Robert Stewart

Curriculum Vitae
January, 2016

Research Interests

I am geographic data scientist in the Geographic Information Science and Technology (GIST) group at the Oak Ridge National Laboratory and a joint faculty assistant professor in Geography at the University of Tennessee. My work is focused on statistical and computational methods in the areas of spatial and spatiotemporal modeling, with an emphasis on uncertainty, risk, and decision analytics. Areas of application include population dynamics, sociocultural/economic analytics, social media, and environmental risk. Quantifying uncertainty and risk as well as understanding the implications of both for decision making is a recurring theme in my work. I currently serve as team lead for the Geographic Data Sciences Team within the GIST group.

Education

2011 Ph.D. Geography, University of Tennessee
1995 M.S. Mathematics, University of Tennessee
1992 B.S. Mathematics and Statistics, University of Tennessee

Experience

2009-present **Geographic Data Sciences Team Lead, Oak Ridge National Laboratory**
As team lead, I oversee a diverse and talented group of ORNL staff, post-docs, interns and students. Research by this team spans a wide spectrum of expertise including imagery analytics, remote sensing, data mining, modeling and simulation, visualization, machine learning, and other big data challenges applied to a wide range of research domains. As researcher, my work is typically computational in nature with a focus on spatial and spatiotemporal analytics, population dynamics, uncertainty analysis, risk, and decision support. As a PI I currently lead the World SpatioTemporal Analytics and Mapping Project (WSTAMP), the Spatial Analysis and Decision Assistance Project (SADA), and significantly contribute to a number of other projects within larger the Geographic Information Science and Technology Group. Also, I currently serve as the ORNL liaison to the World Health Organization's Chemical Risk Network.

2011-present **Joint Faculty Assistant Professor of Geography, University of Tennessee**
Focus is on proposal development, serving on graduate committees, periodically teaching, and mentoring students in summer programs at the Oak Ridge National Laboratory.

1994-2009 **University of Tennessee Senior Research Associate**
Activities included serving as principle investigator, technical lead, and in most cases point of contact with sponsoring agencies such as the Environmental Protection Agency, the Nuclear Regulatory Commission, the Department of Energy, and the Oak Ridge National Laboratory. Effort centered largely on management and development of the Spatial Analysis and Decision Assistance (SADA) software program.

Professional Affiliations

The Society for Risk Analysis
Association of American Geographers
International Society for Bayesian Analysis
International Association for Mathematical Geosciences
World Health Organization Chemical Risk Assessment Network Member

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Awards, Honors, Service

2015	Invited Speaker, JASON Summer Study, San Diego.
	Invited Speaker, 1st International Symposium on Spatio-temporal Computing, George Mason.
2014	DOE Oak Ridge National Laboratory Significant Event Award for R&D in WSTAMP Project
	ORNL Liaison to WHO Chemical Risk Network (presently serving)
2013	Invited Panelist, Characterization & Survey For Decommissioning & Waste Management, WM2013, Phoenix.
	Invited Speaker, Colloquium, University of Chicago at Illinois, School of Public Health
2011	Joint Faculty Member, Geography Department, UT Knoxville (presently serving)
2010	Environmental Protection Agency 2010 Scientific and Technological Achievement Award
ongoing	Reviewer for several journals including Risk Analysis, Applied Geography, Mathematical Geosciences, Environmental Modelling and Software, International Journal of Geographic Science, and Stochastic Environmental Research and Risk Assessment

Peer Review Publications

Stewart, R.N., M Urban, A Morton, and S Duchscherer, *A Bayesian Machine Learning Model for Estimating Building Occupancy from Open Source Data*, Natural Hazards (2016).

Stewart, R.N., J Piburn, A Sorokine, A Myers, and D White (2015) *World Spatiotemporal Analytics and Mapping Project (WSTAMP): Discovering, Exploring, and Mapping Spatiotemporal Patterns across the World's Largest Open Source Geographic Data Sets*, ISPRS Annals of Photogrammetry, Remote Sensing, and Spatial Information Sciences. Volume II-4W2.

Stewart, R.N., J Piburn, E Weber, M Urban, A Morton, G Thakur, and B Bhaduri, (2015). *Can social media play a role in developing building occupancy curves for small area estimation?* Geocomputation 2015, Dallas, Texas.

Piburn, J, A Morton, and **R.N. Stewart** (2015). *Attribute Portfolio Distance: A Dynamic Time Warping based approach to comparing and detecting common spatiotemporal patterns among multi-attribute data portfolios*. Geocomputation 2015, Dallas, Texas.

Morton, A, N Nagle, J Piburn, **R.N. Stewart**, R McManamay (2015). *Hybrid Dasymetric and Machine Learning Approach to High-Resolution Residential Electricity Consumption Modeling*. Geocomputation 2015, Dallas, Texas.

Stewart, R.N., K Tucker, and F Dolislager (2015) *SADA: A Free Geospatial Human Health Risk Tool*, Society of Toxicology Annual Meeting, San Diego, CA.

Thakur, G., B Bhaduri, J Piburn, K Sims, **R.N. Stewart**, M Urban (2015). PlanetSense: A Real-time Streaming and Spatio-temporal Analytics Platform for Gathering Geo-spatial Intelligence from Open Source Data, ACM Sigspatial, Seattle, WA.

Stewart, R.N., M Urban, J Weaver, and D White. A Geographic Data Fusion Model for Estimating Quantitative Population Dynamics from Qualitative Survey Data. Journal of GEOINT Science. (2015)

Bhaduri, B., E Bright, A Rose, C Liu, M Urban, and **R.N. Stewart** (2014), Data Driven Approach for High Population Distribution and Dynamics Models, Winter Simulation Conference, Savannah, Georgia.

Purucker, S.T., **R.N. Stewart,**, and J Wulff (2014) *A spatial decision support system for efficient environmental assessment and remediation*. In Madden, M., Allen, E., (Eds.) Landscape Analysis Using Geospatial Tools, Springer-Verlag.

Stewart, R.N. D White, M Urban, A Morton, C Webster, M Stoyanov, E Bright, and B Bhadui (2013) *Uncertainty quantification techniques for population density estimates derived from sparse open source data.* Proceedings of the SPIE: Geospatial InfoFusion III (refereed) 8747: 874705-874705.

Stewart, R.N. (2012) *A Subsurface Decision Model for Supporting Environmental Compliance*, NUREG/CR-7021. Washington, D.C., United States Nuclear Regulatory Commission.

Stewart, R.N. (2011). *A Geospatial Based Decision Framework for Extending MARSSIM Regulatory Principles into the Subsurface*. Doctoral Dissertation, Department of Geography at the University of Tennessee.

Stewart, R.N. and S.T. Purucker (2011) *An environmental decision support system for spatial assessment and selective remediation.* Environmental Modelling & Software 26(6): 751-760.

Purucker, S. T., **R. N. Stewart**, and C. J. Welsh (2009) *SADA: Ecological Risk Based Decision Support System for Selective Remediation*. Chapter 11, A. Marcomini, G.W. Suter, and A. Critto (ed.), Decision Support Systems for Risk Based Management of Contaminated Sites. Springer Science + Business Media, LLC, New York, NY, pgs. 239-256 (nominated for EPA 2010 Level II Scientific and Technological Achievement Award).

Mahmoud, M., Y Liu, H Hartmann, S Stewart, T Wagener, D Semmens, **R.N. Stewart**, H.V. Gupta, D Dominguez, F Dominguez, D Hulse, R Letcher, B Rashleigh, C Smith, R Street, J Ticehurst, M Twery, H van Delden, R Waldick, D White, L Winter. (2009). *A Formal Framework for Scenario Development to Support Environmental Decision Making*. Environmental Modelling & Software. 24(7): 798-808.

Liu, Y., M Mahmoud, H Hartmann, S Stewart, T Wagener, D Semmens, **R.N. Stewart**, H Gupta, D Dominguez, D Hulse, R Letcher, B Rashleigh, C Smith, R Street, J Ticehurst, M Twery, H van Delden, R Waldick, D White, and L Winter., (2008), *Formal scenario development for environmental impact assessment studies*, Developments in Integrated Environmental Assessment, edited by Jakeman, A., A. Voinov, A. E. Rizzoli, and S. Chen, Elsevier. Volume 3: 145-162.

Voinov, A., R Hood, J Daues, H Assaf, and **Stewart, R.N.** (2008) *Building a Community Modelling and Information Sharing Culture* In Developments In Integrated Environmental Assessment, edited by Jakeman, A., A. Voinov, A. E. Rizzoli, and S. Chen, Elsevier. Volume 3: 345-366.

Modis, K, H-L Yu, G Christakos, **R.N. Stewart** and G Papantonopoulos (2007). *"BME-generated temperature maps of the Nea Kessani geothermal field"*, Invited chapter, In Geothermal Energy Research Frontiers, Columbus, F. (ed.), Nova Science Publ., Inc., Hauppauge, NY.

Purucker, S.T., C.J.E. Welsh, **R.N. Stewart**, and P Starzec. (2007). *Use of habitat-contamination spatial correlation to determine when to perform a spatially explicit ecological risk assessment*. Ecological Modelling, 204(1-2):180-192 (winner of EPA 2010 Level II Scientific and Technological Achievement Award).

Conference, Symposium, and Workshop Contributions

Piburn, J, R.N.Stewart (2015) Using non-linear data mining algorithms for exploring global spatiotemporal trends, Conference on Complex Systems, Tempe, AZ.

Stewart, R.N., J Piburn, A Myers, D White, A Sorokine, 2015*, The World Spatiotemporal Analysis and Mapping Project (World STAMP).* Association of American Geographers Annual Meeting, Chicago, IL.

Duchscherer, S., **RN Stewart**, M Urban, *Reverse Engineering Census Summary Data for Population Density Estimation*, Association of American Geographers Annual Meeting, Chicago, IL.

Morton, A., Stewart, R.N. **Stewart**, S. Duchscherer, and M. Urban, 2015, *A Bayesian Model for Estimating Building Occupancy: Integrating Data, Knowledge, and Uncertainty in an Open Source Environment*, Association of American Geographers Annual Meeting, Chicago, IL.

Piburn, J., **R.N. Stewart**, 2015, *Using Dynamic Time Warping for Finding and Assessing Spatiotemporal Trends in Large Global Datasets: applications and findings from the World STAMP Project*, Association of American Geographers Annual Meeting, Chicago, IL.

Moehl, J., **R.N. Stewart**, N. Nagle, 2015, *Comparing Demographic Household Modeling Techniques*, Association of American Geographers Annual Meeting, Chicago, IL.

Urban, M., **R.N. Stewart**, A Myers, D Axley, E Bright, 2015, *Open Source Occupancy Modeling and Services*, Association of American Geographers Annual Meeting, Chicago, IL.

Stewart, R.N., A Rose, E Bright, 2014 *Spatial Analysis and Decision Assistance: A Free Program Integrating LandScan High Resolution Population Datasets with Advanced Spatiotemporal Risk-Based Decision Support Models*. Association of American Geographers Annual Meeting, Tampa, FL.

Urban, M, **RN Stewart**, A Myers, D Axley, and E Bright, 2014, *Occupancy Modeling Framework Overview*, Association of American Geographers Annual Meeting, Tampa, FL.

Stewart, R.N., Bright, Eddie, Rose, Amy, McGinn, Wilson. *Enriching Risk Based Decision Support Models with Large Scale, High Resolution Population Data*, Society for Risk Analysis Annual Meeting, December 8th-11th, 2013. Baltimore, MD.

Sorokine, A, RN Stewart, 2014, *Multiperspective Database Architecture for Spatiotemporal Geodatasets*, Association of American Geographers Annual Meeting, Tampa, FL.

Stewart, R.N. *What Can('t) SADA Do for You?*, University of Illinois at Chicago (invited speaker), 5/2013.

Stewart, R.N. and White, D. 2013. *Towards a 3D Virtual Gaming Environment for Spatiotemporal Analytics,* Association of American Geographers Annual Meeting, Los Angeles, CA, April 9th-13th.

Sorokine, A. and **Stewart, R.N.** 2013. *Ontology-driven Geographic Database Design for Spatiotemporal Data Mining,* Association of American Geographers Annual Meeting, Los Angeles, CA, April 9th-13th.

Morton, A. and **Stewart, R.N.** 2013. *A Spatiotemporal Process Model for Capturing Museum Visitation Dynamics.* Association of American Geographers Annual Meeting, Los Angeles, CA, April 9th-13th.

Moehl, J and **Stewart, R.N.** 2013. *Relating Indicators and Economic Growth*. Association of American Geographers Annual Meeting, Los Angeles, CA, April 9th-13th.

Urban, M. and **Stewart, R.N.** 2013. *Developing Uncertainty in Population Density Data*. Association of American Geographers Annual Meeting, Los Angeles, CA, April 9th-13th.

Stewart, R.N., 2013. *Application of SADA for 3D Subsurface Characterization and Suggested Approach for Volumetric Compliance with Decommissioning Dose Criteria,* Waste Management Symposium, February

24th-28th, Phoenix (invited panelist, Panel Session 87: Characterization for Decommissioning and Waste Management)

Stewart, R.N. and Urban, M., and Morton, A. 2012. *Population Density Tables: Incorporating socio-cultural dynamics in estimating small area populations at risk,* Society for Risk Analysis Annual Meeting, December 8th-14th, San Francisco, CA.

Stewart, R.N. and Urban, M, 2012. *Eliciting and Transforming Population Density Knowledge into a Bayesian Prior Probability Distribution*, Association Of American Geographers Annual Meeting, New York, NY.

Conley, J. and **Stewart, R.N,** 2011**.** *Using Fine Resolution Population Data and Spatial Interaction Modeling to Estimate Risk from Airborne Toxic Releases*, The 11th International Conference of Geocomputation, London.

Urban, M., Bright, E., **Stewart, R.N.**, Lee, R., and Sylvester, L., 2011 *Creating a Database for Demographic and Socio-cultural Characteristics*, Association of American Geographers Annual Meeting, Seattle, WA.

Stewart, R.N., 2010. *A Geostatistically Informed Environmental Sampling Design for Improving Boundary Delineation of Contaminated Areas*, Association of American Geographers Annual Meeting, Washington D.C.

Stewart, R.N., 2009. *Spatial Analysis and Decision Assistance Version 5 Overview*, Midwestern States Risk Assessment Symposium, Indianapolis, IN.

Stewart, R.N., 2009. *Spatial Analysis and Decision Assistance (SADA): An integration of spatial analysis, risk, sample design, and GIS*, Interagency Steering Committee on Multimedia Environmental Models Public Workshop, Rockville, MD.

Purucker, S.T., **Stewart, R.N.**, Dolislager, F., 2007. *Human health and ecological risk assessment with Spatial Analysis and Decision Assistance (SADA) Freeware.* Office of Solid Waste and Emergency Response, Technology Innovation Program, CLU-IN Studio Internet Seminar (presentation).

Stewart, R.N.., Purucker, S.T., Powers, G.E., 2007. *SADA: A Freeware Decision Support Tool Integrating GIS, Sample design, Spatial Modeling, and Risk Assessment.* Proceedings of the International Symposium on Environmental Software Systems, Prague, Czech Republic.

Stewart, R.N., 2007, Purucker, S.T., 2007. *SADA: A freeware decision support tool integrating GIS, sample design, spatial modeling, and environmental risk assessment*. 233rd American Chemical Society National Meeting, Chicago, IL.

Stewart, R.N., 2006. SADA: A Freeware Decision Support Tool Integrating GIS, Sample design, Spatial Modeling, and Risk Assessment, Graduate Seminar, Department of Geography, UTK, Knoxville, TN.

Stewart, R.N., 2006. SADA: A Freeware Decision Support Tool Integrating GIS, Sample design, Spatial Modeling, and Risk Assessment, East Tennessee Geographic Information Systems Conference, October, 2006.

Stewart, R.N., 2006. SADA: A Freeware Decision Support Tool Integrating GIS, Sample design, Spatial Modeling, and Radiological Assessment, Health Physics Society Midyear, Knoxville, TN.

Stewart, R.N.., Purucker, S.T., 2006. *SADA: A Freeware Decision Support Tool Integrating GIS, Sample design, Spatial Modeling, and Risk Assessment*. Proceedings of the Third Biennial Meeting of the International Environmental Modelling and Software Society, Burlington, Vermont.

Stewart, R.N., Purucker S.T. 2004.*Incorporating Secondary Information Into Environmental Sampling Designs*. Joint Proceedings of the Sixth International Symposium on Spatial Accuracy Assessment in Natural Resources and Environmental Sciences and the 15th Annual Conference of the International Environmetrics Society.

Stewart, R.N., Purucker S.T., Powers, G.E, 2005. *Spatial Approaches for Subsurface Sample Design, Characterization, and Decision Support*, Proceedings of the ANS Topical Meeting on Decommissioning, Decontamination, & Reutilization, Denver, Colorado

Stewart, R.N., Purucker, S.T. 2003. *Geospatially-Based Secondary Sample Designs*, Society for Risk Analysis World Congress on Risk, Belgium.

Stewart, R.N., Purucker, S.T. 2003. *Geospatially-Based Secondary Sample Designs*, Society for Risk Analysis World Congress on Risk, Belgium.

Purucker, S.T., **Stewart, R.N**., Welsh, C.J.E., 2003. *Secondary Sample Designs for Risk Assessment*. Society for Risk Analysis; Baltimore, Maryland, (poster).

Stewart, R.N., Purucker, S.T., 2003. *Initial Sample Designs for Risk Assessment*. Society for Risk Analysis; Baltimore, Maryland, (poster).

Purucker, S.T., **Stewart, R.N**., 2002. SADA: Freeware to Assist in Integrating Ecological and Human Health Risk Assessment with Geostatistical Analyses. Society for Risk Analysis; New Orleans, Louisiana, (poster).

Stewart, R.N., Purucker, S.T**.**, Dolislager, F.G., Clauberg, M., 2001. Spatial Analysis and Decision Assistance (SADA): Incorporation of Geospatial Statistical Analysis into Risk Assessment Based Decision Making. Society for Risk Analysis; Seattle, Washington, (poster).

Stewart, R.N., 2001 Spatial Analysis and Decision Assistance Overview Opening remarks at the annual EPA FIELDS/SADA Conference, Denver, Colorado, 2001

Stewart, R.N., 2000. *Geostatistically Based Sampling Strategies*, FIELDS/SADA 2000 Annual EPA Conference, Chicago Illinois.

Stewart, R.N. Purucker, S.T. 2000. *Geospatial Decision Frameworks for Remedial Design and Secondary Sampling*

NATO/CCMS Special Session on Decision Support Tools Number 245. EPA 542-R-01-002.

Stewart, R.N., 1998. *Geostatistics in Environmental Decision Making*, A presentation given to the National Institute for Environmental Renewal in Pennsylvania covering the contribution of spatial statistics in providing a clear and defensible decision framework.

Lyon, B.F., Purucker, S.T**.**, **Stewart, R.N.**, 1994. *The Value of Perfect Information: How Much is a Crystal Ball Worth?* Proceedings of the International Specialty Conference. Cost Effective Acquisition and Utilization of Data in the Management of Hazardous Waste Sites. Air & Waste Management Association. Pittsburgh, PA. CONF-940386-2:44-55.

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Reports

Norrman, J., Purucker, S.T., Back, P.-E., Engelke, F., **Stewart, R.N**., 2009. Metodik för statistik utvärdering av miljötekniska undersökningar I jord (Method for statistical evaluation of environmental soil investigations). Naturvårdsverket (Swedish Environmental Protection Agency), Rapport 5932. ISBN 978-91-620-5932-3.

Norman, J., Purucker, S.T., **Stewart, R.N**., Back, P.-E., Englelke, F., 2008. Framework for optimizing the evaluation of data from contaminated soil in Sweden. Conference proceedings of ConSoil 2008, 10th International Conference on Soil-Water Systems; Milan, Italy.

Starzec, P., Purucker, S.T., **Stewart, R.N.**., 2006. Kvantifiering och presentation av osäkerheter i riskbedömning och beslutsprocess: exemplifiering med fallstudier. Rapportutkast (Swedish).

Stewart, R.N. and Gogolak, C. 2003. *Viable Geobayesian Approach for Supporting and Characterizing 2d and 3d Sampling Designs*, US Nuclear Regulatory Commission Letter Report, April 2003.

Stewart, R.N., 2002. *Evaluation of Terminated Licenses Parts 30, 40, and 70: The Terminated License Tracking System*, NUREG/CR-6669, United States Nuclear Regulatory Commission, Office of Nuclear Material Safety and Safeguards.

Stewart, R.N. 2001. Test and Evaluation of the Proof-of-Concept Version of SADA Incorporating Bayesian Geostatistics, US Nuclear Regulatory Commission Letter Report.

Stewart, R.N., Purucker, S.T., Lyon, B.F., 1995. *Geostatistical Applications in Environmental Remediation*. ES/ER/TM 146.

Douthat, D., **Stewart, R.N.**, Armstrong, A.Q., 1995. *Fixed Capital Investments for the Uranium Soils Integrated Demonstration Soils Treatment Technologies*, prepared for the Office of Technology Development at DOE.

Douthat, D., **Stewart, R.N.**, Armstrong, A.Q., 1995. *Cost Results from the 1994 Fernald Characterization Field Demonstration for Uranium-Contaminated Soils*, prepared for the Office of Technology Development at DOE.

Douthat, D., **Stewart, R.N.**, Armstrong, A.Q, 1995. *Operating and Life-Cycle Costs for Uranium-Contaminated Soil Treatment Technologies*, prepared for the Office of Technology Development.

Stewart, R.N., Armstrong, A.Q., James, B.R., Douthat, D.M., Purucker, S.T., 1995. *Cost Versus Risk Reduction in Remedial Action: A Decision Framework*. ORNL/TM 13143.

Purucker, S.T., Lyon, B.F., Nanstad, L.D., **Stewart, R.N**., 1994. Decision Support for CERCLA Investigations: An Introduction to Decision Analysis Applications. ES/ER/TM-134.

Teaching

Current

Geographic Concept and Method 599 (Fall 2016), Geography Department, University of Tennessee, Knoxville.
Independent Study 593 (Data Analytics), Periodically. University of Tennessee, Knoxville.
Mentor for the ASTRO, HERE, SULI, and RAMS DOE Education Programs (ongoing), Oak Ridge, TN.

Past

ITRC ARAMS/SADA Conference October, 2008. Kennebunkport, ME, SADA Training
USEPA, TRIAD Conference June 10th-12th, 2008 in Amherst, MA. SADA Training.
State of Illinois, Department of Natural Resources May 21-22nd, 2008. SADA Training.
University of Tennessee SADA Training, Knoxville, TN, April 23rd-25th, 2008. SADA Training.
NMA Uranium Recover Workshop, Denver, May 17th, 2007.
University of Helsinki, “Overview of Environmental Methods in SADA”, Helsinki, May 2007.
Uranium Recovery Workshop, SADA training, Denver CO, May 2007.
University of Tennessee, “Environmental Assessment Methods Using SADA”, Knoxville, TN, April, 2007.
Uses of Spatial Analysis and Decision Assistance. Office of Solid Waste and Emergency Response, Technology Innovation Program, CLU-IN Studio Internet Seminar.
University of Tennessee, “Environmental Assessment Methods Using SADA”, Knoxville, TN, 25-27 October 2006.
Swedish Geotechnical Institute Training, Goteborg, Sweden, 10-12 May 2006. SADA Training
University of Tennessee, “Environmental Assessment Methods Using SADA”, Knoxville, TN, 26-28 April 2006.

University of Tennessee, “Environmental Assessment Methods Using SADA”, Knoxville, TN, 5-7 October 2005.
Swedish Geotechnical Institute, Goteborg, Sweden, 12-15 September 2005. SADA Training.
US Nuclear Regulatory Commission SADA Training, Rockville, MD, 12-14 April 2005.
US Naval Facilities Engineering Command (NAVFAC) SADA Workshop, Philadelphia, Pennsylvania, 2-3 August 2005.
University of Tennessee, “Environmental Assessment Methods Using SADA”, Knoxville, TN, 23-25 February 2005.
Petróleo Brasileiro SA (Petrobras), Rio de Janeiro, Brazil,16-20 Aug 2004.
NRC SADA Workshop, Rockville, MD, 4-5 May 2004.
FIELDS/SADA 2003 Training Conference in Chicago, 5-7 March 2003.
EPA Ecological Risk Assessment Forum, National Conservation Training Center, Shepherdstown, West Virginia, 9 January 2002.
EPA Region 9, San Francisco, California, 28-29 August 2001.
Geospatial Methods For Environmental Decision Making and Cost Benefit Analysis, Fifth Course on Mathematical Ecology at The Abdus Salam International Centre for Theoretical Physics, Trieste, Italy, 2000.

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