biospheres Ventures at the Biosphere 2 Project site, Tucson, 1989.

Organizer and co-chair, Third International Workshop on Closed Ecological Systems with a session on Carbon Dynamics and Cycling in Natural and Engineered Ecosystems, April 1992, Biosphere 2 project site.

Organizing Committee and co-chair, Fourth International Workshop on Biospherics and Closed Ecological Systems, Linnean Society, April, 1996.

Organizer and Chair, Institute of Ecotechnics conference: Complexity: Biospheres, Culture and Evolution, October, 1997, Les Marronniers Conference Center, Aix-en-Provence, France.

Organizer and Chair, Institute of Ecotechnics conference: The Future: Worlds, History and Society, October, 1998, Les Marronniers Conference Center, Aix-en-Provence, France.

Organizer and Chair, Institute of Ecotechnics conference: Experimental Metaphysics: Physiology, Remote Sensing and Cognitive Structures, October, 1999, Les Marronniers Conference Center, Aix-en-Provence, France.

Organizing Committee: Mars Ecosynthesis: Creating Open and Closed Ecosystems, workshop sponsored by NASA Ames Research Center, Astrobiology Institute and Global Ecotechnics consortium, Synergia Ranch, Santa Fe, NM, September 2000.

Organizer and Chair, Institute of Ecotechnics conference, Exploration: Art, Science and Projects, October, 2001, Les Marronniers Conference Center, Aix-en-Provence, France.

Organizer and Chair, Institute of Ecotechnics conference: Time: Metapatterns, the Present Moment and Evolution , October, 2001, Les Marronniers Conference Center, Aix-en-Provence, France.

Organizer and Chair, Institute of Ecotechnics conference: The Ethnosphere: Memes, Themes and Dreams, October, 2002, Les Marronniers Conference Center, Aix-en-Provence, France.

Organizer and Chair: Institute of Ecotechnics conference: The Cybersphere: Intelligence, Feedback and Action, November, 2003, Synergia Ranch Conference Center, Santa Fe, New Mexico.

Organizer and Chair, Institute of Ecotechnics conference: The Noosphere: Science, Art and Projects, October, 2004, Les Marronniers Conference Center, Aix-en-Provence, France.

Organizer and Chair, Institute of Ecotechnics conference: The Technosphere: Revolution, Evolution and Involution, October 2005, Synergia Ranch Conference Center, Santa Fe, New Mexico.

Organizer and Chair, Institute of Ecotechnics conference, "The Microcosmos: The Human Body, Brain and Behavior", Synergia Ranch Conference Center, Santa Fe, New Mexico, October 2007.

Organizer and Chair, Institute of Ecotechnics conference: The Mediterranean, October, 2012, Les Marronniers Conference Center, Aix-en-Provence, France.

Co-organizer and instructor, Workshop on Constructed Wetlands for Treatment of Sewage and Water Reuse for Iraqi Ministry of the Environment, Ministry of Water and Ministry for the Restoration of Iraqi Wetlands, March 2013 in conjunction with Nature Iraq, an Iraqi NGO, Al-Chibayish, Iraq.

Journal Peer-Reviewed Papers

Nelson, M.: Synergetic Management of the Savannahs, presented at the Second International Savannah Symposium, CSIRO, Brisbane, Queensland, Australia. Published in **The World's Savannah: Ecology and Management**, Australian Academy of Science, (ed. Mott and Tothill) University of Queensland Press, 1985.

Allen, J.P., Nelson, M., and Snyder, T.P., Institute of Ecotechnics, *The Environmentalist*, 4 (1984) 205-218, Geneva, 1985.

Nelson, M., Hawes, P., and Augustine, M.: Life Systems for a Lunar Base, delivered at Lunar and Planetary Institute Conference, Houston, and published, pp. 513-518, in *The Second Conference on Lunar Bases and Space Activities in the 21st Century* (ed. W. W. Mendell), NASA Conference Publication 3168, 2 vols.

Nelson, M. and Allen, J.P.: Ecology and Space, presented at Japanese Society for Biological Sciences in Space, Second Annual Conference, Tokyo. Published in *Human Engineering in Space*, Japanese Society for Biological Sciences in Space publication series, Vol. 3, No. 1, Tokyo, 1989, and reprinted in Lunar Habitation Vol. 1, by Japan Macro-Engineer Society and Lunar Habitation Institute, Tokyo, 1989.

Nelson, M., MacCallum,T.M., Leigh,L.S., Alling,A. and N. Alvarez-Romo, Innovative Approaches for Integration in Bioregenerative Testbeds -Biosphere 2 Project, Paper for Biosphere Symposium, 24 May 1991 sponsored by Japanese CELSS Society and Japanese Society of High Technology in Agriculture. Tokyo, Japan, published in symposium proceedings.

Nelson, M. and Allen, J.P.: Ecology and Space, presented at Japanese Society for Biological Sciences in Space, Second Annual Conference, Tokyo. Published in **Human Engineering in Space**, Japanese Society for Biological Sciences in Space publication series, Vol. 3, No. 1, Tokyo, 1989, and reprinted in Lunar Habitation Vol. 1, by Japan Macro-Engineer Society and Lunar Habitation Institute, Tokyo, 1989.

Nelson, M., L. Leigh, A. Alling, T. MacCallum, J. Allen, and N. Alvarez-Romo, l991. Biosphere 2 test module: a ground-based sunlight-driven prototype of a closed ecological system. Paper for COSPAR XXVIII Plenary Meeting, The Hague, Netherlands, 1990, published in *Natural and Artificial Ecosystems, Advances in Space Research*, v. 12, 5:151-158

Nelson, M., T. Burgess, A. Alling N. Alvarez-Romo, W. Dempster, R. Walford, and 1. Allen. 1993. Using a closed ecological system to study Earth's biosphere: Initial results from Biosphere 2. *BioScience* 43(4): 225-236.

Nelson, M., Silverstone, S. and J. Poynter, 1993. Biosphere 2 Agriculture: Testbed for intensive, sustainable, non-polluting farming systems, *Outlook on Agriculture*, Vol 13, No. 3, Sept. 1993 pp. 167-174, CAB International, Oxford, U.K. .

Nelson, M, W. F. Dempster, N. Alvarez-Romo, T. MacCallum. 1994, Atmospheric Dynamics and bioregenerative technologies in a soil-based ecological life support system: Initial results from Biosphere 2. in *Advances in Space Research*14 (11):417-426.

Silverstone, S.E. and M. Nelson, 1996. Food production and nutrition in Biosphere 2: results from the first mission, September 1991 to September 1993, *Adv. In Space Research*, Vol. 18, No. 4/5:49-61

Nelson, M., 1997. Nutrient recycling systems of Biosphere 2: litterfall, decomposition and wastewater recycling, results from the 1991-93 closure experiment, *Life Support and Biosphere Science*, 4(3/4):145-153.

MacCallum, T., Allen, J. P., Leigh, L., Alling, A., Alverez-Romo, N., & Nelson, M. (1997). The Biosphere 2 project-Applications for space exploration and Mars settlement. In: *The Case for Mars IV: The international exploration of Mars-Considerations for sending humans*, pp. 249-272.

Nelson, M., 1998. Wetland systems for bioregenerative reclamation of wastewater -- from closed systems to developing countries, *Life Support and Biosphere Science*, 5(3): 357-369.

Nelson, M., Finn, M, Wilson, C., Zabel, B., van Thillo, M., Hawes, P., and R. Fernandez, 1999. Bioregenerative recycle of wastewater in Biosphere 2 using a created wetland: two year results, *Ecological Engineering* 13: 189-197.

Nelson, M., 1999. Litterfall and decomposition rates in Biosphere 2 terrestrial biomes, *Ecological Engineering* 13: 135-145.

Wetterer, J. K., S. E. Miller, D. E. Wheeler, C. A. Olson, D. A. Polhemus, M. Pitts, I. W. Ashton, A. G. Himler, M. Yospin, K. R. Helms, E. L. Harken, J. Gallaher, C. E. Dunning, M. Nelson, J. Litsinger, A. Southern, and T. L. Burgess. 1999. Ecological dominance by *Paratrechina longicornis* (Hymenoptera: Formicidae), an invasive tramp ant, in Biosphere 2. *Florida Entomologist* 82: 381-388.

Silverstone, S.E., Harwood, R.R., Franco-Vizcaino, E., Allen, J. and M. Nelson, 1999. Soil in the agricultural area of Biosphere 2 (1991-1993), *Ecological Engineering* 13: 179-188.

Allen, J. and M. Nelson, 1999. Biospherics and Biosphere 2, mission one (1991-1993), *Ecological Engineering* 13: 15-29.

Silverstone, S., M. Nelson, A. Alling, J. Allen. 2003. Development and research program for a soil – based bioregenerative agriculture system to feed a four person crew at a Mars base. *Adv. Space Res*. 31(1): 69-75.

Nelson, M., Odum, H.T., Brown, M.T., and A. Alling, "Living off the land": resource efficiency of wetland wastewater treatment, invited paper presented at COSPAR conference, Warsaw, Poland, July, 2000, *Advances in Space Research* vol 27(9): 1546-1556, 2001.

Nelson, M., Alling, A, Dempster, W.F., van Thillo, M. and J. Allen, Integration of wetland wastewater treatment with space life support systems, paper presented at COSPAR conference, Warsaw, Poland, July, 2000, *Life Support and Biosphere Science* 8 (3/4):149-154, 2002.

Alling, A, Nelson, M., Silverstone, S and M. Van Thillo, 2002. Human Factor Observations of the Biosphere 2, 1991-1993, Closed Life Support Human Experiment and Its Application to a Long-Term Manned Mission to Mars, paper presented at NASA Mars Ecosynthesis workshop, Santa Fe, NM Sept 2000, *Life Support and Biosphere Science* Vol 8:71-82

Salisbury, F.B, Dempster, W.F., Allen, J.P., Alling, A., Bubenheim, D., Nelson, M and S. Silverstone, Light, Plants, and Power for Life Support on Mars, paper presented at NASA Mars Ecosynthesis workshop, Santa Fe, NM Sept 2000, *Life Support and Biosphere Science* 8(3/4):161-172, 2002

J.P. Allen, M. Nelson, A.K. Alling, 2003. The legacy of Biosphere 2 for the study of biospherics and closed ecological systems, *Advances in Space Research*, 2003, Vol. 31, issue 7, 1629-1640.

M. Nelson, J. Allen, A. Alling, W.F.Dempster, and S. Silverstone, 2003. Earth applications of closed ecological systems: relevance to the development of sustainability in our global biosphere, *Advances in Space Research*, 2003, Vol. 31, issue 7, 1649-1656. doi: 10.1016/S2073-1177(03)00104-2

M. Nelson, W.F. Dempster, A. Alling, J.P. Allen, R. Rasmussen, S. Silverstone, M. Van Thillo, Initial experimental results from the Laboratory Biosphere closed ecological system facility, paper presented at the World Space Congress, COSPAR general assembly, Houston, TX, October 2002, *Advances in Space Research*, 2003, Vol. 31, issue 7, 1721-1730

Dempster, W.F., Alling, A., van Thillo, M., Allen, J.P. Silverstone, S. and M. Nelson, 2002. Technical review of the Laboratory Biosphere closed ecological system facility, presented at COSPAR/IAF meeting, Houston, October 2002, *Adv. Space Res*., 34: 1477-1482, 2004.

H. Morowitz, J.P. Allen, M. Nelson and A. Alling, 2005. Closure as a Scientific Concept and its Application to Ecosystem Ecology and the Science of the Biosphere, paper presented at COSPAR, Paris, 2004; *Advances in Space Research* 36(7):1305-1311.

M. Nelson, W.F. Dempster, S. Silverstone, A. Alling, J.P. Allen and M. van Thillo, 2005. Crop Yield and Light/Energy Efficiency in a Closed Ecological System: Laboratory Biosphere experiments with wheat and sweet potato, *Advances in Space Research* 35 (9): 1539-1543, 2005.

S. Silverstone, M. Nelson, A. Alling and J.P. Allen, Soil and crop management experiments in the Laboratory Biosphere: An analogue system for the Mars on Earth® facility, *Advances in Space Research* 35 (9):1544-1551, 2005.

Alling, A., M. Van Thillo, W. F. Dempster, M. Nelson, S. Silverstone, J. Allen, 2005, The Mars On Earth® Project: Lessons Learned from Biosphere 2 and Laboratory Biosphere Closed Systems Experiments, *Biological Sciences in Space* 19(4): 250-260

Dempster, W.F, Allen, J. Alling, A., Nelson, M., Silverstone, S. and M.Van Thillo, 2005. Atmospheric dynamics in the "Laboratory Biosphere" with wheat and sweet potato crops, *Adv. Space Res*.35:1552-1556.

Nelson, M., W.F. Dempster, J.P. Allen, S. Silverstone, A. Alling, Cowpeas and pinto beans: Performance and yields of candidate space crops in the Laboratory Biosphere closed ecological system, *Adv. Space Research* 41(5):748-753 (2008)

Nelson, M.; Allen, J.P. and Dempster, W.F. Integration of lessons from recent research for "Earth to Mars" life support systems, *Adv. Space Research* 41(5):675-683 (2008).

Nelson, M.; Allen, J.P. and Dempster, W.F. "Modular Biospheres" – A new platform for education and research" *Adv. Space Research* 41(5):787-797 (2008).

Nelson, M., R. Tredwell, A. Czech, G. Depuy, M. Suraja and F. Cattin, Worldwide Applications of Wastewater Gardens and Ecoscaping: Decentralised Systems which Transform Sewage from Problem to Productive, Sustainable Resource International Conference on Decentralised Water and Wastewater Systems, Environmental Technology Centre, Murdoch University, Fremantle, W.A. July 2006, published in: Decentralised *Water and Wastewater Systems : International Conference, Fremantle, Western Australia, 10-12 July 2006*, pp. 63-73, edited by Kuruvilla Mathew, Stewart Dallas, Goen Ho, *IWA Publications*, London, 2008

Nelson, M., S. Silverstone, P. Burrowes, R. Joglar, M. Robertson and T. Vakil, 2010. The Impact of Hardwood Line-Planting on Tree and Amphibian Biodiversity in a Secondary Wet Tropical Forest, Southeast Puerto Rico, *Journal of Sustainable Forestry* 29(5):503-516.

Nelson, M., W.F. Dempster and J. Allen, 2009. The Water Cycle in Closed Ecological Systems: Perspectives from the Biosphere 2 and Laboratory Biosphere Systems, *Advances in Space Research* 44(12)1404-1412.

S. Anilir, M. Nelson and J.P. Allen, Designing a Small-scale Infra-free (IF) System for Community Applications: Managing Energy, Water and Waste, *Journal of Asian Architecture and Building Engineering*, Vol 7 (1):77-84, 2008.

Visccher, A.M, A-L Paul, M. Kirst, A.K. Alling, S. Silverstone, G. Nechitailo, M.Nelson, W.F. Dempster, M. van Thillo, J.P. Allen and R.J. Ferl, Effects of a spaceflight environment on heritable changes in wheat gene expression, *Astrobiology* 9(4), DOI: 10.1089/ast.2008.0311, 2009.

Dempster, William F., Nelson, M., Silverstone, S., Allen, J.P., 2009. Carbon dioxide dynamics of combined crops of wheat, cowpea, pinto beans in the Laboratory Biosphere closed ecological system. *Advances in Space Research* 43: 1229-1235 (2009). doi:10.1016/j.asr.2008.12.005

Tredwell, R. and M. Nelson, 2009. Effective Approaches for Environmental & Wastewater Management and Training – The Birdwood Downs Case Studies in the Kimberley Region Of West Australia, paper for the Murdoch University/ Conference, July 2006, Published in*: Sustainability of Indigenous Communities in Australia*, eds. G. Ho, K. Mathew and M. Anda, pp. 207-220, Murdoch University, Murdoch, West Australia.

Nelson, M., and Wolverton, B.C., 2011. Plants + Soil/Wetland Microbes and Food Crop Systems that also Clean Air and Water. *Advances in Space Research* (2011) http://dx.doi.org/10.1016/j.asr.2010.10.007

Nelson, M. and H. Bohn, 2011. Soil-based Biofiltration for Air Purification: Potentials for Environmental and Space Life Support Application. *Journal of Environmental Protection* (2011) http://file.scirp.org/Html/7949.html

Nelson, M., S. Silverstone, K.C. Reiss, T. Vakil and M. Robertson, Enriched secondary subtropical forest through line-planting for sustainable timber production in Puerto Rico, *Bois et Forêts des Tropiques* 309(3):51-63 (November 2011).

Nelson, M., W.Dempster, J. Allen, 2013. Key Ecological Challenges for Closed Systems Facilities. *Advances in Space Research* (2013). http://dx.doi.org/10.1016/j.asr.2013.03.019

Nelson, M., K. Gray and J.P. Allen, 2015. Group dynamics challenges: Insights from Biosphere 2, *Life Sciences in Space Research* 6(2015):79-86. http:dx.doi.org/10.1016/j.lssr.2015.07.003

Nelson, M., 2015. Mars Water Discoveries – Implications for Finding Ancient and Current Life, Editorial/Commentary, *Life Sciences in Space Research* October 2015. DOI: 10.1016/j.lssr.2015.10.006

Saggaï, M., Abdelkader, A., Nelson, M., Cattin, and Abdelhak. E. A., 2017. Long-term investigation of constructed wetland wastewater treatment and reuse: Selection of adapted plant species for metaremediation, *Journal of Environmental Management* (201): 1 October 2017, 120-128.

Nelson, M. (2018, in press). Some Ecological and Human Lessons of Biosphere 2, European Journal of Ecology.

Conference Presentations / Magazine Articles

Nelson, M.: Man in the Desert, Desert Conference, Institute of Ecotechnics. Santa Fe, New Mexico, 1977.

Nelson, M.: Patterns of mountain settlement correlated with changes in modes of transport; Mountain Conference, Institute of Ecotechnics, Katmandu, Nepal, 1979.

Nelson, M.: Conceptual Model to Evaluate Ecological Regions; in **Man, Earth, and the Challenges**, proceedings of the Institute of Ecotechnics Planet Earth Conference, Synergetic Press, London, 1981.

Nelson, M.: Vernadsky and the Biosphere, presented at Brown University and Vernadsky Institute Micro symposium, Brown University, Providence, R.I., 1988.

Nelson, M.: Mission to Planet Earth and Biosphere 2 Seminar, Planetary Society, held at the Biosphere 2 site, Oracle, Arizona, 1990.

Nelson, M., Alvarez-Romo, N., MacCallum, T.: The Biosphere 2 Project and its Potential Role in Assisting the Space Exploration Initiative , presented at the Innovative Technologies for the Space Exploration Initiative Symposium of the American Astronautical Society, held at Johnson Space Center, Houston, 1990.

"Design Paradigm for the 21st Century", lectures at the Forum 2000, Nagoya Urban Institute, Nagoya, Japan, 2000 and at the conference of the Human-Centered Design Initiative, Tokyo, Jan. 28, 2000.

"Natural Systems of Wastewater Recycle and Use", May 2001 at Udyana University, Bali, Indonesia at workshop on "A New Ecotechnic Approach to Wastewater Treatment"

"Biosphere 2 and the Ecological Engineering Design Paradigm", May, 2001 at the University of the Pacific, Manila, Philippines at their workshop on Environmental Conservation

Nelson, M. and Tredwell, R., 2002. "Wastewater Gardens": Creating urban oases and greenbelts by productive use of the nutrients and water in domestic sewage, paper for *Conference on Cities as Sustainable Ecosystems*, April 2002 sponsored by United Nations Environment Program and Environmental Technology Centre, Murdoch University, Perth, Australia.

"Introduction and Overview of constructed wetlands for wastewater treatment, ecological restoration and water conservation", and "Wastewater Gardens: Application experience in varying climates around the world", two talks at the Jagellonian University International Workshop on Constructed Wetlands, Krakow, Poland, October 2005.

Nelson M., Cattin F., Tredwell R., Depuy G, Suraja M., Czech A., Why there are no better systems than Constructed Wetlands to treat sewage water? - Advantages, Issues and Challenges, *II International Congress SmallWAT07*, Center of New Water Technologies (CENTA), Ministry of Environment, on « Sewage water treatment in small communities », November 2007, Sevilla, Spain.

Nelson, M. F. Cattin, M. Rajendran, R. Tredwell and L. Hafouda, Value-adding through creation of high diversity gardens and ecoscapes in subsurface flow constructed wetlands: Case studies in Algeria and Australia of constructed wetland systems. Paper presented at the *11th International Conference on Wetland Systems for Water Pollution Control*, November 2008, Indore, India. https://www.researchgate.net/publication/267845275_Value-adding_through_creation_of_high_diversity_gardens_and_ecoscapes_in_subsurface_flow_constructed_wetlands_Case_studies_in_Algeria_and_Australia_of_Wastewater_Gardens_R_systems; https://www.scribd.com/document/71926481/2008-IWAIndia-Copy.

Hafouda L, Hadad M, Arif Y, Djafri K, Balleche O, Talab B, Debba M S, Nelson M, Cattin F, 2008. (L'épuration des eaux usées domestiques par les plantes; une alternative a encouragé pour une préservation durable de l'environnement on zones arides; Cas de la station pilote du vieux Ksar de Temacine ; Touggourt). C*olloque international « Aridoculture »*. Biskra, Algérie, le 13 et le 14 Décembre 2008

Dempster, W.F., Nelson, M. and J.A. Allen, Engineering and Ecological Challenges of Closed Ecological Systems, paper presented at the 2010 COSPAR assembly, Bremen, Germany

Nelson, M., A. Hemsley and M. Anda, Subsurface Flow Wetlands for Domestic Wastewater Treatment in the Southwest of Western Australia, paper for the *International Water Management Conference*, Murdoch University, February 2011

Nelson, M., 2014. "An evaluation of aquaponics – integrated fish aquaculture with plant cropping – for bioregenerative space life support systems", paper presented at the COSPAR General Assembly, Moscow, Russia, August 2014. In preparation for the journal of *Life Sciences in Space Research*.

Nelson, M., 2015 "From Biosphere 2 to southern Iraq to space applications: Wastewater Garden technology", presentation at the Restoring Eden environmental design workshop, March 2015 at Nanyang Technological University, Singapore

Nelson, M. 2015. "Lessons from Biosphere 2, land restoration, sustainable farming and wastewater recycling", talk at the Clean Economy Summit, Albuquerque, NM March 2015.

Nelson, M. 2015. "Ecotechnics: Learning to Integrate with the Biosphere"**, k**eynote talk on Earth Day, April 2015 at Santa Fe Community College, Santa Fe, NM

Nelson, M., 2016 Keynote talk at the Dallas County Community Colleges District Sustainability Summit, Cedar Valley College, 15 April 2016. "Making Peace With Mother Earth: Practical Applications in Sustainability From a Biosphere Pioneer" and leading an all-day workshop on 16 April 2016 for the Clean Carbon Economy Series in Dallas, TX

Popular Magazine Articles

Nelson, M. Leaving the Planetary Cradle, *The World and I Magazine*, February, 1991, p. 388, Washington Times Corp., Washington D.C.

Nelson, M. The Emerging Science of the Biosphere, *The World and I Magazine*, May 1991, Washington Times Corp., Washington D.C.

Nelson, M., Dhyr, K., and Hawes, P., Biosphere 2: Laboratory, Architecture, Symbol and Paradigm, *International Synergy Journal*, Spring 1991.

Nelson, M. "Notes from the Biosphere" October 1991, *Dartmouth Alumni Magazine*
http://archive.dartmouthalumnimagazine.com/search?QueryTerm=biosphere%202

Nelson, M., 1994. Lessons for Space Settlement from the Two Year Closure Experiment in Biosphere 2, Ad Astra, magazine of the National Space Society, 1994.

Nelson, M and W.F. Dempster, Biosphere 2 — A New Approach to Experimental Ecology. Journal of Environmental Conservation, https://www.cambridge.org/core/journals/environmental-conservation/article/biosphere-2-a-new-approach-to-experimental-ecology/70DF2B35A15AACC655270A5954343C1E, https://doi.org/10.1017/S0376892900037255
Published online: 01 August 2009

Solutions Journal, "Adam and Eve's Sewage Problem," July 2014. https://www.thesolutionsjournal.com/article/adam-and-eves-sewage-problem/

World Water journal, "Greening the Planet" by Mark Nelson and Florence Cattin, July/August 2014

Permaculture Magazine, January 2015. https://www.permaculture.co.uk/book-reviews/wastewater-gardener

Setting the Record Straight about Biosphere 2, Motherboard, Vice News, June 24, 2017
https://motherboard.vice.com/en_us/article/mbjz43/setting-the-record-straight-about-the-biosphere-2

https://www.tucsonweekly.com/tucson/a-grand-experiment/Content?oid=14953305
A Grand Experiment: Cover photo and excerpt from "Pushing our Limits: Insights from Biosphere 2"

"The Sea Inside" .http://www.santafenewmexican.com/pasatiempo/books/talks_lectures/the-sea-inside-life-inside-biosphere/article_f499159a-6d8f-58c5-b89e-5376260eb9a8.html

Dartmouth Alumni Magazine, May/June 2018 “Two years out of this world,” M. Nelson
https://dartmouthalumnimagazine.com/articles/biosphere-2-what-really-happened

Interview with Mark Nelson, “The Sea Inside, ”Santa Fe Pasatiempo magazine, May 2018
http://www.santafenewmexican.com/pasatiempo/books/talks_lectures/the-sea-inside-life-inside-biosphere/article_f499159a-6d8f-58c5-b89e-5376260eb9a8.html

Nelson, M. with F. Pearce, “My life in a Bubble”, Retrospective, New Scientist (UK), 14 July 2018.
https://www.newscientist.com/article/mg23931860-500-what-happens-when-you-seal-eight-people-in-a-giant-bubble/

Nelson, M. “Lessons from Biosphere 2,” The Scientist, August 2018
https://www.the-scientist.com/reading-frames/lessons-from-biosphere-2-64464

Nelson, M, 2018. “Biosphere 2’s Science and the Importance of Biospherics to our Future”, The Ecologist (UK) online magazine, August 2018.

Nelson, M. “A View from Another World,” Geographical Magazine (UK), September 2018.
http://geographical.co.uk/magazine/issues/item/2861-september-2018

Video and audio talks

Mark Nelson: “Forty Years of Ecology, Adventure and Radical Cultural Innovation
Talk on Institute of Ecotechnics and Biosphere 2” at the October Gallery, London, 13 June 2016
https://www.youtube.com/watch?v=GTZqApw_8Hw&feature=youtu.be

“Life In Biosphere 2” at New Bioeconomics Symposium 2014. https://www.youtube.com/watch?v=Y0K8gOngjJ0
or: http://ecotechnics.edu/2013/10/mark-nelson-on-life-under-glass/

https://www.youtube.com/watch?v=3O4-_4OYQ-c
Biosphere 2: Story of the Original Design and Building told by Project Co-Founders

https://www.elephantjournal.com/2014/07/the-taboo-of-poo-preserving-the-planet-with-human-waste/
and: https://www.youtube.com/watch?v=lMJAV2R3ycs

https://ecotechnics.edu/2012/02/video-of-presentation-on-biosphere-2-at-the-santa-fe-institute/

https://www.nbcnews.com/video/we-were-all-slightly-space-nuts-biosphere-2-pioneer-751856707850. Interview with NBC news June 2015, broadcast August 2015

Radio Café KSFR Santa Fe. http://www.santaferadiocafe.org/sfradiocafe/2014/07/10/mark-nelson/
Discussing “The Wastewater Gardener: Preserving the Planet one Flush at a Time” July 10, 2014

Lessons from Biosphere 2, Mark Nelson speaking with Joanna Harcourt Smith and Jacob Aman, August 2018;
https://futureprimitive.org/2018/08/insights-from-biosphere-2/

Future Primitive, August 2014, Mark Nelson talking about his book The Wastewater Gardener and Biosphere 2.
https://futureprimitive.org/2014/08/the-wastewater-gardener/

Memberships

Fellow, Royal Geographical Society (2000-2004), Elected Fellow, Explorer’s Club (1994). Vice-Chairman, Subcommission F4 (Space Life Sciences – Natural and Artificial Ecosystems), Committee on Space Research (2004-2012), Main Scientific Organizer and Deputy Organizer, F4.1 COSPAR Innovative Approaches to Space Habitation (2008-2018).

Research interests

Ecological engineering, organic farming and orchardry, innovative ecological methods of wastewater treatment and use, arid zone agriculture and development , sustainable agricultural and rainforest systems, tropical savannah ecology, closed ecological systems; group dynamics, philosophy of science.