Social Ecology

Integrative Science for a Complex World

Daniel Stokols

Psychology and Social Behavior
Urban Planning and Public Policy
School of Social Ecology
Program in Public Health
College of Health Sciences
University of California, Irvine

ISOE Lecture Presented at the Institute for Social Ecological Research,
Goethe University, Frankfurt am Main, Germany
February 8, 2018

Transitions and Transformations in Societal Relations to Nature

- *Nomadic*
- *Agrarian*
- *Industrialized*
- *Digitalized*

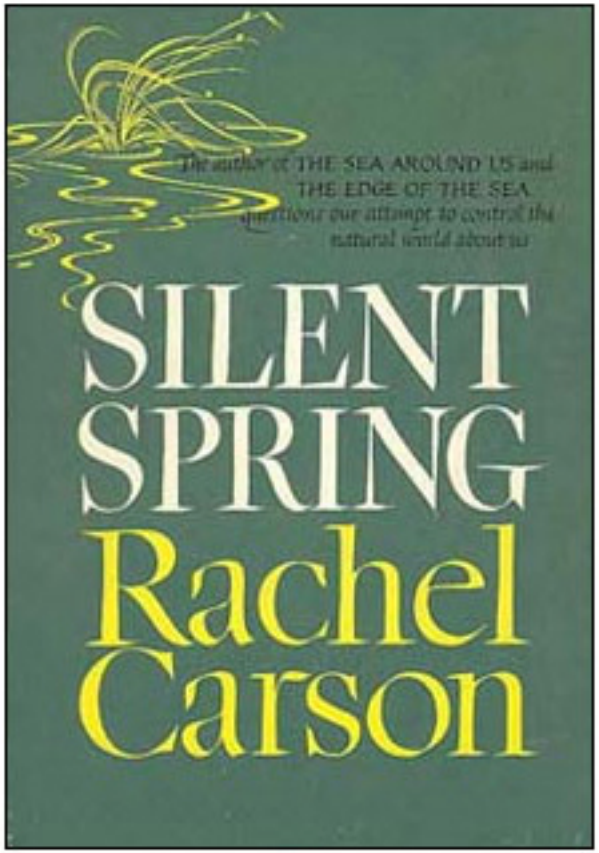
Karl Mannheim

Rational and Irrational Elements in Contemporary Society

- *"general disproportion in the development of human capacities"*
- *functional rationality – "a series of actions is organized in such a way that it leads to a previously defined goal"*
- *substantial rationality – "the capacity to act intelligently in a given situation on the basis of one's own insight into the interrelations of events"*
- *"paralyzing effect of functional rationalization on the capacity for rational (and moral) judgment"*

(Mannheim, *Man and society in an age of reconstruction*, London, Routledge, 1935)

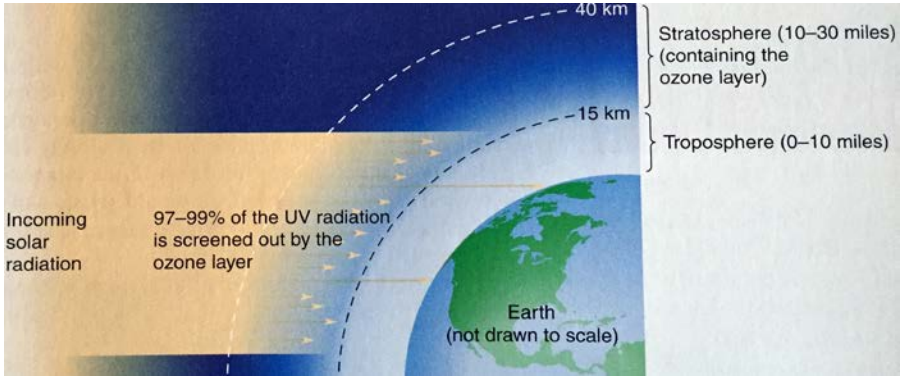
Unveiling Threats to Environmental Quality in the U.S.



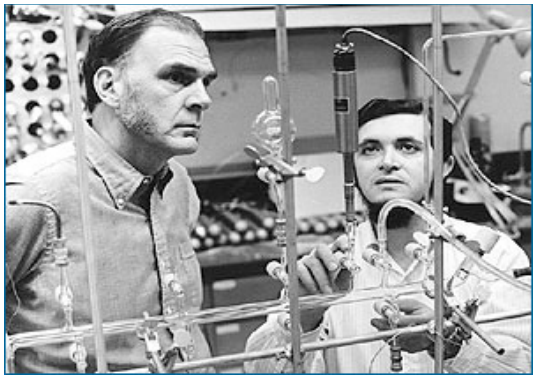
(1962)

From Studies of Regional Environmental Contamination To Evidence of Global Environmental Change

The Case of Atmospheric Ozone Depletion



F. Sherwood Rowland and Mario Molina in their UCI lab



Stratospheric sink for chlorofluoromethanes : chlorine atomc-atalysed destruction of ozone

Mario J. Molina & F. S. Rowland

Department of Chemistry, University of California, Irvine, California 92664

Chlorofluoromethanes are being added to the environment in steadily increasing amounts. These compounds are chemically inert and may remain in the atmosphere for 40–150 years, and concentrations can be expected to reach 10 to 30 times present levels. Photodissociation of the chlorofluoromethanes in the stratosphere produces significant amounts of chlorine atoms, and leads to the destruction of atmospheric ozone.

HALOGENATED aliphatic hydrocarbons have been added to the natural environment in steadily increasing amounts over several decades as a consequence of their growing use, chiefly as aerosol propellants and as refrigerants[1,2]. Two chlorofluoromethanes, CF_2Cl_2 and $CFCl_3$, have been detected throughout the troposphere in amounts (about 10 and 6 parts per 10^{11} by volume, respectively) roughly corresponding to the integrated world industrial production to date[3–9,31]. The chemical inertness and high volatility which make these materials suitable for technological use also mean that they remain in the atmosphere for a long time. There are no obvious rapid sinks for their removal, and they may be useful as inert tracers of atmospheric motions[4–6]. We have attempted to calculate the probable sinks and lifetimes for these molecules. The most important sink for atmospheric $CFCl_3$ and CF_2Cl_2 seems to be stratospheric photolytic dissociation to $CFCl_2 + Cl$ and to $CF_2Cl + Cl$, respectively, at altitudes of 20–40 km. Each of the reactions creates two odd-electron species—one Cl atom and one free radical. The dissociated chlorofluoromethanes can be traced to their ultimate sinks. An extensive catalytic chain reaction leading to the net destruction of O_3 and O occurs in the stratosphere:

$$Cl + O_3 \rightarrow ClO + O_2 \quad (1)$$

$$ClO + O \rightarrow Cl + O_2 \quad (2)$$

This has important chemical consequences. Under most conditions in the Earth's atmospheric ozone layer, (2) is the slower of the reactions because there is a much lower concentration of O than of O_3. The odd chlorine chain (Cl, ClO) can be compared with the odd nitrogen chain (NO, NO_2) which is believed to be intimately involved in the regulation of the present level of O_3 in the atmosphere[7–10]. At stratospheric temperatures, ClO reacts with O six times faster than NO_2 reacts with O (refs 11, 12). Consequently, the Cl–ClO chain can be considerably more efficient than the NO–NO_2 chain in the catalytic conversion of $O_3 + O \rightarrow 2O_2$ per unit time per reacting chain[13].

Photolytic sink

Both $CFCl_3$ and CF_2Cl_2 absorb radiation in the far ultraviolet[14], and stratospheric photolysis will occur mainly in the 'window' at 1,750–2,200 Å between the more intense absorptions of the Schumann–Runge regions of O_2 and the Hartley bands of O_3.

Rowland and Molina, Awarded the 1995 Nobel Prize in Chemistry Along With Paul Crutzen

Destruction of the Earth's Stratospheric Ozone Layer by Chlorofluorocarbons (CFCs) and Other Ozone-Depleting Substances

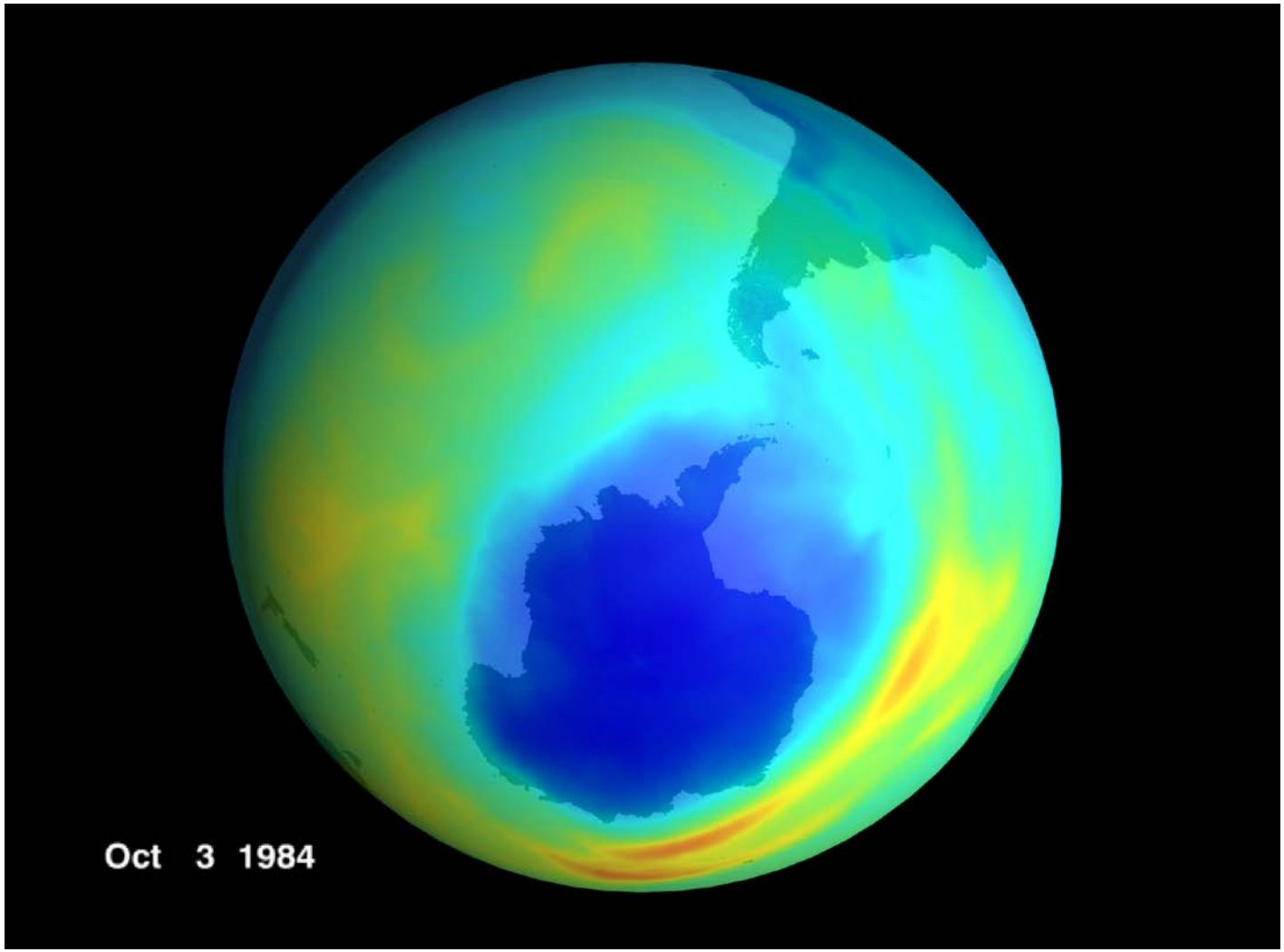
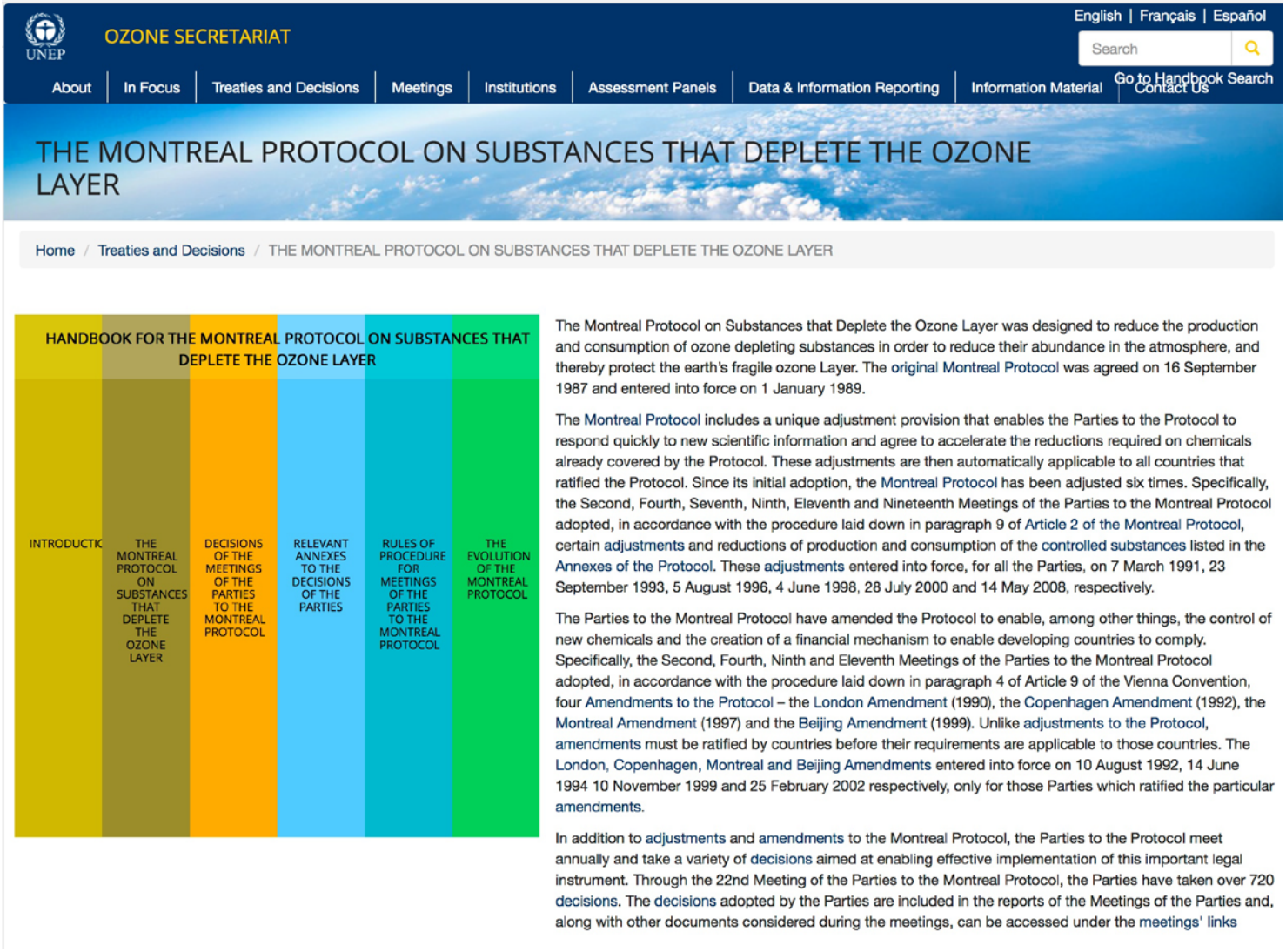


Photo of Antarctic Ozone Hole in 1984, NASA

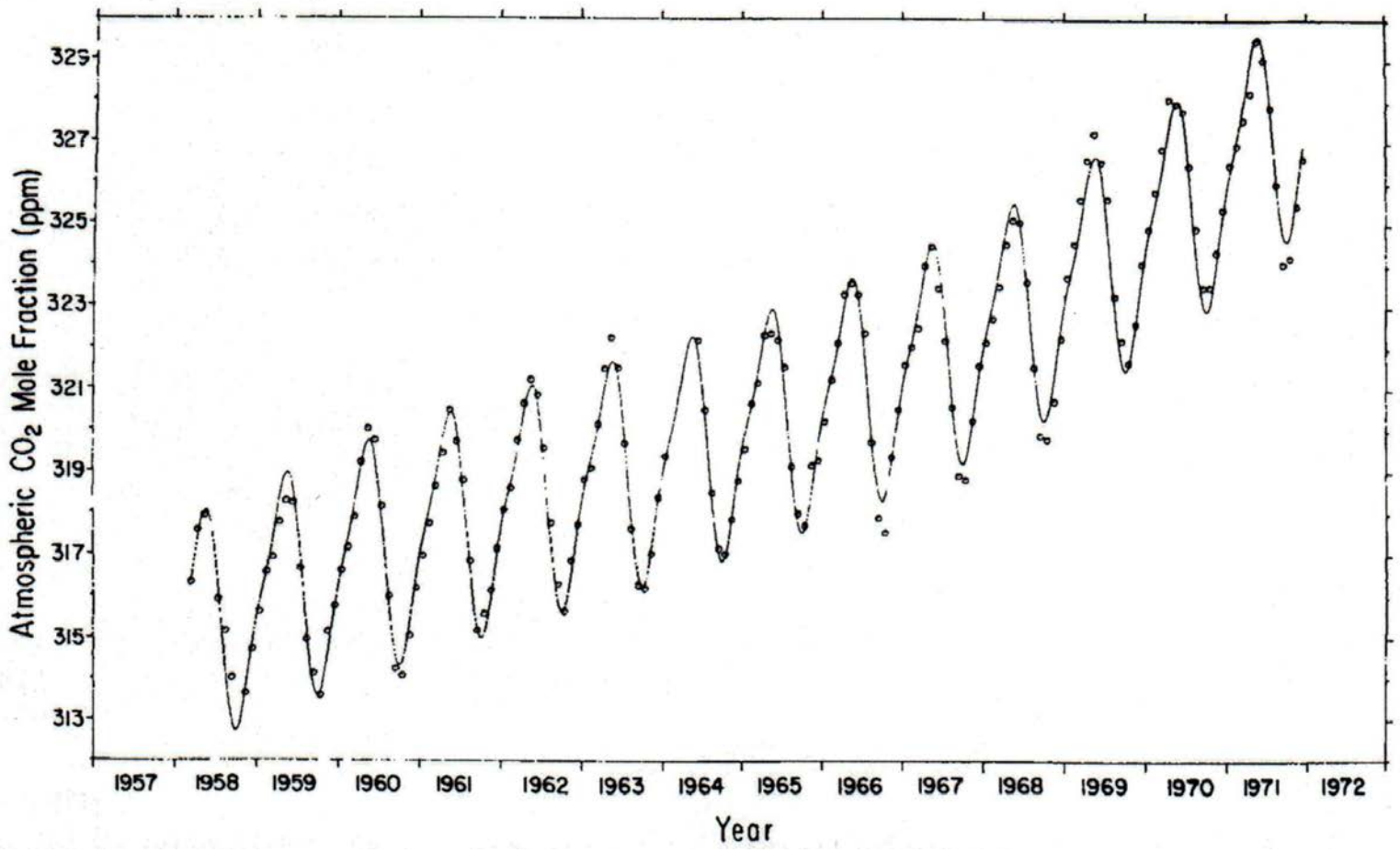
The Montreal Protocol

Multilateral Intervention to Confront a "Wicked Problem"



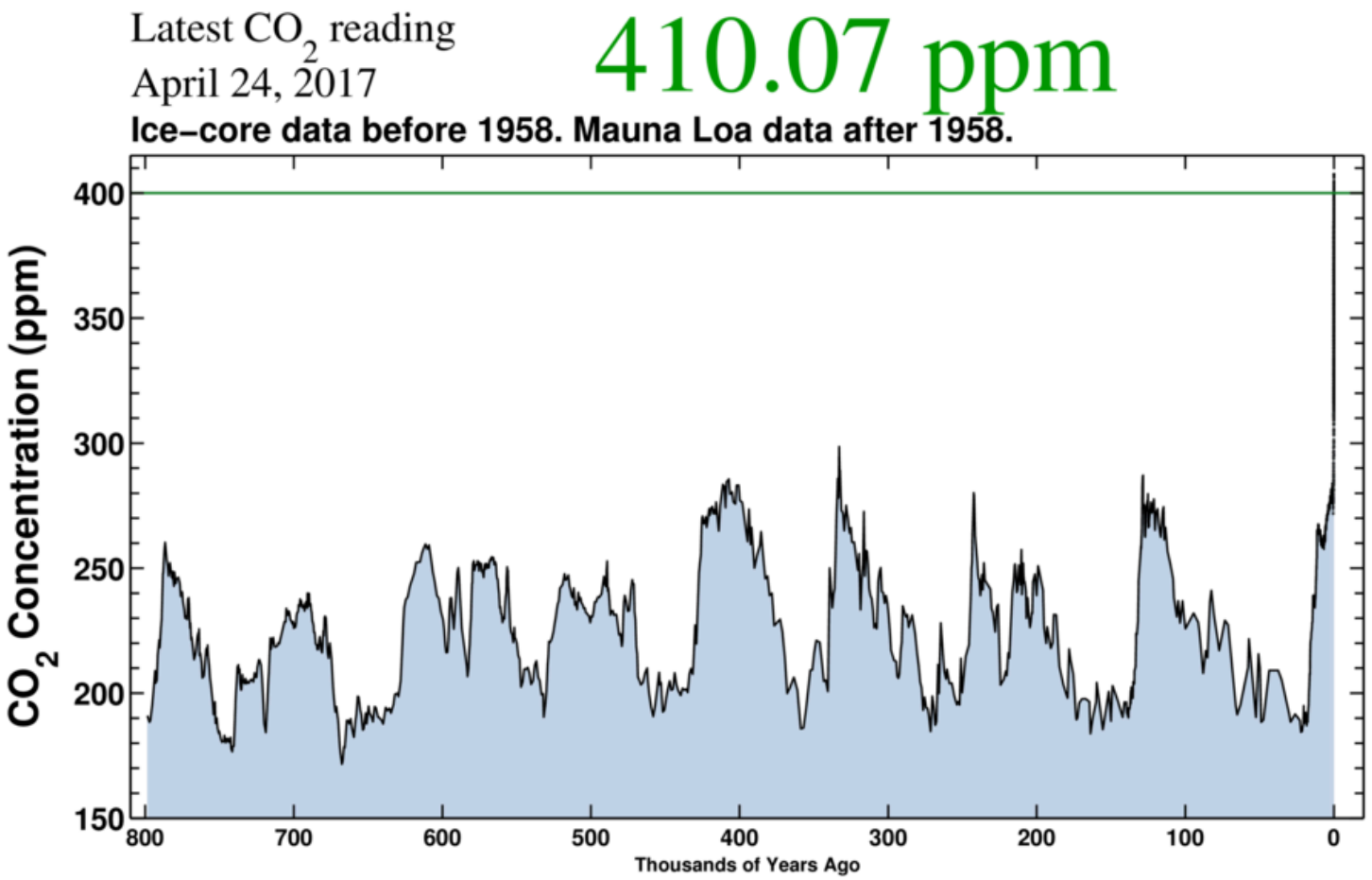
(http://ozone.unep.org/en/treaties-and-decisions/montreal-protocol-substances-deplete-ozone-layer)

The Keeling Curve – Tracking Atmospheric CO2 Levels
1958-1972



(https://scripps.ucsd.edu/programs/keelingcurve)

Changes in Atmospheric CO2 Over 800,000 years



(https://scripps.ucsd.edu/programs/keelingcurve)

The geological period marked by the substantial impact of human activities on the earth system

(Crutzen & Stoermer, 2000)

RESEARCH ARTICLE SUMMARY

SUSTAINABILITY

Planetary boundaries: Guiding human development on a changing planet

Will Steffen,* Katherine Richardson, Johan Rockström, Sarah E. Cornell, Ingo Fetzer, Elena M. Bennett, Reinette Biggs, Stephen R. Carpenter, Wim de Vries, Cynthia A. de Wit, Carl Folke, Dieter Gerten, Jens Heinke, Georgina M. Mace, Linn M. Persson, Veerabhadran Ramanathan, Belinda Reyers, Sverker Sörlin

(2015)

REVIEW SUMMARY

EARTH HISTORY

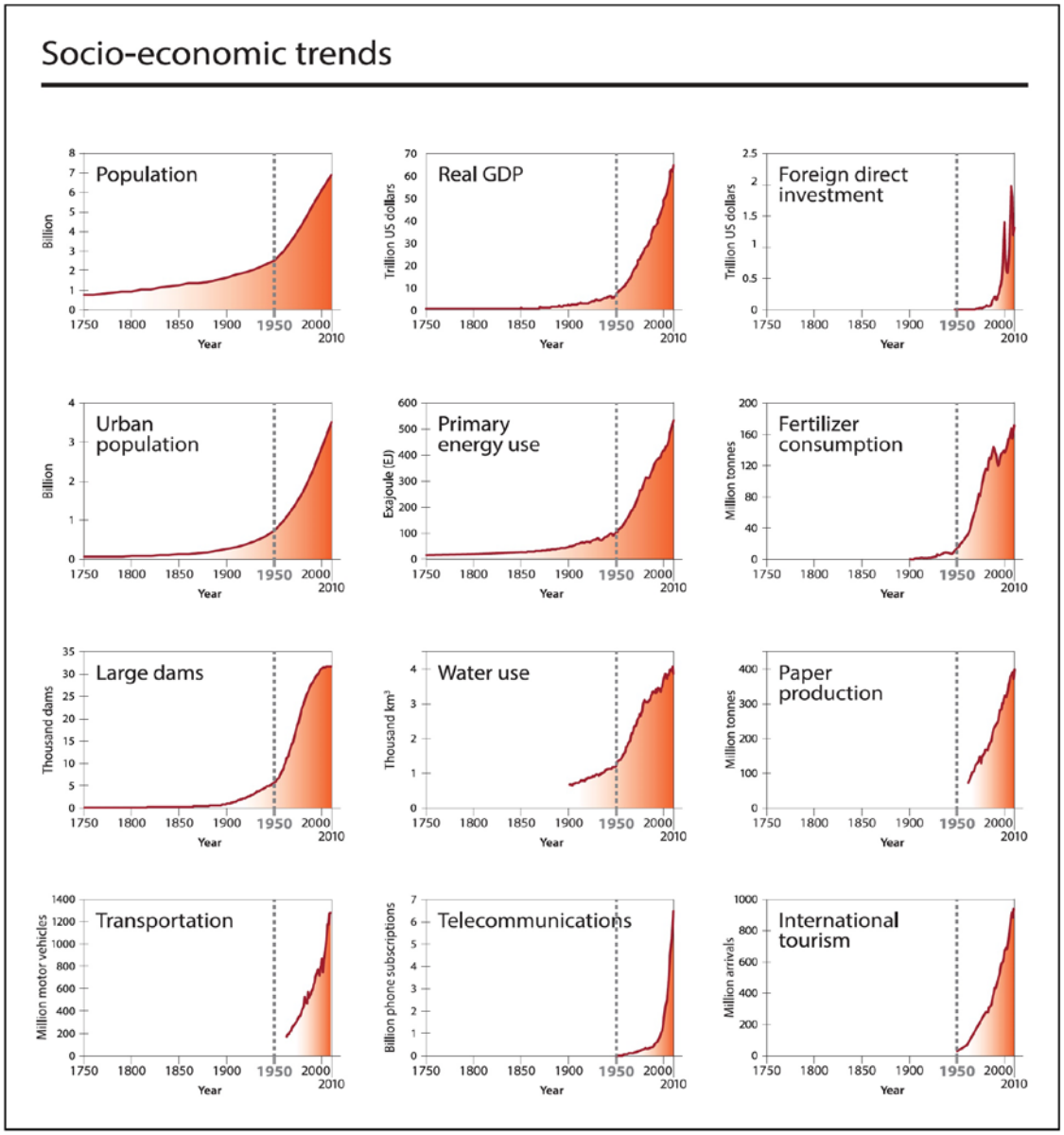
The Anthropocene is functionally and stratigraphically distinct from the Holocene

Colin N. Waters,* Jan Zalasiewicz, Colin Summerhayes, Anthony D. Barnosky, Clément Poirier, Agnieszka Gałuszka, Alejandro Cearreta, Matt Edgeworth, Erle C. Ellis, Michael Ellis, Catherine Jeandel, Reinhold Leinfelder, J. R. McNeill, Daniel deB. Richter, Will Steffen, James Syvitski, Davor Vidas, Michael Wagreich, Mark Williams, An Zhisheng, Jacques Grinevald, Eric Odada, Naomi Oreskes, Alexander P. Wolfe

(2016)

Trajectory of the Anthropocene

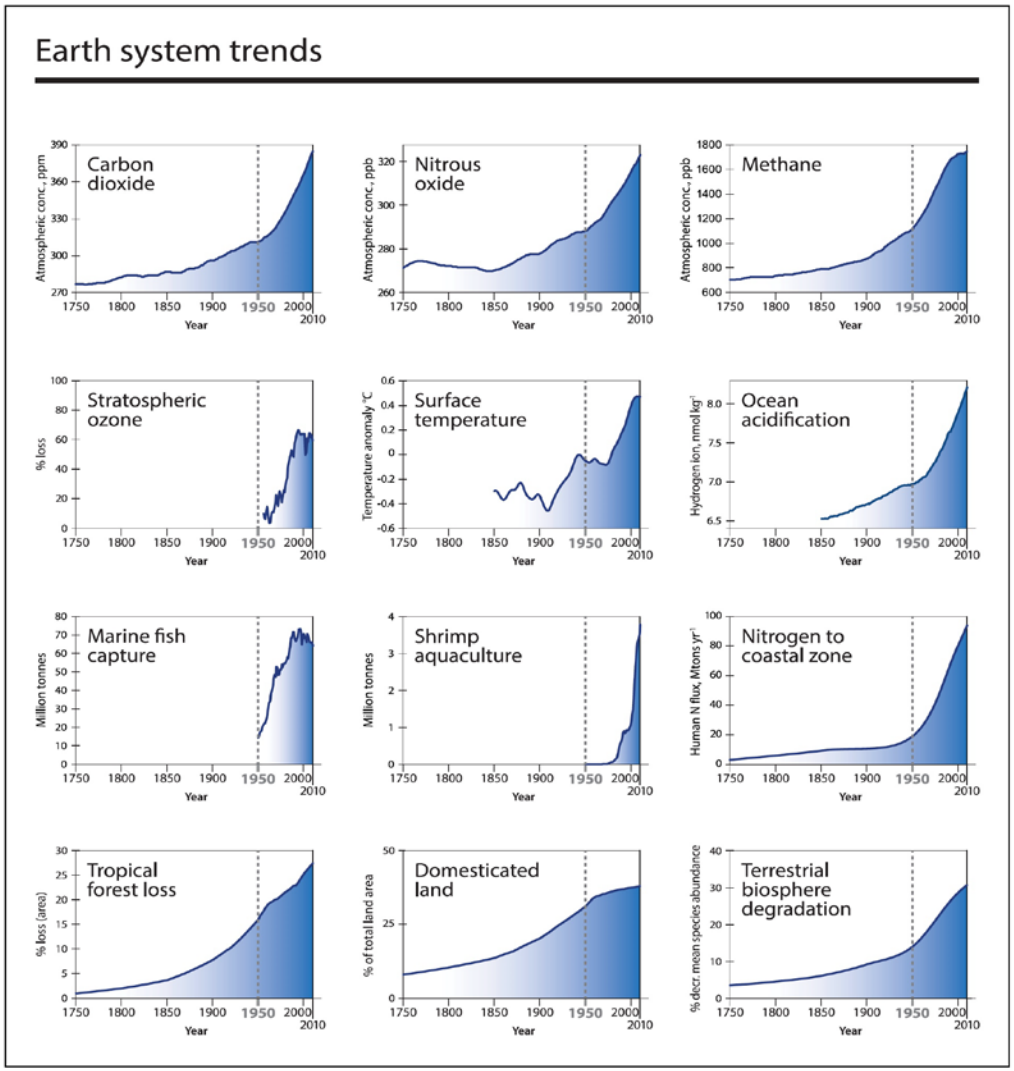
The Great Acceleration, 1950-2010



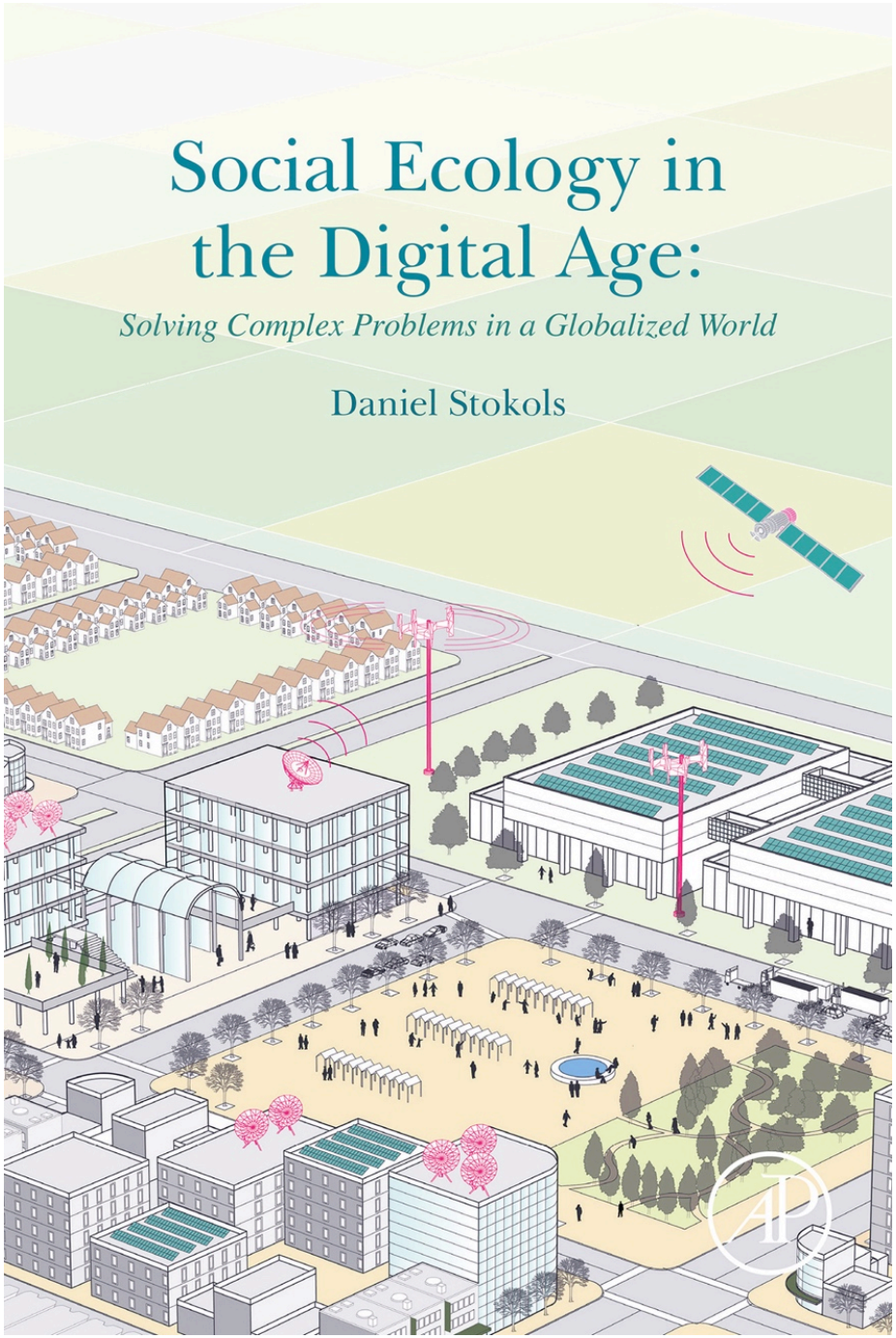
(Steffen et al., 2015)

Trajectory of the Anthropocene

Aftermath of the Great Acceleration, 1950-2010



"Of all the candidates for a start date for the Anthropocene, the beginning of the Great Acceleration is by far the most convincing from an earth system science perspective (p.81)."
(Steffen et al., 2015)



Social Ecology in the Digital Age

Solving Complex Problems in a Globalized World

Daniel Stokols

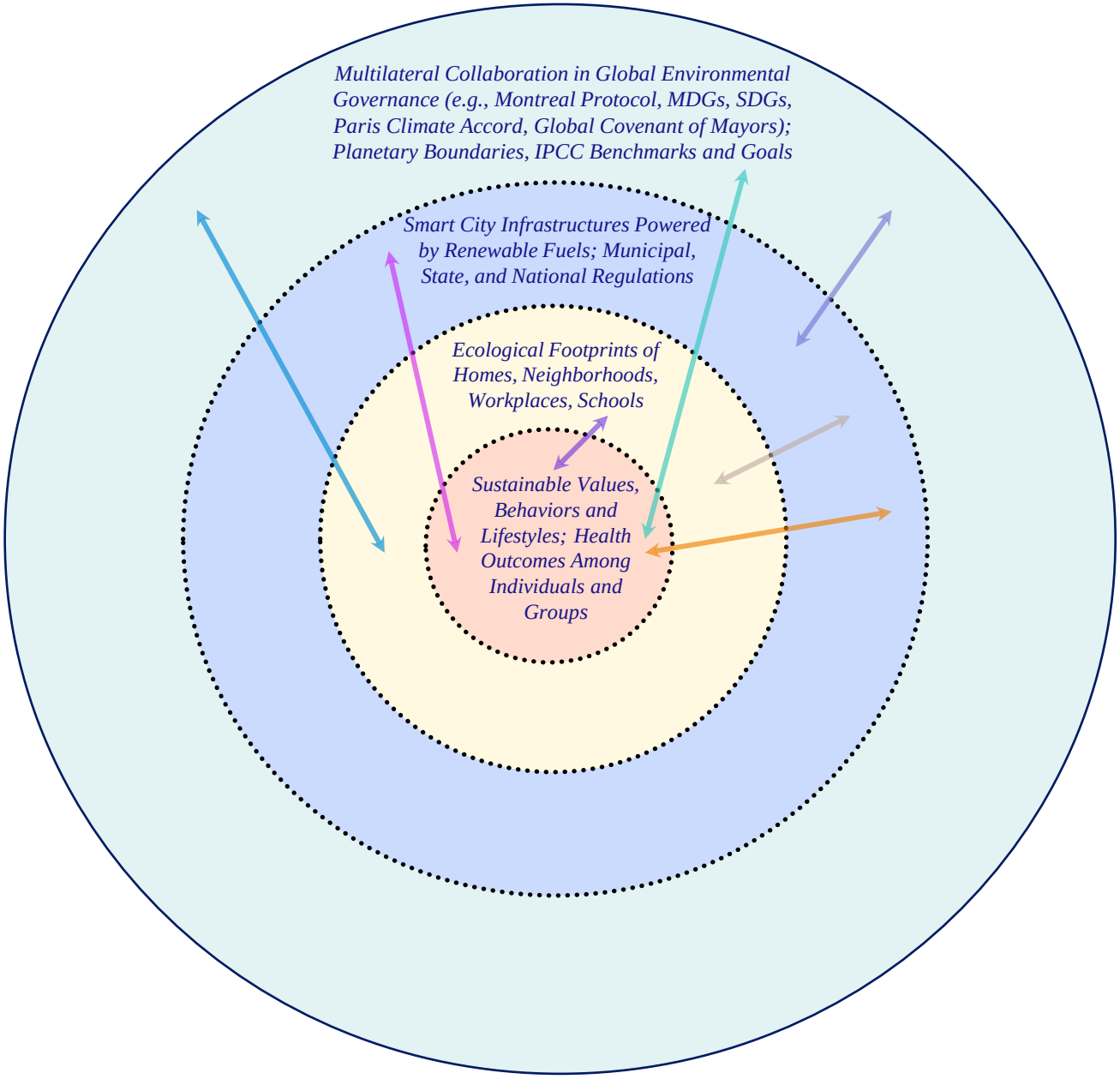
University of California, Irvine

ELSEVIER

ACADEMIC PRESS

An imprint of Elsevier

Linking Multi-Scale Influences on Resilience and Sustainability



(Stokols, 2018)

Coupling Centralized Infrastructures With Localized Sustainable Technologies for Greater Resilience

Energy Sector

http://en.wikipedia.org/wiki/Fossil-fuel_power_station

Agribusiness

http://www.templetonco.com/Agribusiness

Water Sector

http://bit.ly/1ro83WX

Residential Solar

http://bit.ly/WjEf0I

Urban Farming

http://www.shareable.net/blog/12-agrihoods-taking-farm-to-table-living-mainstream

Home Water Capture

http://www.rwh.in/

(Tomlinson, Nardi, Patterson, Richardson, Saphores, & Stokols, 2015, ACM DEV)

Figure 1. A human community
Composite of natural, built, sociocultural, and cyber spheres of the environment

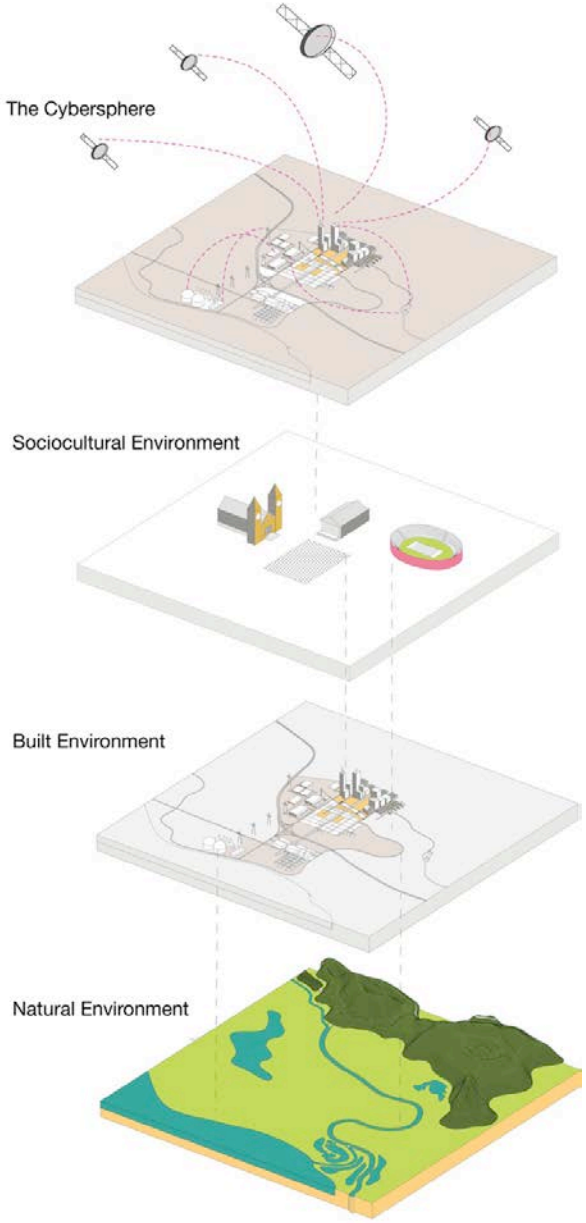


Figure 2. Interconnections between the natural, built, sociocultural, and cyber spheres of environmental influence in human communities

SOCIETY

Chinese village builds giant QR code in field in effort to connect with visitors

Tourism campaign uses 130,000 juniper trees to create scannable pattern that can be seen from the air

Sarah Zheng

UPDATED : Friday, 15 Sep 2017, 2:54PM

Challenges **2015**, *6*(1), 117-157; doi:10.3390/challe6010117

Open Access

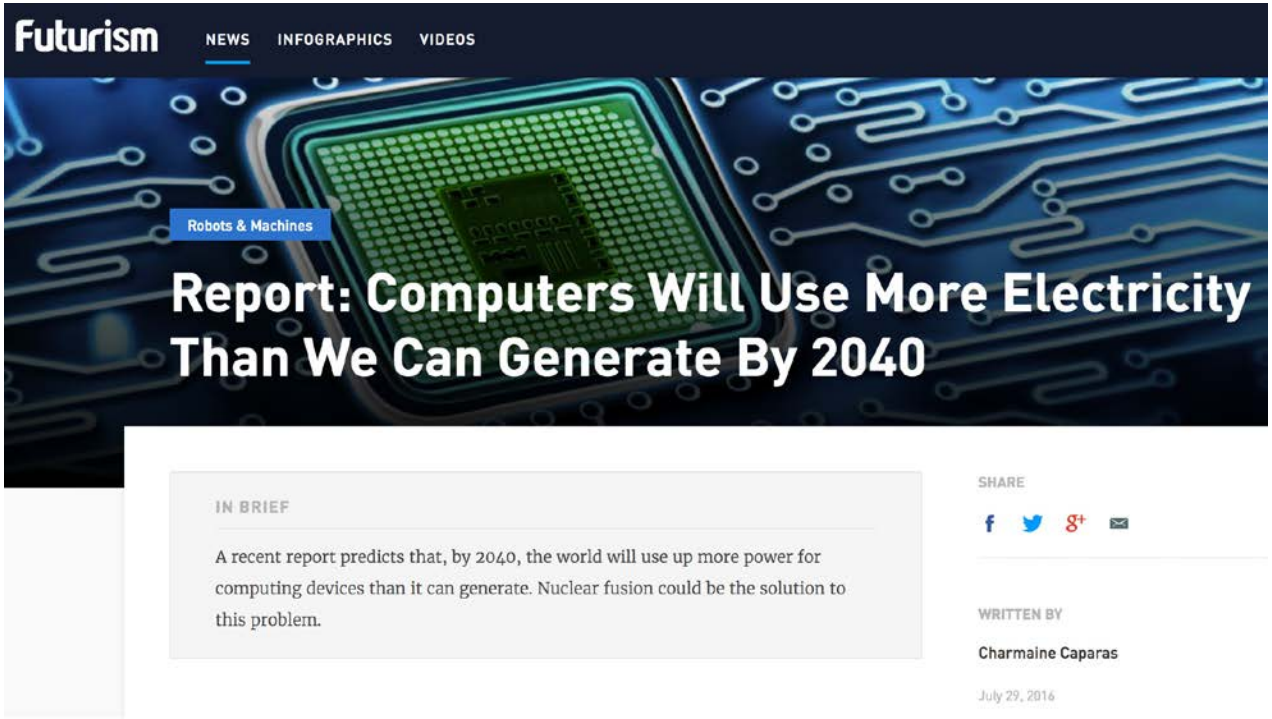
Article

On Global Electricity Usage of Communication Technology: Trends to 2030

Anders S. G. Andrae * and Tomas Edler

Huawei Technologies Sweden AB, Skalholtsgatan 9, 16494 Kista, Sweden

"CT could use as much as 51% of global electricity in 2030…and contribute up to 23% of the globally released greenhouse gas emissions in 2030 (p.117)."

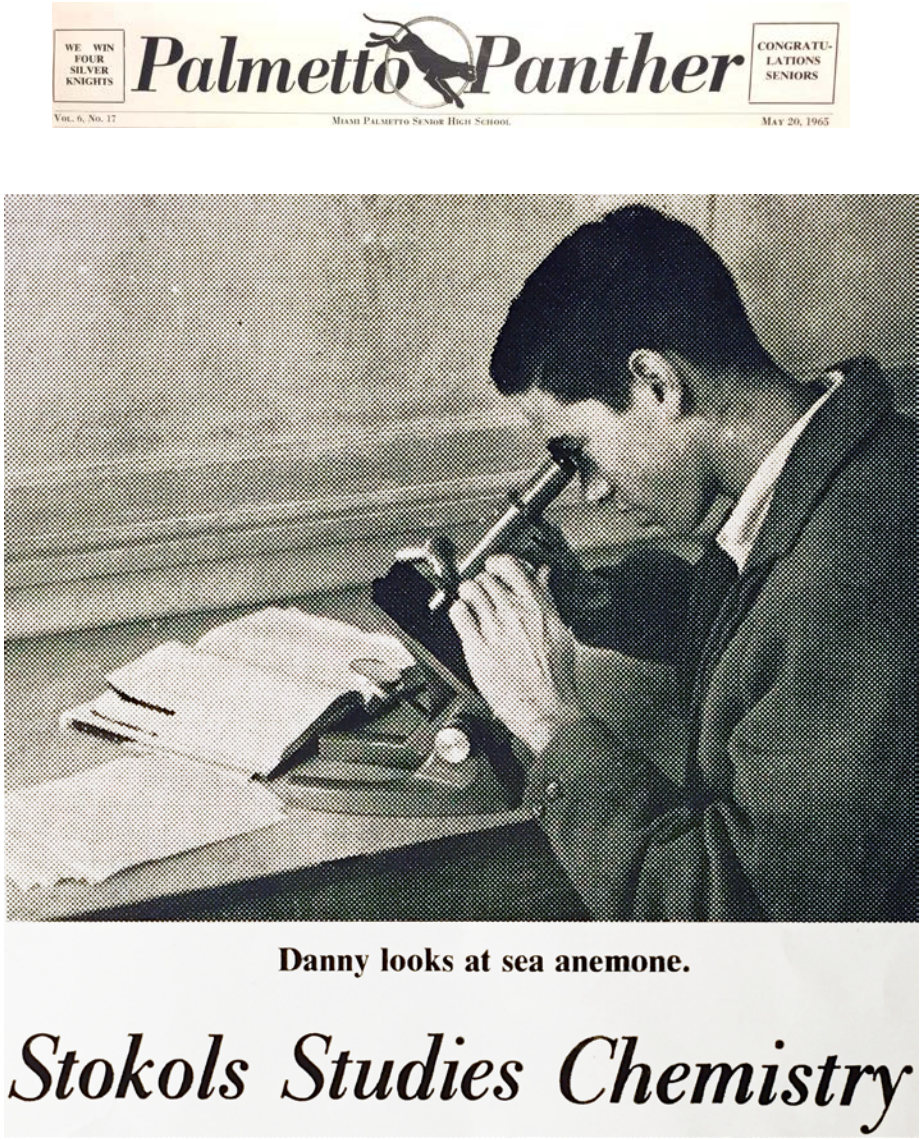


Overview

1. *Personal background and evolution as a social ecologist*

2. *Historical developments in American perspectives on human and social ecology and their links to European and other conceptions of the field*

3. *Epistemic challenges facing social ecologists in the Anthropocene*



WE WIN FOUR SILVER KNIGHTS

Palmetto Panther

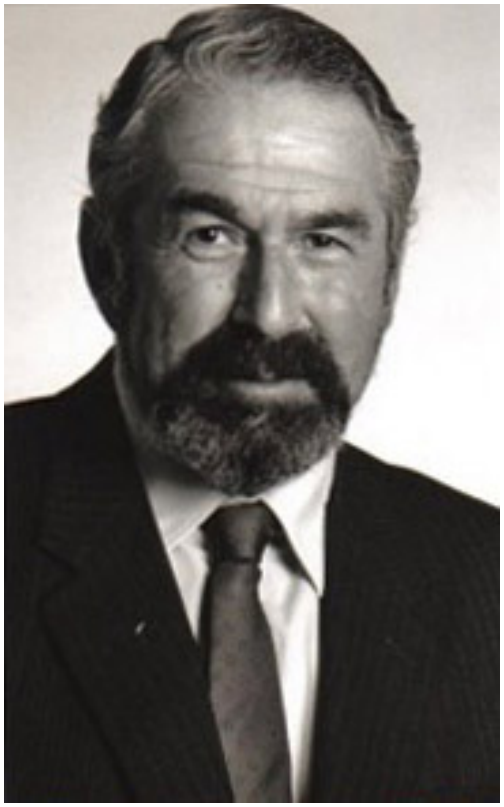
CONGRATULATIONS SENIORS

Vol. 6, No. 17 — Miami Palmetto Senior High School — May 20, 1965

Danny looks at sea anemone.

Stokols Studies Chemistry

Palmetto High School, Miami, Florida, 1965



Professor Howard Lenhoff, my high school mentor at the Laboratory for Quantitative Biology, University of Miami, Florida; later, my colleague at UC Irvine

Settings That Shaped My Interest in Transdisciplinary Ecological Research

College

Main Quad
University of Chicago 1965-69

Graduate School

Psychology Department
University of North Carolina 1969-73

Post-Graduate

Program in and School of Social Ecology, UC Irvine 1973-present

Undergraduate Years at the University of Chicago

Courses on Political Science, Sociology, Anthropology, Psychology, and History of Western Civilization

Professsor Hans Morganthau

Professsor Karl Weintraub

Christian Mackauer

Social Psychology Course at the University of Chicago

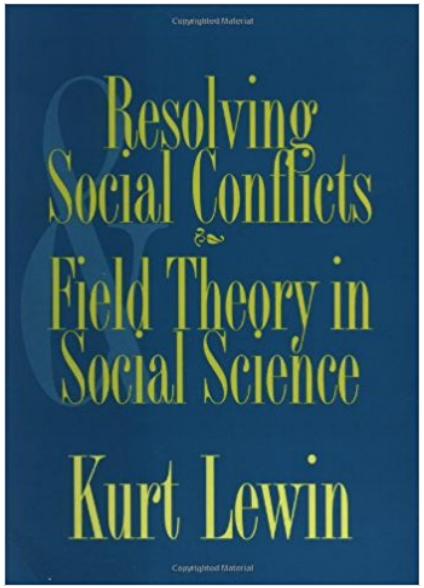
Co-Taught by Professors Richard Flacks and Thomas Crawford

Professor Richard Flacks
Marxist Sociology and Student Protest Movements

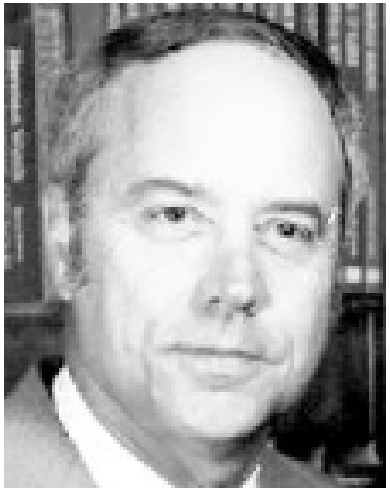
Professor Thomas Crawford
Attitude Change and Interpersonal Influence

Graduate Studies, University of North Carolina, Chapel Hill

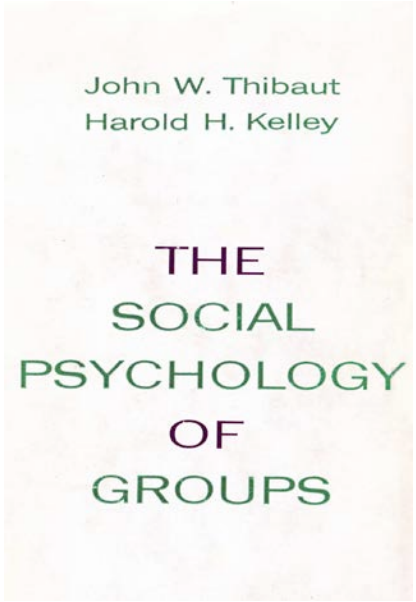
Professor Kurt Lewin, MIT



(1948)



Professor John Thibaut,
University of North Carolina, Chapel Hill



(1959)

Psychological Lifespace

The *perceived situation* or environment that is relevant to an individual at a given point in time; the *totality of perceived facts* that *determine an individual's behavior at a certain moment*:

Behavior = *f* {**Person** x **Environment**)

Diagrammatic Representation of the Life Space

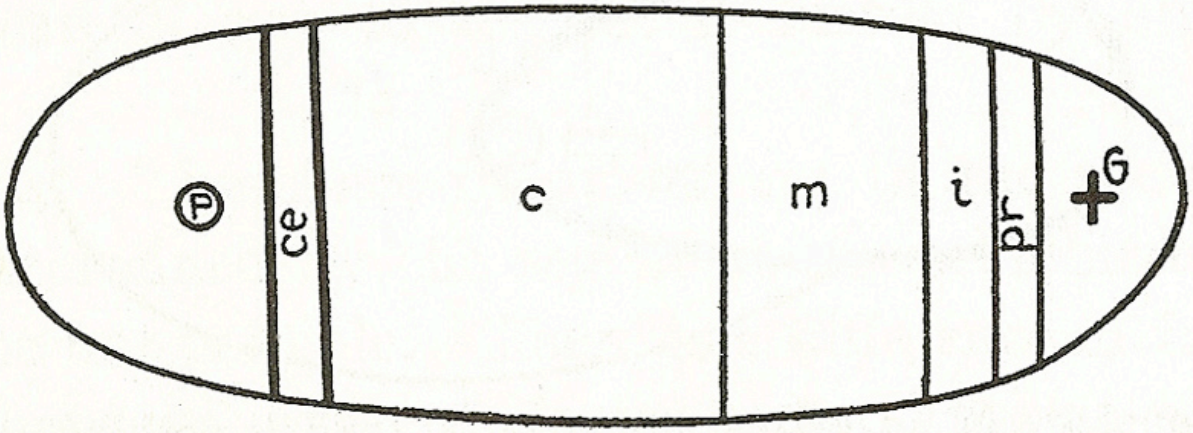
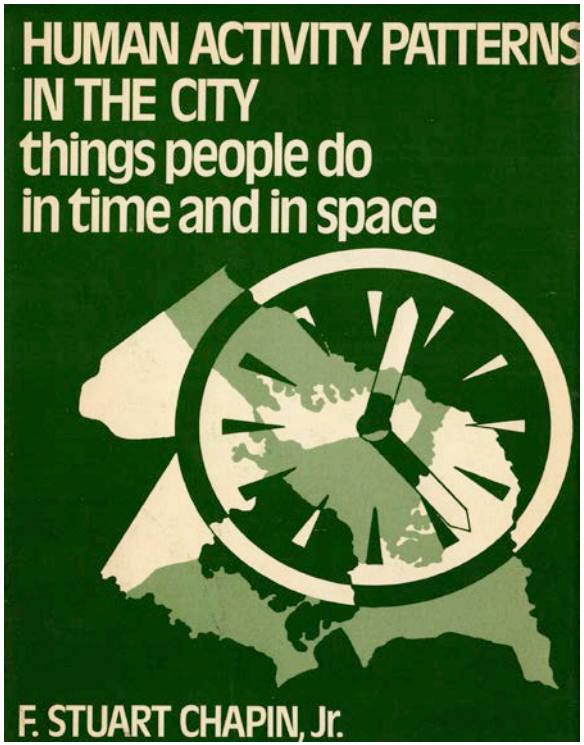


FIG. 4.—Situation of a boy who wants to become a physician. *P*, person; *G*, goal; *ce*, college entrance examinations; *c*, college; *m*, medical school; *i*, internship; *pr*, establishing a practice.

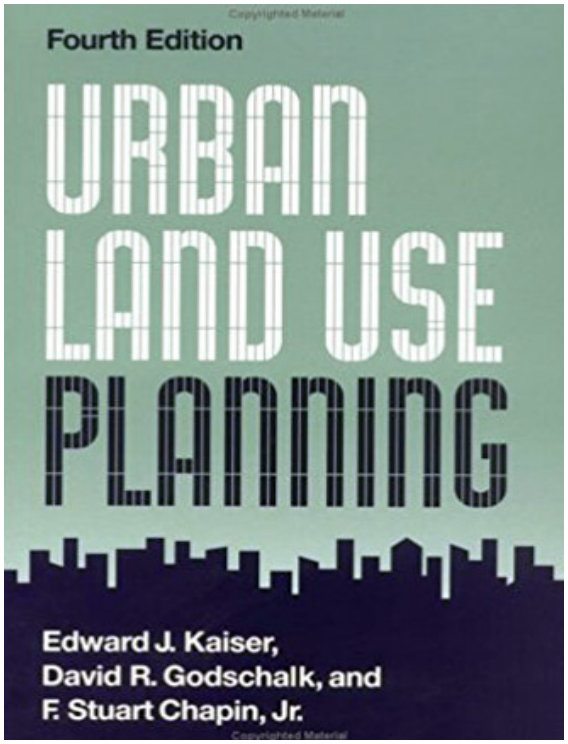
(From Lewin, 1936, p.48)

Mapping Human Activity Patterns Within the Macro Urban Landscape

Professor F. Stuart Chapin, Jr., University of North Carolina, Chapel Hill

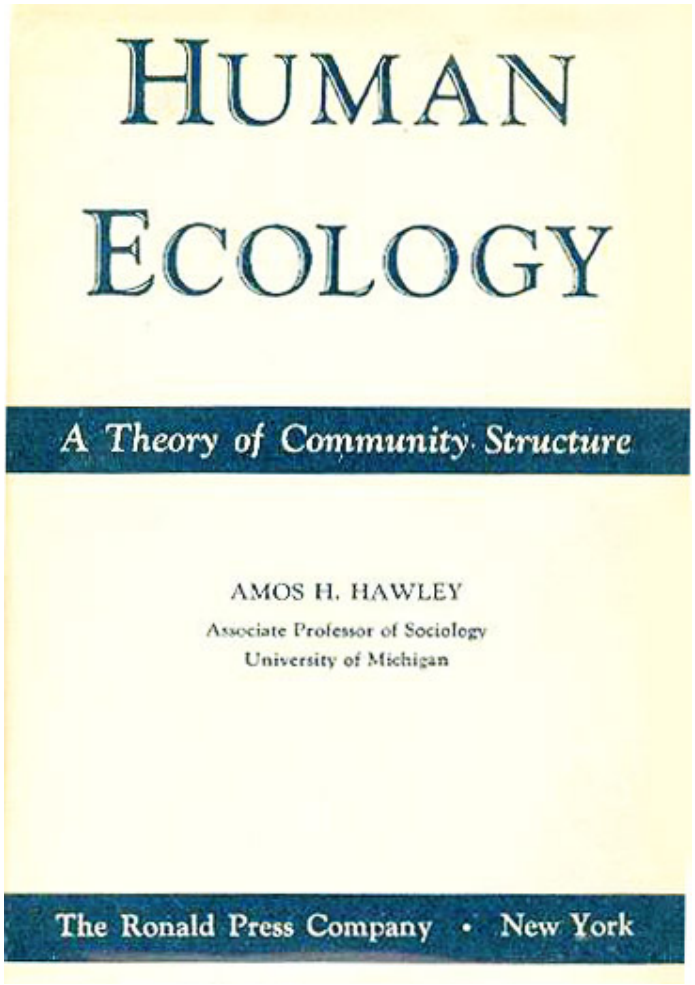


(1974)



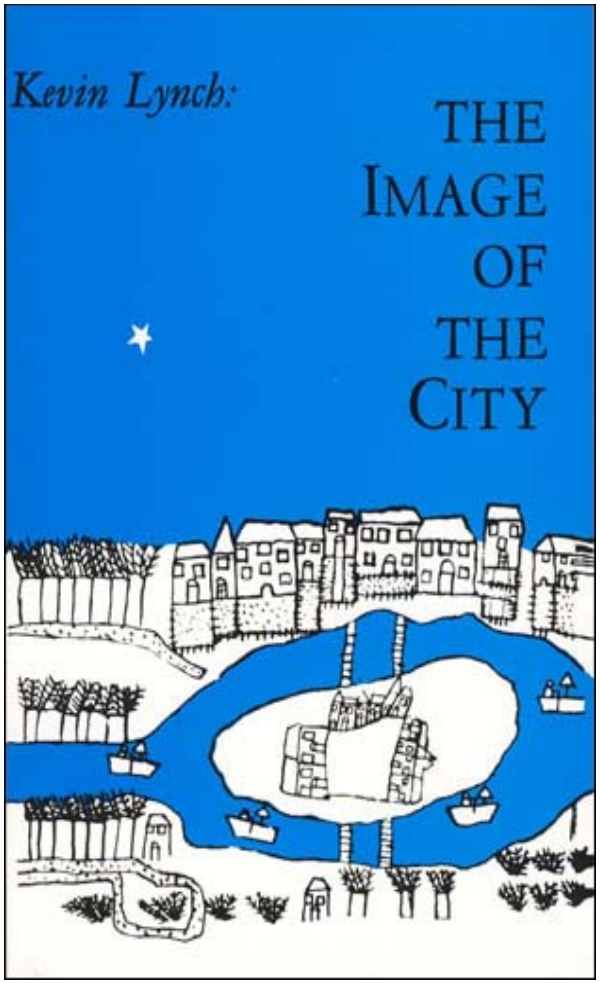
First edition originally published by F. Stuart Chapin, Jr., 1957

Professor Amos Hawley, University of North Carolina, Chapel Hill; student of Roderick McKenzie

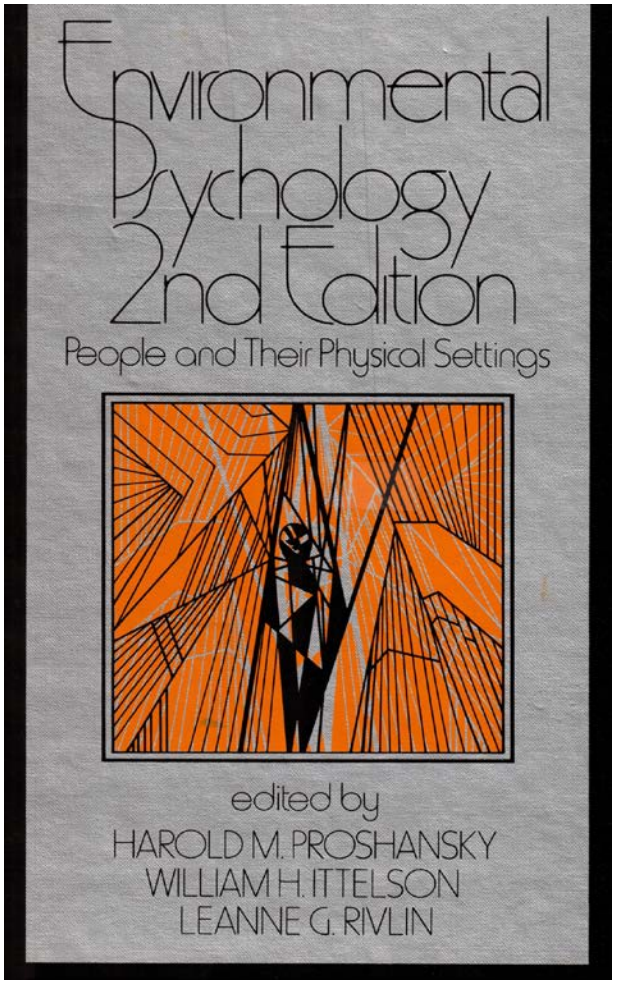


(1950)

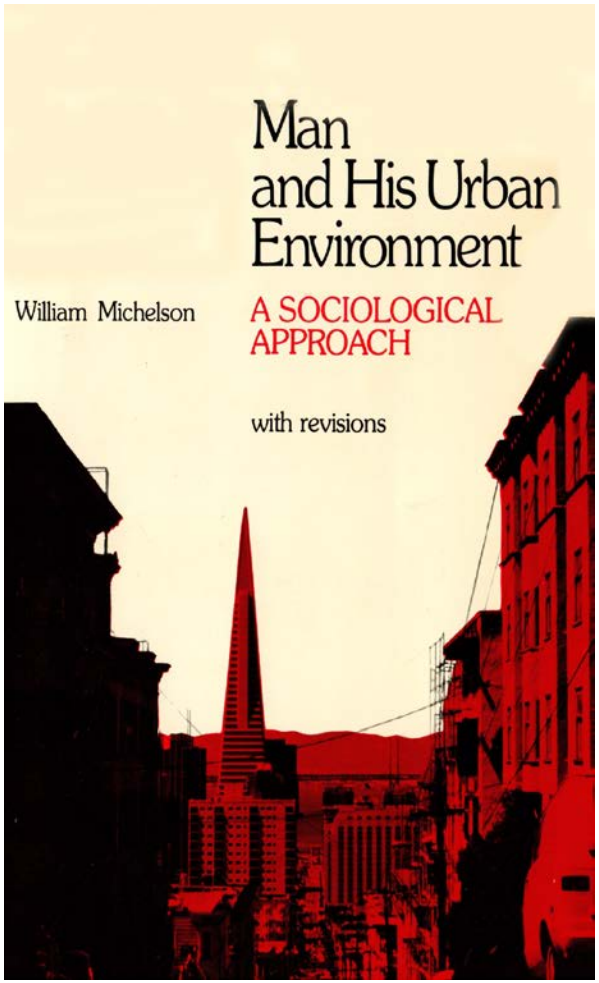
Growing Interest in Environmental Psychology And Urban Sociology While at North Carolina



(1960)



(1970)

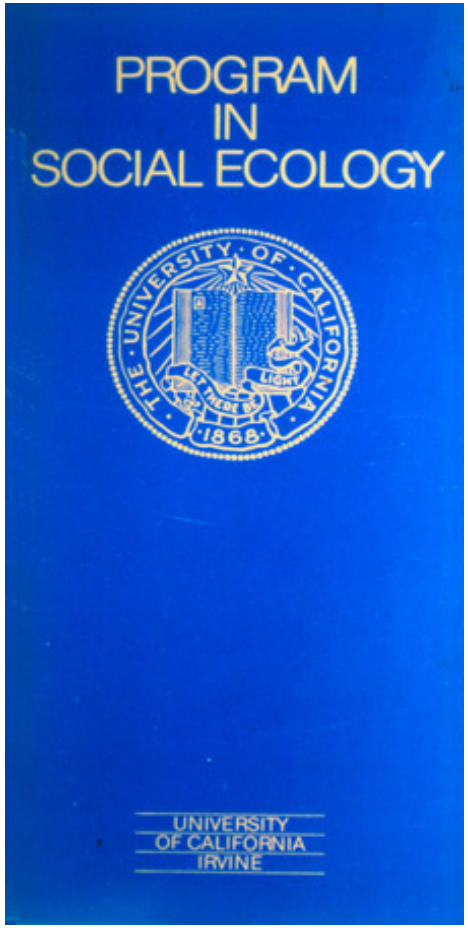


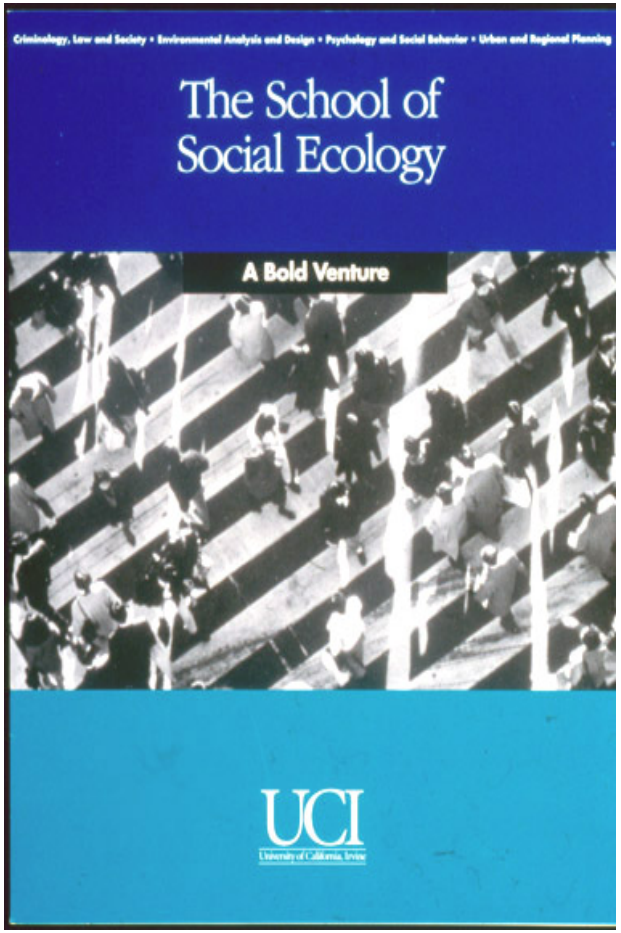
(1970)

The Program in Social Ecology

1970-1992

From a Program to a School of Social Ecology





1970 - Present

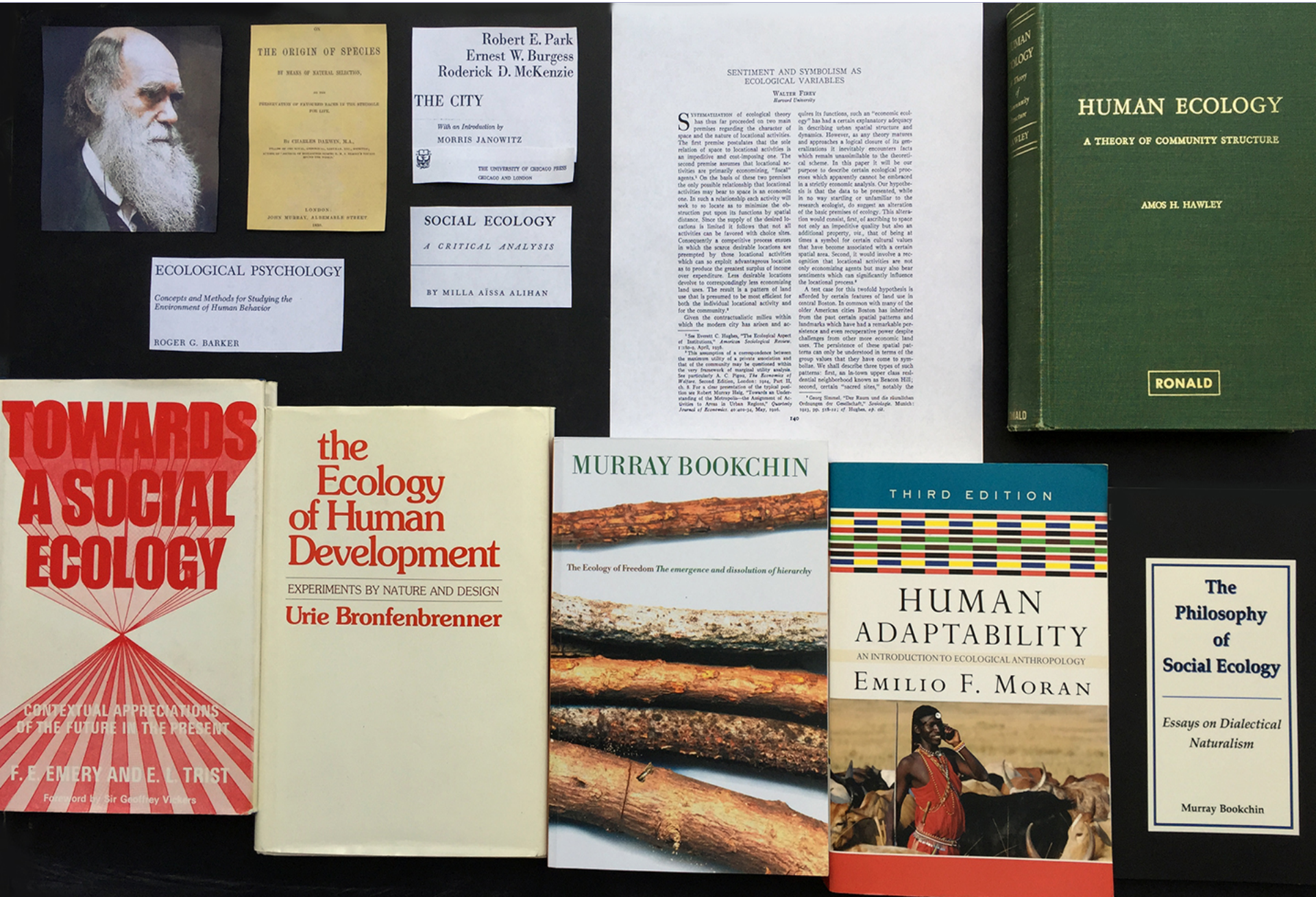
School of Social Ecology

Academic Mission

- Train students to analyze research and policy questions from a broad, *ecological perspective* that *integrates multiple disciplines* and links basic theory and research with *community problem solving*

UCI's Graduate Seminar in Social Ecology
From Multiple Disciplines To Transdisciplinary Research

Historical and Conceptual Foundations of Social Ecology



Origins of Biological Ecology

Ernst Haeckel *–biologist who in 1866 introduced the term* ***ecology*** *defined as "the study of interactions among organisms and their environment"*

Haekel's research focused on the adaptations of plant and animal species to their surroundings over time

Haekel's basic unit of ecological analysis was the ***biome****— a geographically bounded region consisting of biotic (living) and abiotic (non-living) components*

Theoretical Foundations of Biological Ecology

Charles Darwin– *English biologist and ecologist who introduced several catalytic ideas about how plants and animals adapt to their environments, in his landmark books, Origin of Species (1859) and the Descent of Man (1871)*

Key ecological concepts introduced by Darwin include:

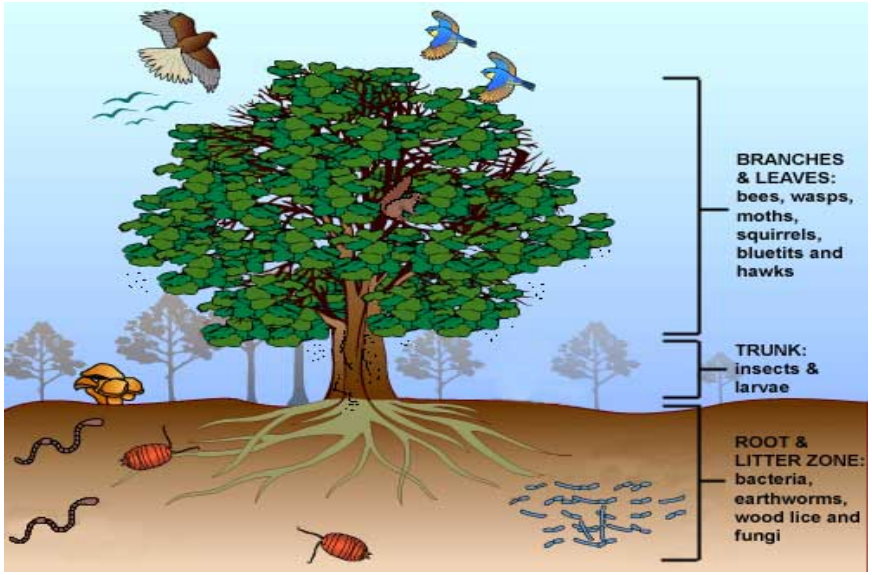
- *the web of life*
- *the struggle for existence*
- *natural selection as the basis for species evolution*

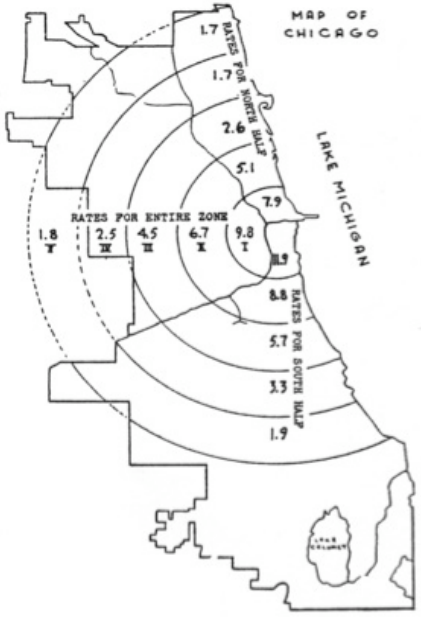
From Bioecology to Social Ecology

- Bio Ecology--study of the relations between organisms and their environments; field studies of plant and animal biomes over extended periods

- Human Ecology--study of the relations between people and their urban ecosystems with an emphasis on biological and economic processes of adaptation, and the spatial distribution of health and behavioral problems

- Social Ecology--study of the relations between people and their environments from a broad, interdisciplinary perspective that gives greater attention to the social, psychological, institutional, and cultural contexts of people-environment relations than did earlier human ecology research





Robert E. Park
Ernest W. Burgess
Roderick D. McKenzie

THE CITY

With an Introduction by

MORRIS JANOWITZ

THE UNIVERSITY OF CHICAGO PRESS
CHICAGO AND LONDON
1925

THE AMERICAN
JOURNAL OF SOCIOLOGY

VOLUME XLII JULY 1936 NUMBER 1

HUMAN ECOLOGY

ROBERT EZRA PARK

ABSTRACT

Human ecology is an attempt to apply to the interrelations of human beings a type of analysis previously applied to the interrelations of plants and animals. The term "symbiosis" describes a type of social relationship that is biotic rather than cultural. This biotic social order comes into existence and is maintained by competition. In plant and animal societies competition is unrestricted by an institutional or moral order. Human society is a consequence and effect of this limitation of the symbiotic social order by the cultural. Different social sciences are concerned with the forms which this limitation of the natural or ecological social order assumes on (1) the economic, (2) the political, and (3) the moral level.

I. THE WEB OF LIFE

Naturalists of the last century were greatly intrigued by their observation of the interrelations and co-ordinations, within the realm of animate nature, of the numerous, divergent, and widely scattered species. Their successors, the botanists, and zoölogists of the present day, have turned their attention to more specific inquiries, and the "realm of nature," like the concept of evolution, has come to be for them a notion remote and speculative.

The "web of life," in which all living organisms, plants and animals alike, are bound together in a vast system of interlinked and interdependent lives, is nevertheless, as J. Arthur Thompson puts it, "one of the fundamental biological concepts" and is "as characteristically Darwinian as the struggle for existence."[1]

[1] *The System of Animate Nature* (Gifford Lectures, 1915–16), II (New York, 1920), 58.

The Chicago School's Concentric Zone Model of Urban Disorder

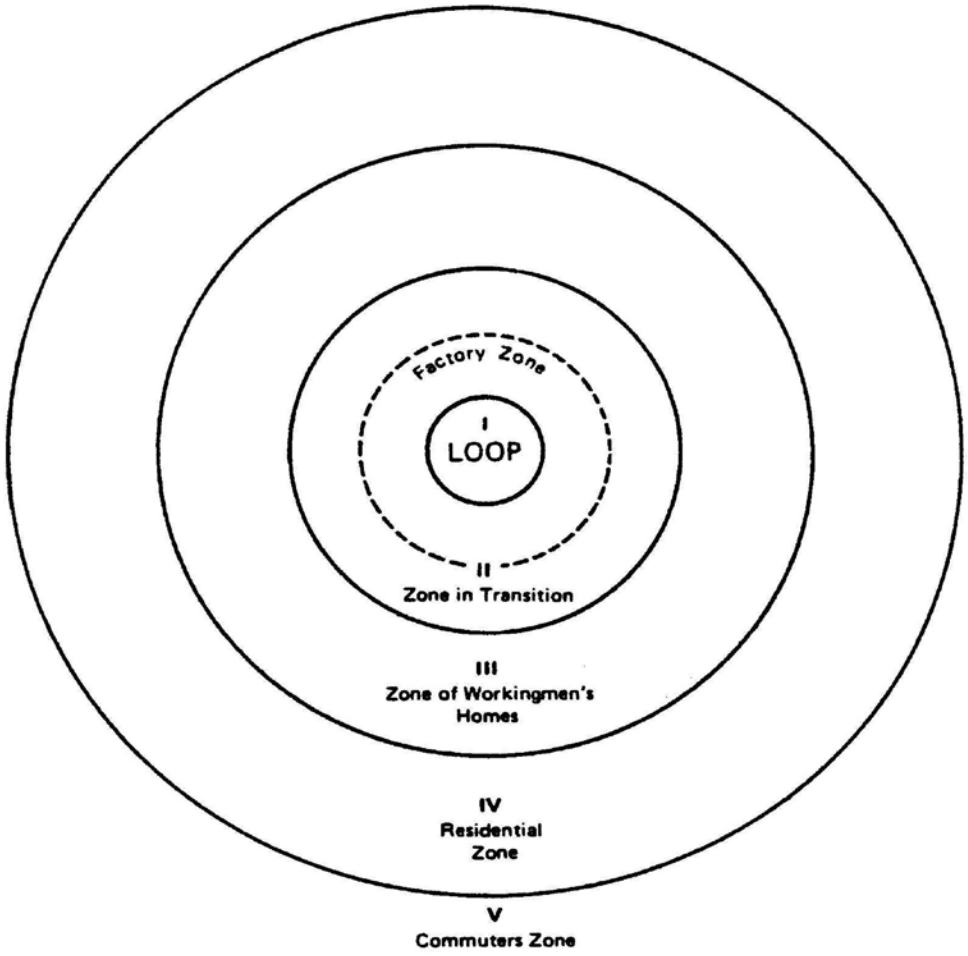
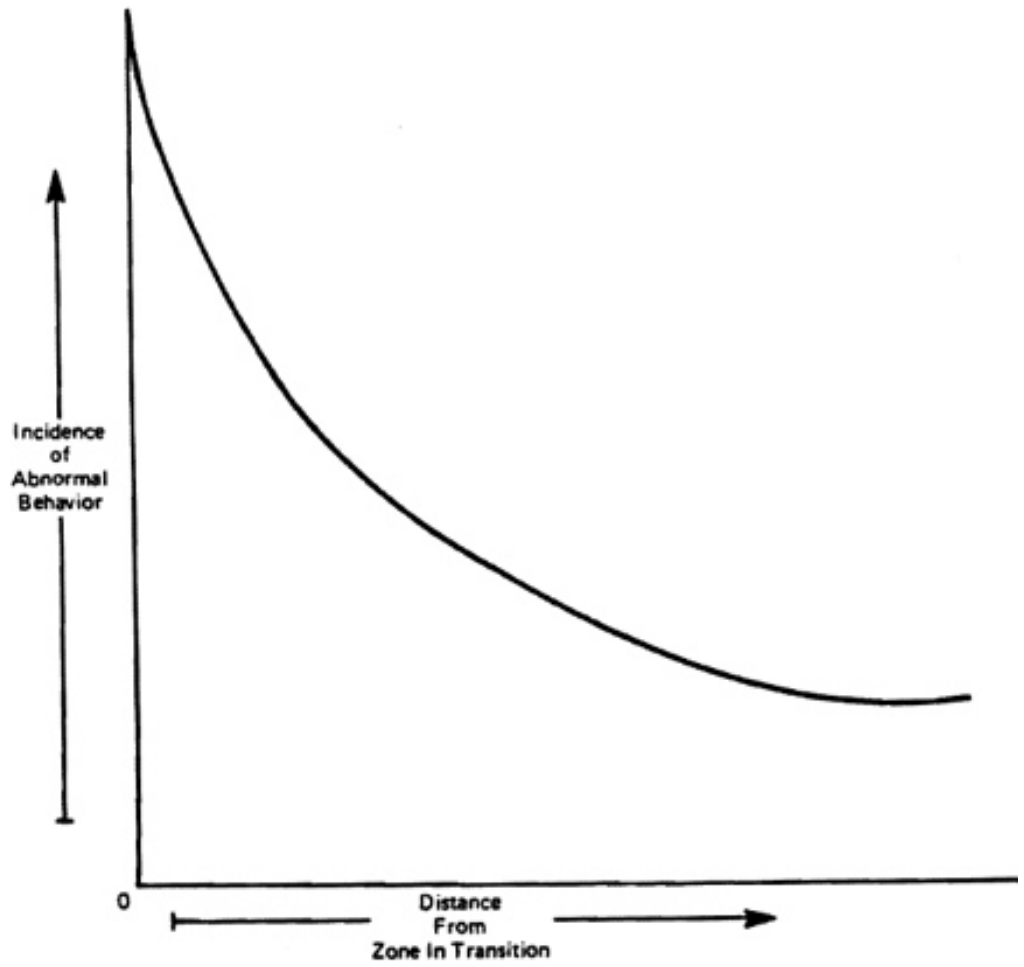


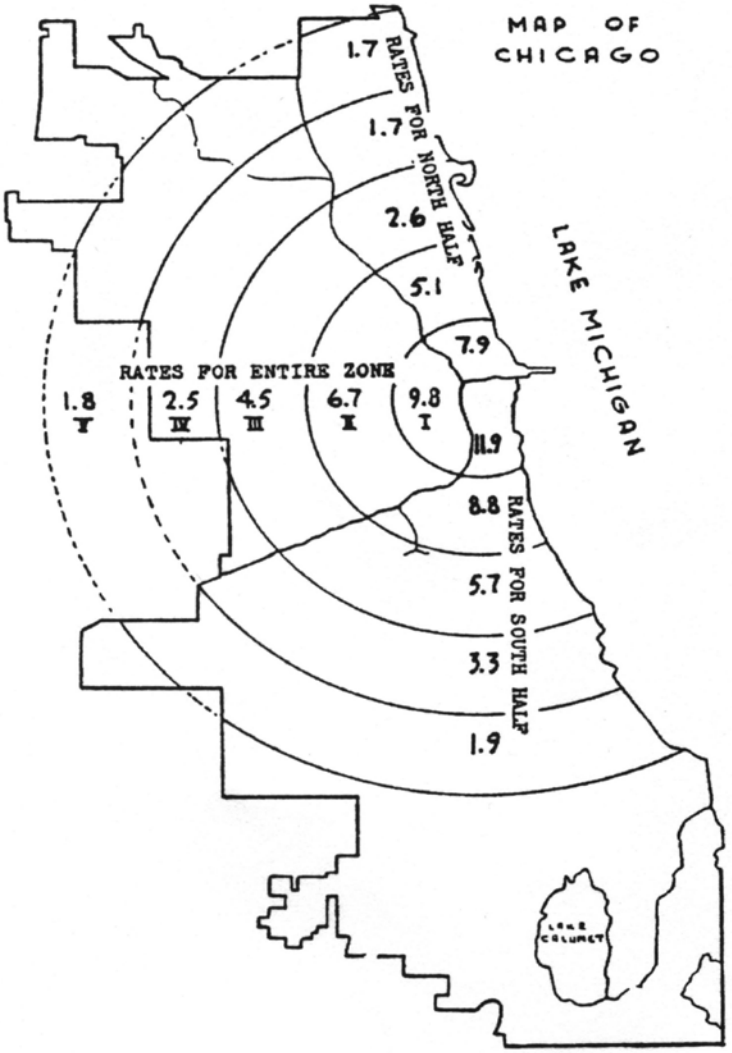
Fig. 4-1. Burgess' concentric zone model. (From Park & Burgess, 1926. Reproduced by permission.)

Relationship Between the Incidence of Abnormal Behavior and Residential Distance from the Zone in Transition



(Catalano, 1979, p. 80)

Zone Map of Male Delinquents in Chicago 1925-1933



Key Limitations of the Chicago School of Human Ecology

- *Over-emphasis on economic, geographic, and biological determinants of behavior and well-being, while ignoring psychological, architectural, societal and cultural influences (Alihan, 1938; Michelson, 1970)*

- *Neglect of symbolic place meanings, which are sometimes more powerful than economic interests (Firey, 1948)*

- *Failure to address the externalized costs of economic production and concerns about environmental injustice (Bookchin, 1995; Catalano, 1979)*

Congruence

-- the degree of fit or compatibility between people's goals, needs, cultural norms and activities, and the physical and social conditions present in their environments

(Michelson, 1970)

SENTIMENT AND SYMBOLISM AS ECOLOGICAL VARIABLES

WALTER FIREY
Harvard University

SYSTEMATIZATION of ecological theory has thus far proceeded on two main premises regarding the character of space and the nature of locational activities. The first premise postulates that the sole relation of space to locational activities is an impeditive and cost-imposing one. The second premise assumes that locational activities are primarily economizing, "fiscal" agents.[1] On the basis of these two premises the only possible relationship that locational activities may bear to space is an economic one. In such a relationship each activity will seek to so locate as to minimize the obstruction put upon its functions by spatial distance. Since the supply of the desired locations is limited it follows that not all activities can be favored with choice sites. Consequently a competitive process ensues in which the scarce desirable locations are preempted by those locational activities which can so exploit advantageous location as to produce the greatest surplus of income over expenditure. Less desirable locations devolve to correspondingly less economizing land uses. The result is a pattern of land use that is presumed to be most efficient for both the individual locational activity and for the community.[2]

Given the contractualistic milieu within which the modern city has arisen and acquires its functions, such an "economic ecology" has had a certain explanatory adequacy in describing urban spatial structure and dynamics. However, as any theory matures and approaches a logical closure of its generalizations it inevitably encounters facts which remain unassimilable to the theoretical scheme. In this paper it will be our purpose to describe certain ecological processes which apparently cannot be embraced in a strictly economic analysis. Our hypothesis is that the data to be presented, while in no way startling or unfamiliar to the research ecologist, do suggest an alteration of the basic premises of ecology. This alteration would consist, first, of ascribing to space not only an impeditive quality but also an additional property, *viz.*, that of being at times a symbol for certain cultural values that have become associated with a certain spatial area. Second, it would involve a recognition that locational activities are not only economizing agents but may also bear sentiments which can significantly influence the locational process.[3]

A test case for this twofold hypothesis is afforded by certain features of land use in central Boston. In common with many of the older American cities Boston has inherited from the past certain spatial patterns and landmarks which have had a remarkable persistence and even recuperative power despite challenges from other more economic land uses. The persistence of these spatial patterns can only be understood in terms of the group values that they have come to symbolize. We shall describe three types of such patterns: first, an in-town upper class residential neighborhood known as Beacon Hill; second, certain "sacred sites," notably the

[1] See Everett C. Hughes, "The Ecological Aspect of Institutions," *American Sociological Review*. 1:180-9, April, 1936.

[2] This assumption of a correspondence between the maximum utility of a private association and that of the community may be questioned within the very framework of marginal utility analysis. See particularly A. C. Pigou, *The Economics of Welfare*. Second Edition, London: 1924, Part II, ch. 8. For a clear presentation of the typical position see Robert Murray Haig, "Towards an Understanding of the Metropolis—the Assignment of Activities to Areas in Urban Regions," *Quarterly Journal of Economics*. 40:402-34, May, 1926.

[3] Georg Simmel, "Der Raum und die räumlichen Ordnungen der Gesellschaft," *Soziologie*. Munich: 1923, pp. 518-22; *cf.* Hughes, *op. cit.*

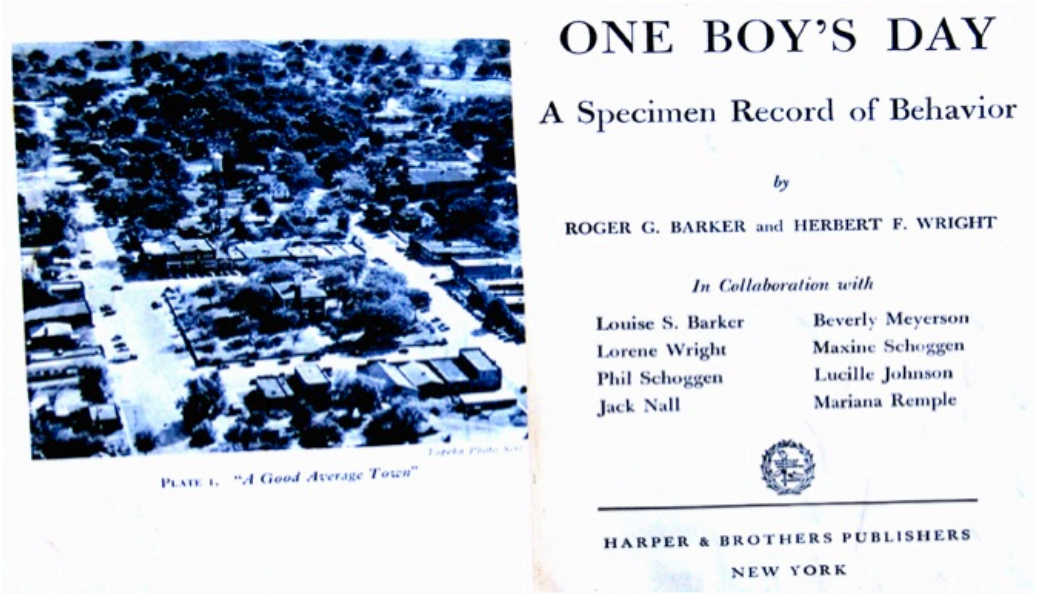
Intersystem Congruence vs. Economic Determinism In Firey's Analysis of Boston Neighborhoods

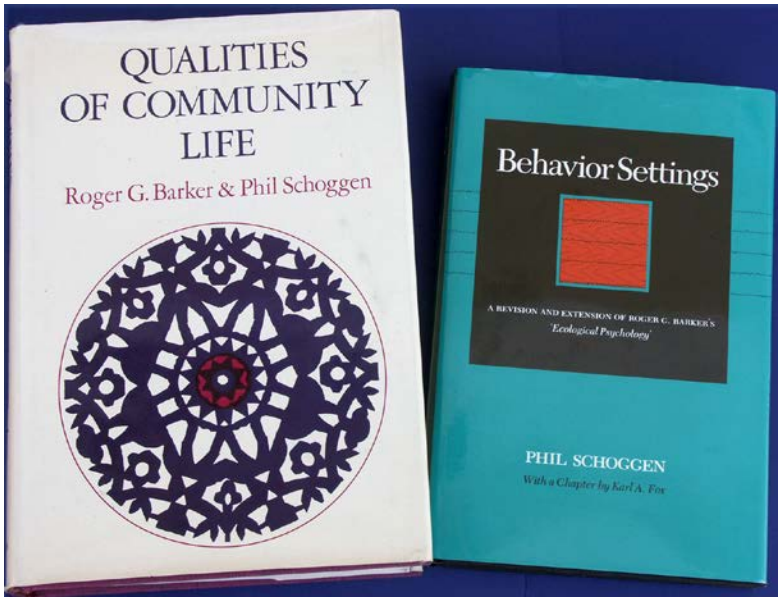
- Beacon Hill
- Boston Common
- The North End

-emphasis on the symbolic and sentimental vs. solely economic functions of space

The Power of Environmental Symbolism

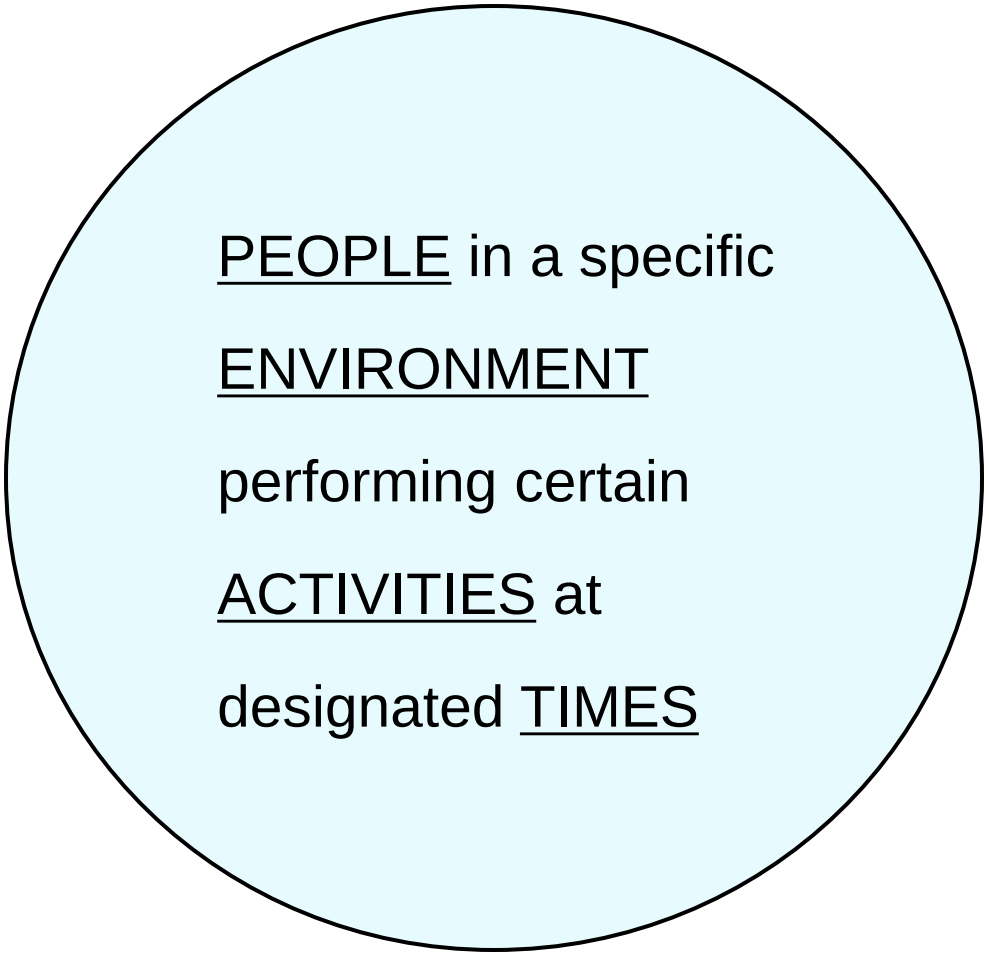
Barker's Conceptualization of Behavior Settings as the *Foreign Hull* of the Life Space





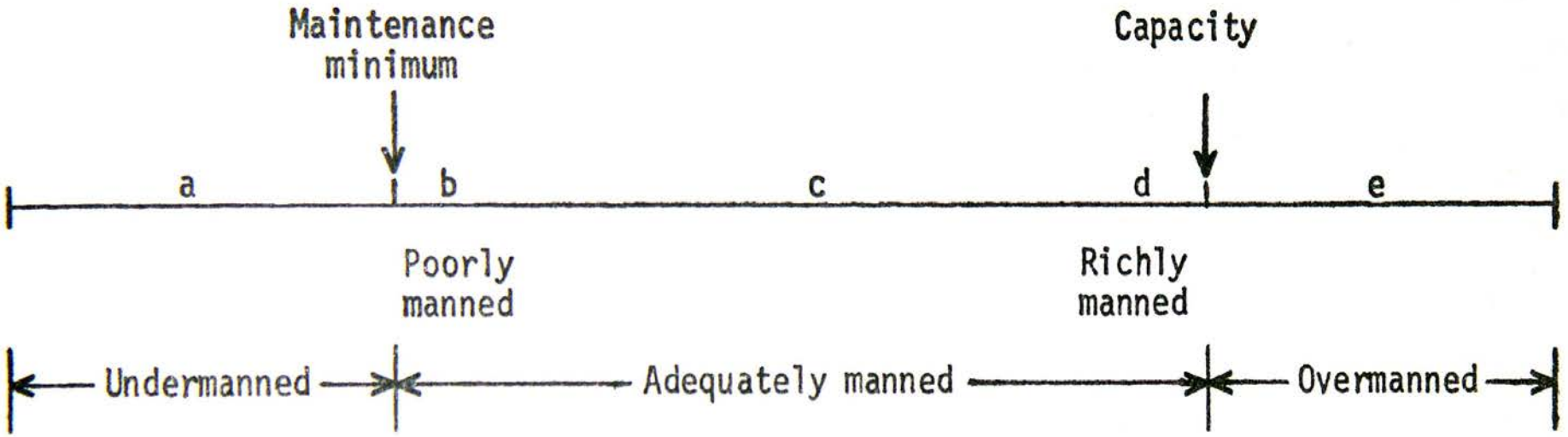
Roger Barker was a student of Kurt Lewin in the Group Dynamics Laboratory at MIT. Barker viewed Lewin's conceptualization of the perceived environment (the "life space") as an incomplete representation of people-environment relations as it neglected the influence of objective, non-perceived aspects of environments on behavior and well-being. Barker's theory of behavior settings offered an objectivist alternative to Lewin's subjectivist representation of the environment.

Behavior Setting



…an eco-behavioral system (Barker, 1968)

Continuum from Under- to Over-Staffing in Behavior Settings

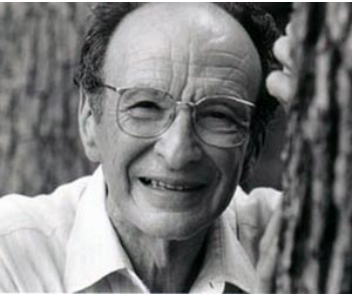


(Wicker, 1973)

High School Students' Participation in Extra-Curricular Activities

Participation measure	*Small-school average*	*Large-school average*
Extracurricular settings entered	19.4	18.4
Number of different kinds of settings entered	6.5	5.4
Number of settings in which respondents had responsible positions	8.7	3.5
Number of settings in which respondents had central positions	3.6	0.6
Number of different kinds of settings in which respondents had responsible positions	3.7	1.6

(Barker, 1968)



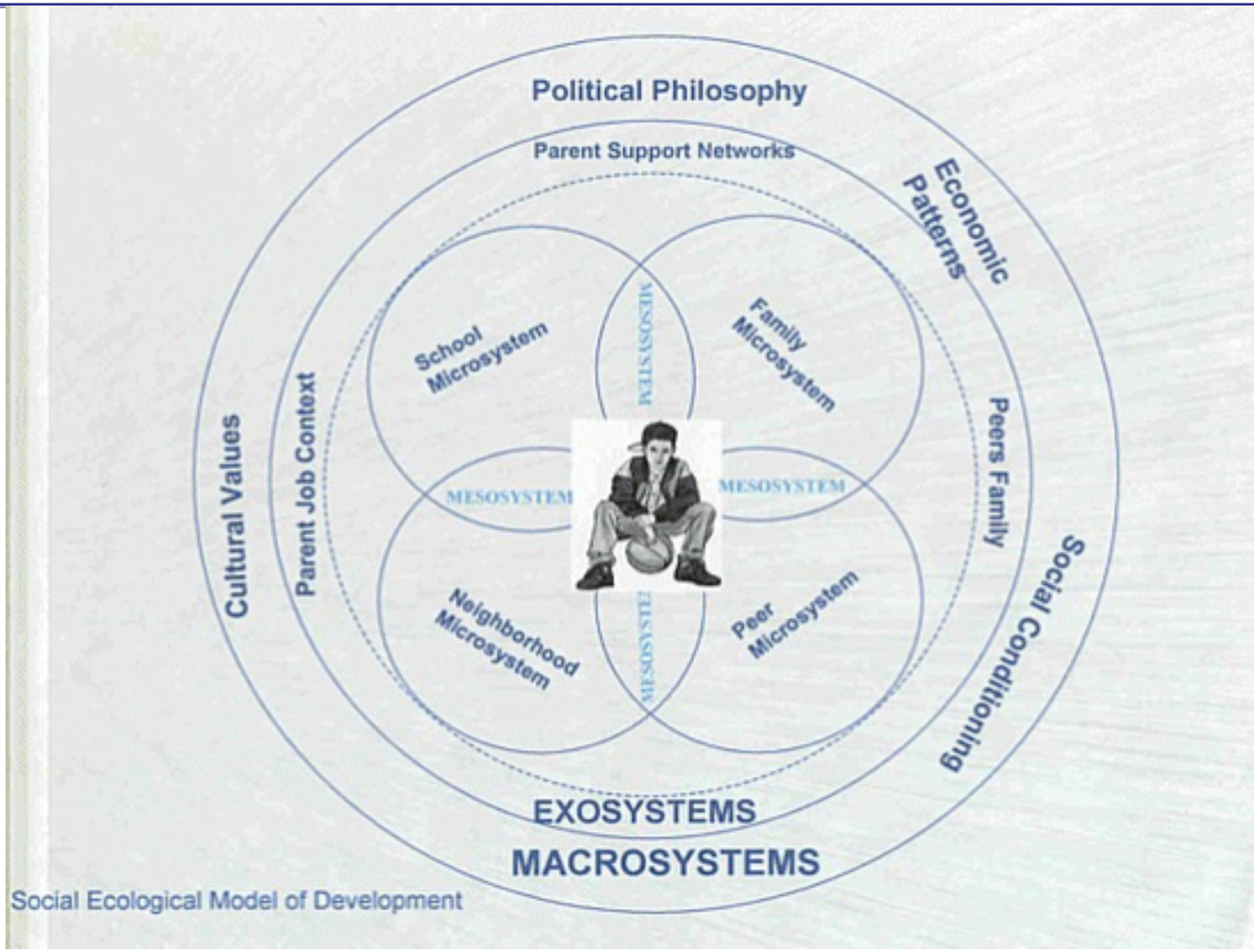
Bronfenbrenner's Ecological Contexts of Development

Microsystem

Mesosystem

Exosystem

Macrosystem



Social Ecological Model of Development

(Bronfenbrenner, 1978)

(Coatsworth, 2002, http://aspe.hhs.gov/hsp/connections-charts04/concept.htm)

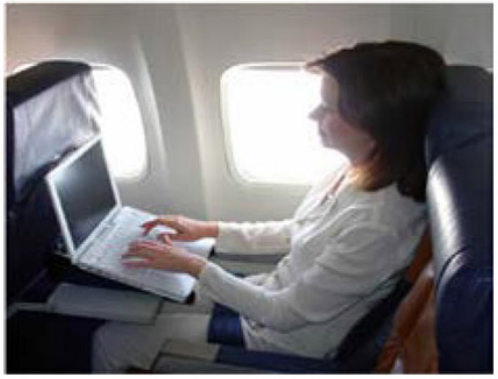
Real-Real and Real-Virtual Mesosystems

{r-r} units - span two or more real settings

Author's Childhood Home in Miami

Author's Elementary School in Miami

{r-v} units - encompass one or more real settings and at least one virtual environment



Checking Social Media from an Airplane

(Stokols, 2018

Barton's Map of the Settlement as an Ecosystem in its Context

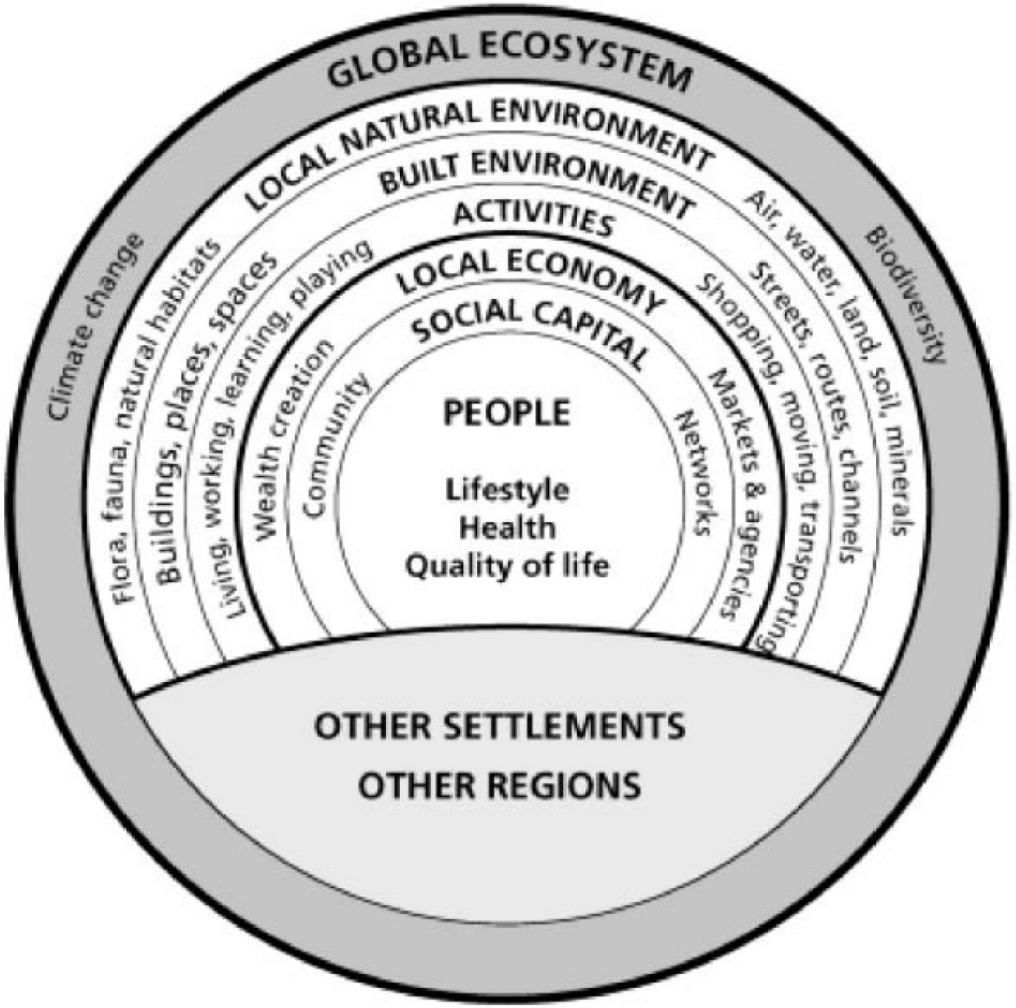


Figure 3. A conceptual model of the settlement as ecosystem, in its context. The settlement ecosystem health map.

Expansion of social-ecological systems science

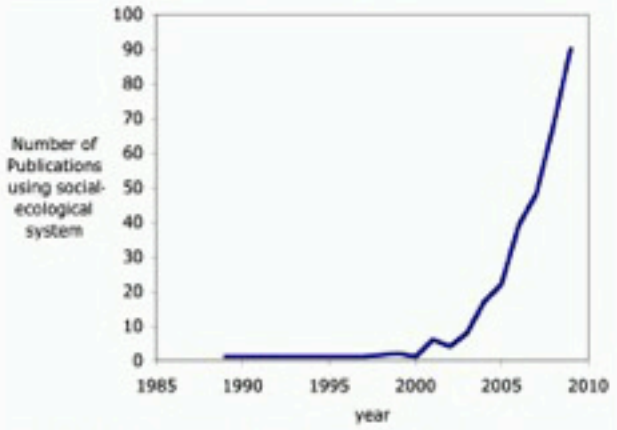
2010 APRIL 16

by Garry Peterson

tags: biblometrics, Carl Folke, Fikret Berkes, ISI, Marty Anderies, Per Olsson, social-ecological systems, Steve Carpenter

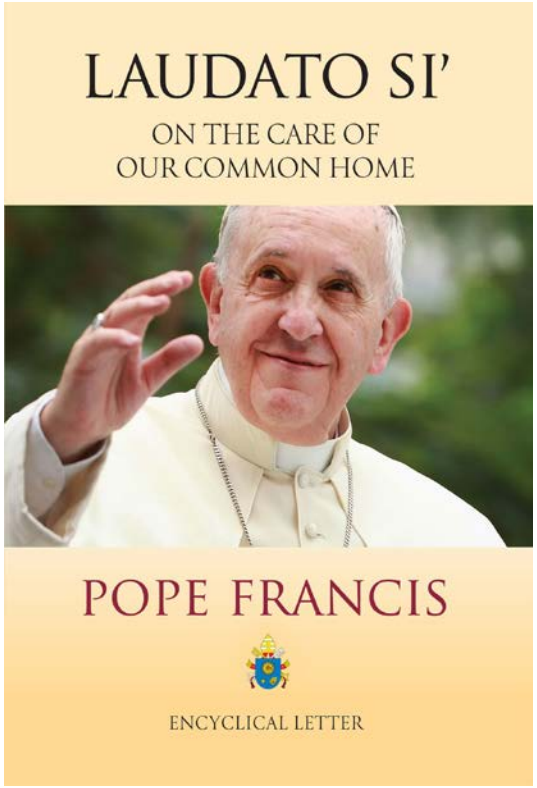
The concept of social-ecological systems has been gaining increased interested in science. Below is a graph showing papers whose topic includes social-ecological systems. During the 1990s there were a few publications and then a rapid rise during the 2000s. Two influential books articulated social-ecological ideas:

- Linking social and ecological systems: Practices and Social Mechanisms for Building Resilience in 2000 and
- Navigating social-ecological systems: building resilience for complexity and change in 2003 .



Papers from ISI - social-ecological or social ecological and Systems

http://rs.resalliance.org/2010/04/16/expansion-of-social-ecological-systems-science/



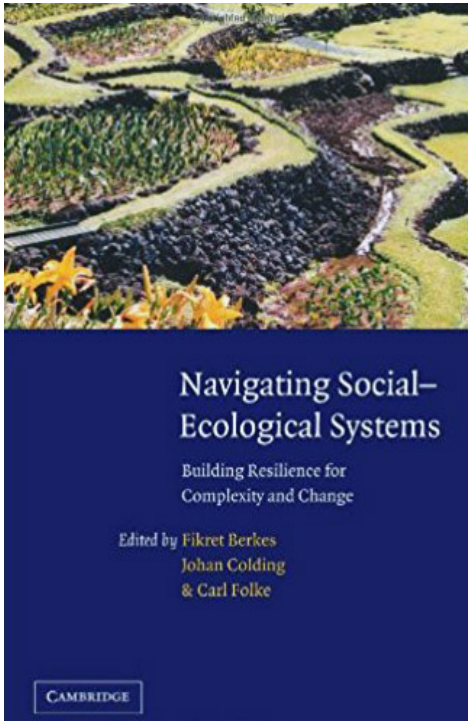
ENCYCLICAL LETTER
ON THE ENVIRONMENT
BY POPE FRANCIS, 2015

(see section 137 on social ecology)

http://w2.vatican.va/content/francesco/en/encyclicals/documents/papa-francesco_20150524_enciclica-laudato-si.html

Stockholm, Frankfurt, and Vienna Schools of Social Ecology

Global, Regional, and Societal-Level Analyses of Social-Ecological Systems, Strongly Influenced by Sustainability Concerns



(2003)

ISOE

Egon Becker and Thomas Jahn

Societal Relations to Nature

Outline of a Critical Theory in the ecological crisis

(2005)

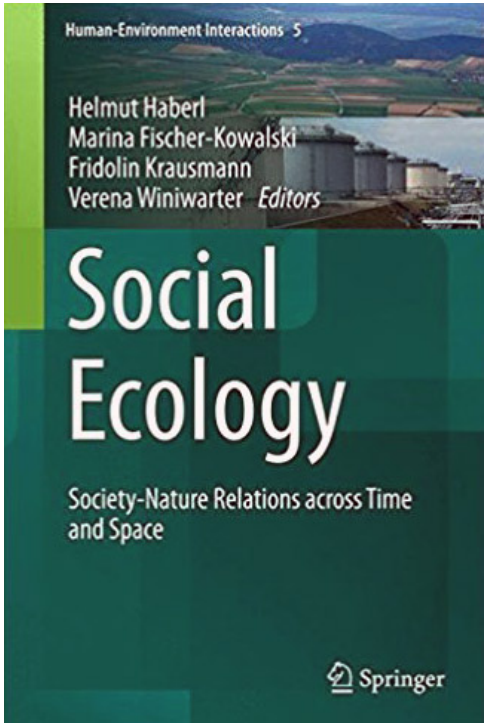
sustainability MDPI

Article

Social Ecology as Critical, Transdisciplinary Science—Conceptualizing, Analyzing and Shaping Societal Relations to Nature

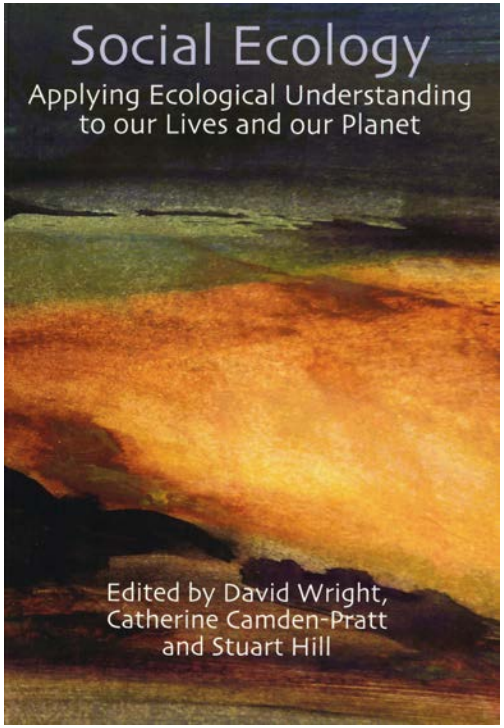
Diana Hummel [1,2], Thomas Jahn [1,2,*], Florian Keil [3], Stefan Liehr [1,2] and Immanuel Stieß [1]

(2017)

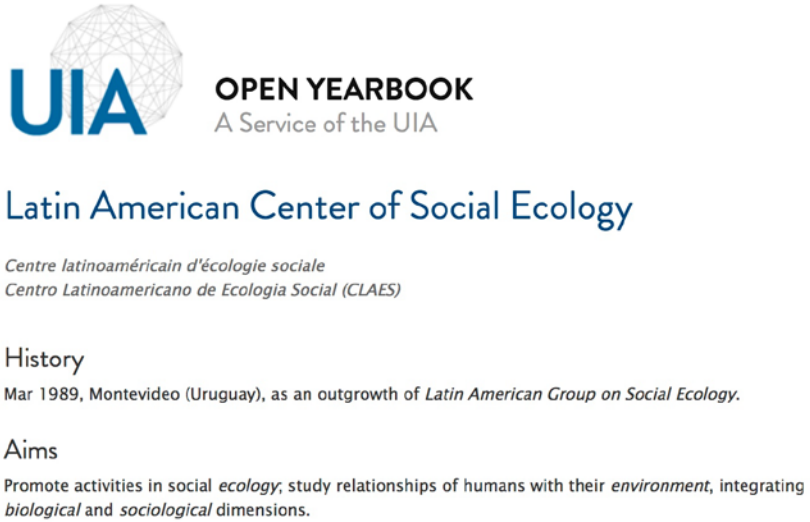


(2016)

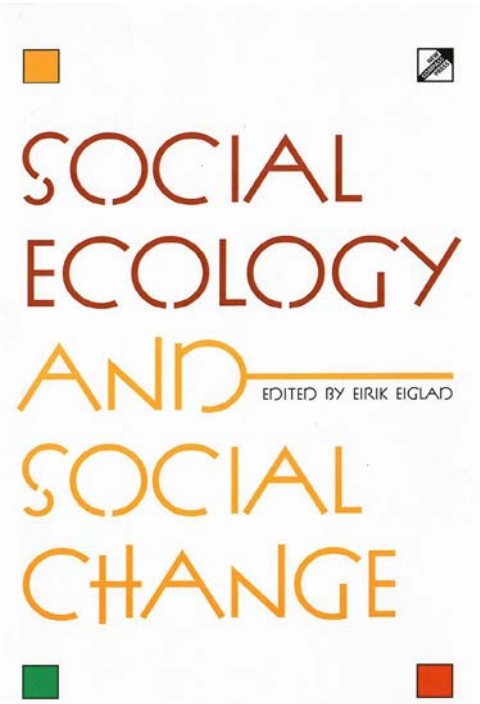
Social Ecology in Australia, Latin America, and Beyond



(University of Western Sydney, 2011)



(Friends of the Earth International, Montivideo, 2018)

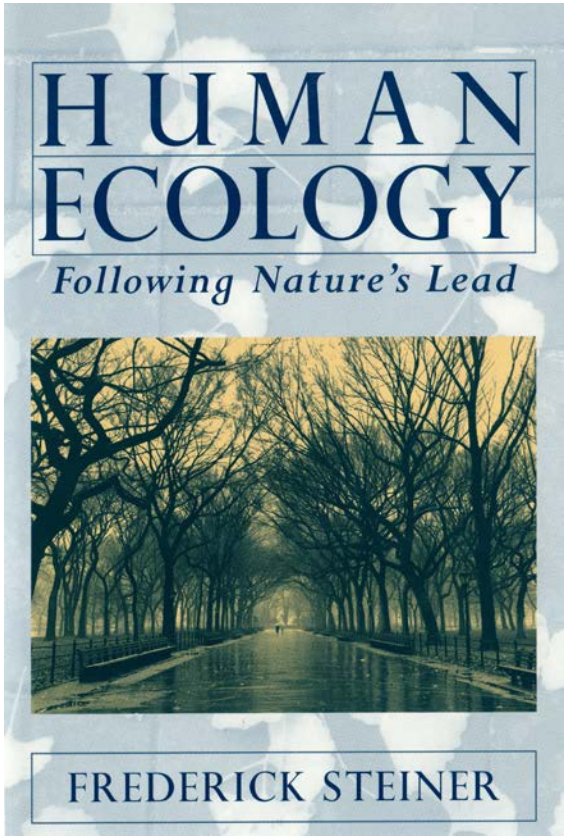


(Institute of Social Ecology, Vermont, 2015)

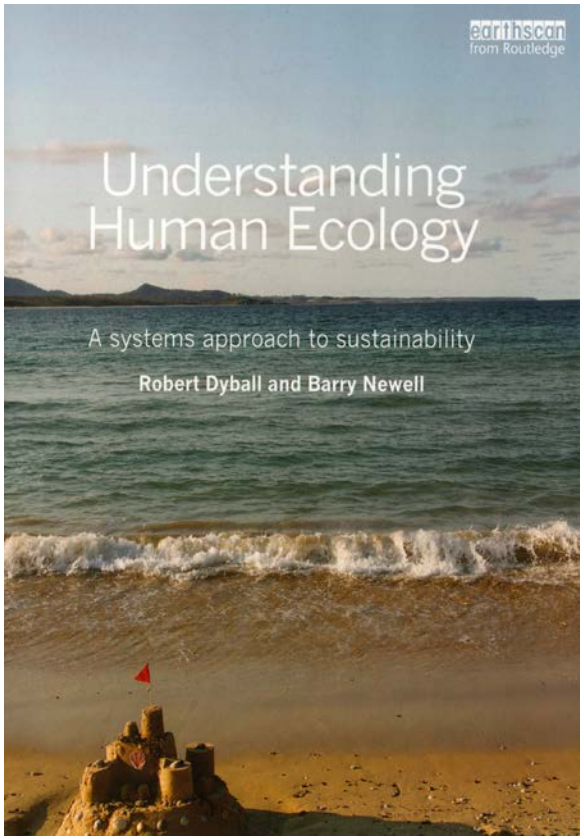
Society for Human Ecology

Human Ecology Programs and Institutions

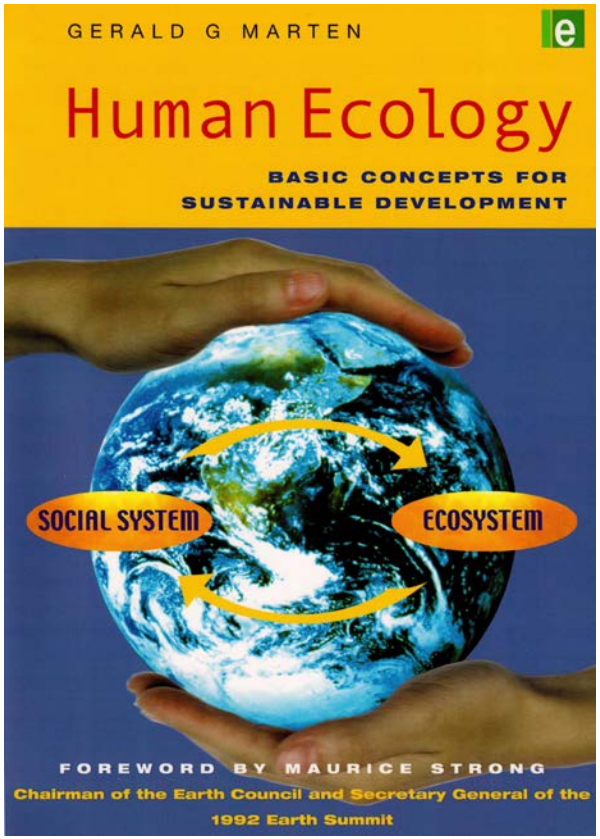
https://societyforhumanecology.org/human-ecology-programs-and-institutions/



(2002)



(2015)



(2001)

Epistemic Challenges for a Social Ecology of the Anthropocene

- *Conceptualizing and delimiting boundaries of social-ecological systems (SES)*
- *Identifying and countering pressures toward unsustainability at local, regional, societal, and global levels*
- *Developing new SES typologies that account for cyber influences on place-based settings and people-environment transactions*

Delimiting Social-Ecological System Boundaries

"A *social-ecological system* consists of a bio-geo-physical unit and its associated social actors and institutions. Social-ecological systems are complex and adaptive and delimited by spatial or functional boundaries surrounding particular ecosystems and their problem context."

(Glaser et al., 2008, Glaser, 2012)

Social-ecological systems as epistemic objects

Egon Becker

Institute for Social-Ecological Research (ISOE), Frankfurt/Main

"The dynamics of social-ecological systems (SES) depend strongly on their boundary conditions and their problem context…Here it is crucial whether the boundary is created and maintained by internal system activities, or is just a demarcation made for the convenience of analysis. In any case, the definition of a spatial or functional boundary introduces empirical conditions into formal systems analysis.'

(Becker, 2012)

Social-Ecological Model of Society-Nature Interaction

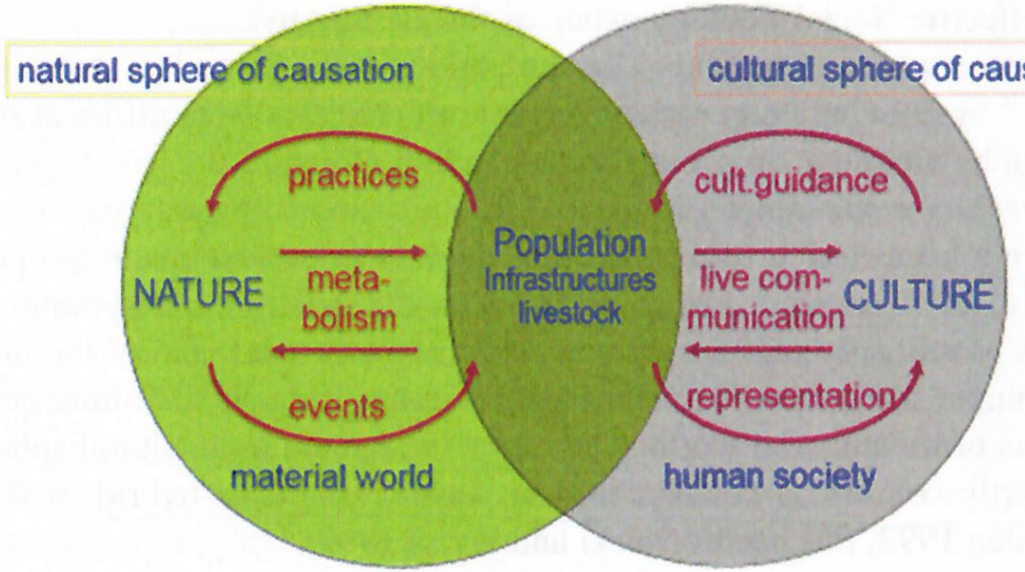
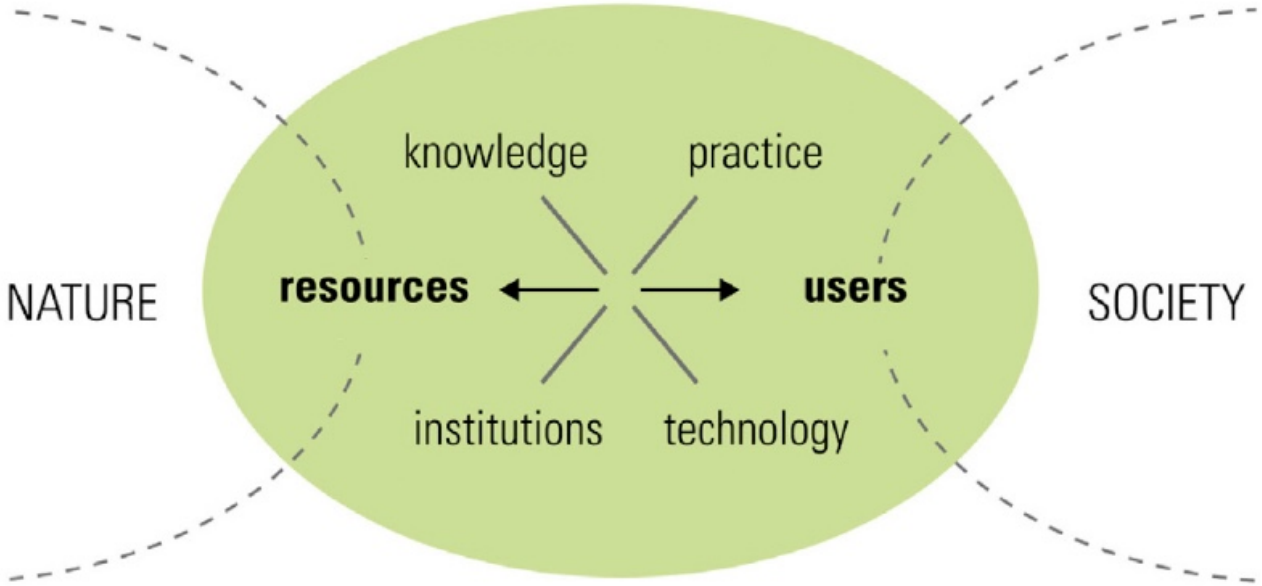


Fig. 1.3 The conceptual model of society-nature interaction developed by the Vienna Social Ecology School. (Elaborated after Fischer-Kowalski and Haberl 2007, p. 13; Fischer-Kowalski and Weisz 1999)

(from Haberl et al., 2016, p.21)

Social-Ecological Systems as Provisioning Systems



(Hummel, Jahn, Keil, Liehr, & StieB, 2017 p.10)

The Anthropocene has made the task of delimiting social-ecological system boundaries more complex owing to new realities of the 21st Century:

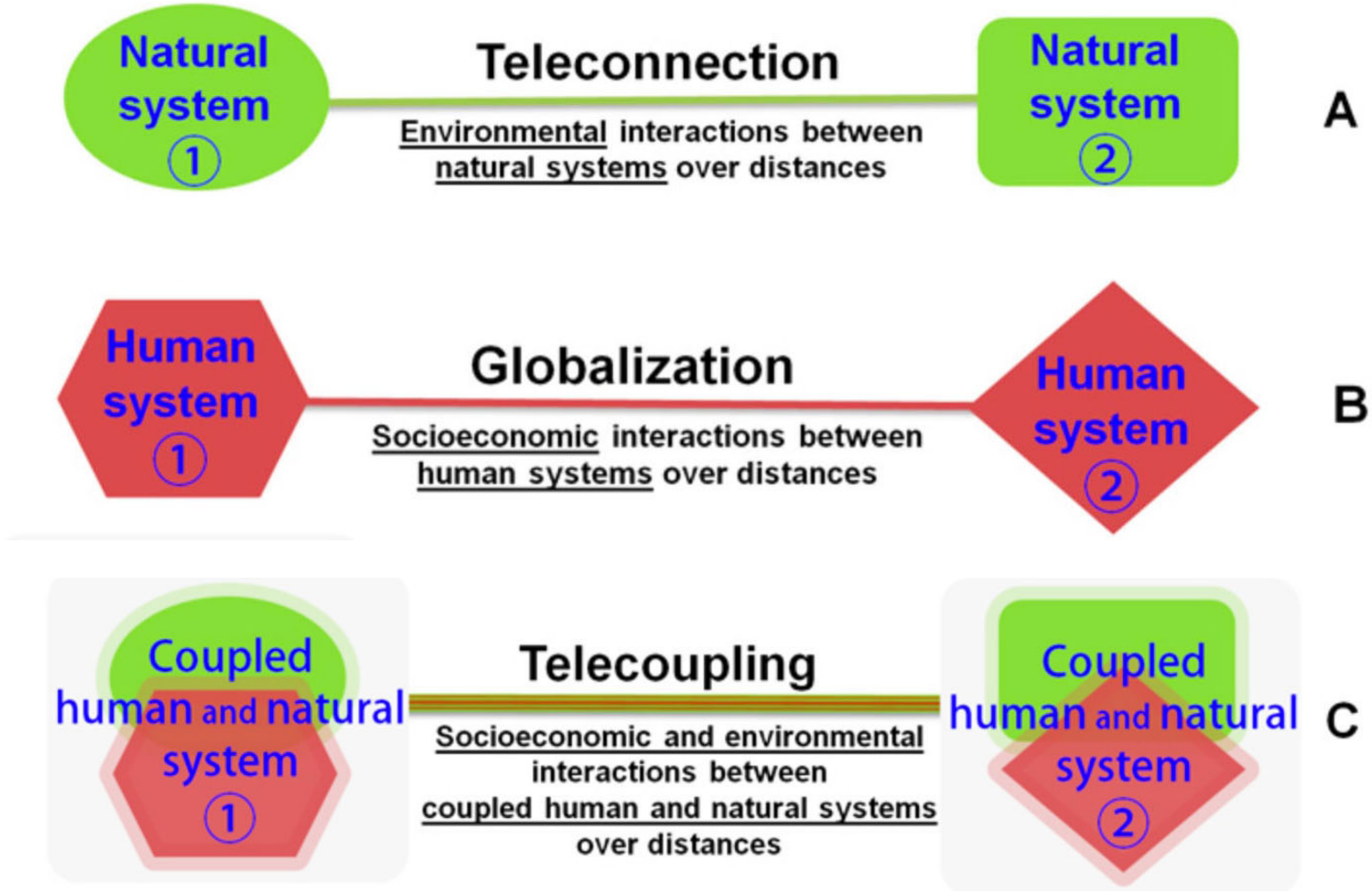
1. Environmental interactions among remote natural systems (Liu et al, 2015)

1. The rise of the cybersphere and the transition from industrial to digital regimes (Stokols, 2018)

1. Telecoupling between remote societal-nature systems; transboundary effects on public health and ecological footprints through atmospheric and marine pollution, international trade (Liu et al, 2015, Qiang et al., 2017, Seto, 2015)

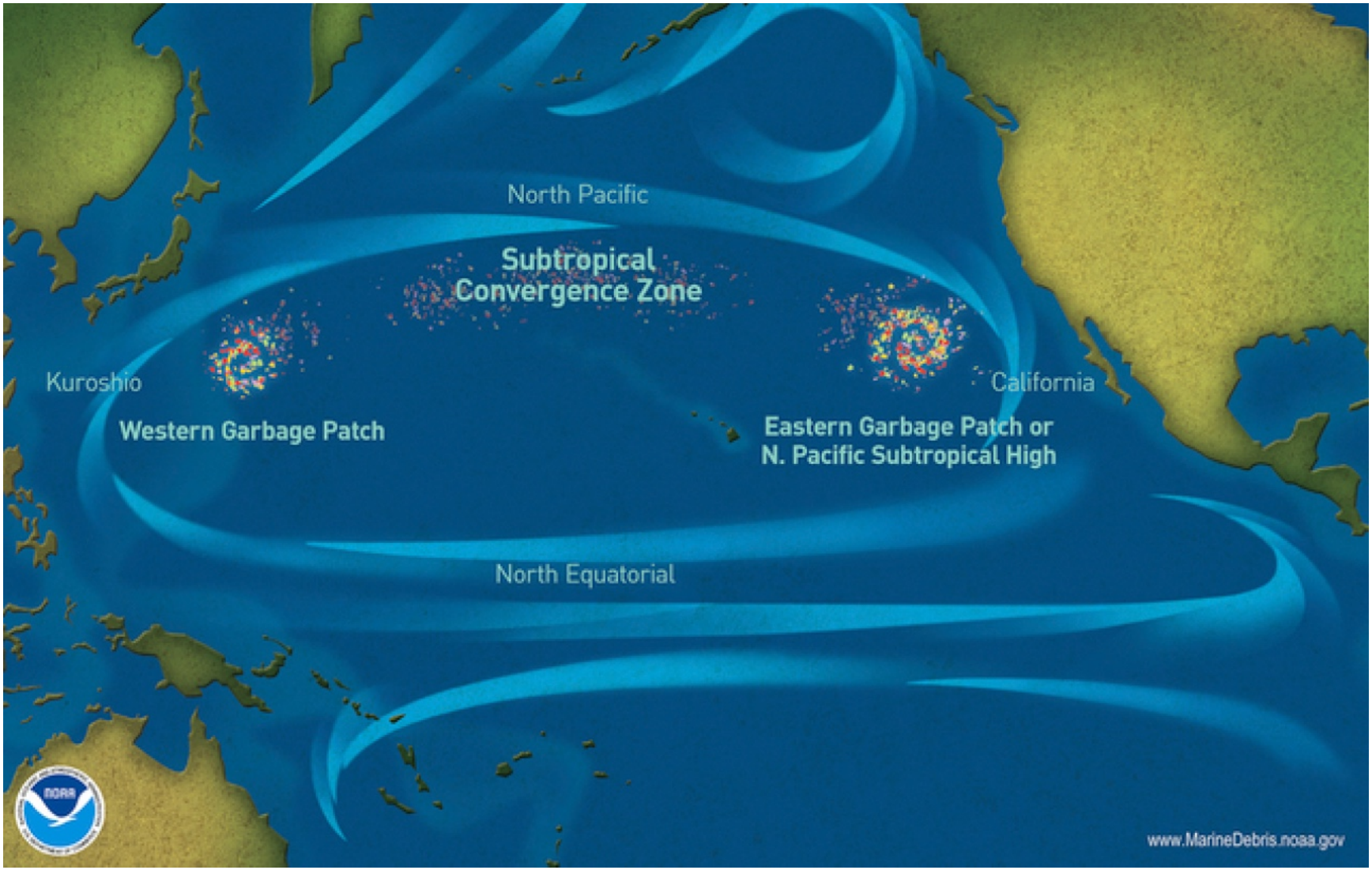
Definitions of Teleconnections, Globalization, and Telecoupling

Proposed by Liu et al., Ecology and Society (2013)



Crystal Cove State Park, Newport Coast, California

Pacific Ocean Trash Vortex



sustainability

MDPI

Article

Challenges for Social-Ecological Transformations: Contributions from Social and Political Ecology

Christoph Görg [1,*], Ulrich Brand [2], Helmut Haberl [1], Diana Hummel [3], Thomas Jahn [3] and Stefan Liehr [3]

Transformational pressures toward unsustainability vs. sustainability due to:

1. Regressive, anti-science political ideologies (including climate change denial)

2. Hegemonic economic systems that privilege surplus vs. use value at the expense of natural capital and sustainability (e.g., extractivism and neo-extractivism)

3. Deviation-amplifying earth system cycles - positive feedback loops that accelerate adverse global environmental changes

Principles of Contextual Analysis

A key idea in contextual research is the concept of *embeddedness*. A particular phenomenon is thought to be embedded in (and influenced by) a surrounding set of events.

The first task of contextual research is to identify the *target problem* to be examined.

The next step is to identify a set of situational or *contextual variables* that are thought to exert an important influence on the form and occurrence of the target problem.

Enhancing Parsimony and Power in Ecological Research

- *Identify high-leverage variables, or those that exert greatest influence on behavior and health across multiple levels of analysis*

- *Target problems that are most prevalent and severe in a community, especially among vulnerable sub-groups of the population.*

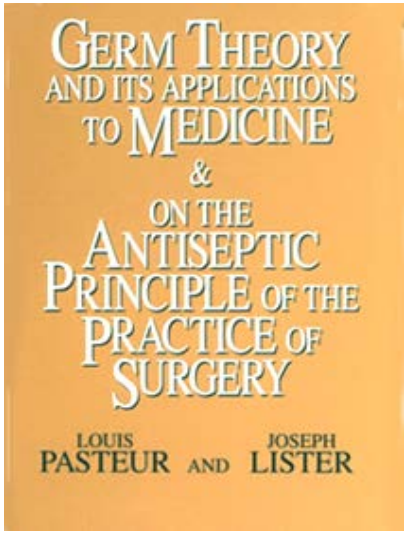
Effective Context

…situational factors that are most crucial for understanding the form and occurrence of the target problem

(Stokols, 1987)

Germ Theory of Infectious Disease

Pathogen → Host → Illness Symptoms



(1878)

Psychological Stress

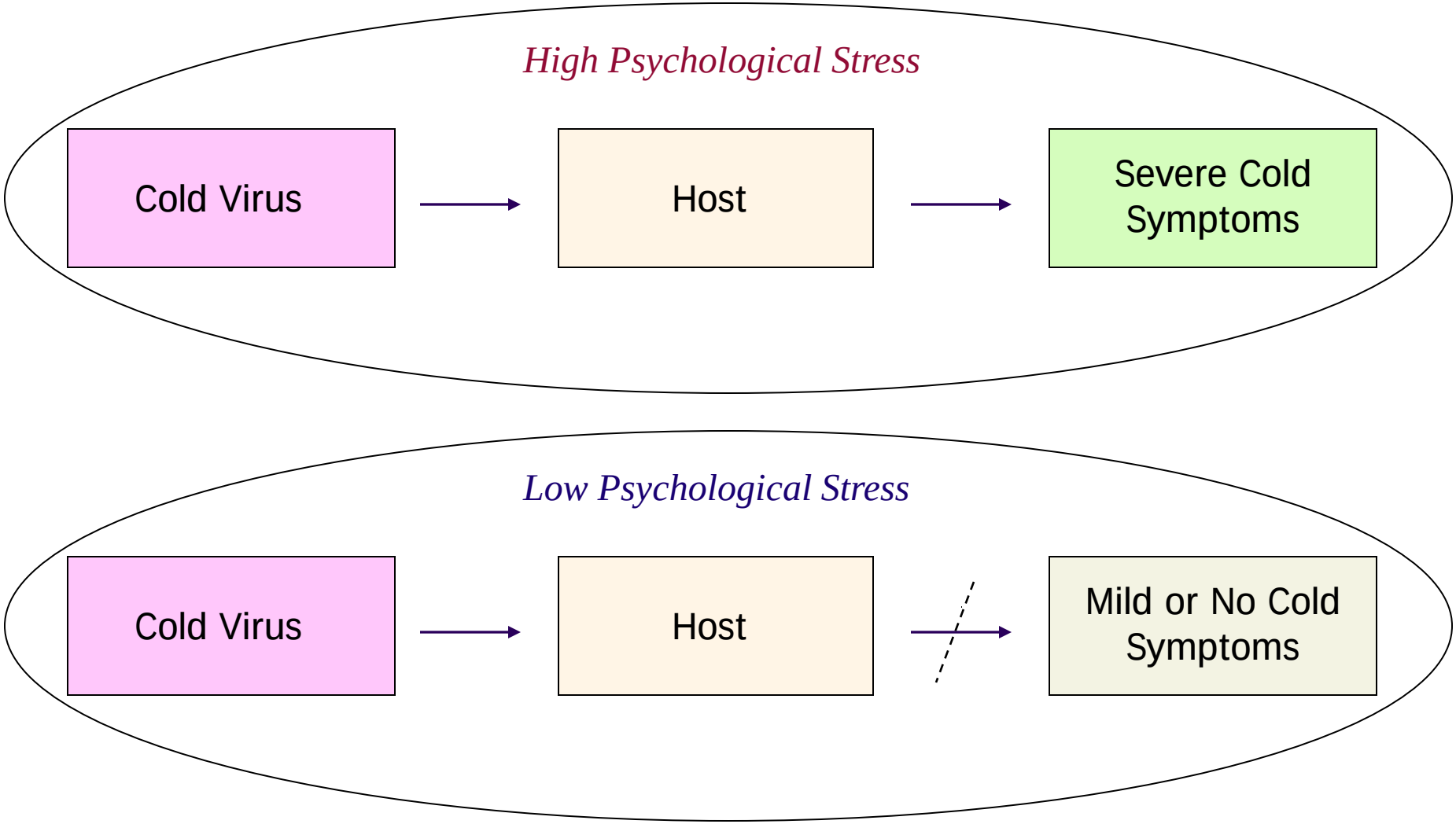
Perceived *environmental demands*

exceed the individual's

Perceived *capacity to cope with those demands*

(Lazarus, 1966)

Biopsychosocial Model of Susceptibility to Colds



(Cohen, Tyrell, & Smith, 1991)

Contextual Theory

…one that specifies and explains a pattern of cross-situational variation in the relationships between a specified set of variables

(Stokols, 1987)

Paradigms for Understanding Health and Illness

- Biomedical Model
- Biopsychosocial Model
- Social Ecological Model

The Ecology of Obesity

Modeling the Effective Context of a Target Problem

- Spatial, sociocultural, temporal, and virtual SCOPE
- Individual or Aggregate FOCUS
- Objectivist or Subjectivist PERSPECTIVE
- Partitive or Composite STRUCTURE

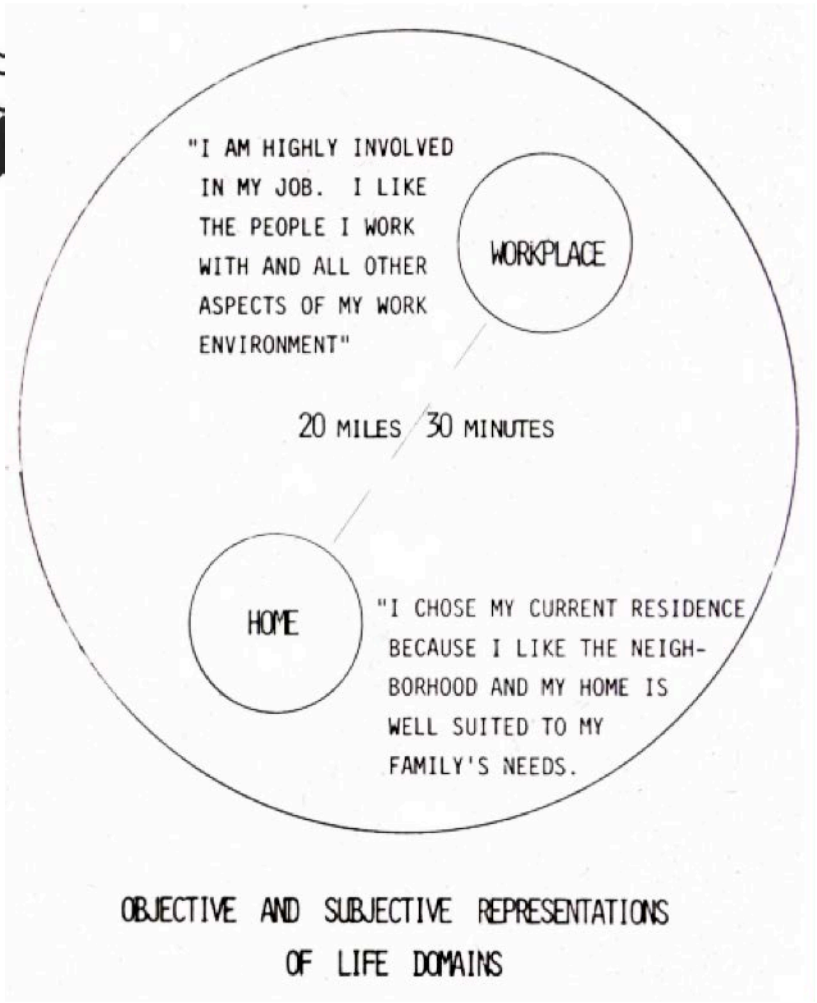
(Stokols, 2018, Chapter 4)

Spatial Scope

- *Spatial scope of an analysis* – increases to the extent that it represents places, processes, and events occurring within a broad rather than narrow region of the individual's or group's geographical environment

Settings Within an Individual's Daily Activity System (Lenntorp, 1978)

Mapping Objective and Subjective Facets of Commuting Between Home and Work



(Stokols, Novaco, Stokols, & Campbell, 1978)

Airplane Viewed From Elementary School in the Flight Path of LAX Airport

(Cohen, Evans, Stokols, & Krantz, 1986)

Effects of Aircraft Noise on Elementary School Children in LA

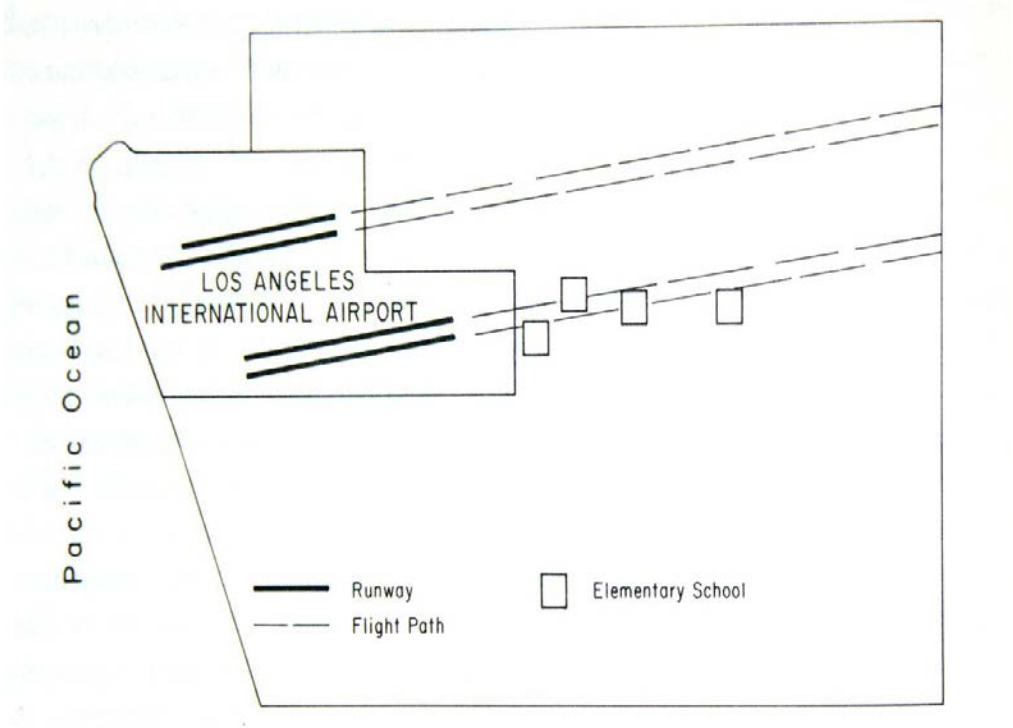
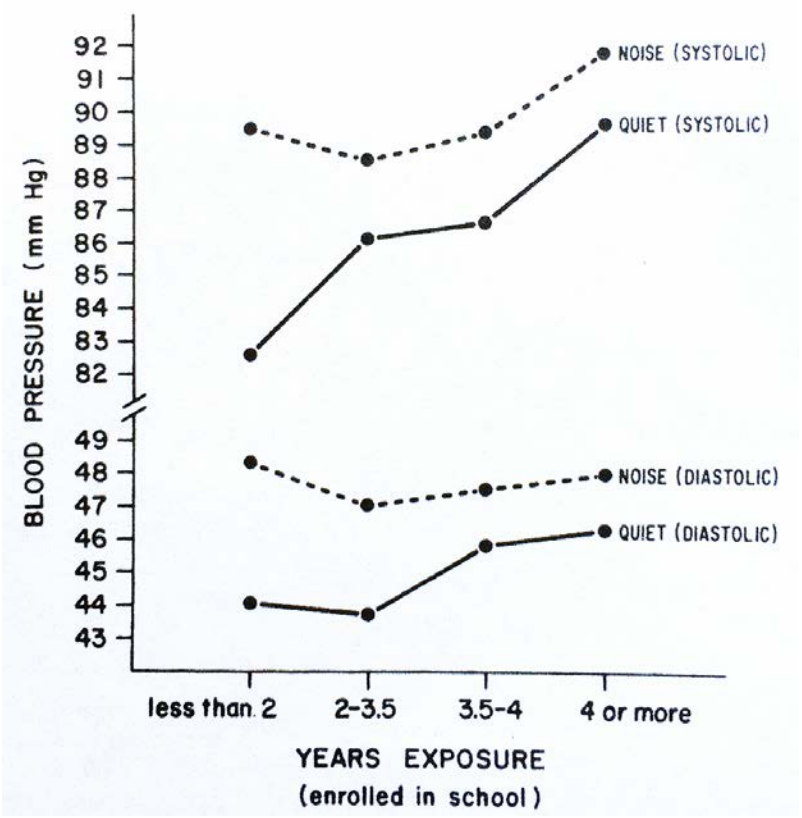


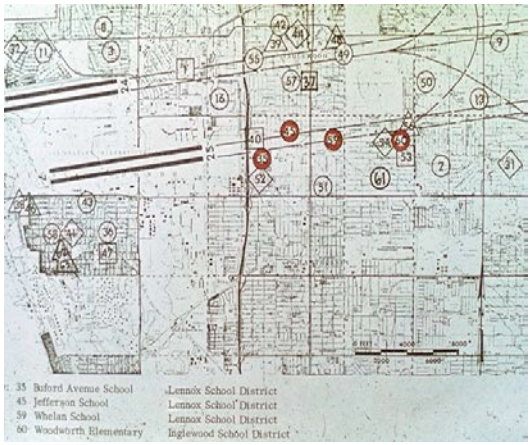
Figure 1. Location of noise-impacted elementary schools in relation to Los Angeles International Airport.



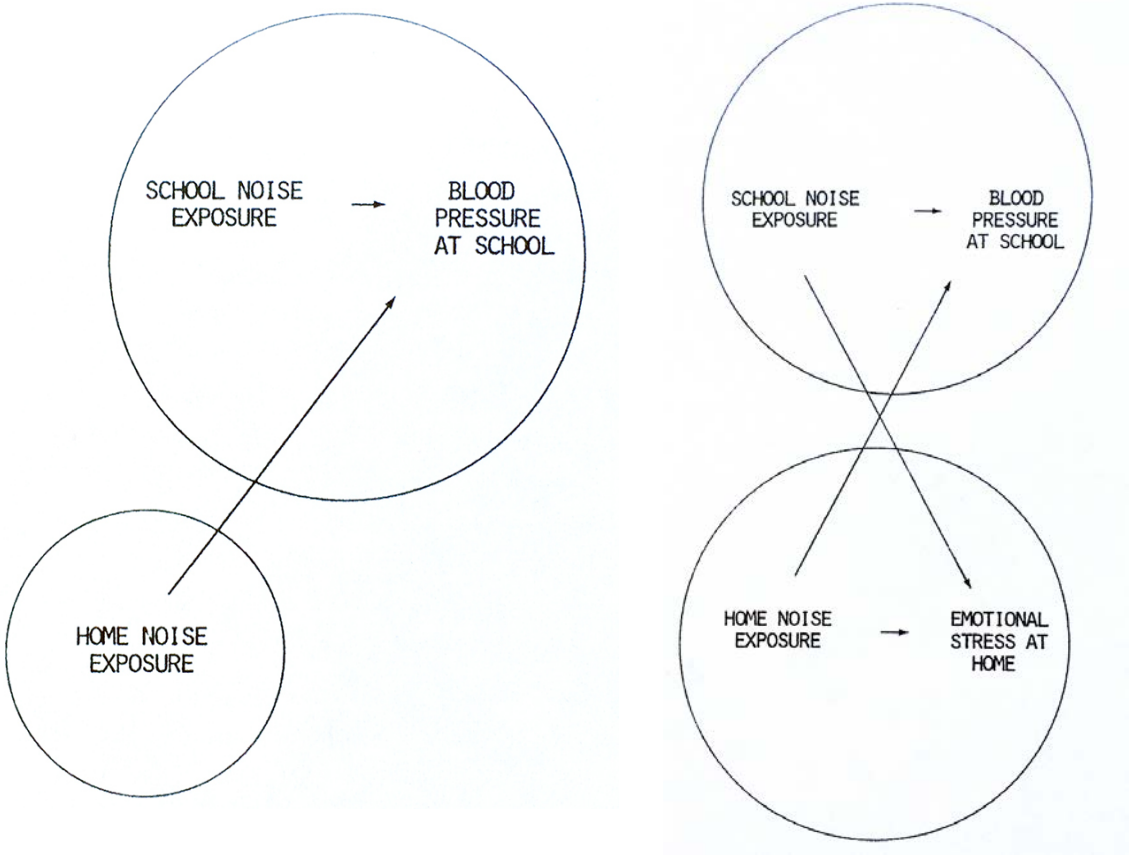
(Cohen, Evans, Stokols, & Krantz, 1986)

Expanding the Spatial Scope of Research on Airplane Noise at School and Children's Blood Pressure

View of Aircraft from Elementary School Playground



Location of Four Elementary Schools in the Flight Path of Los Angeles International Airport

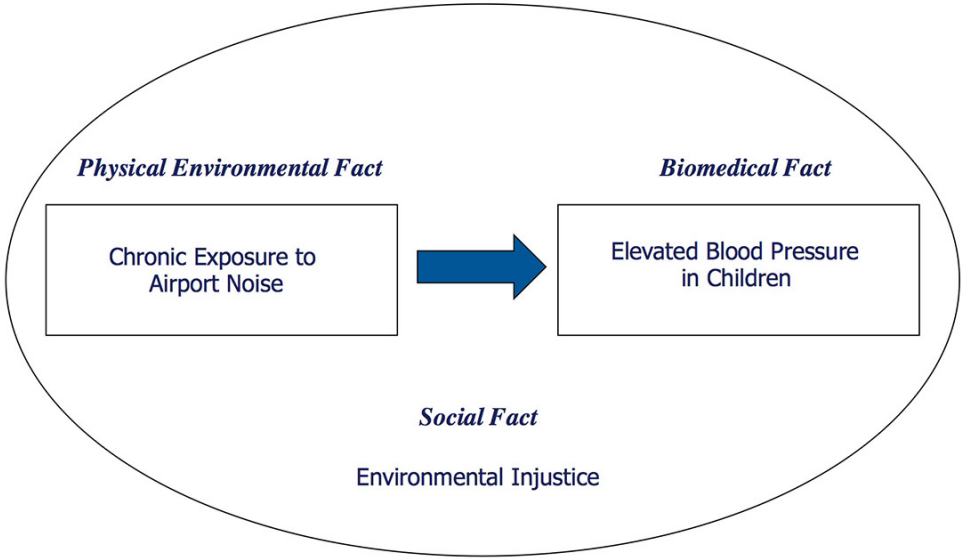


Alternative Research Designs in Which Residential Noise Exposure is Added as a Contextual Moderator of the Relationship Between School Noise and Children's Blood Pressure

(Cohen, Evans, Stokols, & Krantz, 1986)

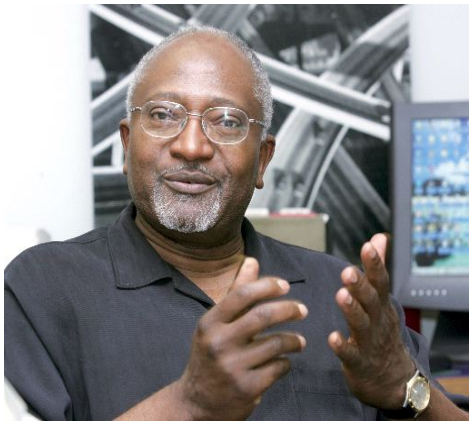
Sociocultural Scope

- *Sociocultural scope of an analysis* – increases to the extent that it describes behaviorally relevant dimensions of an individual's or group's sociocultural environment

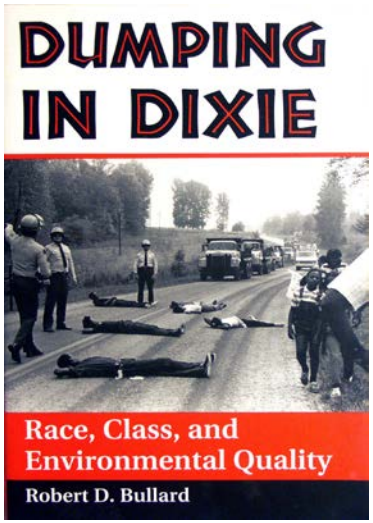


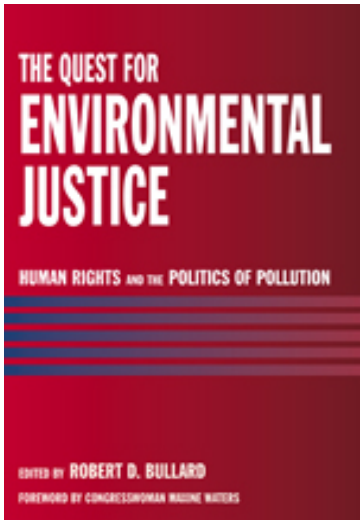
Environmental Injustice--a contextual factor that may help account for the uneven spatial distribution of airport noise and children's blood pressure in urban areas

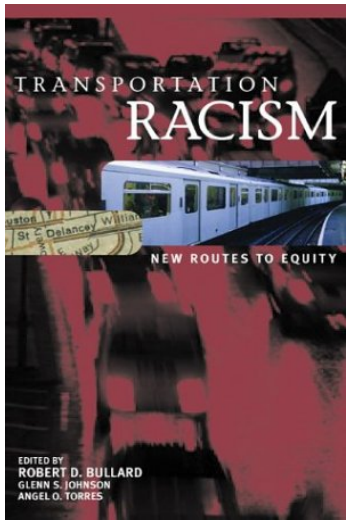
Research on Environmental Racism



Professor Robert Bullard
Texas Southern University







Neighborhood	Location	Incinerator	Landfill	Target Area	Ethnicity of Neighborhood
Fourth Ward	Southwest	1	1	Yes	Black
Cottage Grove	Northwest	1	-	Yes	Black
Kashmere Gardens	Northeast	2	-	Yes	Black
Sunnyside	Southeast	1	2	Yes	Black
Navigation	Southeast	1	-	Yes	Hispanic
Larchmont	Southwest	1	-	No	White
Carverdale	Northwest	1	-	Yes	Black
Trinity Gardens	Northeast	-	1	Yes	Black
Acres Homes	Northwest	-	1	Yes	Black

City of Houston Garbage Incinerators and Municipal Landfills

Scientific and Social Validity

Scientific	Social
Methodological rigor and theoretical adequacy of the research or intervention	*Societal value and practical significance of the research or intervention*

(Geller, 1991)

Cervical Cancer Prevention

The Importance of Integrating Biomedical Research With Behavioral and Social Science

Department of Health and Human Services
Centers for Disease Control and Prevention
CDC en Español
Search CDC search

Sexually Transmitted Diseases

Sexually Transmitted Diseases > Human Papillomavirus (HPV) Infection > HPV Vaccine Information For Young Women

HPV Vaccine Information For Young Women




There is now a vaccine that prevents the types of genital human papillomavirus (HPV) that cause most cases of cervical cancer and genital warts. The vaccine, Gardasil®, is given in three shots over six-months. The vaccine is routinely recommended for 11 and 12 year old girls. It is also recommended for girls and women age 13 through 26 who have not yet been vaccinated or completed the vaccine series.


- Why the HPV vaccine is important
- Who should get the HPV vaccine
- Effectiveness of the HPV vaccine
- Safety of the HPV vaccine
- Cost and paying for the HPV vaccine
- What vaccinated girls/women need to know
- Other ways to prevent HPV and Cervical Cancer

Newsweek


Getty Images

HEALTH

Why Are HPV Vaccine Rates So Low?

It's been hailed as one of the most effective ways to prevent cervical cancer, but millions of young women have yet to get immunized.

By Karen Springen | Newsweek Web Exclusive
Feb 25, 2008 | Updated: 6:02 p.m. ET Feb 25, 2008

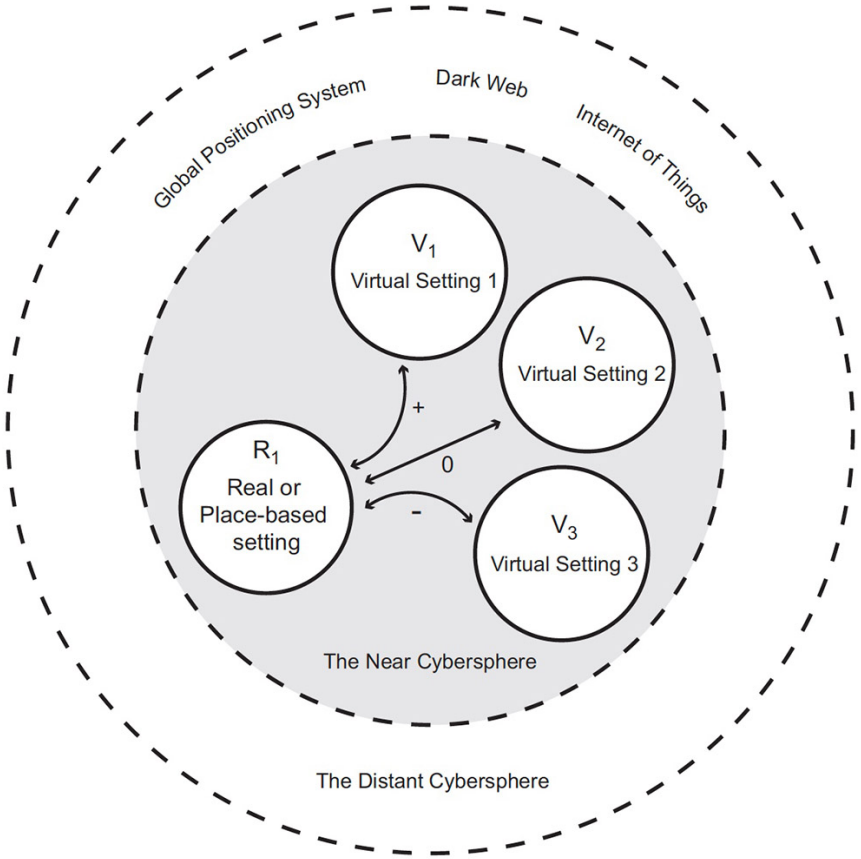
Temporal Scope

- *Temporal scope of an analysis* – increases to the extent that it represents places, processes, and events within an extended rather than narrow time frame

<u>Example</u>: Energy Star ratings of computers denote their power use efficiency, but approximately 90% of a laptop's environmental impact occurs during its manufacture and disposal, not use (Goleman, 2009). Ecological accounting of a laptop's environmental impacts can be broadened temporally by incorporating lifecycle analyses of products into Energy Star rating systems.

Virtual Scope

- The *virtual scope* of an analysis increases to the extent that it includes cyber as well as sociophysical influences on a particular phenomenon.



Thank you!