

Current Position

Professor of Astrophysical Sciences and International Affairs, Princeton University, Princeton, New Jersey 08544

Director, PhD program in security studies, Princeton School of Public and International Affairs

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Selected Government Service

Member, External Review Committee, Global Security Directorate, Lawrence Livermore National Laboratory (2018-present)

Member, President's Council of Advisors on Science and Technology (PCAST), 2009-2017
Co-chair, report to the President on antibiotic resistance
Co-chair, report to the President on biodefense

Member, Review of U.S. Human Spaceflight Plans Committee, June-October, 2009.

Staff of National Security Council (director for international environmental affairs) and Office of Science and Technology Policy, 1993-1995

Contractor for White House to draft President's Decision Directive on response strategy for emerging infectious diseases (PDD NSTC-7), 1995-1996

Contractor for White House to draft strategy document for building on emerging diseases strategy to prepare for bioterrorism, 1996-1997

Committee Service

Member, Editorial Board for *Astrobiology*

Member, Editorial Board for *Science and Global Security*

Member, Editorial Board for *International Security* (begins 2021)

Member, Committee on International Security Studies, American Academy of Arts and Sciences, 2018 to present

Co-Chair, Meeting the Challenge of the New Nuclear Age, American Academy of Arts and Sciences, 2017 to present.

Co-Chair, PCAST [President's Council of Advisors on Science and Technology] Working Group on Defense Against Biological Attack, 2016-2017.

Co-Chair, PCAST [President's Council of Advisors on Science and Technology] Antibiotic Resistance Working Group, 2013-2015.

Member, President's Council of Advisors on Science and Technology (PCAST), August 2009-January 2017.

Member, Review of U.S. Human Spaceflight Plans Committee, June-October, 2009.

Member, Advisory Panel for UN Secretary General's Biotechnology Initiative.

Member, Advisory Council, Foundational Questions Institute (FQXi) (February 2006 to present).

Member, SETI Institute Board of Trustees (2005 to 2006)

Co-Chair, Working Group on Relative Threat Assessment, Princeton Project on National Security. 2005.

Chair, National Research Council Committee on Preventing the Forward Contamination of Mars, February 2004 to December 2005.

Member, Institute of Medicine/National Research Council Committee on Advances in Technology and the Prevention of Their Application to Next Generation Biowarfare Threats, February 2004 to 2005

Member, NASA Astrobiology Institute Executive Committee, October 2003 to July 2005.

Member, National Academy of Sciences Committee on International Security and Arms Control (CISAC), 2002 to present. Chair of CISAC Membership Subcommittee, 2005 to December 2009.

Member, NASA Astrobiology Institute Director's Science Council, April 2002-October 2003.

Member, NASA Astrobiology Institute Director's Search Committee, March 2002.

Member, Board of Editors, *Science and Global Security* (2002 to present)

Member, Editorial Advisory Board, *Astrobiology* (2002 to present)

Member, Monterey Nonproliferation Strategy Group, 2001-2006.

Co-Chair, Strategic Planning Group, SETI Institute (December 2000 to 2005).

Member, SETI LITU Humpback Whale Communication Expedition, Glacier Bay, Alaska, August 2000.

Chair, NASA Solar System Exploration Subcommittee (1999 to 2000)

Member, Executive Committee, NASA Space Science Advisory Committee (1999 to 2000)

Member, Defense Threat Reduction Agency Biological Warfare Defense Panel (1998 to 2001)

Chair, NASA Europa Orbiter Mission Science Definition Team, (September 1997 to 1999)

Chair, Editorial Advisory Board, *The Planetary Report* (January 1997 to 1999)

Chair, Harvard/JPL/SETI Workshop on Searching for Life on Europa (March 1999)

Chair, NASA Campaign Strategy Working Group on Prebiotic Chemistry in the Outer Solar System (February 1998 to January 1999)

Student, *Microbial Diversity* (250 laboratory hours, 110 lecture hours), Woods Hole Marine Biological Laboratory, June 13-July 29, 1999.

Student, *Workshop on Molecular Evolution*, Woods Hole Marine Biological Laboratory, August 1-August 13, 1999.

Member, NASA Solar System Exploration Subcommittee (February 1998 to January 1999).

Member, NASA Astrobiology Institute Director Search Committee (1998).

Member, NASA Exobiology Review Panel (Sept. 1995 to February 1998).

Member, Board of Advisors, Teach for America Math and Science Initiative (1996 to 1998).

Participant, NASA Breckenridge Workshop (May 1997)

Chair, Science Team, *Europa Ocean Discovery* Discovery mission proposal (1996)

Member, NASA Campaign Strategy Working Group on Pre-Biotic Chemistry in the Outer Solar System (November 1996)

Member, NASA Roadmap Development Team (Jan. 1996 to Aug. 1996)

Member, NASA Rosetta Endorsement Review Panel (Sept. 1995)

Member, NASA Discovery Missions Review Panel (Dec. 1994-Jan. 1995)

Member, NASA Mars Science Working Group (1992-1994)

Co-convenor, "Comets and the Origins and Evolution of Life" Conference, University of Wisconsin, Eau Claire (October 1991)

Member, U.S.-Soviet Exobiology Expedition to Northeastern Siberia (June-August 1991)

Graduate Student Associate, Voyager Imaging Team, Voyager spacecraft Uranus and Neptune flybys (1986, 1989)

Member, American Center for International Leadership (ACIL) delegation to Chernobyl (June 1989)

Education

Ph.D. Astronomy (Planetary Science) 1991, Cornell University, New York, U.S.A. Committee: Carl Sagan (Chair), Joe Burns, Martha Haynes, Phil Nicholson, Steve Squyres

M.Phil. History and Philosophy of Science 1986, University of Cambridge, Cambridge, England

B.A. Mathematics (Mathematical Physics) 1984, M.A. 1990, University of Cambridge

B.A. Physics (minors in Philosophy and Mathematics) 1982, Swarthmore College

Professional Honors

Member, President's Council of Advisors on Science and Technology (PCAST), August 2009-January 2017.

Fellow, American Association for the Advancement of Science, September 2003

Doctor of Science honorary degree, Swarthmore College June 1, 2003

MacArthur Fellow, 2001-2006

Presidential Early Career Award for Scientists and Engineers, December 1996

"50 for the Future: Time's roster of America's most promising leaders age 40 and under," *Time Magazine*, December 5, 1994.

White House Fellow, 1993-1994

Sage Graduate Fellow (Cornell University 1985-1987)

Marshall Scholar (University of Cambridge 1982-1985)

Phi Beta Kappa, Sigma Xi (Swarthmore College 1982)

Journal Publications

C. F. Chyba, C. Cassel, S. L. Graham, J. P. Holdren, Eric S. Lander, R. Levin, E. Penhoet, W. Press, M. Savitz, H. Varmus, "The Coming COVID-19 Commission," *Science*, in review.

C. F. Chyba, "Local Hidden Variable Model Without Negative Probabilities that Violates the Bell-CHSH Inequality," *Physical Review Letters*, in review.

Christopher F. Chyba, "New Technologies and Strategic Stability," *Daedalus*, Vol. 149 (2), Spring 2020, pp. 150-170.

Christopher F. Chyba and Robert Legvold, "Conclusion: Strategic Stability and Nuclear War," *Daedalus*, Vol. 149 (2), Spring 2020, pp. 222-237.

Robert Legvold and Christopher F. Chyba, "Introduction: The Search for Strategic Stability in a New Nuclear Era," *Daedalus* Vol. 149 (2), pp. 6-16.

Christopher F. Chyba, Kevin P. Hand, and Paul J. Thomas, "Electrical Heating of Planetary Satellites," *Icarus*, being revised in response to referees' comments.

Christopher F. Chyba & Kevin P. Hand, "Reply to 'Comment on "Electric Power Generation from Earth's Rotation through its Own Magnetic Field," "' *Physical Review Applied*, Vol. 13, 028002 (2020).

Christopher F. Chyba & Kevin P. Hand, "Laboratory Production of Electricity from Earth's Rotation Through Its Own Magnetic Field," *Nature*, being revised in response to referees' comments.

C. F. Chyba and K. P. Hand, "Electric Power Generation from Earth's Rotation Through its Own Magnetic Field," *Physical Review Applied*, Vol. 6, No. 1, 014017 (July 2016). <http://physics.aps.org/articles/v9/91>

C. F. Chyba, K. P. Hand and P. J. Thomas, "Energy conservation and Poynting's theorem in the homopolar generator," *American Journal of Physics*, Vol. 83, No. 1 (January 2015), pp. 72-75. <http://dx.doi.org/10.1119/1.4895389>

C. F. Chyba and C. R. Milne, "Simple calculation of the critical mass for highly enriched uranium and plutonium-239," *American Journal of Physics*, Vol. 82, No. 10 (October 2014), pp. 977-979. <http://dx.doi.org/10.1119/1.4885379>

K. P. Hand, K. Khurana, and C. F. Chyba, "Joule Heating of the South Polar Terrain on Enceladus," *Journal of Geophysical Research—Planets*, vol. 116 (2011), E04010, doi:10.1029/2010JE003776.

C. F. Chyba, "The Hazy Details of Early Earth's Atmosphere—Response," *Science*, vol. 330 (5 November 2010), pp. 755-756.

- W. B. Sparks, M. McGrath, K. Hand, H. C. Ford, P. Geissler, J. H. Hough, E. L. Turner, C. F. Chyba, R. Carlson, and M. Turnbull, "Hubble Space Telescope Observations of Europa In and Out of Eclipse," *International Journal of Astrobiology*, vol. 9, no. 4 (2010), pp. 265-271.
- C. F. Chyba, "Perspectives/Atmospheric Science: Countering the Early Faint Sun," *Science*, vol. 328 (4 June 2010), pp. 1238-1239.
- R. Liemer and C. F. Chyba, "A Verifiable Limited Test Ban for Anti-Satellite Weapons," *The Washington Quarterly*, vol. 33, no. 3 (July 2010), 149-163.
- C. Chyba and A. Nouri, "Reply: Preventing the Misuse of Gene Synthesis," *Nature Biotechnology*, vol. 27, no. 9 (September 2009), p. 801.
- C.F. Chyba and J.D. Crouch, "Understanding the U.S. Nuclear Weapons Policy Debate," *The Washington Quarterly*, Vol. 32, No. 3 (July 2009), pp. 21-36.
- A. Nouri and C.F. Chyba, "Proliferation-Resistant Biotechnology: An Approach to Improve Biological Security," *Nature Biotechnology*, Vol. 27, No. 3 (March 2009), pp. 234-236.
- C.F. Chyba, "Time for a Systematic Analysis: U.S. Nuclear Weapons and Nuclear Proliferation," *Arms Control Today*, Vol. 38, No. 10 (December 2008), pp. 24-29.
- L.R. Doyle, B. McCowan, S.F. Hanser, C. Chyba, T. Bucci, and J.E. Blue, "Applicability of Information Theory to the Quantification of Responses to Anthropogenic Noise by Southeast Alaskan Humpback Whales," *Entropy*, vol. 10, 2008, pp. 33-46.
- J.D. Koenig and C.F. Chyba, "Impact Deflection of Potentially Hazardous Asteroids Using Current Launch Vehicles," *Science and Global Security*, vol. 15, no. 1, 2007, pp. 57-83.
- K.P. Hand and C.F. Chyba, "Empirical Constraints on the Salinity of the European Ocean and Implications for a Thin Ice Shell," *Icarus*, vol. 189, 2007, pp. 424-438.
- K.P. Hand, R.W. Carlson, and C.F. Chyba, "Energy, Chemical Disequilibrium, and Geological Constraints on Europa," *Astrobiology* vol. 7, 2007, pp. 1006-1022.
- K.P. Hand, C.F. Chyba, R.W. Carlson, and J. Cooper, "Clathrate Hydrates of Oxidants in the Ice Shell of Europa," *Astrobiology* vol. 6. No. 3 (2006), pp. 463-482.
- C.F. Chyba, "Biotechnology and the Challenge to Arms Control," *Arms Control Today* 36(8), October 2006, pp. 11-17.
- C.F. Chyba and K.P. Hand, "Astrobiology: The Study of the Living Universe," *Annual Reviews of Astronomy and Astrophysics* vol. 43 (2005), pp. 31-74.
- C.F. Chyba, "Perspectives/Atmospheric Science: Rethinking Earth's Early Atmosphere," *Science* vol. 308 (13 May 2005), pp. 962-963.
- C.F. Chyba, "Letters: Don't Dismiss Astrobiology," *Science* vol. 308 (22 April 2005), pp. 495-496.
- C. Braun and C.F. Chyba, "Proliferation Rings: New Challenges to the Nuclear Nonproliferation Regime," *International Security* vol. 29, no. 2 (Fall 2004), pp. 5-49.
- C.F. Chyba and A.L. Greninger, "Biotechnology and Bioterrorism: An Unprecedented World," *Survival* vol. 46, no. 2 (Summer 2004), pp. 143-162.
- C.F. Chyba, "Book Review: The Global Threat of New and Reemerging Infectious Diseases: Reconciling US National Security and Public Health Policy," *Survival* vol. 46, no. 1 (Spring 2004), pp. 163-164.

- Persistence of Thin Ice Regions in Europa's Ice Crust (L. Buck, C.F. Chyba, M. Goulet, A. Smith and P.J. Thomas). 2002 *Geophysical Research Letters*, 29, 12-1-12-4.
- Defining 'Life' (C. Cleland and C.F. Chyba). 2002 *Origins of Life and Evolution of the Biosphere* 32, 387-393.
- Cometary delivery of biogenic elements to Europa (E. Pierazzo and C.F. Chyba). 2002 *Icarus* 157, 120-127.
- Toward Biological Security (C.F. Chyba). May/June 2002 *Foreign Affairs* 81(3), 122-136. Reprinted in R.D. Howard and R.L. Sawyer, eds., *Terrorism and Counterterrorism: Understanding the New Security Environment* (McGraw-Hill/Dushkin, Guilford Connecticut, 2002), pp. 174-184.
- Europa as an Abode of Life (C.F. Chyba and C.B. Phillips). 2002. *Origins of Life and Evolution of the Biosphere* 32, 47-68.
- Letters: A unified definition of biosecurity (L.A. Meyerson, J.K. Reaser, and C.F. Chyba). 2002. *Science* 295, 44.
- Biological Security after September 11th (C.F. Chyba). Fall-Winter 2002 *Stanford Journal of International Relations*, 3(2), 12-15.
- Editorial: Biological security in a changed world (C.F. Chyba). 2001. *Science* 293, 2349.
- Perspectives/Planetary science: Life without photosynthesis. (C.F. Chyba and K.P. Hand). 2001. *Science* 292, 2026-2027.
- Possible ecosystems and the search for life on Europa (C.F. Chyba and C.B. Phillips). 2001. *Proceedings of the National Academy of Sciences USA* 98, 801-804.
- Seismic detectability of a subsurface ocean on Europa (R.L. Kovach and C.F. Chyba). 2001. *Icarus* 150, 279-287.
- Biological terrorism and public health (C.F. Chyba). 2001. *Survival* 43, 93-106. Reprinted in A. O'Day, ed., *Weapons of Mass Destruction and Terrorism* (Ashgate Publishing, Ltd., Aldershot, 2004), pp. 115-128.
- Letters: Building biodefenses (C.F. Chyba). May/June 2001 *Foreign Affairs* 80(3), 152.
- Correction: Energy for microbial life on Europa (C.F. Chyba). 2000. *Nature* 406, 368.
- Energy for microbial life on Europa (C.F. Chyba). 2000. *Nature* 403, 381-382.
- Racemization of meteoritic amino acids (B. Cohen and C.F. Chyba). 2000. *Icarus*, 145, 272-281.
- Amino acid survival in large cometary impacts (E. Pierazzo and C.F. Chyba). 1999. *Meteoritics and Planetary Science* 32, 909-918.
- Book review: An exobiologist's life search. (C.F. Chyba), 1999. *Nature* 401, 857-858.
- Radar detectability of a subsurface ocean on Europa (C.F. Chyba, S.J. Ostro, B.C. Edwards). 1998. *Icarus* 134, 292-302.
- Monitoring the Comprehensive Test Ban Treaty: Possible ambiguities due to meteorite impacts (C.F. Chyba, G.E. van der Vink and C.B. Hennek). 1998. *Geophysical Research Letters* 25, 191-194.

Letters: Organic shielding of greenhouse gases on early Earth (S.L. Miller, J.R. Lyons and C.F. Chyba). 1998. *Science* 278, p.779a.

News and Views/Origins of life: Buried beginnings (C.F. Chyba). 1998. *Nature* 395, 329-330.

The early faint Sun paradox: organic shielding of ultraviolet-labile greenhouse gases (C. Sagan and C. Chyba). 1997. *Science* 276, 1217-1221.

News and Views/Origins of life: A left-handed solar system? (C.F. Chyba). 1997. *Nature* 389, 234-235.

News and Views/Exobiology: Life on other moons (C.F. Chyba). 1997. *Nature* 385, 201.

Carl Sagan (1934-1996) (C.F. Chyba). 1997. *EOS Trans.* 78(16), 167.

William Reid Thompson, 1952-1996 (C.F. Chyba). 1997. *Bull. Am. Astron. Soc.*, 29, 1492-1493.

News and Views/Exobiology: Life beyond Mars (C.F. Chyba). 1996. *Nature* 382, 576-577.

The origin of life in the Solar System: current issues (C.F. Chyba and G.W. McDonald). 1995. *Annual Review of Earth and Planetary Sciences* 24, 215-249. Reprinted in *Origins of Planets and Life* (ed. J. Melosh), pp. 265-299, Annual Reviews Inc., Palo Alto, 1997.

Comets in other planetary systems? (C.F. Chyba). 1995. *Advances in Space Research* 15(3): 45-48.

Book review (C.F. Chyba). 1994. *Environmental Evolution: Effects of the Origin and Evolution of Life on Planet Earth*. (eds. L. Margulis and L. Olendzenski), MIT Press, Cambridge, MA. *Icarus* 109, 219-220.

Explosions of small Spacewatch objects in the Earth's atmosphere (C.F. Chyba). 1993. *Nature* 363, 701-703.

The 1908 Tunguska explosion: atmospheric disruption of a stony asteroid (C.F. Chyba, P.J. Thomas, and K.J. Zahnle). 1993. *Nature* 361, 40-44.

The violent environment of the origins of life: progress and uncertainties (C.F. Chyba). 1993. *Geochimica et Cosmochimica Acta* 57, 3351-3358.

Production and optical constants of ice tholin from charged particle irradiation of (1:6) C₂H₆/H₂O at 77 K (B.N. Khare, W.R. Thompson, L. Cheng, C. Chyba, C. Sagan, E.T. Arakawa, C. Meisse, and P.S. Tuminello.) 1993. *Icarus* 103, 290-300.

Endogenous production, exogenous delivery and impact-shock synthesis of organic molecules: an inventory for the origins of life (C. Chyba and C. Sagan). 1992. *Nature* 355, 125-132. Reprinted in *Origins of Life: The Central Concepts* (eds. D.W. Deamer and G.R. Fleischaker), 123-130, Jones and Bartlett, Boston (1994).

Terrestrial mantle siderophiles and the lunar impact record (C.F. Chyba). 1991. *Icarus* 92, 217-233.

Electrical energy sources for organic synthesis on the early Earth (C. Chyba and C. Sagan). 1991. *Origins of Life and Evolution of the Biosphere* 21, 3-17.

Cometary delivery of organic molecules to the early Earth (C.F. Chyba, P.J. Thomas, L. Brookshaw, and C. Sagan). 1990. *Science* 249, 366-373. Reprinted in *Origins of Life: The Central Concepts* (eds. D.W. Deamer and G.R. Fleischaker), 213-220, Jones and Bartlett, Boston (1994).

Triton's streaks as windblown dust (C. Sagan and C. Chyba). 1990. *Nature* 346, 546-548.

Impact delivery and erosion of planetary oceans in the early solar system (C.F. Chyba). 1990. *Nature* 343, 129-133.

News and Views/Meteoritics: Extraterrestrial amino acids and terrestrial life (C.F. Chyba). 1990. *Nature* 348, 113-114. Reprinted in D.B. Cline, ed., *Physical Origin of Homochirality in Life* (American Institute of Physics, Woodbury, New York, 1996), pp. 3-4.

Voyager 2 at Neptune: Imaging science results (B.A. Smith *et al.*). 1989. *Science* 246, 1422-1449.

Orbital evolution in the Neptune-Triton system (C.F. Chyba, D.G. Jankowski, and P.D. Nicholson). 1989. *Astronomy and Astrophysics* 219, L23-L26.

The heliocentric evolution of infrared cometary spectra: results from an organic grain model (C.F. Chyba, C. Sagan, and M.J. Mumma). 1989. *Icarus* 79, 362-381.

Solid organic residues produced by irradiation of hydrocarbon-containing H₂O and H₂O/NH₃ ices: infrared spectroscopy and astronomical implications (B.N. Khare, W.R. Thompson, B.G.J.P.T. Murray, C.F. Chyba, C. Sagan, and E.T. Arakawa). 1989. *Icarus* 79, 350-361.

On the obliquity and tidal heating of Triton (D.G. Jankowski, C.F. Chyba, and P.D. Nicholson). 1989. *Icarus* 80, 211-219.

Organic cometary matter still a contentious issue (C. Chyba and C. Sagan). 1988. *Nature* 332, 592.

The cometary contribution to the oceans of primitive Earth (C.F. Chyba). 1987. *Nature* 330, 632-635.

Infrared emission by organic grains in the coma of comet Halley (C. Chyba and C. Sagan). 1987. *Nature* 330, 350-353.

Cometary organics but no evidence for bacteria (C. Chyba and C. Sagan). 1987. *Nature* 329, 208.

Kaluza-Klein unified field theory and apparent four-dimensional spacetime (C.F. Chyba). 1985. *American Journal of Physics* 53, 863-872.

Time-dependent embeddings for Schwarzschild-like solutions to the gravitational field equations (C.F. Chyba). 1982. *Journal of Mathematical Physics* 23, 1662-1667.

U.S. military-support equipment sales to the People's Republic of China (C.F. Chyba). 1981. *Asian Survey* 21, 469-484.

The effect of coolant loss on current leads for superconducting magnets (C. Chyba, L.G. Hyman, and L. Roberts). 1981. *Cryogenics* 21, 615-618.

Congressional Testimony

Testimony of Christopher F. Chyba for the Hearing before the Subcommittee on Science and Space, Committee on Science, Commerce, and Transportation, on "Contributions of Space to National Imperatives," United States Senate, 112th Congress, 1st session, May 18, 2011.

Testimony of Christopher F. Chyba for the Hearing before the Subcommittee on Space and Aeronautics, Committee on Science, on "Life in the Universe," House of Representatives, 107th Congress, 1st session, July 12, 2001, Serial No. 107-17.

Edited Books and Journal Volumes

R. Legvold and C. F. Chyba, Eds. (Spring 2020) "[Meeting the Challenges of the New Nuclear Age.](#)" *Daedalus* Vol. 149 (2).

G. Bunn and C.F. Chyba, eds., *U.S. Nuclear Weapons Policy: Confronting Today's Threats* (Washington DC: Brookings Institution Press, 2006), 340 pp.

P.J. Thomas, R.D. Hicks, C.F. Chyba, and C.P. McKay, eds. *Comets and the Origin and Evolution of Life*, 2nd ed. (Springer-Verlag, New York, 2005), 365 pp.

P.J. Thomas, C.F. Chyba, and C.P. McKay, eds. *Comets and the Origins and Evolution of Life*. (Springer-Verlag, New York, 1997), 296 pp.

Book Chapters

A. Nouri and C. F. Chyba, "DNA Synthesis Security," in Jean Pecoud (ed.), *Gene Synthesis: Methods and Protocols*, Methods in Molecular Biology, vol. 852, DOI 10.1007/978-1-61779-564-0_21 (Springer, 2012), pp. 285-296.

C. Braun and C. F. Chyba, "Proliferation Rings: New Challenges to the Nuclear Nonproliferation Regime," in M. E. Brown, Owen R. Coté, S. M. Lynn-Jones and S. E. Miller, Eds., *Going Nuclear: Nuclear Proliferation and International Security in the 21st Century* (Cambridge, MA: MIT Press, 2010), pp. 368-412.

K. P. Hand, C. F. Chyba, J. C. Priscu, R. W. Carlson, and K. H. Nealson, "Astrobiology and the Potential for Life on Europa," in R. Pappalardo, W. McKinnon, and K. Khurana, eds. *Europa* (Tucson: University of Arizona Press, 2009), pp. 589-629.

A. Nouri and C.F. Chyba, "Biotechnology and Biosecurity," in N. Bostrom and M.M. Cirkovic, *Global Catastrophic Risks*, Oxford University Press, Oxford, 2008, pp. 450-480.

C.F. Chyba, "Second-Tier Suppliers and Their Threat to the Nuclear Nonproliferation Regime," in J.F. Pilat, Ed., *Atoms for Peace: A Future after Fifty Years?* (Johns Hopkins Univ. Press, Baltimore, 2007), pp. 117-127.

C.F. Chyba, "Time for Comprehensive Policies on Nuclear and Biological Weapons," in J. Laurenti and C. Robichaud, Eds., *Breaking the Nuclear Impasses: New Prospects for Security Against Weapons Threats*, Century Foundation, New York, 2007, pp. 51-60.

C.F. Chyba and C.B. Phillips, "Europa," in W.T. Sullivan and J.A. Baross, Eds., *Planets and Life: The Emerging Science of Astrobiology*, Cambridge Univ. Press, Cambridge, 2007, pp. 388-423.

C. Cleland and C.F. Chyba, "Does 'Life' Have a Definition?" in W.T. Sullivan and J.A. Baross, Eds., *Planets and Life: The Emerging Science of Astrobiology*, Cambridge Univ. Press, Cambridge, 2007, pp. 119-131.

C.F. Chyba, "Epilogue," in W.T. Sullivan and J.A. Baross, Eds., *Planets and Life: The Emerging Science of Astrobiology*, Cambridge Univ. Press, Cambridge, 2007, pp. 558-559.

C.F. Chyba and K. Sasikumar, "A World of Risk: The Current Environment for U.S. Nuclear Weapons Policy," in G. Bunn and C.F. Chyba, eds., *U.S. Nuclear Weapons Policy: Confronting Today's Threats* (Washington DC: Brookings Institution Press, 2006), pp. 1-33.

C.F. Chyba, C. Braun, and G. Bunn, "New Challenges to the Nonproliferation Regime," in G. Bunn and C.F. Chyba, eds., *U.S. Nuclear Weapons Policy: Confronting Today's Threats* (Washington DC: Brookings Institution Press, 2006), pp. 126-160.

- C.F. Chyba, C. Braun, and G. Bunn, "Strategies for Tackling Proliferation Challenges," in G. Bunn and C.F. Chyba, eds., *U.S. Nuclear Weapons Policy: Confronting Today's Threats* (Washington DC: Brookings Institution Press, 2006), pp. 161-219.
- G. Bunn and C.F. Chyba, "U.S. Nuclear Weapons Policies for a New Era," in G. Bunn and C.F. Chyba, eds., *U.S. Nuclear Weapons Policy: Confronting Today's Threats* (Washington DC: Brookings Institution Press, 2006), pp. 297-323.
- C.F. Chyba and K.P. Hand, "Comets and Prebiotic Organic Molecules on Early Earth," in P.J. Thomas, R.D. Hicks, C.F. Chyba, and C.P. McKay, eds. *Comets and the Origin and Evolution of Life*, 2nd ed. (Springer-Verlag, New York, 2006), pp. 177-214.
- E. Pierazzo and C.F. Chyba, "Impact Delivery of Prebiotic Organic Matter to Planetary Surfaces," in P.J. Thomas, R.D. Hicks, C.F. Chyba, and C.P. McKay, eds. *Comets and the Origin and Evolution of Life*, 2nd ed. (Springer-Verlag, New York, 2006), pp. 143-176.
- C.F. Chyba, "Contingency and the Cosmic Perspective," in W. Orchiston, ed., *The New Astronomy: Opening the Electromagnetic Window and Expanding our View of Planet Earth* (Springer, Dordrecht, Netherlands, 2005), pp. 27-39.
- C.F. Chyba, "Biological terrorism and public health," in A. O'Day, ed., *Weapons of Mass Destruction and Terrorism* (Ashgate Publishing, Ltd., Aldershot, England, 2004), pp. 115-128.
- C.F. Chyba, "Toward Biological Security," in R.D. Howard and R.L. Sawyer, eds., *Terrorism and Counterterrorism: Understanding the New Security Environment* (McGraw-Hill/Dushkin, Guilford Connecticut, 2004), pp. 198-207.
- R. Greeley, C.F. Chyba, J.W. Head, T. McCord, W.B. McKinnon, and R.T. Pappalardo. "Geology of Europa," in F. Bagenal, T.E. Dowling, W.B. McKinnon, eds., *Jupiter: The Planet, Satellites and Magnetosphere* (Cambridge Univ. Press, Cambridge, 2004), pp. 329-362.
- Prospects for Life on Europa (K.P. Hand and C.F. Chyba). *Frontiers of Life* (The Gioi Publishers, Vietnam, 2003), L.M. Celnikier and J. Tran Thanh Van, eds. pp. 167-171.
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Professional Experience and Previous Positions

Associate Professor, Department of Geological and Environmental Sciences, Stanford University, Stanford California (October 1999 to July 2005; began this period as Associate Professor (Research) before receiving tenure)

Co-Director, Center for International Security and Cooperation (CISAC), Stanford University, Stanford California (October 1999 to July 2005)

Carl Sagan Chair for the Study of Life in the Universe, The SETI Institute, 2035 Landings Drive, Mountain View (September 1998 to July 2005)

Assistant Professor, Department of Planetary Sciences, The University of Arizona, Tucson, Arizona, 85721 (August 1996 to August 1998).

Contractor, White House Office of Science and Technology Policy (September 1997 to April 1998). Researched and wrote study on improving surveillance for biological terrorism.

Contractor, White House Office of Science and Technology Policy (August 1995 to April 1996). Developed and drafted Presidential directive on U.S. Government response to the threat of emerging infectious diseases.

Visiting Scientist, Department of Geosciences and Center for Energy and Environmental Studies, Princeton University, Princeton, NJ 08544-1003 (August 1995 to August 1996).

Energy Liaison, Division of National Security and International Affairs, White House Office of Science and Technology Policy, the White House (Oct. 1994-July 1995).

Director for International Environmental Affairs, National Security Council staff, The White House (Sept. 1993-Oct. 1994).

National Research Council Associate (NASA Ames Research Center and Goddard Space Flight Center, 1991-1993)

Teaching Assistant (introductory astronomy), Astronomy Department, Cornell University (1987-1988)

Laboratory Assistant to Dr. Neal B. Abraham (chaos in ring laser system), Physics Department, Bryn Mawr College (summer 1982)

Undergraduate Research Participation Program, with Dr. Lloyd G. Hyman (superconducting magnet code; neutrino oscillation monte carlo code), Argonne National Laboratory (autumn 1980)

National Science Foundation Undergraduate Research Project, with Dr. John R. Boccio (black hole evolution), Physics Department, Swarthmore College (summer 1990)

Research Assistant to Dr. Eric Silver (X-ray diagnostic on the PDX fusion tokamak), Princeton University Plasma Physics Laboratory (summer 1979)

Research Assistant to Dr. David Rosen (development of three-dimensional computer graphics package in APL language), Mathematics Department, Swarthmore College (summer 1978)

Teaching Assistant (undergraduate laboratory), Physics Department, Swarthmore College (1978-1980)