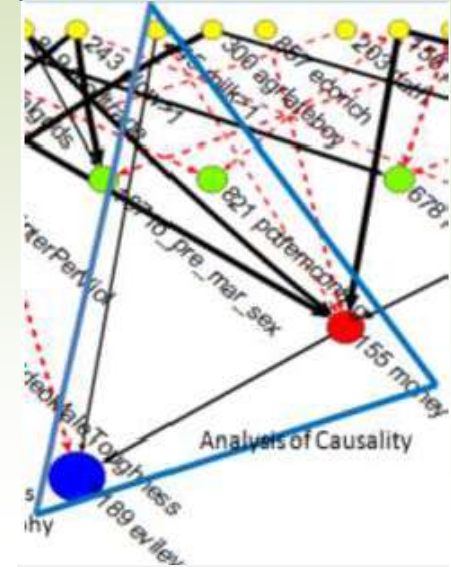


MBS Program in Social Dynamics and Complexity

[pub/0News](#)



Inaugural Issue: SDC research on Cultural Causality

Cultural Consequences of Regionally Fluctuating Inequality

SDC researchers at the **Institute for Mathematical Behavioral Sciences** have created R open-source software to investigate causes and consequences of the 1000+ socio-cultural variables in the Standard Cross-Cultural Sample (SCCS) database of 186 societies. Their study (D. White, S. White, T. Oztan, R. Ren 2010) discovers two regions of the world characterized historically by fluctuating inequality – caused both by monetary exchange economies and by pre-monetary exchange economies of cattle for wives – that breed similar consequences: envy and evil eye beliefs. Moral gods help to assuage the effects of inequality; and beliefs in the evil eye express resentment and envy for these inequalities. The inequalities in these two systems are more severe in periods of Malthusian population pressures on resources, heightened by exclusive ownership of food-productive resources. With population increase and resource scarcity, ownership by corporations, which takes the form of lineages in pastoral societies, and ownership by individuals, entails that when productive resources become scarce, owners gain economic advantage over non-owners, whose increased numbers in times of competitive scarcity reduce their benefits in work for owners.

R software for Causal Graphs

White, White, Oztan, and Ren (2010), specifically S. White (see inside story p. 3), refactored R software written by A. Eff and M. Dow (2009) to create an R package that makes it easier for researchers and students to do causal graph analysis using the regression-based methods of Judea Pearl (2000). (Inside story pp. 3-4).

Next Issue: MPG and SFI: Our team, with MBS graduate students Tolga Oztan and Giorgio Giosti and Xi'an's Ren Feng, collaborates on the causality project. Stories: Edu-Mod@UCI

Contents

Thematic Interest Articles

Regionally Fluctuating Inequality	1
R software for Causal Graphs	1
The Fluctuations of Inequality	2
Societies in the SCCS	2
Maps of the SCCS variables	4
SCCS variables in the model	4
Graph of Causes and Consequences	4

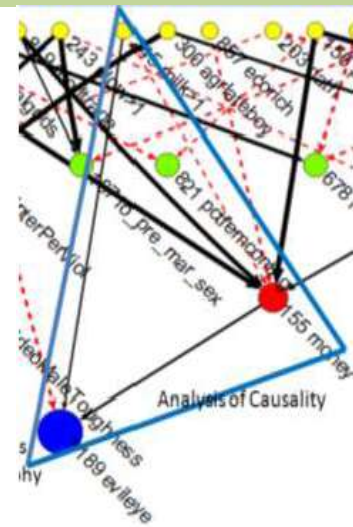
Individual Highlights

Inside story: P. Turchin	2
Inside story: S. White	3
Inside story: A. Eff and M. Dow	3
Inside story: D. White	3
Inside story: J. Pearl	3
Inside story: K. Chalak, H. White	3
Inside story: D. Bell	3
Next issue: T. Oztan, G. Giosti, R. Feng	

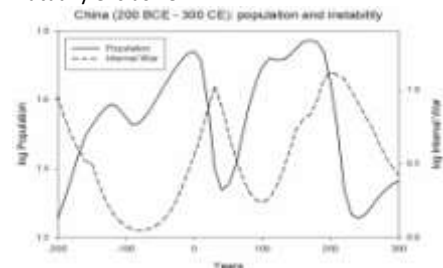
MBS Program in Social Dynamics

Societies in the SCCS

Africa [Nama \(Hottentot\)](#) • [Kung \(San\)](#) • [Thonga](#) • [Lozi](#) • [Mbundu](#) • [Suku](#) • [Bemba](#) • [Nyakyusa \(Ngonde\)](#) • [Hadza](#) • [Luguru](#) • [Kikuyu](#) • [Ganda](#) • [Mbuti \(Pygmies\)](#) • [Nkundo \(Mongo\)](#) • [Banan](#) • [Tiv](#) • [Igbo](#) • [Fon](#) • [Ashanti \(Twi\)](#) • [Mende](#) • [Bambara](#) • [Tallensi](#) • [Massa](#) • [Azande](#) • [Otoro](#) • [Nuba](#) • [Shilluk](#) • [Mao](#) • [Maasai](#) Circum-Mediterranean [Wolof](#) • [Songhai](#) • [Wodaabe](#) • [Fulani](#) • [Hausa](#) • [Fur](#) • [Kaffa](#) • [Konso](#) • [Somali](#) • [Amhara](#) • [Bogo](#) • [Kenuzi Nubian](#) • [Teda](#) • [Tuareg](#) • [Riffians](#) • [Egyptians \(Fellah\)](#) • [Hebrews](#) • [Babylonians](#) • [Rwala](#) • [Bedouin](#) • [Turks](#) • [Gheg \(Albanians\)](#) • [Romans](#) • [Basques](#) • [Irish](#) • [Sami \(Lapps\)](#) • [Russians](#) • [Abkhaz](#) • [Armenians](#) • [Kurd](#) East Eurasia. [Yurak \(Samoyed\)](#) • [Basseri](#) • [West Punjabi](#) • [Gond](#) • [Toda](#) • [Santal](#) • [Uttar Pradesh](#) • [Burusho](#) • [Kazak](#) • [Khalka](#) • [Mongols](#) • [Lolo](#) • [Lepcha](#) • [Garó](#) • [Lakher](#) • [Burmese](#) • [Lamet](#) • [Vietnamese](#) • [Rhade](#) • [Khmer](#) • [Siamese](#) • [Semang](#) • [Nicobarese](#) • [Andamanese](#) • [Vedda](#) • [Tanala](#) • [Negeri Sembilan](#) • [Atayal](#) • [Chinese](#) • [Manchu](#) • [Koreans](#) • [Japanese](#) • [Ainu](#) • [Gilyak](#) • [Yukaghir](#) Insular Pacific [Javanese \(Miao\)](#) • [Balinese](#) • [Iban](#) • [Badjau](#) • [Toraja](#) • [Tobelorese](#) • [Alorese](#) • [Tiwi](#) • [Aranda](#) • [Orokaiva](#) • [Kimam](#) • [Kapauku](#) • [Kwoma](#) • [Manus](#) • [New Ireland](#) • [Trobrianders](#) • [Siuai](#) • [Tikopia](#) • [Pentecost](#) • [Mbau Fijians](#) • [Ajie](#) • [Māori](#) • [Marquesans](#) • [Western Samoans](#) • [Gilbertese](#) • [Marshallese](#) • [Trukese](#) • [Yapese](#) • [Palauans](#) • [Ifugao](#) • [Chukchi](#) North America [Deg Hit'an](#) • [Aleut](#) • [Copper Eskimo](#) • [Montagnais](#) • [Mi'kmaq](#) • [Saulteaux \(Ojibwa\)](#) • [Slave](#) • [Kaska \(Nahane\)](#) • [Eyak](#) • [Haida](#) • [Bellacoola](#) • [Twana](#) • [Yurok](#) • [Pomo](#) • [Yokuts](#) • [Paiute \(Northern\)](#) • [Klamath](#) • [Kutenai](#) • [Gros Ventres](#) • [Hidatsa](#) • [Pawnee](#) • [Omaha \(Dhegiha\)](#) • [Huron](#) • [Creek](#) • [Natchez](#) • [Comanche](#) • [Chiricahua](#) • [Zuni](#) • [Havasupai](#) • [Papago](#) • [Huichol](#) • [Aztec](#) • [Popoluca](#) South America [Quiché](#) • [Miskito \(Mosquito\)](#) • [Bribri \(Talamanca\)](#) • [Cuna](#) • [Goajiro](#) • [Haitians](#) • [Callinago](#) • [Warrau \(Warao\)](#) • [Yanomamö](#) • [Carib](#) • [Saramacca](#) • [Mundurucu](#) • [Cubeo \(Tucano\)](#) • [Cayapa](#) • [Jivaro](#) • [Amahuaca](#) • [Inca](#) • [Aymara](#) • [Siriono](#) • [Nambicuara](#) • [Trumai](#) • [Timbira](#) • [Tupinamba](#) • [Botocudo](#) • [Shavante](#) • [Aweikoma](#) • [Cayua \(Guarani\)](#) • [Lengua](#) • [Abipon](#) • [Mapuche](#) • [Tehuelche](#) • [Yaghan](#) ([Wikipedia: Standard Cross-Cultural Sample](#))



The three variables within the triangle in the causal graph above show the effect of money and milking (e.g., pastoralism) on SCCS variable 1188, Evil Eye. Yet milking and money societies (connected by the red line in the graph) are mutually exclusive.



The graph above shows “secular”, i.e., century-long, cycles for Han China. The dynamic directional change shows the solid line of resource/people ratios leading by a generation intrasocietal conflict (dashed line), leading to high scarcity and high civil violence. The empirical dynamics moves to lower population leading lower conflict, and from there back to the starting point, with levels of peace leading better resources ratios by a generation. Cycle dynamics are repeated twice over 500 years.

The Fluctuations of Inequality

Peter Turchin (2003, 2005, 2009) studies the fluctuation of inequality in historical agrarian empires. Inequalities become more severe in periods of (Malthusian) population pressures on resources, heightened by exclusive ownership of agrarian land. With population increase and resource scarcity, when agrarian resources become scarce relative to population, ownership entails economic advantage over workers. Increased numbers of workers in times of scarcity receive lower benefits relative to owners. Studies of many different agrarian empires show, recurrently, for periods with no external warfare, that levels of civil violence lag by roughly a generation the rise and fall of the detrended resource/population scarcity. Inversely, by roughly a generation, the recovery or decline of peace in civil society leads the fall or rise of relative scarcity. Irregular (metastable) cycles of oscillation recur, each over one or more centuries, in the absence of major external conflicts.

See larger Turchin graphs at: <http://intersci.ss.uci.edu/wiki/images/2/2e/TurchinKoro.png>
The larger graphs shown in the png at this url include the phase diagram of interactive time-series predictions between scarcity cycles and internal conflict cycles.

Peter Turchin: [References](#)

- 2003 *Historical Dynamics: Why States Rise and Fall*. Princeton University Press.
- 2005 Dynamical Feedbacks between Population Growth and Sociopolitical Instability in Agrarian States. *Structure and Dynamics* 1(1): 49-69.
- 2005 *War and Peace and War: The Rise and Fall of Empires*. Pi Press.
- 2009. *Secular Cycles*. (with Sergei Nefedov) Princeton University Press.

Scott D. White



Quote from the SCCS article 1969

“If ... valid scientific generalizations could be reached by the intensive study of individual cultures ... cross-cultural research would be unnecessary. Unfortunately, the integrative process is much more complex.”

(G. P. Murdock and D. R. White 1969: 329)

Study of three initial variables in the SCCS, *Evil Eye* (v1188), *Money* (v155), and *Milking* (v245) convinced Doug White that investigation was needed to discover their interconnections by means of causal graphs using other variables in the SCCS. Moral gods, Caste stratification, Population density, Jurisdictional levels, External war, Fraternal interest groups, and Bridewealth soon joined the set of independent variables shared by two or more of the initial three variables.

Causal Graphs: Judea Pearl

Judea Pearl's development of methods of Inference needed to develop causal graphs has inspired many projects, most recently in the Health Sciences. His Cambridge U Press *Causality: Models, Reasoning, and Inference* (2009) and recent articles at his causality blog, <http://www.mii.ucla.edu/causality>, address current modeling issues, as do the Recent [YouTube presentations](#) honoring his work on Causality.



Computer scientist Scott D. White refactors the R code of Eff and Dow

The result is a standard R package for causal graph analysis complemented by a single page in which the user enters the dependent variables and a set of potential variables, and successively pares down a smaller set of variables to those that are statistically significant given Eff and Dow's method of controlling for prior predictions from spatial and linguistic proximities of related societies and for imputing missing data.

Anthon Eff and Malcolm Dow are authors and coauthors of cross-cultural, evolutionary and economic studies that contribute to refining statistically valid methods for comparative research. Their 2009 article, "How to Deal with Missing Data and Galton's Problem in Cross-Cultural Survey Research: A Primer for R", appeared the *Structure and Dynamics* SDC-edited and peer-reviewed eScholarship electronic journal hosted by the Institute for Mathematical Behavioral Sciences.

Inside Story: Humboldt Scientist Doug White

Douglas R. White is the developer of the Societal Research Archives System (SRAS 1966, 1967), hosted by Dartmouth College for New England Colleges and High Schools as the first on-line interactive cross-cultural database. His work on social structure led to the 1990-1992 Humboldt Distinguished Senior Scientist Award to collaborate at the University of Cologne with other distinguished comparativists, Thomas Schweizer and Ulla Johansen.

As a faculty colleague with G. P. Murdock at the University of Pittsburgh (1967-77), White coauthored the SCCS (1969) and cofounded the NSF funded Cross-Cultural Cumulative Coding Center. In the next seven years the CCCCC produced coded data for the first 650 SCCS variables out of today's 2000+ resulting from collaborative efforts by hundreds of comparativists. The problems of valid statistical analysis for nonindependent cases have remained a problem until very recently.

Inside Story: Karim Chalak's

UCSD PhD with econometrician **Halbert White** focused on the extension of Pearl's causal modeling to include reciprocal and recursive causality. He is now an assistant professor at Boston College with several articles on generalized "setttable systems" for causal modeling. Pending funding of the Cultural Causality project, he is slated to help the project as causality advisor. A project goal is to combine S. White's further refactoring of the project R package to automate solutions with solving complex problems of causal estimation, including recursive and reciprocal causality. These methods apply the theorems developed by Pearl as to whether the results of regression models can solve for causal effects analytically, aided by supporting Bayesian inferences.

Bayesian inferences are often needed as an auxiliary to establish limitations on causal relations. In the example discussed in this issue, **Turchin's work** establishes a basis for interpreting the two key independent variables that measure the existence of exchange systems in the causal model, identified for societies with **monetary exchange** and those pastoral societies with **nonmonetary tradeoffs between lineages** involving acquisition of animals for herds capable of reproduction in exchange for women whose status as valued wives provides reproduction of lineage children. These kinds of exchanges involve recursive and reciprocal causality.

Inside Story: Economic anthropologist Duran Bell's

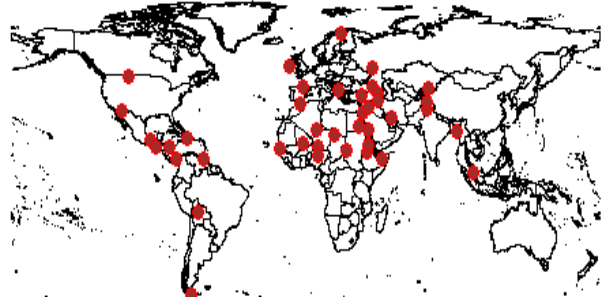
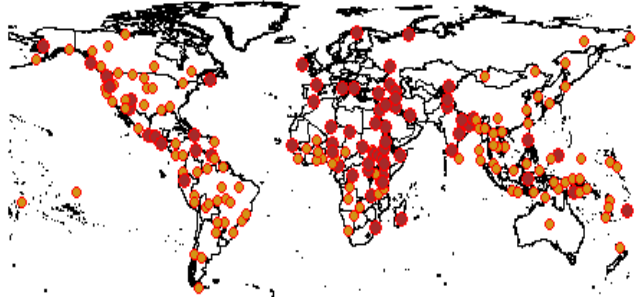
comparative and simulation studies of pastoral societies establishes the theoretical and empirical frameworks of the project for modeling **nonmonetary tradeoffs between lineages** that involve acquisition of animals for herds, capable of reproduction, in exchange for brides whose status as valued wives provides reproduction of lineage children. D. Bell and S. Song. 1990. Growth and Process in a lineage-based social technology. *Journal of Quantitative Anthropology* 2:17-49.

DEEPEST DEPENDENT VARIABLE

sccs v1189 Beliefs in the Evil Eye in the SCCS (N=186) **large node=Yes small=No**

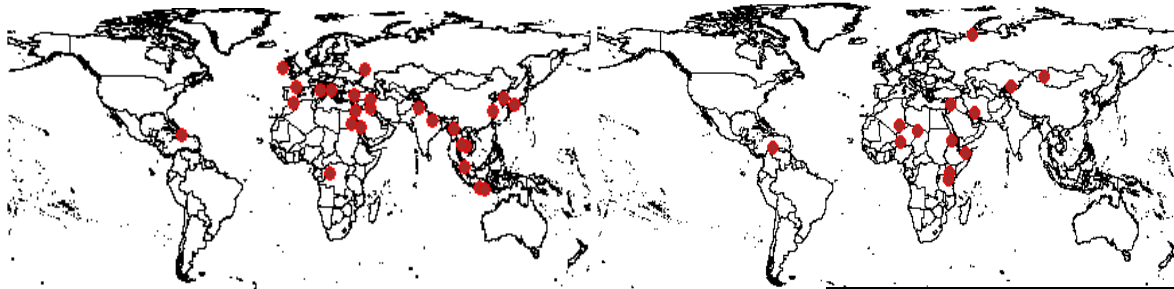
INDEPENDENT VARIABLE

sccs v238 Beliefs in Moral high gods Present=Yes



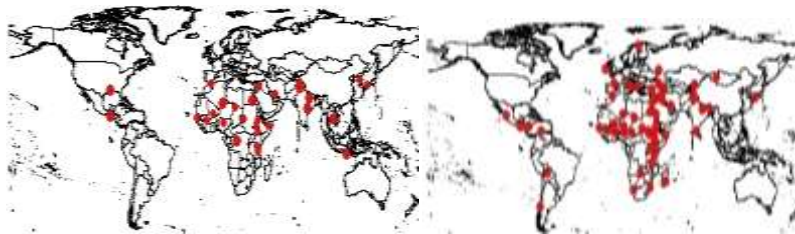
INDEPENDENT CAUSAL VARIABLE
True Money

INDEPENDENT CAUSAL VARIABLE
PastoralExch (Bridewealth in Cattle or Camels)

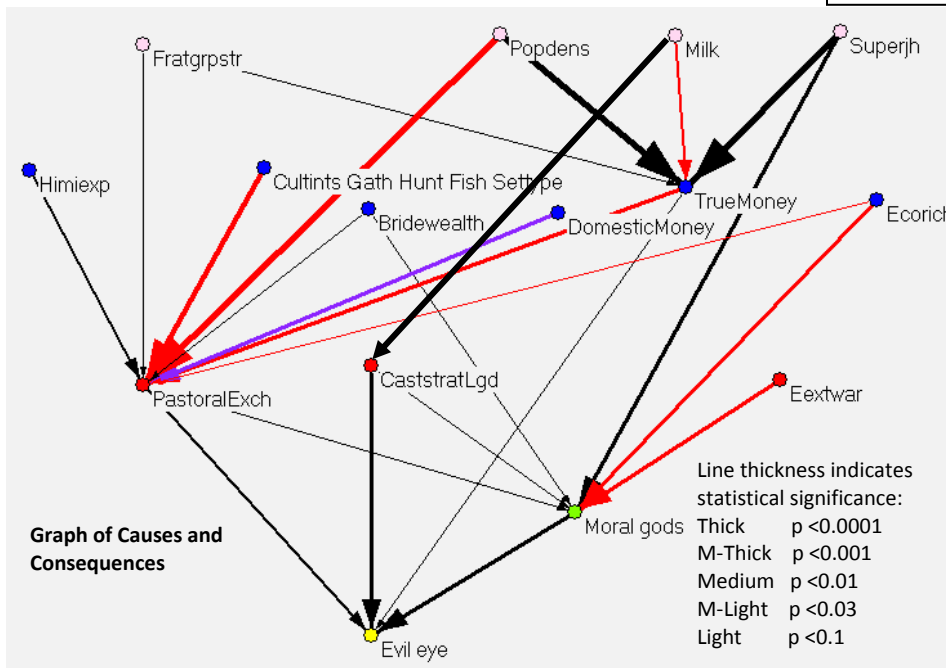


INDEPENDENT VARIABLE
Caste Stratification

INDEPENDENT VARIABLE
Milked animals



Legend for the causal graph: Red arrows are negative consequences, Black are positive. The blue arrow is consistent with a negative relation to True Money but is a truncation of the Money scale 155, 0= No money, elementary, or true money, 1= domestically usable articles, 2= alien currency. The True Money scale continues with 0= no money, 1 or 2 above, 1= elementary forms of money, 2 = true money. Causal arrows are partially ordered as a directed asymmetric graph (DAG) that satisfy Pearl's causal graphs.



Graph of Causes and Consequences

Line thickness indicates statistical significance:
 Thick p < 0.0001
 M-Thick p < 0.001
 Medium p < 0.01
 M-Light p < 0.03
 Light p < 0.1

Definition of variables:

- Fratgrpstr 570**=Fraternal group strength
 - Popdens 156**=Population density
 - Milk 245:1**=Milked animals
 - Superjrh 237**=Levels of supra-community political hierarchy, 1=none 4=states
 - Himiexp 899**=High military expectations
 - Cultintns 232, etc.**=Cultivation intensity, hunting, fishing and complex settlement types (absent)
 - Bridewealth 208:1** (e.g., in exchange for bovines)
 - Ecorich 857**=Rich environment
 - PastoralExch**=Pastoralism and bridewealth payments for wives
 - CaststratLgd 272**=Log of caste stratification
 - Eextwar 1650**=External warfare
 - Moral gods 238**=High gods, from 1=absent, to 4=concerned with human morality
 - Evil eye 1188**=Beliefs in ability to transmit ill luck to others (associated with inequality and envy).
- Variable numbers from SCCS codebook** at <http://bit.ly/gjplcO>