

LOREN COBB

Address

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Education

PhD in Mathematical Sociology from Cornell University, Ithaca, New York.
MA in Sociology from Cornell University, Ithaca, New York.
BA in Mathematics from Cornell University, Ithaca, New York.

Current Positions

2009– Associate Research Professor, Department of Mathematical and Statistical Sciences (primary appointment), University of Colorado Denver.
2010– Associate Research Professor, Department of Sociology (25%), University of Colorado Denver.

Previous Positions

2008–09 Visiting Assistant Professor, Department of Mathematical and Statistical Sciences, University of Colorado Denver.
2006–08 Contractor, NationLab Project, Center for Hemispheric Defense Studies, National Defense University, Washington DC.
1988–08 President, Ætheling International Consultants.
1988–93 Research Associate Professor, Department of Family Medicine, University of New Mexico Medical School, Albuquerque, New Mexico.
1979–88 Associate Professor, Dept. of Biostatistics, Epidemiology, and Systems Science, Medical University of South Carolina, Charleston, South Carolina.
1977–79 NIMH Post-Doctoral Fellow, Department of Psychiatry, University of South Florida Medical School, Tampa, Florida.
1972–77 Assistant Professor, Department of Sociology and Anthropology, University of New Hampshire, Durham, New Hampshire.

Honors & Awards

2008 *Conferencista* (honorary professor), College of Advanced Strategic Studies, San Salvador, El Salvador.
2007 Plenary Address, Institute for Operations Research and Management Science.

- 2004 *Emblema de Oro* — Gold Medal of the School of Advanced National Studies of Bolivia, presented for the development of NationLab.
- 1992 IBM OS/2 Developer’s Award (for CodeCheck).
- 1991 *Computer Language* Productivity Award (for CodeCheck).
- 1969–70 Woodrow Wilson Fellow.
- 1966–72 Ford Foundation 6-Year Ph.D. Program Scholar.

Languages

English, German, Spanish (all reasonably fluent).

Grants and Contracts

- 2009– National Library of Medicine, “Improved Epidemic Tracking” (grant, \$600k, Principal Investigator).
- 2009– US Southern Command, “Non-Kinetic Exercise Model” (subcontract, through Northrop Grumman IT, Inc., \$300k, Principal Investigator).
- 2006–08 Center for Hemispheric Defense Studies, National Defense University, “NationLab” (subcontract, through Northrop Grumman IT, Inc.)
- 1998–06 US Southern Command, “NationLab” (subcontract, through Northrop Grumman IT, Inc.)
- 1996–04 US Southern Command, “DEXES: Deployable Exercise System for Military Operations Other Than War” (subcontract, through Northrop Grumman (1996-2004), and Synectics Corp. (1994-96))
- 1997–03 US Office of the Joint Staff/J8 & Ministry of Defence of Sweden, “Strategic Management System” (subcontract, through George Mason University (2002-03), BAE Systems (2000-01), and Synectics Corp (1997-01))
- 1994–96 US Air Force Space & Missile Center, “Space Effectiveness Analysis System” (subcontract, through Synectics Corp.)
- 1994–95 UK Ministry of Defence, “Mathematical Automata for C³I” (subcontract, through Synectics Corp.)
- 1991–95 US Office of the Joint Staff, DoD, “Basic Technology for the Next Generation of Models with Embedded Command and Control” (subcontract, through Synectics Corp.)
- 1990 Rome Laboratories, “Electronic Workbench Integration” (subcontract, through Synectics Corp.)
- 1988–90 Defense Advanced Research Projects Agency, “Stochastic Nonlinear Dynamical Systems” (subcontract, through Synectics Corp.)
- 1987–89 US Office of the Joint Staff, DoD, “Decision Aids Based on Catastrophe Theory Manifolds” (subcontract, through Synectics Corp.)

- 1988 US Office of the Joint Staff, DoD, “Research into the Applicability of Cellular Automata Mathematics” (subcontract, through Synectics Corp.)
- 1986 Rome Laboratories, “Indications and Warnings Applications of Catastrophe Theory” (subcontract, through Synectics Corp.)
- 1985 Office of the Joint Staff, DoD, “Numerical Solution & Computer Graphics for Stochastic Lanchester Equations” (Contractor)
- 1980-83 National Science Foundation (ISP-80-11451), “Statistical Theory for Non-linear Dynamical Systems with Singularities” (Co-Principal Investigator)
- 1973-77 National Science Foundation (SOC-73-40074 & SOC-75-13737), “Periodicities in Long-Term Interaction” (Co-Principal Investigator)

Courses Taught

Undergraduate

Human Communication
 Mathematical Sociology
 Population Dynamics
 Methods of Social Research
 Probability and Statistics
 Mathematical Statistics
 Biomedical Computing
 Methods of Social Psychology

Graduate (MS & PhD)

Statistical Consulting Workshop
 Stochastic Processes I & II
 Time Series Analysis
 Mathematical Statistics I & II
 Applied Statistical Analysis
 Exploratory & Robust Data Analysis
 Game Theory for Anthropology
 Sociological Research Methods
 Introduction to Biostatistics
 Artificial Intelligence
 Mathematics of Computer Graphics
 Compiler Construction
 Assembly Language Programming

International Exercises and Leadership Seminars

Between 1995 and 2008:

- Designed and facilitated a series of annual two-day Epidemic Crisis Management exercises in Peru, Paraguay, El Salvador, the Dominican Republic, Ecuador, Uruguay, and Honduras. Epidemics were either smallpox or avian influenza.
- Designed and facilitated crisis management exercises and seminars for the National Security Councils of Ecuador and Colombia.
- Designed and facilitated 20+ high-level week-long “NationLab” exercises in national strategic issues in Bolivia, Peru, Paraguay, El Salvador, the Dominican Republic, Ecuador, Uruguay, and Honduras. Alumni of these exercises have become cabinet ministers, ambassadors, central bankers, generals, presidential advisors, and executives.
- Designed and facilitated six week-long “RegionLab” exercises in hemispheric multinational negotiations at the Inter-American Defense College (the educational institution of the Organization of American States, located in Washington, DC).

- Wrote dynamic mathematical simulations to support eleven multinational peacekeeping exercises in Latin America. Provided on-site liaison between civilian, United Nations, and military exercise groups.
- Wrote dynamic mathematical simulations to support four major multinational humanitarian disaster relief exercises in Latin America. Focus was on the inter-agency process, managing refugee flows, and cholera epidemics. Provided on-site liaison between civilian, United Nations, OAS, and military exercise groups.
- Assisted the Office of the Presidency of Honduras with the formulation and testing of their first National Strategic Plan.

Major Software Projects

- 2010– **DEXES-II**, a second-generation social-political-medical-refugee simulation for the analysis, planning, and training for international complex humanitarian emergencies, peacekeeping, and non-traditional conflict.
- 2008 **StrategyLab**, a simulation of the social and political conditions that gave rise to the current low-level insurgency in Paraguay.
- 2003–2008 **RegionLab**, a simulation for regional security issues, used annually in international crisis management exercises at the Inter-American Defense College, a branch of the Organization of American States.
- 1999–2003 **STRATMAS**, simulation and optimization of civil/military peacekeeping operations, humanitarian operations, natural disasters, and health emergencies.
- 1998–2008 **NationLab**, a simulation of socio-economic development, used annually in national strategic exercises in Bolivia, Dominican Republic, Ecuador, El Salvador, Honduras, Paraguay, Peru, and Uruguay.
- 1995–2008 **DEXES**, a social-political-medical-refugee simulation for peacekeeping and disaster relief operations, used in over 25 multinational exercises throughout the hemisphere.
- 1989–2004 **CodeCheck**, published by Abraxas Software, Inc., Portland, Oregon. This is a static code analysis tool and language for checking C and C++ source code for compliance with corporate standards, in use by many Fortune-500 companies.

Patents

- 1994 US patent #5293629, for the software algorithms introduced in CodeCheck.

Books and Special Issues

Cobb L. *A Survey of Non-kinetic War and its Precursors in Latin America and the Caribbean*. Miami, FL: US Southern Command, 2010.

Cobb, L. [*C and C++ Code Analysis using CodeCheck*](#). Portland, OR: Abraxas Software, 1989.

Cobb, L and Thrall, RM (eds.) *Mathematical Frontiers of the Social and Policy Sciences*. Boulder, CO: Westview Press, 1981.

Chapters in Books

Cobb, L (in press) “The Impact of Social Theory on Model Development”, in *Human, Social, Cultural, and Behavioral Modeling*, edited by M Baranick. Washington, DC: NDU Press.

Christensson, SA, Woodcock, AER, Hitchins, DK, and Cobb, Loren (2004) “Modeling the Governance and Stability of Political Dynamical Systems.” In *The Cornwallis Group VIII Proceedings*, pp. 123–161. Clementsport, Nova Scotia: The Canadian Peacekeeping Press.

Kume, Y, Liu, C-L, and Cobb, L (2003) “Management of Information and Knowledge in Human Computer Interaction using System for Cusp Surface Analysis.” In *Human-Centered Computing: Cognitive, Social and Ergonomic Aspects*, edited by Don Harris. Mahwah, New Jersey: Lawrence Erlbaum Associates.

Cobb, L (2001) “NationLab 1999: The Economic and Social Reconstruction of Bolivia.” In *Analysis for Crisis Response and Societal Reconstruction*, edited by AER Woodcock and D Davis. Clementsport, Nova Scotia: The Canadian Peacekeeping Press.

Woodcock, AER, and Cobb, L (1999) “Training and Exercise Support for Peace and Humanitarian Operations.” In *Analysis for Peace Operations*, edited by AER Woodcock and D Davis. Clementsport, Nova Scotia: The Canadian Peacekeeping Press.

Woodcock, AER, Hitchins, DK, and Cobb, L (1998) “The Strategic Management System (STRATMAS).” In *Proceedings of the Fourth International Command and Control Research and Technology Symposium*, held in Stockholm, Sweden.

Woodcock, AER, Cobb, L, and Dockery, JT (1993) “The Electronic Workbench: A Synthetic Modeling and Analysis Environment.” In *The Military Landscape*, edited by AER Woodcock and JT Dockery. Cambridge, England: Woodhead Press.

Woodcock, AER, Cobb, L, and Langendorf, M (1993) “Catastrophe Theory Analysis of Indications and Warnings Problems.” In *The Military Landscape*, edited by AER Woodcock and JT Dockery. Cambridge, England: Woodhead Press.

Woodcock, AER, Cobb, L, and Dockery, JT (1993) “Cellular Automata Models.” In *The Military Landscape*, edited by AER Woodcock and JT Dockery. Cambridge, England: Woodhead Press.

Kume, Y, Murata, A, and Cobb, L (1992) “Application of Stochastic Catastrophe Models to Visual Perception.” in *Advances in Industrial Ergonomics and Safety, IV*. Edited by S Kumar. Bristol, PA: Taylor & Francis.

- Cobb, L and Zacks, S (1988) “Nonlinear Time Series Analysis for Dynamical Systems of Catastrophe Type.” In *Nonlinear Time Series and Signal Processing*, edited by R Mohler. New York: Springer-Verlag.
- Cobb, L (1988) “Statistical Catastrophe Theory.” In *The Encyclopedia of the Statistical Sciences, Vol. 8*, edited by NL Johnson and S Kotz. New York: Wiley-Interscience. [Translated into Japanese, 1990.] doi: 10.1002/0471667196.ess2528.pub2
- Cobb, L (1983) “Stochastic Difference Equations.” In *Modules in Applied Mathematics, vol. 2*, edited by SJ Brams, WF Lucas, and PD Straffin. New York: Springer-Verlag. [First published in 1976 by the Mathematics Association of America, then reprinted by Springer.]
- Hayes, DP and Cobb, L (1982) “Cycles of Spontaneous Conversation and Silence under Long-Term Isolation.” In *Interaction Rhythms*, edited by M Davis, New York: Human Sciences Press.
- Cobb, L (1981) “The Multimodal Exponential Families of Statistical Catastrophe Theory.” In *Statistical Distributions in Scientific Work, Vol. 4*, edited by C Taillie, GP Patil, and B Baldessari. The Netherlands: Reidel Press.
- Crain, BR and Cobb, L (1981) “Parameter Estimation for Truncated Exponential Families.” In *Statistical Distributions in Scientific Work, Vol. 5*, edited by C Taillie, GP Patil, and B Baldessari. The Netherlands: Reidel Press.
- Cobb, L (1981) “[Stochastic Differential Equations for the Social Sciences](#).” In *Mathematical Frontiers of the Social and Policy Sciences*, edited by L Cobb and RM Thrall. Boulder, CO: Westview Press.
- Hayes, SP and Cobb, L (1979) “Ultradian Biorhythms of Social Interaction.” In [Of Time and Speech: Temporal Speech Patterns in Interpersonal Contexts](#), edited by A Siegman and S Feldstein, New York: Erlbaum Associates.

Refereed Journal Articles

- Ghorbani, MA, Khatibi, R, Sivakumar, B, and Cobb, L (2010) “[Study of discontinuities in hydrological data using catastrophe theory](#),” *Hydrological Sciences Journal*, vol. 55, #7, 1137–1151, (doi: 10.1080/02626667.2010.513477).
- Mandel, J, Beezley, J, Cobb, L, and Krishnamurthy, A (2010) “[Data driven computing by the morphing fast Fourier transform ensemble Kalman filter in epidemic spread simulations](#),” *Procedia Computer Science*, vol. 1, 1215–23.
- Cobb, L, and González, MA (2007) “[Explaining corruption as a system of interlocking vicious cycles](#),” *Security and Defense Studies Review*, vol. 7, #1.

- Orrison, WW, Gentry, LR, Stimac, GK, Tarrel, RM, Espinosa, MC, and Cobb, L (1994) "Blinded comparison of cranial CT and MR in closed head injury evaluation." *American Journal of Neuro Radiology*, vol. 15, 351-356.
- Olson, LM, Sklar, DP, Cobb, L, Sapien, R, and Zumwalt, R (1993) "An analysis of childhood pedestrian deaths in New Mexico." *Annals of Emergency Medicine*, 22, #3, 512-516.
- Orrison, WW, Stimac, GK, Stevens, EA, LaMasters, DL, Espinosa, MC, Cobb, L, and Mettler, FA (1991) "Comparison of CT, ultra-low-field MRI, and high-field MRI." *Radiology*, vol. 181, #1, 121-128.
- Cobb, L, Cyr, L, Schmehl, MK, and Bank, H (1989) "Comparison of statistical methods for the analysis of limiting dilution assays." *In Vitro*, vol. 24, 76-81.
- Schmehl, MK, Cobb, L, and Bank, H (1989) "Power analysis of statistical methods for comparing treatment differences from limiting dilution assay." *In Vitro*, vol. 25, 69-75.
- Schmehl, MK, Bank, HL, and Cobb, L (1989) "Evaluation and validation of statistical methods for viability assays: Monte Carlo simulation and power analysis of limiting dilution assay data." *Cryobiology*, vol. 26, 239-247.
- Smith, SM, Hoy, WE, and Cobb, L (1989) "Low incidence of glomerulosclerosis in normal kidneys." *Archives of Pathology and Laboratory Medicine*, vol. 113, 1253-1255.
- Woodcock, AER, Cobb, L, and Dockery, JT (1989) "Models with embedded C2 V: Cellular Automata." *International C.I.S. Journal*, vol. 3, #3, 5-44.
- Woodcock, AER, Cobb, L, and Dockery, JT (1989) "Models with embedded C2 IV: The decision space." *International C.I.S. Journal*, vol. 3, #2, 5-31.
- Hurwitz, GA, Webb, HG, Walle, T, Gourley, LA, and Cobb, L (1988) "Enhanced exercise norepinephrine concentrations during propranolol treatment: A limiting factor in cardiac beta-adrenoceptor blockade." *Canadian Journal of Cardiology*, vol. 4, 262-269.
- Giacanelli, M, Liguori, M, ... Pickett, JB, and Cobb, L. (1986), "Motor amplitude measurement." *Muscle & Nerve*, 9: 756-759. doi: 10.1002/mus.880090812
- Cobb, L and Zacks, S (1985) "[Applications of catastrophe theory for statistical modeling in the biosciences](#)." *Journal of the American Statistical Association*, vol. 80, 793-802.
- Wong, MY, Thompson, RP, Cobb, L, and Fitzharris, TP (1983) "Computer reconstruction of serial sections." *Computers and Biomedical Research*, vol. 16, 580-586.
- Cobb, L, Koppstein, P, and Chen, NH (1983) "[Estimation and moment recursion relations for multimodal exponential distributions](#)." *Journal of the American Statistical Association*, vol. 78, 124-130.

Smith, CE and Cobb, L (1982) “The stationary moments of Poisson-driven nonlinear dynamical systems.” *Journal of Applied Probability*, vol. 19, 702-706.

Cobb, L and Watson, WB (1980) “Statistical catastrophe theory: An overview.” *Mathematical Modeling*, vol. 1, 311-317.

Cobb, L (1981) “[Parameter estimation for the cusp catastrophe model.](#)” *Behavioral Science*, vol. 26, 75-78. doi: 10.1002/bs.3830260107

Cobb, L (1978) “[Stochastic catastrophe models and multimodal distributions.](#)” *Behavioral Science*, vol. 23, 360-374. doi: 10.1002/bs.3830230407

Cobb, L and Ragade, RK. “[Applications of Catastrophe Theory in the Behavioral and Life Sciences,](#)” *Behavioral Science*, 23, #5, 1978. doi: 10.1002/bs.3830230511

Papers Accepted for Publication

Cobb, L (to appear 2011) “Mathematics of the Cold War”, to appear in *Encyclopedia of Mathematics and Society*. Pasadena, CA: Salem Press.

Mandel, J, Cobb, L, and Beezley, J (to appear 2010) “On the convergence of the ensemble Kalman filter”, to appear in *Applications of Mathematics*.

Papers Submitted for Publication

Papers in Preparation

Cobb, L (in prep) “National Income and Fertility Dynamics, 1975–2005”.

Cobb, L (in prep) “The Geometry of Statistics”.

Recent Presentations and Invited Lectures

(in Reverse Chronological Order)

2010

- Oct: “Adventures of a Freelance Mathematician”, presentation to the 2010 Regional NSF GK-12 Conference, Denver, Colorado.
- Sept: Presentation on “Improved Tracking for Emerging Epidemics from Climate Change” at the Board of Regents of the National Library of Medicine, Bethesda, MD.
- June: Presentation on "Tracking Spatial Epidemics with the Morphing FFT Ensemble Kalman Filter" at the 2010 International Conference on Computer Science in Amsterdam, The Netherlands.

- May: Presentation on "Non-Kinetic Exercise Model" at the JCAC 2010 Conference at the National Defense University, Washington, DC.
- April: Presentation on "The Statistics and Agnotology of Anthropogenic Global Warming", Math Department, UC-Denver.
- Mar: Presentation on "Trauma and War", Sociology Department, UC-Denver.
Presentations on "Survey of Irregular War" to the US Embassies in Paraguay, Colombia, and El Salvador, and to the National War College of Colombia.
- Feb: Presentation on "Genomics: Past, Present, and Future" at the Boulder Future Society, Boulder, Colorado.

2009

- Nov: Presentation on "Tracking Emerging Epidemics", Workshop on Health Consequences of Climate Change, National Institutes of Health, Bethesda, MD.
Invited lecture on "The Future of War and Peace", La Vida Llena, Albuquerque, New Mexico.
- Oct: Presentation with Jan Mandel on "Convergence of the Ensemble Kalman Filter", Statistics Department, Colorado State University.
Invited lecture on "The Future of Public Health", Colorado School of Public Health, Aurora, Colorado.
- Sept: Presentation on "The Coming Revolution in Social Dynamics" at the Triple Nine Society Global Gathering, Denver, Colorado.
Presentation on "The Geometry of Statistics", Math Department, UC-Denver.
- June: Presentation on "Impact of Social Theory on Model Development", Conference on Human, Social, Cultural, and Behavioral Modeling, National Defense University.
- March: Invited lecture on "Perspectives on Global Warming", La Vida Llena, Albuquerque, New Mexico.
- Feb: Presentation on "Convergence of the Ensemble Kalman Filter", Math Department, UC-Denver.

2008

- Nov: Presentation on "Simulations of Society" at the *People's Café*, Lafayette, CO.
- Sept: Presented daily simulation briefings at the *StrategyLab 2008 Paraguay Strategic Seminar*, Instituto de Altos Estudios Estratégicos, Asunción, Paraguay.
- Aug: Presentation on "Simulations of Society" at the *Boulder Future Society*.
- July: Presented a paper on "The Impact of Social Theory on Model Development", and co-chaired the "Macro-scale Social Modeling" at the *Workshop on Human, Social, Cultural, and Behavioral Modeling*, National Defense Univ.

- June: Facilitated and presented daily simulation briefings for the *NationLab El Salvador 2008 Strategic Seminar*, Centro de Altos Estudios, San Salvador, El Salvador.
- May: Facilitated and presented daily simulation briefings for the *RegionLab 2008 Strategic Seminar*, Inter-American Defense College, Washington DC.

Departmental Service

Director, Statistical Consulting Service, Department of Mathematical and Statistical Sciences, University of Colorado Denver.

Miscellaneous

Erdős Number = 4 (For an explanation, see: <http://www.oakland.edu/enp/>)

Path: *Paul Erdős — Gordon Basil — Sinai Robins — Shelemyahu Zacks — Loren Cobb.*

Mathematics Genealogy Project: <http://www.genealogy.ams.org/html/id.phtml?id=105912>

Memberships:

American Sociological Association
American Mathematical Society
American Statistical Association