

NSF

Missing Links: A Network Theory of Union Protest and Development in South Asia

1. Introduction

An important question for South Asia is whether trade unions help or hinder economic development. Because unions affect development by creating or disrupting social stability, it is crucial to know what protest strategies unions in South Asia pursue and why they pursue them. Instead of conducting research along these lines, scholars have often relied on arguments supported by the experience of advanced industrial states. This practice has led to a lack of evidence on the subject and a paucity of theory appropriate to the South Asian context. I will work to overcome this problem through an examination of the political economy of labor protest in six cities in South Asia (Calcutta, Cochin, Colombo, Madras, Bombay, and Delhi) during the period 1991-2000. My request in this proposal is for funding to conduct interviews and surveys in these cities over a period of twenty-four months.

My proposed study will advance the understanding of union behavior in South Asia on both theoretical and empirical fronts. First, it will employ a network-based theory of union behavior, which holds that union strategies differ based on a union's degree of formalized connections to employers and institutions of the state. Unions with more ties protest less, and use routine strategies of protest. Unions without ties protest more, utilizing one of two alternatives: extreme acts of violence or Scottian "weapons of the weak" (Scott: 1985). This higher volume of alternative protest strategies disrupts economic development. Evidence to test the theory will come from a) interviews with union leaders, government officials, and managers, b) descriptions of protest events as reported in the Indian and Sri Lankan press and c) surveys of and interviews with employers and investors.

2. The Debate Regarding Unions and their Effect on Economic Development in South Asia

Writings on the role of unions in development are often polarized between advocates of full social and political participation and those advocating restrictions on the power of unions. This debate has stagnated because authors lack sufficient evidence and theory to better understand the determinants of the volume and type of labor militancy in developing countries. Instead, the tendency has been to rely on comparisons with the experiences of advanced industrial countries. This tendency has not been limited to, but has been especially true of authors discussing trade unions in South Asia.

Those in favor of high levels of union participation argue that unions provide a voice for workers and access to institutional means of grievance resolution, decreasing social tensions and increasing political stability (Fisher: 1961; Kearney: 1971; Ramaswamy: 1983; DeSilva: 1998; Heller: 1999). These conditions in turn a) attract investment, b) reduce the amount of profits lost to strikes and c) increase productivity by reducing absenteeism and turnover. Many advocates of this position rely on the experiences of corporatist European countries like Norway and Sweden to support their claims.

Those suggesting greater restrictions on union activity argue that unions which provide voice and access to state institutions of grievance resolution also tend to be politically connected and powerful. This produces *more* conflict, not less. Such unions hurt the economy by a) discouraging investment, b) lowering profits through strike activity, and c) pushing up wages and

inflation. These authors argue that the benefits of union participation can be attained without its detriments by restricting unions to negotiations over firm-level issues and often point to the experiences of the U.S. and Japan (Mehta: 1957; DeSchweinitz: 1959; Deyo: 1987; World Bank: 1995).

There are two reasons for increasingly polarized perspectives and a diminishing number of fresh insights in this debate. The first reason is empirical. We do not know enough about union behavior and its causes to confirm or deny opposing claims. Enough research has not been done.

The second reason is theoretical. The two ideal types that structure this debate--Scandinavian Corporatism and firm-level bargaining--do not fit the reality of the South Asian context. They are based upon the realities of the highly institutionalized political economy of labor in advanced industrial countries (Pontusson: 1999; Kitschelt 1999; Pempel: 1998, 1-80).^{*} To expect the experience of these states to provide us with insights into what is happening on the ground in South Asia is unrealistic. Three things make labor relations in South Asia different than in advanced industrial countries: 1) the type of arbitrary power exercised over workers by employers, unions, and the state; 2) the grievances produced by this arbitrary power; and 3) the means through which these grievances may be addressed.

In South Asia, power over workers often takes the form of patriarchal, charismatic, or "sovereign power" as often as it does rule-governed interactions (Foucault: 1975, Weber: 1978). In his study of jute mill workers in Bengal, Dipesh Chakrabarty argues that "unions. . . were never organizations based on a relatively disciplined body of workers subject to. . . institutional controls. . ." (Chakrabarty: 1988, 135). Despite their best efforts over a half century of organizing, Communists "formed organizations based on 'loyalty,' where authority did not flow through a grid of rules and procedures but derived directly from hierarchy and status" (Chakrabarty: 1988, 158). Similarly, "corporatism" and "firm-level unionism" in the developing world may tend to rely on entirely different mechanisms of control--fear, repression, guilt, and violence--than the formal rules and compliance procedures one would expect.

Because the power structure is more hierarchical, workers often have fundamentally different grievances. Generally speaking, workers in advanced industrial countries agitate for increases in wages and benefits and little more. During the 1980s and 1990s wage and bonus issues in India were the stated cause for about only 30% of reported industrial disputes (Labour Bureau: 1980-98). "Indiscipline and violence" were the stated cause of about 15% of disputes, while the firing of fellow workers was the stated cause for about 18% of industrial disputes. A full 35% of disputes were classified in the "other" category--issues such as insults, harassment, theft, personal leave, etc. These figures represent a workplace in which workers' grievances are very often not those of broken rules, but broken egos and broken bones.

They are also representative of a workforce that often responds to differences with management in fundamentally different ways than unions in advanced industrial countries, resorting alternately to "indiscipline and violence" and "weapons of the weak." In a dramatic incident in 1997, a group of workers in Colombo ransacked the home of the manager of Coca-Cola and held him hostage (Lakehouse:1997). This type of action is typical of industrial relations in South Asia and many parts of the world in which disputes are "resolved" through

^{*} By "institutionalized" I mean rule-governed. For the purposes of this project, "institutions" are rule-governed (formal) interactions that reproduce themselves over time. The difference between formal and informal interactions is crucial to the network theory of union behavior I develop in the next section.

destructive attacks on the life and property of those in power. This type of protest resembles the attacks on the manors of feudal lords in England prior to the massive shift to petitioning of central state authority (Tilly: 1995) or the "*public, collective, destructive and total*" peasant insurgencies of 19th century India (Guha: 1999, 109). It is far from being fully institutionalized.

3. A Network Based Theory of Union Behavior

To answer the question of how unions help or hinder economic development in South Asia, we should stop making inferences from the fully institutionalized setting of advanced industrial states and ask questions closer to the ground. The first question must be "which unions in South Asia do what and why?" It is the primary question because the deciding factor in whether unions are good or bad for development is the amount and type of protest in which they engage. Higher levels of disruptive social protest may threaten investment and decrease productivity. Cross-sectional analyses have shown a correlation between disruptive social protest and poor macro-economic performance (Barro: 1991; Easterly and Rebelo: 1993). More subtle forms of protest like failing to show up to work also negatively affect economic performance by lowering firm productivity. This section lays out a series of hypotheses based on a network theory of union behavior geared at explaining what causes unions to adopt varying forms of protest.

The fundamental premise of network theory is that the behavior of individuals is guided by repeated interactions over time, which are defined as "network ties." Network ties may or may not be institutionalized (i.e., rule governed). In fact, in the absence of access to institutional resources, groups may sustain themselves entirely on informal network ties (Diani: 1995). Network ties affect the amount of financial, institutional, and informational resources to which an actor or group has access. These resources and information may affect the success of a group's collective action (Laumann and Knoke: 1987; McCarthy and Zald: 1977), the representation of its interests in government (Eulau: 1986; Knoke, 1990), its spread of propaganda (Katz and Lazarsfeld: 1955), its recruitment efforts (Gould; 1995; McAdam 1988), or its strategies of social protest (Tilly: 1978).

Moving away from a sole focus on formal institutional arrangements does not require ignoring the importance of institutions altogether. My plan is to analyze union behavior along a continuum of least to most institutionalized network ties with political parties and employers. This continuum avoids the mistake of falsely dichotomizing between corporatism and firm-level unionism while allowing for the possibility that different forms of institutionalized relationships may affect union strategies and thus development.

My hypotheses are represented in the following set of diagrams:

		Employer		Employer			
		Strong Ties	Weak Ties	Strong Ties	Weak Ties		
Powerful Party	Strong Ties	(A) T: Routine V: Moderate	(B) T: Routine V: High	Minor Party	Strong Ties	(E) T: Non-routine actions V: Moderate	(F) T: Outward Violence V: High
	Weak Ties	(C) T: Routine V: Low	(D) T: Some Weapons of the Weak V: Moderate		Weak Ties	(G) T: Routine V: Low	(H) T: Weapons of the Weak, Inward Violence V: High

T= Tactics pursued by union. V= Volume of protest activity.

These diagrams represent ideal-typical combinations of ties with employers and political parties. The most institutionalized set of ties is represented in box A of the left diagram. Here, unions have strong ties to well-connected, powerful political parties and employers. The least institutionalized set of relationships is represented in box H of the right diagram. Here, unions have few connections with any political parties or employers and would be the least likely to be governed by rule-bound interactions.

The diagrams also present predictions of the amount of protest in which unions will engage and the types of tactics they will employ as a result of these ties to employers and parties. "Routine protest" actions are actions such as marches, pickets, and the circulation of petitions. "Violent" tactics can be directed outwardly at management, police, company property, or other political organizations. They can also be inwardly projected as when strikers threaten or carry out suicide actions. Tactics are "non-routine" if the action is not usual but not violent as in the case of occupations ("sit-ins"). Weapons of the weak include things such as "shirking" (skipping work) and quitting a job. Finally, the volume of strikes is the amount of strike activity measured in number and length of protest events.

The left diagram summarizes my hypotheses regarding the influence of connections with large and powerful parties. Connections to large political parties will lead to routine strike behavior for one main reason: democracy and economic liberalization have put big parties under electoral pressure to ensure a smooth functioning economy. Even in West Bengal, one of the most militant states during the 1970s and 1980s, the number and length of strikes have dropped near or below the all-India average after liberalization during the 1990s (Labour Bureau: 1970-1990). Large parties must still "flex their muscle" to compete with other unions for members, but they must do so without crossing the line of political viability. So they cannot allow affiliated unions to be overly disruptive in terms of their protest tactics in which they engage. In cases in which unions have weak ties with large party unions or employers will they engage in weapons of the weak (Box D). This is because they will be without institutional means of resolving their grievances and will not have the aid of a political party in overcoming collective

action problems. Also included in this diagram are some intuitive predictions regarding the volume of union protest as it relates to ties with unions and parties.

My hypotheses regarding the impact of minor or small political parties are summarized in the right diagram. Unions with connections to small parties will not be constrained in the same manner as unions affiliated with large parties. They are well organized but do not have the same investment in social stability, and thus will be more prone to violent protest tactics and non-routine forms of protest. The most violent unions will be those with strong ties to small parties and weak ties to employers (Box F). Avoiding this outcome requires that the union with ties to a small party also have ties to employers. I predict that unions with this set of ties will engage in non-routine but non-violent actions (Box E). If unions only have weak ties to a small party and strong ties to employers, we can expect a fairly smooth process of industrial relations (Box G). Because of their isolation, unions with few ties to parties or employers will be less inclined to engage in organized violence and more inclined toward individual acts of passive aggressive behavior or acts of total desperation, such as threatening to jump from a high place or self-immolation (Box H). The difference in behavior between workers with weak ties to both small parties and employers (Box H) and workers with weak ties to both large parties and employers (Box D) is explained by the moderating influence of the large party as explained in the previous paragraph. This diagram also includes some intuitive predictions regarding volume of protest.

4. Cases, Models and Data Collection

Cases

To test these hypotheses, my study will analyze patterns of strike protest in six South Asian cities during the period 1991 to 2001. These cities were chosen for the study because of the large amount of variation they exhibit in the predominant types of network ties held by unions. A list of the cases and a summary of the predominant type of network ties is found in the following table:

Table 1

City	Predominant Union Ties
Calcutta	<u>Single party unionism</u> . The vast majority of unions operates under the banner of the Communist Party of India (Marxist)
Cochin	<u>Two party unionism</u> . Union leaders are connected primarily to the two major parties in the state of Kerala, the CPM and the Congress.
Colombo	<u>Competitive unionism</u> . Union movement is split between unions with strong connections to parties, strong politically independent unions such as the Ceylon Mercantile Union (CMU), and isolated workers' organizations in Export Processing Zones.
Madras	<u>Charismatic party unionism</u> . Unions have weak links with the major parties in the state of Tamil Nadu—DMK and AIADMK. Charismatic unionism by famous politicians and other individuals is common.
Bombay	<u>Connected firm-level unionism</u> . Unions have ties to employers and weak links to political parties of varying sizes. They occasionally join together under the banner of political parties during joint protests, but mostly operate

	at the firm level.
Delhi	<u>Isolated firm-level unionism</u> . Unions have few ties with either employers or political parties.

Information for this table was gathered from C.S. Venkata Ratnam, 2001 and through dozens of my own interviews with unions, employers, and labor officials in South Asia

The cases exhibit the range of ties needed to test the theory. This method of comparison follows the lead of scholars who have recognized the advantages of comparative study within South Asia in addressing important questions in political economy (Herring: 1987; Dreze and Sen: 1995; Dreze and Sen: 1998; Sinha: 2000). These scholars have been able to generalize based on South Asia's rich diversity while remaining sensitive to concerns of context specificity.

Models

While my hypotheses are conveniently represented in the two by two diagrams above, they will be tested with continuous variables measured at the firm level in a series of statistical models. These will be Ordinary Least Squares (OLS) cross-sectional regression models of union protest in which measures of strategies and volume of strike protest will be the dependent variables and measures of ties to parties and unions will be the primary independent variables of interest. The equation estimated for each of these models will be as follows:

$$DepVar = B_0 + B_1CBI + B_2DRI + B_3PTI + B_4PPI + B_5NCI + B_6Wages + B_7Inflation + B_8Unemployment + B_9Growth + \epsilon$$

Where *DepVar* is one of eight dependent variables, *CBI* is an index measure of the degree of institutionalized bargaining, *DRI* is an index measure of the degree of cooperative interaction outside of the formal collective bargaining arena, *PTI* is an index measure of a union's ties to political parties, *PPI* is a measure of the power of the party to which a union is affiliated, *NCI* is a measure of the nature of conflict between a union and employers, *Wages* is the average wage of a group of workers, *Inflation* is the average rate of change in the consumer price index per year, *Unemployment* is the average percentage of the labor force not employed per year, and *Growth* is the average annual rate of change in the state domestic product.

The eight dependent variables include 1) the number of routine strike actions, 2) number of non-routine strike actions, 3) number of acts of outward violence, 4) number of acts of inward violence, 5) average length of strikes, 6) average number of strikes, 7) absenteeism, and 8) turnover. I will measure these dependent variables and the primary independent variables of interest (measures of union ties to employers and parties) at the firm level. I will also gather information on wages at the firm level. Inflation data is available at the regional/city level while unemployment and growth are state-level variables. The following sections elaborate on the definitions of these variables and the sources I will use to measure them.

Data Collection

Dependent Variables: Strategies and Volume of Strike Protest

Data for the dependent variables in the study will mainly be gathered from a selection of newspapers prior to my arrival in South Asia. Each event reported in the press will be coded for strike tactics in the categories outlined above: routine acts of protest; violence toward others; inwardly directed violence; and non-routine, non-violent tactics. Each event will also be coded for length of strike.

Passive-aggressive forms of protest (weapons of the weak) will of course rarely appear in the press. My solution to this problem will be to measure absenteeism and turnover rates through firm records and interviews with firm managers. While this admittedly ignores some forms of protest that might be classified under the broad term "weapons of the weak," from the perspective of economic growth, absenteeism and job-leaving are the most crucial forms of passive-aggressive protest because of their effects on productivity. Data on length of strike may also not be clear from press reports. These will also be gathered during interviews with managers.

The newspaper articles for four of the six cities in the study are on microfilm available from the collection of The Center for Research Libraries in Chicago, Illinois. Articles from Sri Lanka were gathered during my research there during the 1997-98 academic year. The articles for Cochin are available in a collection of newspaper clippings at the Secretariat library in Kerala. I expect that the gathering and coding of these articles will be completed by September of 2002. A summary of the work completed so far and the work to be done is presented in Table 2.

Table 2

City	Newspapers	Work Status
Calcutta	Statesman (Calcutta), Amrita Bazar Patrika	244 reels of microfilm to be read and coded
Cochin	Malayala Manorama, Mathrabhumi, Hindu (Cochin)	Articles at library of State secretariat in Trivandrum to be read and coded
Colombo	Daily News, Island, Daily Mirror	Complete through 1998. Remaining articles at Lakehouse Press in Colombo
Madras	Indian Express (Madras)	Work begun, 127 more reels of microfilm to be read and coded
Bombay	Times of India (Bombay), Economic Times	280 reels of microfilm to be read and coded
Delhi	Indian Express, Hindu	Articles retrieved from microfilm

It might be argued that press reports are less reliable than other sources such as government records. Profit motives and editorial bias may result in coverage bias, excluding less spectacular events or excluding some details from a report. I have two responses to this claim. First, I will test for coverage bias by comparing the average number and size of strike events reported in the press with those reported in government sources (such as the Indian Labour Yearbook). Second, even if some details are omitted, the information contained in press reports will be infinitely more detailed than the mere counting of events in government records.

Independent Variables: Measures of Union Ties to Political Parties and Employers

The data for the independent variables (network ties) will be collected through surveys and interviews with employers, union leaders, and government officials who were involved in the strike events reported in the press. These data will be used to construct the following indices of the strength of institutionalized union ties to employers and political parties, which will then be entered as variables in the OLS analysis. The data for all of the indices will be based on as much information as memories and records permit.

Collective bargaining index (CBI). A score of zero will be assigned to unions that have not signed a collective bargaining agreement. Unions that have signed collective bargaining agreements will receive a score of one divided by the number of violations of the agreement.

Dispute resolution index (DRI). This index will measure cooperative interaction between employers and management that may not take the form of institutionalized bargaining. Scores on the index will be calculated as the number of disputes referred to the Ministry of Labour for conciliation plus the number of disputes that fail in conciliation.

Party ties index (PTI). This index will gauge variation in union-party ties by adding the following measures: a) percentage of strikes in support of a political issue b) percentage of strikes in support of a particular candidate for office; c) percentage of strike decisions mandated by political leadership.

Political power index (PPI). This index will measure the political power of a union's affiliated party by combining two standard measures into an additive index: a) percentage of seats in the state or national legislatures and b) percentage of seats in the Chief Minister's or Prime Minister's cabinet.

Nature of conflict index (NCI). This index will measure the nature of conflict between employers and unions by taking the number of disputes that are caused by "violence," "indiscipline," or abuse and harassment of workers as a percentage of the total number of disputes in a firm.

Control Variables

Data for control variables will be collected from secondary sources to test competing explanations centering on the level of prosperity of workers. I will collect wage data at the firm level during interviews with employers. Data on unemployment and inflation are published at the state level in the *Indian Labour Yearbook*. State-level growth figures are published by the Center for Monitoring for the Indian Economy.

5. Assessing the Impact of Union Protest on Development

While a large portion of the research for this dissertation is designed to test the claim that networks matter in determining union protest strategies, it is crucial to show that protest strategies actually make a difference with respect to developmental outcomes. Because of the small number of economic centers in the analysis (six cities), formal statistical models of macro-economic performance (such as models of inflation or state domestic product) would not produce

robust results. Instead, I will utilize a variety of other strategies to assess the impact of protest strategies on economic performance. These will include: 1) a survey of representatives of private sector firms; 2) a survey of foreign investors; 3) interviews with employers; and 4) the firm-level models of absenteeism and productivity discussed in section four of this proposal.

Survey of Private Sector Firms

This survey will be modeled after a survey conducted by the World Bank (World Bank, 2000). In this survey, 210 private sector firms were asked to rate eighteen potential obstacles to operation and growth of business on a four-point scale ranging from "no obstacle" to "major obstacle." In rank order, the obstacles most often cited as moderate to major were "inflation," "labor regulation," "corruption," "infrastructure," and "policy instability/ uncertainty." "Labor regulation" ranked second, but to most Indian employers this term probably meant restrictions on hiring and firing of workers. India has notorious regulations requiring employers to obtain permission from the government before firing or laying-off workers. In my survey, I will parse the "labor regulation" term into two categories—"restrictions on hiring/firing of workers," and "the functioning of industrial relations." The survey will be carried out during the course of the interviews with employers described in section four.

Survey of Foreign Investors

A similar survey will be conducted of a separate sample of top level management of foreign firms operating in India. The aim of this survey is to shed light on the major considerations of foreign investors in choosing one location in India over another. The survey will include a list of things investors might consider in choosing one location versus another for their investment and investors will be asked to identify each of these considerations as "major," "moderate," "small," or "not considerations at all." Considerations will then be ranked according to the percentage of investors rating each of them as "moderate" to "major" considerations. The sample will be randomly selected from a list.

Interviews with Employers

Survey data can only go so far in providing an understanding of the impact of industrial relations on the growth of a firm and the efficiency of its operation. During my discussions with employers, I hope to collect hundreds of stories about industrial disputes and how they were resolved. These stories will help uncover and illustrate the mechanisms through which industrial relations affect firm-level growth. So as not to bias the results of the survey data, these interviews will occur after the "private sector firm" survey has been administered.

Models of Absenteeism and Turnover

Absenteeism and turnover strongly affect a firm's productivity. In section three of the proposal, I hypothesized that worker organizations with few ties to employers or political parties would be more likely to employ "weapons of the weak," i.e., shirking or switching jobs. This is because these workers would be left without any option to protest through institutional channels

and would also be without the resources of a party needed for collective mobilization. The full statistical models of absenteeism and turnover were laid out in section four.

6. Concluding Thoughts and Practical Considerations

Since economic liberalization in 1991, states in India have begun reforming their labor policies in an effort to attract investment. In this respect, the reduction and simplification of labor regulations has been a competitive effort vis-à-vis other Indian states and other countries in Asia (Venkata Ratnam, 2001). It is clear that employers would prefer more labor mobility and thus less restrictive laws regarding their hiring and firing practices. However, the basis for competition with regard to industrial relations policy is less clear. Employers, government officials and unions in South Asia do not know whether unions are good for development or what kinds of unions are good for development. My aim is to change this by 1) using new evidence to test the theory that isolation of unions from political parties and employers creates more socially disruptive protest and 2) by showing whether such disruptive protest has substantial effects on developmental outcomes. This will be accomplished through cross-sectional statistical analyses of the relationship between union network ties and forms of strike protest, and surveys of employers, investors, union leaders and government officials in six South Asian cities.

It should be noted that while the project sounds big, the research is to be very targeted. The universe of cases for this study is all strike events that have been reported in the press in the six cities of the study. The first benefit of this method of case selection is that I will have a clear idea of whom to interview when I arrive. The second benefit is that it makes the number of interviews to be conducted a manageable one. Based on government data through 1997, the average number of strikes per year in states in India during the 1990s was 83 (Labour Bureau: 1991-97). Not all of these have been reported in the press, and because active unions strike often in the same firms, the ratio of the number of strikes reported and the number of required interviews with union leaders is less than one to one.

The efficiency of my research will be aided by my contacts on the ground and first-hand familiarity with South Asia. I have friends and acquaintances throughout India, and I have especially strong contacts in Kerala. I visited and applied for support from the Centre for Development Studies (CDS) in Trivandrum. These contacts will serve as a good base for research in other locations.

From both a practical and a theoretical standpoint, my research in Sri Lanka can be considered as a test case for this study. During the 1997-98 academic year, I carried out interviews with union leaders, employers and government officials. I found informants to be very willing to meet and share information. I also collected and coded thirty years of newspaper articles gathered from the Lakehouse archives in Colombo. Results from preliminary analyses of these data support the theories laid out above.

Sri Lanka began its policy of liberalization in the late 1970s. During the 1980s, the United National Party pursued highly repressive policies against unions in an effort to attract investment in low-end manufacturing industries. My research indicates that this repression created an unwieldy process of industrial relations, with unions pursuing increasingly desperate measures to call attention to their demands—hostage taking, destruction of property, etc. Many of these events made international headlines and caused the closure of foreign enterprises. Whether this evidence from Sri Lanka can be generalized to the rest of South Asia will be of

direct interest to employers, unions, governments, workers and investors in South Asia and will have implications for debates over industrial relations policy throughout the developing world.

Bibliography

- Barro, R.J. "Government Spending in a Simple Model of Endogenous Growth." *Quarterly Journal of Economics*. 106 (1991): 407-44.
- Bean, R. and Holden, K. "Determinants of Strikes in India: A Quantitative Analysis." *Indian Journal of Industrial Relations*. 28;2 (October, 1992): 161-168.
- Chakrabarty, Dipesh. *Rethinking Working-Class History: Bengal 1890-1940*. Princeton: Princeton University Press, 1988.
- Lakehouse Publications. *The Daily News*. July 1997.
- Deyo, Frederic. "State and Labor: Modes of Political Exclusion in East Asian Development" in Frederic Deyo, ed., *The Political Economy of the New Asian Industrialism*. Ithaca: Cornell University Press, 1987.
- DeScheweinitz, Karl. "Industrialization, Labor Controls, and Democracy," *Economic Development and Cultural Change*. 7:4 (July 1959): 385-404.
- DeSilva, S.R. *Elements of A Sound Industrial Relations System*. Bangkok: ILO, 1998.
- Diani, Mario. *Green Networks: A Structural Analysis of the Italian Environmental Movement*. Edinburgh: Edinburgh University Press, 1995.
- Dreze, Jean and Amartya Sen, eds. *Indian Development: Selected Regional Perspectives*. Oxford, Oxford University Press, 1998.
- Easterly, W. and Robello, S. "Fiscal Policy and Growth." *Journal of Monetary Economics*. 32: 417-58.
- Evans, Peter, ed. *State-Society Synergy: Government and Social Capital in Development*. Berkeley: University of California Press, 1997.
- Evans, Peter. *Embedded Autonomy: States and Industrial Transformation*. Princeton: Princeton University Press, 1995.
- Eulau, Heinz. *Politics, Self, and Society: A Theme and Variations*. Cambridge: Harvard University Press, 1986.
- Fisher, Paul. "The Economic Role of Unions in Less Developed Areas," *Monthly Labor Review*. 84:9 (September, 1961): 951-956.
- Freeman, Richard and James Medoff. *What do Unions Do?* New York: Basic Books, 1984.
- Foucault, Michel. *Discipline and Punish: The Birth of the Prison*. New York: Vintage, 1975.
- Gamson, William. *The Strategy of Social Protest*. Belmont, Calif.: Wadsworth, 1990.
- Garrett, Geoffrey. *Partisan Politics in the Global Economy*. New York: Cambridge University Press, 1998.
- Guha, Ranajit. *Elementary Aspects of Peasant Insurgency in Colonial India*. Durham: Duke University Press, 1999.
- Guhan, S. *India's Development Experience: Selected Writings of S. Guhan*. S. Subramaniam, ed. Oxford: Oxford University Press, 2001.
- Gould, Roger. *Insurgent Identities: Class, Community, and Protest in Paris from 1848 to the Commune*. Chicago: University of Chicago Press, 1995.

- Heller, Patrick. *The Labor of Development: Workers and the Transformation of Capitalism in Kerala, India*. Ithaca: Cornell University Press, 1999.
- Herring, Ronald. *Land to the Tiller: The Political Economy of Agrarian Reform in South Asia*. New Haven: Yale University Press, 1983.
- Jayawardena, Kumari. *The Rise of the Labour Movement in Ceylon*. Durham: Duke University Press, 1972.
- Kannan, K.P. *Political Economy of Labour and Development in Kerala: Some Reflections on the Dilemmas of a Socially Transforming Labour Force in a Slow Growing Economy*. Trivandrum: Center for Development Studies, 1998.
- Kannan, K.P. *Of Rural Proletarian Struggles: Mobilization and Organization of Rural Workers in South-West India*. Oxford University Press: Delhi, 1988.
- Kearney, Robert. *Trade Unions and Politics in Ceylon*. Berkeley: University of California Press, 1971.
- Katz, Daniel and Paul Lazarsfeld. *Personal Influence: The Part Played by People in the Flow of Mass Communications*. Glencoe, Ill.: free Press, 1955.
- Kitschelt, et. al. *Continuity and Change in Contemporary Capitalism*. Cambridge: Cambridge University Press, 1999.
- Knoke, David. *Political Networks: The Structural Perspective*. Cambridge: Cambridge University Press, 1990.
- Knoke, David, et. al. *Comparing Policy Networks : Labor in the U.S., Germany, and Japan*. New York: Cambridge University Press, 1996.
- Labour Bureau. *Indian Labour Yearbook*. Annual.
- Laumann, Edward and David Knoke. "Event outcomes." In Edward Laumann and David Knoke, *The Organizational State*. Madison: University of Wisconsin Press, 1987.
- McAdam, Doug. *Freedom Summer*. New York: Oxford University Press, 1988.
- McCarthy, John and Mayer Zald. "Resource mobilization and social movements: a partial theory." *American Journal of Sociology*, 82 (1977), pp. 1212-41.
- Mehta, Asoka "The Mediating Role of the Trade Union in Underdeveloped Countries," *Economic Development and Cultural Change*, 5:3 (October, 1957), pp. 16-23.
- Olson, Mancur P. *The Logic of Collective Action: Public Goods and the Theory of Groups*. Cambridge: Harvard University Press, 1965.
- Pempel, T.J. *Regime Shift: Comparative Dynamics of the Japanese Political Economy*. Ithaca: Cornell University Press, 1998.
- Pontusson, Jonas. "Labor Market Institutions and Wage Distribution in Sweden and Austria." In Torben Iversen, Jonas Pontusson, and David Soskice, eds., *Unions, Employers and Central Banks: Macroeconomic Coordination and Institutional change in Social Market Economies*. Cambridge: Cambridge University Press, 1999.
- Ramaswamy, E.A. "The Indian Management Dilemma: Economic vs. Political Unions." *Asian Survey* 23:8 (1983), pp. 976-90.
- Rudolph, Lloyd and Susanne Hoeber Rudolph. *In Pursuit of Lakshmi: The Political Economy of the Indian State*. Chicago, University of Chicago Press, 1987.
- Scott, James. *Weapons of the Weak: Everyday Forms of Peasant Resistance*. New Haven: Yale University Press, 1985.
- Sinha, Aseema. "Divided Leviathan: Comparing Subnational Development States in India." Ph.D. Dissertation. Cornell University, Ithaca, 2000.

- Tarrow, Sidney. *Power in Movement: Social Movements and Contentious Politics*. Cambridge: Cambridge University Press, 1998.
- Tarrow, Sidney. *Democracy and Disorder: Protest and Politics in Italy, 1965-1975*. Oxford: Oxford University Press, 1989.
- Tilly, Charles. *From Mobilization to Revolution*. Reading, Mass.: Addison-Wesley, 1978.
- Tilly, Charles. *Popular Contention in Great Britain, 1758-1834*. Cambridge: Harvard University Press, 1995.
- Traugott, Mark. *Repertoires and Cycles of Collective Action*. Durham: Duke University Press, 1995.
- Venkata Ratnam, C.S. *Globalization and Labour-Management Relations : Dynamics of Change*. Thousand Oaks, CA: Sage Publications, 2000.
- Weber, Max. *Economy and Society: An Outline of Interpretive Sociology*. Berkeley: University of California Press, 1978.
- Wellman, Barry and S.D. Berkowitz. *Social Structures: A Network Approach*. Cambridge: Cambridge University Press, 1988.
- World Bank. *India: Reducing Poverty, Accelerating Development*. Oxford: Oxford University Press, 2000.
- World Bank. *World Development Report, 1995: Workers in an Integrating World*. Washington D.C.: World Bank, 1995.

The Chinese Scientific Community at Century's End: Its Reconstitution, Changing Social Roles, and International Significance

Introduction

With China's rapid economic growth and emergence as a major trading nation, its increasing importance for global climate change, and its growing significance for international security affairs, there is a pressing need for an improved understanding of China's scientific and technological capabilities. China's scientific base is of direct relevance to each of the three international issue areas noted above. Projections about where China is going in the 21st century, as a nation and as a culture, which do not consider the role of science are likely to be quite misleading. A comprehensive study of China's scientific community-its historical evolution, internal characteristics, economic importance, and political roles-is therefore especially timely.

Throughout the 20th century, science has occupied a special place in Chinese and foreign thinking about Chinese modernization. Within China, Chinese elites concerned for the future of the country exhibited special interest in for the introduction of modern science. As a result, serious institution building for science began during the first two decades of the 20th century with the establishment of modern universities, scientific societies, and science-related government agencies. These efforts continued in the 1920s with the establishment of the Academia Sinica, and into the 1930s with a variety of government and non-government initiatives designed to root science in Chinese soil. Many of these efforts were supported by foreign religious and philanthropic organizations.

Throughout the "May 4th era" of the late 'teens and early 1920s, Chinese cultural iconoclasts saw in science a way to destroy the inherited Confucian order and build a rich and powerful country. An especially important theme sounded at that time was the close relationship between "science" and "democracy;" a modern and capable China needed both. Thus, since early in the 20th century, "science" was associated with economic development and political change in the minds of progressive intellectuals and new nationalistic political elites.

The full story of China's introduction and institutionalization of science in 20th century has yet to be told. We do know, however, that it is a story of achievements and failures occasioned by frequent disruptions by war and political campaigns, with only relatively brief periods of stable development. The period since 1978, when seen against the century as a whole, is among the longest of these relatively stable times.

China's 20th century scientific development story is also one that reaches

across oceans. Foreign training has played a major role in the development of China's cadre of scientists. Large numbers of Chinese have pursued their professional careers outside of China, and there has been continuing interest in Chinese scientific development from foreign governments and non-governmental institutions. In light of this history of domestic political disruptions and "scientific Diaspora," it has been difficult-though not entirely impossible-during most of the 20th century for China's scientists to develop a clear sense of their own national community. On the other hand, the many ties which have survived the Diaspora have led to an "extended community," a network of professional, community-like relationships which transcend national boundaries and political ideologies.

As China approaches the beginning of the 21th century, it does so with policies for its research and higher education systems which, since the late 1970s, have sought both to elevate the status of science and to reaffirm the theme from earlier in the century that science is the key to a prosperous, strong, and modern China. These policies have led to major reforms within scientific institutions, and although they have not always put resources behind declarative policy, they have revolutionized the context in which science is conducted in China. By encouraging the strengthening of scientific associations, supporting peer recognition of genuine scientific achievement, providing sanction for active professional communication, and allowing extensive internationalization of research and education, these policies have permitted the reconstitution of a national Chinese scientific community after years of social turmoil and political intervention into science.

Project Overview and Investigators

The project being proposed here seeks to understand the terms of this reconstitution. It attempts to do so with reference to:

1. the dilemmas of scientific community building in 20th century China
2. the reform policies since 1978 which have reshaped the landscape for scientific community building
3. the inherent characteristics of the Chinese scientific community-its size and disciplinary composition, modes and levels of training, institutional environment, patterns of communication and social stratification, and degrees of cosmopolitanism
4. its relations to the economy, including the implications of the economic reform agenda for science, and
5. its political standing and relations to the state.

While our concern is with the scientific community as a whole, for

convenience and manageability, we will focus on selected disciplines (tentatively, chemistry, earth sciences, areas of engineering, genetics, and physics). Although the scope of the project is broad, we believe that an approach which looks at the integration of each of the five items noted above is necessary if the dynamics of the scientific community are to be understood. In light of our prior work, familiarity with the issues, and knowledge of the research environment, we believe that the comprehensive approach being proposed is manageable.

The project grows out of some 15 months of scholarly exchange between the principal investigator, Richard P. Suttmeier, and co-investigator, Cong Cao. Suttmeier's early work on the Chinese scientific community, which focused on the Chinese Academy of Sciences (CAS) (Suttmeier, 1974), has helped provide background information for Cao's recently completed dissertation research on elite formation and a changing CAS, the progress of which Suttmeier has followed with interest. Both investigators have had extensive experience with science policy and organizations in China and have published widely on topics relevant to the project. Before beginning his doctoral work at Columbia, for instance, Cao was employed for five years at the Institute of Scientific and Technical Information of Shanghai. Suttmeier has followed and published on Chinese scientific development for many years, and recently has had unique opportunities to observe the scientific community in operation as a consultant to the World Bank/UNDP Key Studies Development Project and as a member of an international team organized by the Canadian International Development Research Center to review a decade of science and technology (S & T) reforms on behalf of the State Science and Technology Commission. Through months of exchange, the investigators discovered common interests in scientific community formation in China and came to agreement that this important subject has been neglected and warrants considerable attention.

Key Research Questions

Much western thinking about scientific communities has been inspired by sociologist Robert Merton and his followers. Although the Mertonian tradition has been critiqued by more recent cohorts of scholars working on the social studies of science, certain underlying questions raised by Merton and his followers remain central for theoretical definitions of what scientific communities are. These involve intra-community issues, such as:

- * operative norms
- * professional socialization
- * patterns of communication
- * social stratification
- * rewards and punishments

and the broader social and political contexts in which the community exists.

We believe that in exploring the nature of the scientific community in China, these questions are appropriate foci as well. However, we also expect that an understanding of the nature and behavior of the Chinese scientific community will require special attention to institutional and political contingencies and to the strong "relational" nature of Chinese culture. Indeed, our expectation is that scientific-community characteristics in China will be a complex blending of:

- * culture-based emphases on personal relationships
- * political influences from the Chinese state
- * powerful commercial imperatives resulting from the post-Mao reforms
- * the norms and practices of science in the West, including those found in both academic and commercial spheres.

The relative influence of these combined factors, and the direction of change in relative influence, will be principal areas of interest in the study. Using documentary analysis and interviews in both China and the U.S., the project will include the following four tasks, each of which is likely to form a book chapter in the project's final product.

TASK 1: Defining the Chinese Scientific Community

The first main task of the project will be to define the Chinese scientific community with reference to its size and disciplinary composition, modes and levels of training, institutional environment, patterns of communication and social stratification, and degrees of cosmopolitanism. The Chinese government over the past decade has vastly improved the quality and quantity of statistical data on the numbers of scientists in China, their training and current projects, and places of employment. These data would provide the foundation for the analysis. Less work, though, has been done on the more subtle and complex community-defining characteristics having to do with scientific communication, stratification and elite formation (cf., Cao, 1997), social control and quality assurance, and degrees of cosmopolitanism. These questions, however, go to the heart of the challenge of understanding the reconstitution of China's scientific community. The political penetration of science and the interruptions of professional careers during the Maoist period undercut the possibilities of establishing a viable scientific community, as that term is normally used. These actions disrupted communication, tended to make stratification more a function of political criteria than of achievement, compromised mechanisms of quality control, and contributed to the provincialism which characterized Chinese science at the end of the Mao era.

In exploring how China has moved-and hopes to move further-beyond the pathologies of the Maoist era, we propose that research into the inherent characteristics of the scientific community be approached in the following ways:

Organizational Analysis

A central issue in the comparative study of scientific communities is the extent to which the formal organizations in which scientists work undercut or support professional norms. This has been true in China as well. In the 1950s, for instance, Soviet-inspired organizational forms were imposed on a fledgling scientific community whose values were derived from alternative, Western-inspired organizational arrangements.

Since the initiation of reforms, the organizational context for the work of scientists has changed in important ways. First, there have been a number of changes in the organization and operation of the Chinese Academy of Sciences. Second, the research role of universities has become far more prominent than before. Third, there are more vigorous efforts being made to strengthen research in industry.

The proposed project would investigate the work environment in a sample of units in each of these three sectors with reference to the resources available, the quality and style of management, and the extent to which professional as opposed to organizational values are being promoted. A special organizational issue with important sociological implications is the (re)introduction of the honorific academician (yuanshi) system within the CAS, with elite membership being drawn from all organizational sectors of the Chinese science community (Cao, 1997).

Professional Societies

The study of professional societies in China has been quite limited (cf., Suttmeier, 1973). Yet professional societies in other countries often play a crucial facilitating role in--indeed, are often the central nucleus of--community formation. In China, the societies were subject to political penetration early in the history of the PRC and continue to be seen by the Communist Party as mechanisms for political control. Yet it is also clear that, in the post-Mao era, professional societies have benefited significantly from political liberalization and a general pro-science policy environment. Moreover, they have resumed a significant role in scientific communication and coordination among scientists in different organizational systems (CAS, universities, etc.). In some fields (e.g., medicine), the relevant societies now play an active role in shaping policy pertaining to research in that field. As will be discussed further below, professional societies also have begun to play a more active role in providing advice to the government on technical issues over which they have

cognizance.

Communication, Deviance, and Quality Control

Mechanisms of scientific communication are central features of an active scientific community, both for binding the community together and as instruments of social control. Normal mechanisms of scientific communication were disrupted during the Maoist period, but since the late 1970s there has been a steady growth in the appearance of journals and professional meetings. At the same time, China has not been free of problems of plagiarism and fraud in the use of media of scientific communication. This suggests, among other things, that norms of scientific integrity are not as fully established as they might be, that new incentives for deviant behavior may be operative, and that mechanisms for quality control are not fully institutionalized. As part of this study, we would explore the communication practices of selected disciplines to ascertain communication preferences, prestige judgments, attitudes towards deviance, peer-review practices, and the more general economic and political environments surrounding publications, meetings, electronic communications, and other forms of scientific communication.

Cosmopolitanism

Patterns of communication will also shed light on the question of cosmopolitanism, an issue which has special significance for China. Because of the close historic links between science and nationalism in 20th century China, and pressures for autarky during the Maoist period, the international qualities of science have been politically and psychologically problematic for many in China. To be cosmopolitan has often been interpreted as being less than Chinese. A contemporary manifestation of this issue is the debates which go on among Chinese scientists about the desirability of publishing in English, the international standard for the sciences, as opposed to Chinese.

At the same time, China's 20th-century scientific Diaspora, including large numbers of scientists and science students who have gone abroad since the late 1970s, has led to a large number of Chinese scientists living outside of China, many of whom maintain professional ties with mentors and colleagues within their native country. We can thus speak of a transnational "extended" Chinese scientific community as well as a "national" one, with the former providing a constant source of cosmopolitan influence on the latter. How these influences are received by China's national community is not entirely clear, but one can assume they are quite important for its development with reference to training and research quality, norms of scientific practice, and more general science-society understandings pertaining to relations with the economy and with the state.

Through interviews with scientists, both in China and in the U.S., we will

seek to understand the degree of cosmopolitanism within the Chinese scientific community and to identify the attitudes towards the values of cosmopolitanism. While we would expect to find considerable enthusiasm for international cooperation in science, we also expect that the idea of participating in an internationally common, cosmopolitan community will be more complex and problematic for many Chinese scientists for reasons of language, material conditions, national policy, political ideology, and cultural pride. Special attention will be given to the question of using Chinese as a cosmopolitan language of science.

TASK 2. Examining Reform Policies and Their Impacts on Professional Life

There have been a number of studies in China-and, to a lesser extent, outside of China -of the broad contours of the science and technology reforms which began in the early 1980s (e.g., Gu, 1995; IDRC, 1997). These studies have tended to focus on macro-level funding and organizational changes, with particular attention to reforms intended to more effectively link research to production. This second section of the study will build on this existing work, especially with reference to the reorganization of research (e.g., through the development of "key" and "open" laboratories and engineering research centers); the establishment of new funding mechanisms, including the National Science Foundation of China (NSFC); and quality-enhancing programs, which lead to the funneling of resources to elite institutions. Understanding how these have affected professional life and the research environment is imperative to understanding Chinese scientific research.

Special attention will be given to various innovative programs for supporting the work of young scientists and to attract back to China young Chinese who are studying or working abroad (e.g., the Special Fund for Outstanding Young and Middle-Aged Scientific Personnel, the Special Fund for Chinese Scholars Abroad to Return for Short Term Research or Lecturing, the Fund for Distinguished Young Scholars, etc.). We also will examine the new "100 / 1,000 / 10,000" (baiqianwan gongcheng) initiative designed to nurture selected numbers of young scientists to become international leaders in their fields by the beginning of the 21st century. In addition, China's National People's Congress has passed a number of laws during the reform period which pertain to science and whose significance needs to be assessed.

TASK 3. Examining the Relationships Between Science and the Economy

The third main focus of the study will examine the relationships between science and the economy. A major objective of post-Mao S & T reform

policies has been to encourage closer links between scientific research and economic activities, the absence of which has been problematic since the establishment of the PRC. The difficulties of connecting science with the economy have been a complex mixture of the failures of institutional design-the Soviet-inspired institutions created in the 1950s were characterized by strong disincentives for cooperation between scientific and economic actors-and a scientific culture lacking in commercial and applied orientations.

Much has changed as a result of the reform policies, but to the extent that these changes have been analyzed, the focus has been on the relative success in making research-to-production linkages. The deeper issues of what the reforms have meant for both the nature of the Chinese scientific community and for industrial structure, as well as longer-term direction of the Chinese economy, have received insufficient attention. This section of the study will therefore allow for the examination of the following issues:

Budget Policies

What have been the scientific consequences of the reform strategy of using the state budgets as a lever to force research institutions, including both government institutes and universities, to "enter the market?" What do changing budget policies in the late 1990s-with the promise of greater state support for basic research and increased R&D spending by enterprises, both patterns closer to international norms than those seen at the beginning of the reform period-entail for the scientific community? What are the specific changes in budget policies and how are these decisions made? Are they likely to enhance or disrupt community building? What are their implications for the core values of China's science community?

"Spin Off" Enterprises

One of the more interesting consequences of the reform era has been the creation of a large number of "spin-off" or "new technology enterprises" (NTEs) by research institutes and universities or by individual scientists or groups of scientists (Gu, 1994). The more successful of these have become important sources of revenues for research institutions and sources of income for individuals. The creation and operation of NTEs also have injected commercial values into China's scientific community and created the new professional role of "scientist-entrepreneur." In some cases, the NTEs have significantly out-performed firms in the state sector, with the result that the voices of the scientist-entrepreneur now are taken more seriously in policy councils.

Although this project will not attempt a complete study of the NTEs (see, Gu, 1994, 1995), the implications of the NTE phenomenon for science will be examined. Of particular interest is the role of NTEs as supporters of research, signs that NTEs are prepared to make philanthropic contributions

to basic research and scientific education, the role of NTEs in building the institutions of civil society (e.g., sponsoring China's first private bank), and the positive and negative consequences of the introduction of commercial values into science via the NTEs. Throughout this analysis, China's experience with scientific and technological entrepreneurship, as well as with the commercialization of research more generally, will be compared with international trends.

"Drop Outs"

One of the more worrisome aspects of the institutionalization of marketing reforms for science is that promising students who once would have entered scientific careers now choose more lucrative educational and career paths, while, at the same time, talented young scientists who have already completed their formal education are abandoning research for careers in business and finance. The full extent of these losses to science, and the longer term implications of these current trends, have yet to be systematically explored. One of the objectives of this third part of the study would be to investigate and assess these issues through interviews and documentary analysis in both China and the U.S.

TASK 4. Examining Linkages Between Science and State

As noted at the outset, scientific development in China during the 20th century has been closely linked to politics since the beginning. The "science and democracy" themes introduced during the May 4th era continue to resonate in China even as the relationships between science and democracy remain opaque (Miller, 1996; Fan and Cohen, 1996). Any attempt to better clarify the "science-democracy" relationship must begin with the nature of the scientific community, as we are doing here, and then ask pointed questions about the manifestation of state policies.

As noted above, the state has repeatedly penetrated and disrupted the scientific community in the past, but, in the more recent reform era, has celebrated science and accorded scientists an honored place in society-up to a point. For leading scientist-dissidents, such as Fang Lizhi and Xu Liangying (and many of their western supporters), reformist China remains fundamentally anti-science and anti-democracy. Regardless of the official celebration of the importance of science, basic political rights of speech, inquiry, and association have yet to be granted and/or won, and without these, China's authoritarian traditions will persist. In this view, it is precisely this authoritarianism which is chiefly responsible for China's scientific backwardness over the past few centuries.

Other observers, of course, would note that although the institutionalization of a regime of political rights would be desirable,

political systems without such rights have nevertheless sustained productive scientific research. Still others would argue that democratization involves not only the granting of rights, but also the creation of a middle class and a civil society of voluntary associations, the institutionalization of rules of universalism in law and policy, and the use of high standards of empirical and logical adequacy in assessing claims to truth in public settings. Science's relationship to democracy (and democratization), in this latter view, might then best be explored with reference to its contributions to achieving these objectives.

In an effort to better understand the trends in science-state relations in China, including possible connections between science and democratization, we will focus on four areas:

Political Structure

What are the mechanisms by which science and state are connected (e.g., Party organization and control, budgeting and resource allocation, national planning and objective setting, etc.). What characterizes behavior in these various modes? How have these relationships changed over the past 15 years? To what extent do we see a more self-conscious sense of collective identity among scientists in these interactions during the course of the reform era?

Legal System

What is the legal and constitutional framework for science in China? How does it affect questions of professional autonomy? In addition to reviewing the relevant Chinese laws, this part of the project again will examine the changing public positions and roles of professional societies.

Public Policy and Planning

How is science used in public policy making and what are the mechanisms for policy advice? The analyses here will focus on formalized mechanisms for advice involving established institutions, such as professional societies and the academicians of CAS, as well as informal mechanisms based on personal relationships and other approaches.

Economic Linkages

With an increasing number of scientists becoming active in the world of business (e.g., through the NTEs, as a result of leaving scientific careers entirely, etc.), how does China's scientific community bridge the worlds of commerce and the state? Has its role in serving as a bridge enhanced or reduced its autonomy? Is it better at playing this role from a position of greater or lesser autonomy?

Timetable

We seek support for a project of two year's duration, a summary of which is shown below in the timetable chart. During the initial four-month period (Phase I), the investigators will complete a review of the secondary literature in English and Chinese on scientific development and the changing nature of the scientific community in post-Mao China. This review will focus on Tasks 1 and 2, defining the Chinese scientific community and examining reform policies and their impacts on professional life, respectively. Being already familiar with the literature will allow us to efficiently and quickly launch the project, but we do not expect these works, in and of themselves, to provide clear answers.

At the end of this initial exercise, we expect to have a refined and focused strategy for a four-month period of field work (Phase II), the majority of which will be conducted by Cao and will involve interviews and the collection of relevant Chinese studies and government reports. Cao's work within China's science community will be invaluable here. Following this initial field work, the investigators will together review and analyze the initial findings and begin drafting reports of those findings as journal articles or book chapters (Phase III). By the end of this four- to six-month phase, we expect have a solid sociological account of the scientific community as structured by the kinds of questions raised above under Tasks 1 and 2.

Phase IV of the project will begin early in the second year and involve a return to China for further field work. This will involve a stay of up to three months for Cao and a somewhat shorter period for Suttmeier. The main focus of activities during this period of field work will be the issues raised under Task 3, those associated with the economic roles of the scientific community and the impacts of a changing economy on them.

Phase V will span a four-month period and include analysis and writing back in the U.S. A third and final period of field work of two to three months (Phase VI) will follow, during which time loose ends and uncertainties from the work to date will be checked and the issues raised in Task 4 will continue to be pursued. Finally, the remainder of the grant period (Phase VII) will be spent in the U.S., analyzing findings related to all task areas, preparing a book-length manuscript for publication and dissemination, and presenting or preparing to present findings at professional conferences.

Significance of Expected Results

The project being proposed will be of interest to three somewhat different types of audiences. The first is composed of policy makers and policy-oriented academics in the U.S., in China, and in other countries who

are faced with the tasks of understanding and assessing China's prospects as a society and member of the international community in the 21st century. A large number of questions about China's future-economic progress, environmental protection, military capabilities, cultural identity-turn on issues of science and technology. Central to the behavioral dimensions of these issues are the questions being raised here about China's scientific community, its sense of identity, its values and governance mechanisms, its economic role, and its constitutional standing vis a vis the state. By providing data and analysis of these issues, this study will be of considerable interest and use to this first group.

A second audience to be served is composed of specialists on China in the social sciences and some areas of the humanities who have academic interests in such issues as China's culture and history, its politics and economics, its treatment of intellectuals, and the patterns and implications of China's reform experience. Most China specialists, unfortunately, have tended to regard the issues surrounding China's scientific development as esoteric; they have a nodding acquaintance with the historical significance of the topic, but typically lack an understanding of how to delve into the complexities of science in China's modern history and contemporary experience. While there is a small literature that involves the social studies of science in China, there have been no major additions to it in English for almost a decade-a period of great change for China (see, Simon and Goldman, 1989). This study will fill a serious gap in this literature and provide much needed access to the role science plays in Chinese society for those whose professional identities revolve around teaching and writing about modern China.

Finally, the study will be of interest to scholars in the interdisciplinary field of science, technology, and society. Although China has not loomed large on the horizons of most people working in the STS area in the past, that is likely to change. The increasing importance of China to the international economy, to international security, and to international environmental issues has already attracted many "non-China specialists." Chinese science, as manifested in both the national and extended communities, is also acquiring a growing international importance. With it will come increasing interest in its behavioral and institutional characteristics, i.e., in the kinds of questions which we expect to answer through this project.

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American Indian or Alaska Native. A person having origins in any of the original peoples of North and South America (including Central America), and who maintains tribal affiliation or community attachment.

Asian. A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam.

Black or African American. A person having origins in any of the black racial groups of Africa.

Native Hawaiian or Other Pacific Islander. A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.

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NAME OF PERFORMING ORGANIZATION, IF DIFFERENT FROM ABOVE			ADDRESS OF PERFORMING ORGANIZATION, IF DIFFERENT, INCLUDING 9 DIGIT ZIP CODE			
PERFORMING ORGANIZATION CODE (IF KNOWN)						
IS AWARDEE ORGANIZATION (Check All That Apply) <small>(See GPG II.C For Definitions)</small>		<input type="checkbox"/> SMALL BUSINESS		<input type="checkbox"/> MINORITY BUSINESS		<input type="checkbox"/> IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE
		<input type="checkbox"/> FOR-PROFIT ORGANIZATION		<input type="checkbox"/> WOMAN-OWNED BUSINESS		
TITLE OF PROPOSED PROJECT Analysis of the effects of environmental treaties						
REQUESTED AMOUNT		PROPOSED DURATION (1-60 MONTHS)		REQUESTED STARTING DATE		SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE
\$ 282,364		36 months		07/01/03		
CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW						
<input type="checkbox"/> BEGINNING INVESTIGATOR (GPG I.A)			<input type="checkbox"/> HUMAN SUBJECTS (GPG II.C.11)			
<input type="checkbox"/> DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C)			Exemption Subsection _____ or IRB App. Date _____			
<input type="checkbox"/> PROPRIETARY & PRIVILEGED INFORMATION (GPG I.B, II.C.6)			<input type="checkbox"/> INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.9)			
<input type="checkbox"/> HISTORIC PLACES (GPG II.C.9)						
<input type="checkbox"/> SMALL GRANT FOR EXPLOR. RESEARCH (SGER) (GPG II.C.11)			<input type="checkbox"/> HIGH RESOLUTION GRAPHICS/OTHER GRAPHICS WHERE EXACT COLOR REPRESENTATION IS REQUIRED FOR PROPER INTERPRETATION (GPG I.E.1)			
<input type="checkbox"/> VERTEBRATE ANIMALS (GPG II.C.11) IACUC App. Date _____						
PI/PD DEPARTMENT			PI/PD POSTAL ADDRESS			
Department of Political Science			1284 University of Oregon			
PI/PD FAX NUMBER			Eugene, OR 974031284			
541-346-4860			United States			
NAMES (TYPED)		High Degree	Yr of Degree	Telephone Number	Electronic Mail Address	
PI/PD NAME						
CO-PI/PD						
CO-PI/PD						
CO-PI/PD						
CO-PI/PD						

CERTIFICATION PAGE

Certification for Authorized Organizational Representative or Individual Applicant:

By signing and submitting this proposal, the individual applicant or the authorized official of the applicant institution is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding debarment and suspension, drug-free workplace, and lobbying activities (see below), as set forth in Grant Proposal Guide (GPG), NSF 03-2. Willful provision of false information in this application and its supporting documents or in reports required under an ensuing award is a criminal offense (U. S. Code, Title 18, Section 1001).

In addition, if the applicant institution employs more than fifty persons, the authorized official of the applicant institution is certifying that the institution has implemented a written and enforced conflict of interest policy that is consistent with the provisions of Grant Policy Manual Section 510; that to the best of his/her knowledge, all financial disclosures required by that conflict of interest policy have been made; and that all identified conflicts of interest will have been satisfactorily managed, reduced or eliminated prior to the institution's expenditure of any funds under the award, in accordance with the institution's conflict of interest policy. Conflicts which cannot be satisfactorily managed, reduced or eliminated must be disclosed to NSF.

Drug Free Work Place Certification

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Drug Free Work Place Certification contained in Appendix A of the Grant Proposal Guide.

Debarment and Suspension Certification

(If answer "yes", please provide explanation.)

Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency?

Yes

No

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Debarment and Suspension Certification contained in Appendix B of the Grant Proposal Guide.

Certification Regarding Lobbying

This certification is required for an award of a Federal contract, grant, or cooperative agreement exceeding \$100,000 and for an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding \$150,000.

Certification for Contracts, Grants, Loans and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

AUTHORIZED ORGANIZATIONAL REPRESENTATIVE		SIGNATURE	DATE
NAME Karen Findtner			01/14/02
TELEPHONE NUMBER 541-346-5131	ELECTRONIC MAIL ADDRESS Karen_Findtner@orsa.uoregon.edu	FAX NUMBER 541-346-5138	

*SUBMISSION OF SOCIAL SECURITY NUMBERS IS VOLUNTARY AND WILL NOT AFFECT THE ORGANIZATION'S ELIGIBILITY FOR AN AWARD. HOWEVER, THEY ARE AN INTEGRAL PART OF THE INFORMATION SYSTEM AND ASSIST IN PROCESSING THE PROPOSAL. SSN SOLICITED UNDER NSF ACT OF 1950, AS AMENDED.

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) - continued from page 1
(Indicate the most specific unit known, i.e. program, division, etc.)

SES - DECISION RISK & MANAGEMENT SCI
SES - POLITICAL SCIENCE
EAR - GLOBAL CHANGE

Project Summary

Statement of Objectives

This project will help scholars and practitioners better understand the causes of variation in the effects of environmental treaties. Environmental treaties vary considerably in how much they achieve their objectives. Some halt harmful behaviors and “solve” environmental problems; others have few effects; others achieve their objectives simply due to fortuitous circumstances. This project will analyze environmental outcomes (both environmental quality and behaviors) targeted by a range of environmental agreements to:

- assess what share of variation in those outcomes reflects the effects of relevant agreements and what share is better explained by other factors;
- compare agreements to identify which have greater, and lesser, effects;
- determine how much particular design features contribute to an agreement’s effects; and
- analyze how the benefits of particular design features depend upon characteristics of the environmental problem, international context, countries involved, and other factors.

Methods to be Employed

Working closely with a statistical consultant and undergraduate and graduate research assistants, the PI will build a unique meta-dataset linking existing and new data on scores of environmental agreements, the outcomes they target and indicators of legal, economic, political, and social drivers of those outcomes. The project will develop and test regression models designed to distinguish effects of agreements from other explanatory factors, to allow meaningful comparison of the effects of agreements that address quite different environmental problems, and to evaluate how generalizable “successful” design features are to other problems.

Intellectual Merit of Proposed Activity

Prior research on the effectiveness of environmental agreements at achieving, or facilitating progress toward, their goals has derived claims largely from case studies. This project will test those claims with quantitative methods and a larger and more diverse set of agreements than has previously been analyzed. This approach offers an alternative means to distinguish the effects of agreements from other factors and allows assessment of whether qualitative findings generalize well or are case-specific. Because analyzing more agreements requires analyzing variation in more variables, the project allows better control than with case studies of non-agreement factors, better assessment of the confidence that should be placed in estimates of agreement effects, and better comparison of one agreement’s effects to those of others and to non-agreement factors. Results will be made available through scholarly, methodological, and policy-oriented articles; a book; and a website that will provide access to project data, coding methods, and findings.

Broader Impacts Resulting from Proposed Activity

For scholars, the research will evaluate existing claims regarding environmental treaty effectiveness, confirming some, identifying scope conditions for others, and refuting others. The project will also develop new methods and provide a new dataset that will help scholars, governments, treaty secretariats, and non-governmental organizations to investigate questions beyond those addressed here. For the policy community, the research responds to recent domestic and international calls for policy-relevant, decision-support research on global environmental change and a “transition to sustainability” by identifying features of environmental treaties that can make both existing and future agreements more effective.

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B Table of Contents	1	_____
C Project Description (Including Results from Prior NSF Support) (not to exceed 15 pages) (Exceed only if allowed by a specific program announcement/solicitation or if approved in advance by the appropriate NSF Assistant Director or designee)	15	_____
D References Cited	4	_____
E Biographical Sketches (Not to exceed 2 pages each)	2	_____
F Budget (Plus up to 3 pages of budget justification)	7	_____
G Current and Pending Support	1	_____
H Facilities, Equipment and Other Resources	1	_____
I Special Information/Supplementary Documentation	4	_____
J Appendix (List below.) (Include only if allowed by a specific program announcement/solicitation or if approved in advance by the appropriate NSF Assistant Director or designee)	_____	_____

Appendix Items:

*Proposers may select any numbering mechanism for the proposal. The entire proposal however, must be paginated. Complete both columns only if the proposal is numbered consecutively.

Project Description

How should we design international environmental agreements (IEAs) to better manage global environmental change? Are there universal rules of "good" treaty design and, if not, how does the "best" agreement depend on such factors as the type of environmental problem, the international context, and the characteristics of the countries involved? Countries have negotiated hundreds of environmental agreements, some of which have resolved problems, some of which have had limited influence, and some of which have had no impact at all. Accurately determining which have been most effective and whether to imitate their provisions for other problems proves challenging. Global production of ozone depleting substances and European emissions of acid precipitants have declined sharply since relevant treaties were signed while levels of many marine pollutants and fish harvests have risen despite regional and global efforts. It is tempting to interpret environmental improvement as "success" and continuing decline as failure; to attribute improvements that occur as caused by some treaty and its particular design features; and to promote those features in other arenas.

Although such interpretations may be valid, they risk misinterpreting the evidence. First, although improvement is preferable to decline, the drivers of environmental degradation are often so strong that success may be evident in slower rates of degradation rather than improvement. Second, we can only estimate treaty influence through the difficult comparison of actual outcomes to what would have happened *without* the treaty rather than what did happen *before* the treaty. Some "successes" are treaty effects but others reflect simply fortuitous but coincidental economic or technological developments. Third, even if the ozone and acid rain agreements proved to be truly more effective than marine pollution or fishery treaties, that greater effectiveness might reflect differences in the problems addressed rather than the agreements addressing them. Finally, the influence of agreements that induce major changes in one arena may be highly contingent and may not generalize to other problems. This project investigates why the effects of environmental treaties vary using quantitative methods that have rarely been applied in this arena and that have been selected precisely to address these problems.

This project extends previous work on regime effects by addressing whether, how much, and under what conditions IEAs contribute to environmental protection (Miles, Underdal, Andresen, Wettestad, Skjærseth, and Carlin 2001; Young 1999; Victor, Raustiala, and Skolnikoff 1998; Brown Weiss and Jacobson 1998). It develops and applies quantitative approaches to allow comparisons of one agreement's effects to others and to variation in outcomes due to other factors, shedding light on how much leverage IEAs offer us for environmental protection. The project responds to calls from the US National Research Council, the International Human Dimensions Programme on Global Environmental Change, and many scholars for research on "the social determinants of environmentally significant consumption" and the relative effectiveness of different institutions in managing environmental change and a transition to sustainability (Committee on the Human Dimensions of Global Change and National Research Council 1999, 2; Stern, Young, and Druckman 1992, 12-13; Board on Sustainable Development Policy Division and National Research Council 1999, 11; Committee on Grand Challenges in Environmental Sciences and National Research Council 2001, 4; Young, Agrawal, King, Sand, Underdal, and Wasson 1999). It responds to recent calls for "decision support" research on how and under what conditions international institutions influence environmental behavior so that domestic and international policymakers can be better informed when designing policy to address global change (US Climate Change Science Program 2002; United Nations Environment Programme 2002).

The project seeks funding for analysis (including data and methods development) of the effects of IEAs. Planned deliverables for the project include substantive and methodological articles, a book, and a large dataset of IEA-related variables that will be made publicly available via a website. Major costs include summer funding for the PI, wages for undergraduate and graduate research assistants, and fees for statistical consulting and programming. The Principal Investigator (a political scientist) has agreement from Glenn Deane, SUNY-Albany, to work closely as the project's statistical consultant (including two site visits during the project). The project has an advisory board of senior scholars: Peter Sand (University of Munich), an international lawyer, principal legal officer for the 1992 UNCED conference, who has worked for UNEP, FAO, and the World Bank; Robert O. Keohane (Duke University), an international relations scholar, recipient of the Grawemeyer Award for Ideas Improving World Order, who has published extensively on regimes; and William C. Clark (Harvard University), an ecologist, member of the National Academy of Sciences, who has extensive research experience on issues of environmental science and policy. These scholars have given feedback on (but are not responsible for) the current proposal and have agreed to provide guidance to the project.

Existing literature and the contribution of quantitative analysis

What do we know about IEAs? I define international environmental agreements as legally-binding intergovernmental declarations designed to manage human impacts on natural resources. An extensive literature has provided considerable insight into IEAs as dependent variables, explaining their content and the timing of their formation (see, e.g., Young and Osherenko 1993; Young 1998; Lipschutz 1991). The literature on IEA effects, i.e., IEAs as independent variables, is less well-developed and even basic questions remain unanswered. Most of that literature has involved qualitative methods and case studies of either one or a small set of environmental "regimes" or governance systems (see, e.g., Haas, Keohane, and Levy 1993; Cameron, Werksman, and Roderick 1996; Keohane and Levy 1996; Victor, Raustiala, and Skolnikoff 1998; Krasner 1983). These studies' constraints have kept much of their analytic focus on *whether* an agreement achieved its objectives. They have produced useful conjectures about *why* some agreements work and others do not and under what conditions they work. However, those conclusions have been derived from variation over time and across countries within a single context, making it unclear whether they apply equally well in other environmental settings. Recent projects are developing qualitative methods to identify the determinants of "success" by comparing agreements, using three, five, twelve, or even thirty regimes (Young 1999; Brown Weiss and Jacobson 1998; Miles et al. 2001; Breitmeier, Levy, Young, and Zürn 1996; Sprinz and Helm 1999).

This project is unique in the degree to which it addresses this research quantitatively, seeking to complement, rather than replace, existing case studies. First, quantitative analysis of already-examined regimes allows replication that can buttress (or refute) existing qualitative conclusions through alternative methods. Second, case studies convince precisely when their primary explanatory variable (e.g., the agreement's existence) varies but other explanatory variables (which, had they varied, would have affected the dependent variable) do not. But this feature precludes evaluating the impact of variables held constant and weakens claims that findings generalize to contexts in which those variables had other values. Quantitative comparison of multiple cases fosters analysis of important non-IEA variables, allowing a) more explicit control of these variables' impacts on the dependent variable (making attribution of agreement effects more accurate), b) evaluation of their impacts as important questions in their

own right, and c) assessment of which extant claims regarding regime effects are generalizable and which are linked to the specific conditions of the case studies from which they are derived. Third, attempts to systematically compare the effects of multiple agreements clearly engage complex theoretical, empirical, and methodological problems. Yet, negotiators must (and do) regularly make such comparisons with little, if any, supporting empirical evidence when they add one treaty provision and delete another. Even if this project's attempts to make convincing comparisons fail, they will nonetheless clarify the difficulties to making such comparisons and identify strategies to help negotiators who must make them to use available evidence wisely. If the project's attempts succeed, they can replace claims that "this design always works best" or "this design worked in this case" with more contingent policy prescriptions of design features that will work for particular problems in particular contexts during particular time periods.

Explaining environmental outcomes: the dependent and independent variables

Governments negotiate and join IEAs when they value the environmental benefits they expect from collective efforts more than the economic and other costs they expect to incur in contributing to those efforts. Agreements are meaningful, therefore, to the extent that they cause environmental behaviors, and hence environmental quality, to differ from what they would have been otherwise. This project uses environmental quality indicators as the dependent variable (DV), whenever possible. But behavior will also be used since agreements can have environmental effects only through behavioral ones, because influences on behavior tend to be better understood and more systematic than those on environmental quality, and because data on behavior often is more available, more comprehensive, and of better quality.

This project focuses on agreement "effects" defined as the differences between environmental outcomes observed with an agreement in place (as evident in environmental quality or corresponding behaviors) and the "counterfactual" estimate of what those outcomes would have been were the agreement not in place. This "observed minus counterfactual" approach is central to much regime "effectiveness" research but "effectiveness" is also often used to refer, *inter alia*, to an agreement's ability to achieve its environmental goals (Young 1999; Young 2001; Miles et al. 2001; Sprinz and Helm 1999). The project adopts the term "effects" as a semantic choice with important analytic implications. Comparing observed outcomes to counterfactuals defines effects as progress *in the direction of* agreement goals without requiring measurement of *the distance from* those goals. It permits analysis of many agreements that have goals with no specific reference points (e.g., "sustainable development") without relying on the analyst to create one subjectively. It also encourages attention to important agreement effects that may be unexpected, negative, or fall short of (or exceed) specific agreement standards (Barnett and Finnemore 1999; Victor, Raustiala, and Skolnikoff 1998). For each agreement, the project asks "how far have we come?" rather than "how far do we have to go?"

To say that the effects of IEAs will be evident in changes in outcomes is not to say that IEAs are the only sources of such changes. The skepticism of realist theory reminds us that changes in treaty-regulated behaviors are often due to factors other than the treaty (Waltz 1979; Strange 1983). Even those who believe regime's *can* have significant effects recognize that they often do not and that whether they do depends on other factors. Most research on IEAs and the regimes that surround them has asked "how do regimes influence environmental behaviors and outcomes?" This project seeks to answer that question through the broader question of "what explains variation in environmental behaviors and outcomes?" which more explicitly accounts

for the influence of other factors on those behaviors. This takes advantage of economic research into the factors that explain variation in pollution levels across countries (Harbaugh, Levinson, and Wilson 2000). Including non-IEA explanatory or independent variables (IVs) in an analysis allows their use as *control variables*, demonstrating that co-variation between an IEA and some outcome persists even after controlling for other factors. Economic, technological, political, and other drivers of behavior also can serve as *comparators*, allowing assessment of whether an IEA's influence is "large" or "small" (although, for cautions, see King 1986). Assessing the influence of non-IEA factors is valuable in its own right and clarifies whether IEAs contribute much or little to environmental protection. Finally, non-IEA IVs can serve as *interaction terms*, clarifying whether and how IEA influence depends on non-IEA-related conditions.

The plethora of factors hypothesized as driving environmental degradation can be categorized into four classes: characteristics of the country, the international context, the environmental problem, and the agreement (Brown Weiss and Jacobson 1998). Cutting across these categories run distinctions between domestic and international factors and among economic, political, social, and demographic factors.

Country characteristics explain variation across countries in environmental degradation, i.e., why some countries are "green" and others are "brown." Political scientists have noted that countries vary in terms of both relatively constant "parameters" and more time-varying "fundamental" factors (Jacobson and Brown Weiss 1998, 535). Economic models of variation in pollution commonly include economic, political, demographic, and social indicators (Amin 1992; Grossman and Krueger 1995; Selden and Song 1994; Hilton and Levinson 1998; Harbaugh, Levinson, and Wilson 2000; Ravallion, Heil, and Jalan 2000; Anderson and Cavendish 2001). Based on this scholarship, specific IVs will include indicators of per capita income, economic growth, market structure, technological development, foreign investment and trade, government type, number of environmental parties and nongovernmental organizations (NGOs), extent of domestic environmental regulation, polling data on environmental concern, population size and density, resource endowments, land area, and number of neighboring countries (Jacobson and Brown Weiss 1998, 535; Haas, Keohane, and Levy 1993; Inglehart 1990; Ross 1999; Ross 2001; Steinberg 2001).

International context characteristics tend to explain simultaneous shifts in many countries' environmental practices (Jacobson and Brown Weiss 1998, 528). The end of the Cold War, the start of the war on terrorism, large-scale shifts toward democratic governance, shifts in economic production and investment patterns, global economic booms or recessions, and development of new technologies can dramatically alter how, and how much, countries protect or destroy the environment. Economic, political, and informational globalization may hasten environmental degradation and also encourage environmental protection (Held and McGrew 1999). More explicitly environmental trends include increasing environmental attention by the media and the public, major environmental conferences (e.g., Stockholm in 1972, Rio in 1992, and Johannesburg in 2002), and major science assessments (e.g., the Intergovernmental Panel on Climate Change). The influence of these forces on behavior can be independent of, or reflect interactions with, with the features of IEAs (Young 2002; Stokke 2001). Specific IVs will include dummy variables for many of these (e.g., the end of the Cold War or major conferences) plus global indicators of more continuous variables, including indicators of global economic growth and trade, number of extant environmental agreements, and media coverage of environmental issues (Social Learning Group 2001).

Problem characteristics explain differences in outcomes across environmental realms (Jacobson and Brown Weiss 1998, 521). Behaviors whose environmental costs are borne largely by those who engage in them are more likely to decline as scientists identify those costs than those whose costs are largely displaced on others. The latter may decline as their costs come to light, if those bearing those costs can punish those who impose them and/or reward those who do not. Behaviors will tend to decline more rapidly if their environmental costs are clear, large, and immediate rather than uncertain, contestable, and far off in time. Governments or corporations responsible for an environmental harm that are powerful and few in number may be more able to resist pressures for behavior change but may also be more visible and easily targeted by those seeking such change (Olson 1965). The availability and price of alternative means of achieving the goals that motivate a behavior also influence the adoption of more environmentally benign behaviors. Social and cultural commitment to an activity and economic "embeddedness" can create inertial resistance to change, as evident in American fossil fuel dependence or Norwegian whaling. When an IEA regulates an activity, certain traits may make it harder to regulate (more "malign") than others (Miles et al. 2001). Market structures can reinforce or undercut regulatory efforts – international marine pollution regulations benefit from the incentives shipbuilders and ship insurers have to monitor and enforce them while international endangered species regulations create shortages and price increases that encourage smuggling that undermines their effectiveness (Mitchell 1994; Jacobson and Brown Weiss 1998, 521). Reciprocal Tragedy of the Commons problems pose different compliance problems than asymmetric upstream-downstream problems (Mitchell and Keilbach 2001). In some cases, many states do not contribute to the problem and of those that do, some want it resolved but others do not, creating a problem with both Tragedy of the Commons and upstream-downstream aspects. The political character of many problems also changes over time, as state incentives and capabilities change. This project will develop and code indicators for most problem characteristics, since little systematic data on them yet exists.

IEA characteristics constitute a final set of influences (Jacobson and Brown Weiss 1998, 523ff). Indeed, this project starts with the assumption that some variation in IEA effects is due to their designs, not just to exogenous factors. Outcomes may vary due to differences in their primary substantive rules, informational provisions, response provisions, and institutional structure (Chayes and Chayes 1995; Mitchell 1996; Jacobson and Brown Weiss 1998, 528; Victor, Raustiala, and Skolnikoff 1998). A major contribution of this project involves developing indicators of IEA characteristics including, inter alia, the use of bans or limits; legal specificity; self- or other-reporting; independent verification; sanctions, rewards, or capacity enhancements; as well as number of members, scientific advisory committees, secretariat resources, and regularity of conferences. Some IEA features may have influence in most contexts. The influence of others may be contingent on other variables. Thus, sanctions may be less influential than capacity building when behaviors reflect an inability to "do the right thing" rather than the desire not to. Sanctions may work better among states with many economic and political interdependencies while rewards may work better among states that have few.

Evaluating IEA influence poses challenging endogeneity problems: country, international context, and problem characteristics influence environmental outcomes but also influence what IEA features states adopt to address them. Endogeneity offers a rival explanation of any claimed IEA influence: any co-variation of outcomes and IEA features is not due to those features but to underlying factors that explain both a) the IEA features adopted and what countries become members and b) any variation in subsequent outcomes. IEAs are usually signed only when and

by those states ready to control certain activities; therefore, by definition but for reasons unrelated to IEAs, the activities of member states will differ both from their prior behavior and from that of non-member states. Indeed, "leader" states sometimes have met IEA requirements years before those agreements were negotiated due to domestic political, rather than international legal, reasons. Even after they sign, environmental improvements often reflect such forces. Changes in economic interests may lead states to negotiate IEAs and changes their behaviors. Highly interdependent (e.g., European) states may be more likely both to adopt more ambitious IEAs and to change their behaviors accordingly than less interdependent states. Clarifying what *independent* influence IEA features have requires evaluating how such variables drive IEA design. This project will develop models that include these variables and apply techniques (e.g., two-stage least squares) that can evaluate whether, when they are included, IEA effects vanish.

Identifying and collecting the data

Even though many IEAs cannot be assessed for lack of data, useful conclusions about any require knowing whether those studied are representative of the larger population. No accepted definition or list of IEAs exists. This project's definition (see above) considers conventions, protocols, and amendments as separate cases but excludes non-binding accords and agreements with significant but indirect environmental impacts. By combining and extending over 30 major lists of environmental instruments (including, inter alia, Burhenne 1974-2002; Center for International Earth Science Information Network 2001; ECOLEX 2002; FAOLEX 2002; Fletcher School of Law and Diplomacy 2002; Ruster and Simma 1975; United Nations Environment Programme 1996), the PI has identified over 700 multilateral IEAs and an even larger number of bilateral ones (Mitchell under review). This list, with descriptive data and electronic text and organized into legally-linked regimes, will itself contribute significantly to research by identifying an IEA population using a consistent, explicit, and public definition. Having the complete list of IEAs will allow evaluation of whether those for which data on relevant outcome variables is available are representative, and if not, to facilitate judgments about the generalizability of findings from the project.

Identifying and collecting indicators of dependent variables

The analysis proposed here requires identifying relevant outcomes with available data. Some IEAs have a single and obvious indicator, e.g., agreements protecting particular species or limiting specified emissions. Others target multiple behaviors (e.g., the Convention on International Trade in Endangered Species addresses numerous species) or regulate behaviors not readily quantified (e.g., the Convention on Wetlands of International Importance requires countries to "promote the conservation [and] wise use of wetlands"). Although scholars often assume data is not available even in the former cases, this project has identified detailed, multi-country, multi-year (panel) datasets relevant to over 50 IEAs addressing fisheries, endangered species, marine and river pollutants, regional air pollution, and ozone depletion.

Panel data often requires combining, cleansing, and restructuring data from often obscure sources covering different countries, years, formats, and units. I have collected datasets from treaty secretariats; other international, governmental, and non-governmental organizations; scientists; and published sources. Creating multi-country datasets for fur seal population and harvest (relevant to treaties from 1911 and 1957) that stretch from 1811 to the present and for polar bear harvests from 1950 to the present has allowed me to establish systematic procedures to identify, combine, cleanse, and validate datasets. Collected by other people for other

purposes, these data avoid bias in measurement of the DV. Data quality problems are addressed by acquiring most data from secretariats or peer-reviewed literature and cross-checking, rejecting biased datasets but accepting "noisy" ones that pose only the benign problem of missing IEA effects when they exist rather than "finding" them when they do not. The project will fund research assistants to identify more datasets and, more importantly, to match outcome data to IEAs. Thus, a UN FAO dataset of 50 years of fish catch does not identify which species were regulated in which years for which countries. Creating that regulatory database (and similar ones for other IEAs) is a major, but necessary, element of using data to assess IEA effects.

Collecting data on explanatory variables

The regression techniques proposed here (see below) require collecting data on proxies for drivers of environmental outcomes that are general enough to apply sensibly to a range of IEAs but not so general that their very generality limits their correlation with particular IEA outcomes. World Development Indicators, the Penn World Tables, the Inter-University Consortium for Political and Social Research, and other sources supply country-year data that are appropriate proxies for many of the country and international context variables noted above. Data on some IEA-related variables and particularly on IEA practice (as opposed to IEA law) are available from individual academics or project teams and the principal investigator has initiated discussions with the International Regimes Database, the "Engaging Countries" project, the "Oslo project," and several other scholars to coordinate archiving and use of such data in this project and by other scholars (Breitmeier, Levy, Young, and Zürn 1996; Brown Weiss and Jacobson 1998; Miles et al. 2001; Meyer, Frank, Hironaka, Schofer, and Tuma 1997, Haas, personal communication, Stevis, personal communication).

This project seeks support both to compile extant data and to develop coding procedures and collect data on the many characteristics of IEAs and environmental problems on which data does not currently exist. Consistent data is needed on the legal provisions of IEAs, their practice, and the environmental problems they address, such as incentive structures, incidence of environmental costs, and availability of alternative behaviors. I have devised initial coding procedures to categorize each article in an IEA into one of 30 categories that distinguish substantive requirements and implementation provisions from less consequential clauses on entry into force, depository governments, or authentic languages. Coding the latter articles is an investment with little value for the current project that makes the resultant database more useful to other scholars. Funding will cover development of more detailed codings to capture rule types and specificity, monitoring provisions, and responses to compliance and noncompliance. Although many agreements will not have outcome indicators available, the project plans to code all known IEAs because each requires, on average, only 2-3 hours to code and because the resultant data would be valuable for a wide array of research beyond that envisioned here. I have begun (or plan) to develop additional procedures for consistent and reliable coding of problem "malignity," incentive structures, uncertainty, and other parameters of environmental problems. All data will become publicly available as soon as my own analyses are underway.

Data coding

The value of the project's findings (and of its data to other scholars) depends on collection procedures that produce reliable data. To ensure features of an IEA or environmental problem are coded identically regardless of the person doing the coding, the PI is creating coding manuals that allow simple, unambiguous codings by non-experts. Data reliability will be ensured by

training coders on practice cases (that will not be part of the final dataset) until they achieve high levels of inter-coder reliability (> 80% matching responses from coder 1 and coder 2). 20% of all IEAs entering the database will be coded by two coders to re-check reliabilities, re-training coders whose reliability falls below acceptable levels. Coding difficulties will be discussed at regular coding meetings to maintain reliability levels (Perreault and Leigh 1989; Miles and Huberman 1994). As international environmental scholars rarely use such procedures, the project will make coding procedures publicly available and publish methodological articles so that the project promotes new methods as well as producing new data.

The project will use undergraduates as coders. The International Regimes Database project has used two experts to code each of 30 regimes (most consisting of several IEAs) with the goal of producing very accurate codings (Breitmeier, Levy, Young, and Zürn 1996). This project recognizes the value of expert codings but argues that using non-experts has virtues in the present project, can complement expert codings, and can demonstrate the value of an alternative approach. First, using experts limits the size of, and imports selection bias into, any database because experts exist for only a small, and unsystematic, sample of IEAs. Second, an expert's knowledge of both concepts and cases makes them more likely than non-experts to infuse codings with nuanced interpretations of terms and facts that, while more "true" to a given case, reduce comparability across coders. To avoid non-expert codings undermining accuracy excessively, experts and treaty personnel will evaluate codings of a sample of IEAs, some randomly selected and some selected as particularly useful for coding system validation. Third, coding hundreds of IEAs, as planned here, requires relatively broad codings designed more to ensure consistent and appropriate categorizations than to ensure nuanced and detailed case descriptions. Fourth, using undergraduates as coders will produce codings of more IEAs in less time and for less money than will employing experts – the International Regimes Database, although useful, will have taken over five years and considerable resources to produce a database covering only 30 regimes. Finally, undergraduate coders will learn valuable research skills and gain considerable experience working closely with a faculty member.

Data structures

Primary data structures will be composed of multi-country, multi-year data relevant to a single IEA. Each will include a relevant outcome as the dependent variable and a set of independent variables appropriate to explaining that outcome. Pollution IEAs would have emissions or ambient levels of the targeted pollutant (the DV) and IVs such as, inter alia, income per capita, level of development (e.g., OECD membership), economic growth rates, market structure, trade levels, degree of democracy, type of regulatory culture, and population density. The records would consist of annual observations of IVs and DV for countries involved in the targeted or similar activities whether they were regulated or not. For each IEA, the goal is to maximize observations that facilitate estimation of the "no-IEA" counterfactual that underlies estimates of IEA's effect. Thus, data on the Convention on Long-Range Transboundary Air Pollution's (LRTAP's) 1985 sulfur protocol would include data on sulfur emissions and corresponding IVs for all available countries since 1980 to examine whether, after controlling for economic, political, and social drivers, emissions of countries after they became members differ from their previous emissions and from same-year emissions of similar countries who did not, or had not yet, become members. Observations for a 1980 treaty regulating catch of salmon in the North Atlantic would include IV and DV data from 1960 on for all countries fishing for salmon anywhere in the world. IEA effects could then be estimated by comparing regulated catch

(salmon caught in the North Atlantic by member states after 1980) to several variants of unregulated catch (salmon caught in the North Atlantic by member states *before* 1980, salmon caught *outside* the North Atlantic by member states after 1980, and salmon caught in the North Atlantic by *nonmember* states after 1980).

Two "master" datasets will be constructed. A master IV dataset will include data on explanatory variables (as identified above) from all available countries in all available years. A master DV dataset will combine datasets on DVs relevant to individual IEAs. Individual IEA data structures will be constructed by combining the relevant DV data from the latter dataset with that subset of observations and variables for relevant countries in relevant years from the former. As described below, regressions using these primary data structures will identify effects of single IEAs with the relative effects of IEAs based on comparisons among these regressions.

Conducting the analysis

This section describes considerations relevant to developing models to be used in evaluating the effects of individual IEAs and for comparing effects of multiple IEAs. It has been developed in consultation with Glenn Deane, a statistician and sociologist at SUNY-Albany, who will be a statistical consultant, helping design and test these models and addressing methodological issues. A biographical sketch of Deane and a letter confirming his willingness to serve as a consultant are included as supplementary documents to the current proposal.

Evaluating the effects of individual IEAs: the promise of panel analysis

The project will initially evaluate effects of individual IEAs, developing models of outcomes an IEA sought to influence as a function of country, international context, problem, and the IEA's characteristics. Such a model transforms the case study question of "what are the effects of this IEA?" into "what are the causes of variation in an environmental outcome, and is this IEA among them?" Put simply, the project will estimate an IEA's influence by examining the variation in an environmental outcome addressed by that IEA for which other influences cannot account. Rather than compare the aggregate behavior of all countries before and after an IEA took effect, the project adopts a country-year level of analysis. Using country level data captures IEA effects in the differences between what states do as members and what they would do if they were not and allows control for variation in country characteristics. Using annual data allows control for the influence of variation over time in characteristics of countries, the international context, and environmental problems. A country-year approach also increases the number of observations enough to allow application of quantitative techniques.

Using raw data on behavior or environmental quality as a DV is not particularly useful because of huge variance in initial levels of those indicators that simply reflects relatively stable country traits such as physical size, culture, or economic and political structure, many of which may be quite difficult to quantify. We approach the problem, therefore, by normalizing data across countries and years through annual percentage change (APC) scores (expressed as change in a country's outcome indicator from the previous year as a percentage of the previous year's behavior). Although normalizing variables requires considerable caution, in the present time-series context it converts the DV into units that seem more meaningful as a metric of IEA influence while also reducing limiting the number of included IVs (King 1986, 673).

To evaluate models that include discrete (e.g., IEA membership) and continuous (e.g., economic growth rates) explanatory variables, regression analysis is preferable to other methods (King 1986, 680). The PI will work closely with the statistical consultant in the project's first

year to specify a general model through choices regarding which, how many, and the form (e.g., lagged, logarithmic, quadratic) in which to include indicators of country, context, problem, and IEA characteristics. Choices will need to address interaction among IEA factors and between IEA and other factors and endogeneity (see above). Models will be evaluated using pilot data on an initial set of complete data on ten IEAs. Initial collaboration between the PI and Deane has suggested strategies that can provide compelling assessments of IEA effects.

Regression analysis can only ever identify correlations and not causation. Yet, the availability of multi-country, multi-year (i.e., panel) data and the use of APCs as the dependent variable circumvent problems common to cross-section and time-series approaches, thereby strengthening the efforts being made here to analyze IEA "effects" rather than IEA correlations. First, in cross-sectional studies, definitional dependence between IVs and the DV can create non-zero regression coefficients that are mathematical artifacts rather than substantive correlations (Voas, Olson, and Crockett 2002). Panel data which includes measures of the IVs at the beginning of the period over which change in the DV is measured improve estimates of coefficients by eliminating these artifacts (Finkel 1995). Second, omitted variables can introduce significant specification bias into coefficients of cross-sectional analysis. But this bias is eliminated by using time-series data with a change score as a dependent variable so long as the omitted variables do not change over time (Firebaugh and Beck 1994). Although this can be demonstrated mathematically, the intuition is that the effect on environmental outcomes of variables that differ across countries but do not vary over time (e.g., geographic size and location) is accounted for through the conversion of raw data into a change score. Thus, using APC as the DV in a panel analysis allows country-specific, time-invariant effects to be ignored.

The project's data collection effort positions it ideally to take advantage of these properties. Initial efforts show that differences in treaty timing, treaty membership, and data availability will mean some datasets will consist of few timepoints (10-15 years) but many cross-sectional units (40-100 countries) while others will consist of few cross-sectional units (4, 5, or 6 countries) but many timepoints (40-50 years). For all IEAs, we exploit the time dimension by regressing APC on IVs measured at, or prior to, the beginning of the APC period. We start with a traditional change score panel analysis which lends itself to a pooled approach or the specification of seemingly unrelated regressions and random coefficient models (Hsiao 1986; Baltagi 1995; Dielman 1989). The feasible generalized least squares estimation often used in pooled cross-sectional time series analysis procedures only performs well for data structures in which time points are numerous relative to cross-sectional units (our first type of IEAs) (Beck and Katz 1995). OLS estimation with panel-corrected standard errors performs well when cross-sectional units are numerous relative to time points (our second type of IEAs). STATA supports both estimations and implementation of a variety of assumptions about correlation across and within panels (cross-sectional and auto-correlation) (StataCorp 2001).

Models will regress APCs of outcomes targeted by an IEA on country, context, environmental problem, and IEA features that vary in ways (most notably by changing over time) not captured by this normalizing of the DV. IEA effects will be evaluated in two different ways. In the first logic, IEA influence is evident in member/non-member differences. As noted above, data on regulated and unregulated activities by both members and non-members allows estimation of IEA influence by the co-variation of APC with membership after controlling for other factors. More developed models would include indicators of both IEA existence and membership (since countries often join IEAs years after the IEAs are created) to evaluate whether IEAs influence all states or only member states and would also provide for lagged

effects, investigating whether the influence of IEAs is not evident immediately but occurs one, two, three, or perhaps four years after an IEA enters into force or a country becomes a member. Even modeling a single IEA allows us to ask whether certain types of countries (e.g., democracies, market economies) are more responsive to a certain IEA or whether certain context variables (e.g., the end of the Cold War) foster or inhibit an IEA's influence. Agreements with protocols and amendments are particularly useful, since indicators for rule changes can shed light on whether efforts to improve performance delivered. Given a DV formulated in terms of APC, the coefficient on a dummy variable indicating membership would correspond to the difference between a member's annual percentage change and a nonmember's. For example, for a pollution IEA, a coefficient on membership of -3% would indicate that members emissions are increasing at a rate 3% slower (or declining at a rate 3% faster) than nonmembers.

The second logic conceptualizes IEA influence as causing a structural change in the time series of the behavior or environmental quality used as the DV. A structural break is considered to have occurred if at least one of the effects of the IVs has changed at some date – called the breakdate – in the study period. The Chow test (a classical test for structural change) splits the sample into two subperiods, estimates the parameters for each subperiod, and tests the equality of the two sets of parameters using an F statistic (Chow 1960). In our dataset, these subperiods are defined by the entry into force of an IEA. For reasons of simplicity and parsimony, most time-series analysis focuses on the simple case of a structural break occurring immediately following change in the relevant explanatory variable (Hansen 2001). The analysis here will start with that assumption but, since theory suggests that an IEA's long-term effects may be larger than its short-term ones, will also use available statistical techniques to explore whether longer lags between explanatory and dependent variables better fit the data.

Results from such a model highlight the benefits and limitations of a quantitative approach. The model estimates only an average effect, obscuring how IEAs influence some states dramatically and others not at all or even negatively. Correlations that appear to indicate causation can be evaluated and strengthened with evidence from the finer grain analysis possible with case studies. Yet, a quantitative approach offers unique benefits. They estimate IEA effects from "counterfactuals" based on actual data on unregulated behavior, an arguably more reliable method than thought experiments (Tetlock and Belkin 1996). They also estimate (e.g., with t-statistics) the likelihood of membership-outcome correlations or of structural breaks after IEA adoption occurring by chance and an accepted criterion (usually a .05 significance test) for deciding whether to interpret those differences as evidence of IEA influence. Thus, applying quantitative techniques to panel data for single IEAs (which to date has been done only rarely) offers insights not readily available through qualitative research techniques (Murdoch, Sandler, and Sargent 1997; Murdoch and Sandler 1997).

Comparing the effects of multiple IEAs

An important, but challenging, project goal is to compare IEA effects. Here, quantitative methods and a large-N study can make unique contributions. Although some colleagues have argued that each environmental problem is so unique that comparing their effects is not possible, this project believes it is worth attempting for two reasons. First, negotiators do ask, often implicitly, questions such as whether LRTAP's 1985 or 1994 sulfur protocol was more effective, which of the Montreal Protocol's four amendments led to the greatest reductions in use of ozone depleting substances (ODSs), or, finally, whether the Montreal Protocol's regulations on ODSs were more effective than LRTAP's regulations on sulfur. Helping negotiators make such

comparisons requires either providing firm empirical evidence that the uniqueness of each case precludes making any valid comparisons or providing empirically-based guidance on when such comparisons can be made validly and how to do so. Second, prior systematic comparisons among cases provide a precedent for the work here, having shown that such comparisons are possible (if difficult) so long as appropriate theoretical, empirical, and methodological caveats are kept in mind (Brown Weiss and Jacobson 1998; Young 1999; Miles et al. 2001; Breitmeier, Levy, Young, and Zürn 1996).

Recent proposals for comparative metrics produce nominally comparable "percentage of success" scores measuring progress toward a treaty's goal from a no-treaty counterfactual baseline (Sprinz and Helm 1999; Miles et al. 2001). Including the treaty's goals as a reference point in the metric produces the unsatisfactory conclusion that an IEA that caused emission reductions of 10% by establishing an ambitious reduction goal of 50% (receiving an effectiveness score of 20 [10%/50%]) would be deemed less effective than another treaty that induced reductions of only 2% but did so against a less ambitious goal of 4% (receiving an effectiveness score of 50 [2%/4%]). Embedding "ambitiousness" in the DV also precludes analysis of an important hypothesis in the field: that an IEA's ambitiousness or "depth of cooperation" is a major determinant of the magnitude of its effects (Downs, Rocke, and Barsoom 1996). Keeping ambitiousness as an IV also engages the endogeneity issue: a finding that variation in the behavior change *required* by an IEA (ambitiousness as IV) predicts actual behavior change (the DV) better than other IEA features would shed light on whether states adopt seemingly "ambitious" goals only when they know those goals are achievable.

Given the obvious obstacles to comparing IEA effects convincingly, this project adopts a multi-step approach. First, recognizing that IEAs differ too much to compare *all* IEAs, we distinguish some initial categories. Comparing numbers of whales killed, acres of deforestation, and tons of pollutants emitted makes little sense not only because the metrics differ but because the drivers of those behaviors also differ. Thus, the price of fish relative to other foods may explain much variation in countries' fish catch but little in their pollution levels. The patterns of behavioral change that relevant IEAs seek to induce also differ: pollution IEAs usually try to reduce emissions below some baseline while most fishery IEAs try to induce initial catch reductions sufficient that stocks recover so catch can return to a sustainable level. Our approach will break IEAs into categories designed to allow more meaningful and convincing comparisons *within* than across categories: for example, distinguishing pollution, wildlife, and habitat IEAs.

Second, the APC formulation normalizes measurement units across outcomes as well as across countries and years. It also captures the intuitive notion that meaningful comparison measures changes in an outcome relative to the level of that outcome rather than in absolute terms. For example, most people would view a Dutch reduction of methane emissions from 1,000 to 700 tons (a 30% reduction) as less significant than a Dutch reduction of sulfur dioxide emissions from 200 to 100 tons (a 50% reduction) but both as more significant than an American reduction of methane emissions from 30,000 to 27,000 tons (a 10% reduction that is ten times larger than the Dutch methane reduction).

Third, however, meaningful comparison requires controlling for the dramatic differences in the difficulty of inducing change or problem "malignity" (Miles et al. 2001). Because some environmental problems are more resistant to remedy, we are actually interested in effort, i.e., not just the *amount of change* also but *how hard* that change was to induce. Consider, for example, that if the UN Framework Convention on Climate Change reduced the *growth* in fossil fuel emissions relative to baseline scenarios by even a few percent, it would be reasonable to

claim that it had a greater behavioral effect than much larger percentage reductions in ODS production due to the Montreal Protocol, because energy consumption is so much more costly to change than ODS consumption. This project proposes several approaches to this problem. The first involves comparing the effects of IEAs using *amount* of change (APC) but only among IEAs that can be plausibly claimed as involving relatively equivalent *costs* of change. A second strategy would search out independently generated estimates of the costs of regulating different behaviors to place IEAs in roughly similar categories, as involving high, medium or low regulatory costs, again using APC to compare among IEAs within each category. The third, most ambitious strategy, would seek indicators from which to create "per unit effort" (PUE) scores that correspond to the difficulty of achieving a 1% change in a particular behavior, e.g., the costs of inducing a 1% reduction in a pollutant, a 1% reduction in harvest of a species, or a 1% increase in habitat protected. Such indicators already exist in some cases, e.g., in catch per unit effort data common to fisheries and country-year abatement tables created for European atmospheric pollutants. In these cases, the product of PUE and APC scores creates an "environmental effort" score that, with appropriate caveats, would facilitate comparison of IEA effects on behaviors that differ in their susceptibility to change, as in the ozone-climate example.

Since this third strategy is likely to be possible for only a few IEAs, we will primarily use the first two strategies to compare "like" cases. Multivariate analysis of variance (MANOVA), discriminant analysis, and multiple regression can all be used to compare effects on multiple dependent variables (Pedhazur 1982). Using APC as the DV across regressions provides a methodological starting point for comparing the effects of IEAs that address different environmental outcomes to each other and to other non-IEA variables – even if the principle findings involve claims (based on failure to reject the null of no difference) that two IEA's effects differ without being able to identify the magnitude of that difference. Comparing variables within, let alone across, regression equations requires considerable caution, most notably to ensure variances across variables and equations are equal (King 1986; King 1991). That said, the APC form facilitates the use of methods for comparing effects of variables across equations ("equality constraints" or "linear restrictions"). Linear restrictions in procedures for seemingly unrelated regressions (SUR) provide a suitable way to compare coefficients derived from regressing the same independent variables and data on different DVs (Hargens 1988). For example, this approach could evaluate the relative effects of the different LRTAP protocols by regressing each pollutant regulated by a protocol on the same model, the same variables, and the same data, and test whether the coefficients of the membership indicator in the different regressions differed enough from each other to reject the null hypothesis of no difference. A similar approach could be applied to fishery IEAs that regulate the same countries but different species or regions. When comparing less similar cases in which the model, the variables, or the data are not identical, efforts to assess whether the effect of a given variable (say IEA membership) is identical in the two IEAs may still be possible. Long and Miethe have identified techniques that, by taking appropriate account of differences in variance across regressions, can test whether the coefficients of a given variable derived from two different regressions are sufficiently different to reject the null hypothesis that they are equal and, by extension, test they hypothesis that coefficients of all variables are equal in the separate regressions (1988).

Schedule

The project consists of three phases. Data collection has begun but considerable work remains. Funding will cover costs for the PI's summer salary and research assistant wages to

develop additional coding manuals, train coders, code new data on IEAs and environmental problems, create regulatory histories, and collect data on relevant outcome indicators and explanatory variables. If funded, this phase – begun at Stanford's Center for Environmental Science and Policy and supported by the American Philosophical Society and the University of Oregon – should be complete by June 2004. Discussions with the statistical consultant during the first year of the project would ensure that data is collected and formatted in ways that facilitate subsequent analysis and ensure the data's value and usability to other scholars. Complete primary data structures on ten IEAs will be created as a pilot study, and these data structures will be used both to refine coding and data collection techniques and to provide a basis for preliminary analyses.

The project's second phase (starting in year 1 and running through year 2) will involve close work between the PI and the statistical consultant to develop and test econometric models for individual IEAs. These analyses would build on the pilot study phase and evaluate different operationalizations of the dependent and explanatory variables and different specifications of the econometric models. Funding will support a graduate research assistant well-trained in econometric methods at the University of Oregon as well as a programmer at SUNY-Albany to facilitate analysis. The PI and graduate research assistant would work closely with undergraduate research assistants to guide manipulation of existing, and collect necessary additional, data for the modeling efforts. Undergraduate research assistants would work on coding particular features across the dataset of IEAs throughout the course of this year.

The projects' third phase (starting in year 2 and ending in year 3) will compare indicators across IEAs. During this phase, the PI, statistical consultant, and graduate research assistant would evaluate more complex comparative models to identify ways to allow meaningful comparison among IEA effects and with other IVs, particularly attempting to identify ways to evaluate the relative influence of different features of IEAs. Undergraduate research assistants would ensure that the data and documentation of the project's master datasets were in condition to facilitate use by other scholars before the data is posted on a project website. Articles, conference presentations, and listservs will be used to increase awareness and use of the dataset.

The PI and statistical consultant will co-author substantive and methodological articles throughout the project period and plan to complete a book manuscript on the comparative analysis of IEAs by fall 2006. The dataset, coding manuals, method descriptions, and related information will be made public through a project website designed both to disseminate and gather additional relevant information. The PI has had (or plans) preliminary discussions with organizations such as UNEP, FAO, ECOLEX, CIESIN, the Ocean Law Project, and the Fletcher Multilaterals Project to coordinate collection, dissemination, and archiving of project data in ways that would address the need for "one overall MEA Web site that (a) links to other MEA sites, and (b) contains a place for referencing those MEAs without sites" (Krist 2002, 35). The PI has already made available on the Web a list of over 200 environment-related intergovernmental secretariats (Mitchell 2002).

Broader impacts of proposed research

The project offers substantive, methodological, and data-related benefits. Substantively, the project extends past research by testing hypotheses regarding IEA effects generated from single case studies and smaller scale multi-case comparisons. These hypotheses will be tested against more, and more diverse, cases using methods that enhance the credibility of the findings by being more careful in specifying indicators of IEA effects, in accounting for non-IEA drivers of

those indicators, and in developing the metrics and techniques that allow meaningful comparison of IEAs that have different goals and indicators. In particular, using this larger dataset allows assessment of whether hypotheses that have generally been formulated categorically actually can generalize to most other environmental problems or whether the benefits of particular design features are more contingent on country, international context, and environmental problem characteristics. Articles in journals and a book will benefit the scholarly community by confirming (or refuting) existing qualitative claims about particular treaties; identifying the range of conditions under which such claims hold true; differentiating the relative influence of IEA design, problem type, and contextual conditions (and their interplay) on environmental progress; and identifying new questions regarding IEA design. The international policy community will benefit from a comprehensive list of IEAs from which lessons can be derived; linking those IEAs and indicators that can be used to assess their effects; and identifying principles of good IEA design, both directly through the research proposed here and through other scholars findings from the databases created.

Methodologically, the project will break new ground by using quantitative techniques to separate the effects of IEAs from other drivers of environmental outcomes and by directly engaging the question of how to compare effects of IEAs that address quite different problems. By involving an expert statistician in a project with panel data structures that can support sophisticated quantitative methods allows development of techniques and metrics that facilitate the types of comparisons that international negotiators regularly make, but which to date they have had to make without the benefit of strong empirical support. Since most scholars of international environmental politics do not tend to use these techniques, publishing substantive articles will demonstrate their usefulness while publishing methodological articles will demonstrate how the techniques can be employed.

In terms of data, the project will provide a much-needed coherent and comprehensive list of IEAs and will compile or create a high-quality dataset that includes features of the agreements, indicators of their effects, and indicators of a wide range of country, context, and problem variables whose influence on those environmental indicators can be carefully evaluated. The dataset differs from existing projects in important ways. Electronic and print sources of IEAs provide scholars with their texts but none, that I know of, code them to allow useful analysis. Likewise, sources of environmental indicators (e.g., NASA's Global Change Master Directory or FAO's fishery and agriculture datasets) are well-designed for scientific scholarship but do not link indicators of environmental progress to corresponding IEAs in ways that permit policy evaluation. Finally, existing treaty effectiveness projects have examined groups of 30 or fewer treaties; the database proposed here will provide comparable data for a larger and more representative set of IEAs. Making these materials available to treaty personnel, scholars, and students will foster analysis of numerous understudied IEAs for a long time to come.

Results from Prior NSF Support

Not applicable.

References Cited

- Amin, S. 1992. "Can environmental problems be subject to economic calculations?" *World Development* 20: 523-530.
- Anderson, D., and W. Cavendish. 2001. "Dynamic simulation and environmental policy analysis: beyond comparative statics and the environmental Kuznets curve." *Oxford Economic Papers* 53: 721-746.
- Baltagi, B. H. 1995. *Econometric analysis of panel data*. Chichester, UK ; New York: Wiley.
- Barnett, M. N., and M. Finnemore. 1999. "The politics, power, and pathologies of international organizations." *International Organization* 53: 699-732.
- Beck, N., and J. N. Katz. 1995. "What to do (and not to do) with time-series cross-section data." *American Political Science Review* 89: 634-647.
- Board on Sustainable Development Policy Division, and National Research Council. 1999. *Our common journey: a transition toward sustainability*. Washington, DC: National Academy Press.
- Breitmeier, H., M. A. Levy, O. R. Young, and M. Zürn. 1996. "The International Regimes Database as a tool for the study of international cooperation." Report WP-96-160 of the International Institute for Applied Systems Analysis, Laxenburg, Austria.
- Brown Weiss, E., and H. K. Jacobson, eds. 1998. *Engaging countries: strengthening compliance with international environmental accords*. Cambridge, MA: MIT Press.
- Burhenne, W. E., ed. 1974-2002. *International environmental law: multilateral treaties*. Bonn: Kluwer Law International.
- Cameron, J., J. Werksman, and P. Roderick, eds. 1996. *Improving compliance with international environmental law*. London: Earthscan.
- Center for International Earth Science Information Network. 2001. *ENTRI treaty texts: menu of treaty texts (in reverse chronological order)*. <http://sedac.ciesin.org/entri/ENTRIchron.html>. Accessed on: 10 December 2002.
- Chayes, A., and A. H. Chayes. 1995. *The new sovereignty: compliance with international regulatory agreements*. Cambridge, MA: Harvard University Press.
- Chow, G. C. 1960. "Tests of equality between sets of coefficients in two linear regressions." *Econometrica* 28: 591-605.
- Committee on Grand Challenges in Environmental Sciences, and National Research Council. 2001. *Grand challenges in environmental sciences*. Washington, DC: National Academy Press.
- Committee on the Human Dimensions of Global Change, and National Research Council. 1999. *Human dimensions of global environmental change: research pathways for the next decade*. Washington, DC: National Academy Press.
- Dielman, T. 1989. *Pooled cross-sectional and time series data analysis*. New York: Marcel Dekker.
- Downs, G. W., D. M. Roche, and P. N. Barsoom. 1996. "Is the good news about compliance good news about cooperation?" *International Organization* 50: 379-406.
- ECOLEX. 2002. *Multilateral treaties*. <http://www.ecolex.org/iucn/elipac/treaties/>. Accessed on: 06 June 2002.
- FAOLEX. 2002. *FAOLEX database*. <http://faolex.fao.org/faolex/index.htm>. Accessed on: 5 November 2002.
- Finkel, S. E. 1995. *Causal analysis with panel data*. Thousand Oaks, CA: Sage.

- Firebaugh, G., and F. D. Beck. 1994. "Does economic growth benefit the masses? Growth, dependence, and welfare in the Third World." *American Sociological Review* 59: 631-653.
- Fletcher School of Law and Diplomacy. 2002. *Multilaterals Project: multilateral conventions - chronological listing*. <http://fletcher.tufts.edu/multi/chrono.html>. Accessed on: 06 June 2002.
- Grossman, G. M., and A. B. Krueger. 1995. "Economic growth and the environment." *Quarterly Journal of Economics* 110: 353-377.
- Haas, P. M., R. O. Keohane, and M. A. Levy, eds. 1993. *Institutions for the earth: sources of effective international environmental protection*. Cambridge, MA: MIT Press.
- Hansen, B. E. 2001. "The new economics of structural change: dating breaks in U.S. labor productivity." *Journal of Economic Perspectives* 15: 117-128.
- Harbaugh, W., A. Levinson, and D. Wilson. 2000. "Re-examining the empirical evidence for an environmental Kuznets curve." Report 7711 of the National Bureau of Economic Research (May), Cambridge, MA.
- Hargens, L. L. 1988. "Estimating multiequation models with correlated disturbances." In *Common problems/proper solutions*, ed. J. Scott Long. Newbury Park, CA: Sage, 65-83.
- Held, D., and A. McGrew. 1999. "Globalization." *Global Governance* 5: 483-496.
- Hilton, H. F. G., and A. Levinson. 1998. "Factoring the environmental Kuznets curve: evidence from automotive lead emissions." *Journal of Environmental Economics and Management* 35: 126-141.
- Hsiao, C. 1986. *Analysis of panel data*. Cambridge, UK: Cambridge University Press.
- Inglehart, R. 1990. *Culture shift in advanced industrial society*. Princeton: Princeton University Press.
- Jacobson, H. K., and E. Brown Weiss. 1998. "Assessing the record and designing strategies to engage countries." In *Engaging countries: strengthening compliance with international environmental accords*, eds. Edith Brown Weiss, and Harold K. Jacobson. Cambridge, MA: MIT Press, 511-554.
- Keohane, R. O., and M. A. Levy, eds. 1996. *Institutions for environmental aid: pitfalls and promise*. Cambridge, MA: MIT Press.
- King, G. 1986. "How not to lie with statistics: avoiding common mistakes in quantitative political science." *American Journal of Political Science* 30: 666-687.
- King, G. 1991. "'Truth' is stranger than prediction, more questionable than causal inference." *American Journal of Political Science* 35: 1047-1053.
- Krasner, S. D. 1983. "Structural causes and regime consequences: regimes as intervening variables." In *International regimes*, ed. Stephen D. Krasner. Ithaca, NY: Cornell University Press, 1-22.
- Krist, W. 2002. "Bringing order to governance of multilateral environmental agreements." *Environmental Change and Security Project Report*: 35-38.
- Lipschutz, R. D. 1991. "Bargaining among nations: culture, history, and perceptions in regime formation." *Evaluation Review* 15: 46-74.
- Long, J. S., and T. D. Miethe. 1988. "The statistical comparison of groups." In *Common problems/proper solutions*, ed. J. Scott Long. Newbury Park, CA: Sage, 108-131.
- Meyer, J. W., D. J. Frank, A. Hironaka, E. Schofer, and N. B. Tuma. 1997. "The structuring of a world environmental regime, 1870-1990." *International Organization* 51: 623-629.

- Miles, E. L., A. Underdal, S. Andresen, J. Wettestad, J. B. Skjærseth, and E. M. Carlin, eds. 2001. *Environmental regime effectiveness: confronting theory with evidence*. Cambridge, MA: MIT Press.
- Miles, M. B., and A. M. Huberman. 1994. *Qualitative data analysis*. Thousand Oaks, CA: Sage Publications.
- Mitchell, R. B. 1994. *Intentional oil pollution at sea: environmental policy and treaty compliance*. Cambridge, MA: MIT Press.
- Mitchell, R. B. 1996. "Compliance theory: an overview." In *Improving compliance with international environmental law*, eds. James Cameron, Jacob Werksman, and Peter Roderick. London: Earthscan, 3-28.
- Mitchell, R. B. 2002. *Environmental treaty secretariats*.
<http://www.uoregon.edu/~rmitchel/secretariats.html>. Accessed on: 15 December 2002.
- Mitchell, R. B. under review. "International environmental agreements." *Annual Review of Environment and Resources* 28.
- Mitchell, R. B., and P. Keilbach. 2001. "Reciprocity, coercion, or exchange: symmetry, asymmetry and power in institutional design." *International Organization* 55: 891-917.
- Murdoch, J. C., and T. Sandler. 1997. "The voluntary provision of a pure public good: the case of reduced CFC emissions and the Montreal Protocol." *Journal of Public Economics* 63: 331-349.
- Murdoch, J. C., T. Sandler, and K. Sargent. 1997. "A tale of two collectives: sulphur versus nitrogen oxides emission reduction in Europe." *Economica* 64: 281-301.
- Olson, M. 1965. *The logic of collective action: public goods and the theory of groups*. Cambridge, MA: Harvard University Press.
- Pedhazur, E. J. 1982. *Multiple regression in behavioral research*. New York: Holt, Rinehart, Winston.
- Perreault, W. D., and L. E. Leigh. 1989. "Reliability of nominal data based on qualitative judgments." *Journal of Marketing Research* 26: 135-148.
- Ravallion, M., M. Heil, and J. Jalan. 2000. "Carbon emissions and income inequality." *Oxford Economic Papers* 52: 651-669.
- Ross, M. L. 1999. "The political economy of the resource curse." *World Politics* 51: 297.
- Ross, M. L. 2001. *Timber booms and institutional breakdown in southeast Asia*. New York: Cambridge University Press.
- Rüster, B., and B. Simma, eds. 1975. *International protection of the environment: treaties and related documents*. Dobbs Ferry, NY: Oceana Publications.
- Selden, T., and D. Song. 1994. "Environmental quality and development: Is there a Kuznets curve for air pollution emissions?" *Journal of Environmental Economics and Management* 27: 147-162.
- Social Learning Group, ed. 2001. *Learning to Manage Global Environmental Risks, Volume 1: A Functional Analysis of Social Responses to Climate Change, Ozone Depletion, and Acid Rain*. Cambridge: MIT Press.
- Sprinz, D., and C. Helm. 1999. "The effect of global environmental regimes: a measurement concept." *International Political Science Review* 20: 359-369.
- StataCorp. 2001. *Stata statistical software: release 7.0*. College Station, TX: Stata Corporation.
- Steinberg, P. F. 2001. *Environmental leadership in developing countries: transnational relations and biodiversity policy in Costa Rica and Bolivia*. Cambridge, MA: MIT Press.

- Stern, P. C., O. R. Young, and D. Druckman, eds. 1992. *Global environmental change: understanding the human dimensions*. Washington, DC: National Academy Press.
- Stokke, O. S. 2001. *Governing high seas fisheries: the interplay of global and regional regimes*. Oxford: Oxford University Press.
- Strange, S. 1983. "Cave! hic dragones: a critique of regime analysis." In *International regimes*, ed. Stephen D. Krasner. Ithaca, NY: Cornell University Press, 337-354.
- Tetlock, P. E., and A. Belkin, eds. 1996. *Counterfactual thought experiments in world politics: logical, methodological, and psychological perspectives*. Princeton: Princeton University Press.
- United Nations Environment Programme. 1996. *Register of international treaties and other agreements in the field of the environment*. Nairobi, Kenya: United Nations Environment Program.
- United Nations Environment Programme. 2002. "Guidelines on compliance with and enforcement of multilateral environmental agreements (adopted by Decision SS.VII/4)." Report of the UNEP Governing Council (February).
- US Climate Change Science Program. 2002. "Draft strategic plan for the Climate Change Science Program." Report of the US Climate Change Science Program (11 November), Washington, DC.
- Victor, D. G., K. Raustiala, and E. B. Skolnikoff, eds. 1998. *The implementation and effectiveness of international environmental commitments*. Cambridge, MA: MIT Press.
- Voas, D., D. V. A. Olson, and A. Crockett. 2002. "Religious pluralism and participation: why previous research is wrong." *American Sociological Association* 67: 212-230.
- Waltz, K. 1979. *Theory of international politics*. Reading, MA: Addison-Wesley Publishing Co.
- Young, O. R. 1998. *Creating regimes: Arctic accords and international governance*. Ithaca: Cornell University Press.
- Young, O. R., ed. 1999. *Effectiveness of international environmental regimes: causal connections and behavioral mechanisms*. Cambridge, MA: MIT Press.
- Young, O. R. 2001. "Inferences and indices: evaluating the effectiveness of international environmental regimes." *Global Environmental Politics* 1: 99-121.
- Young, O. R. 2002. *The institutional dimensions of environmental change: fit, interplay, and scale*. Cambridge, Mass.: MIT Press.
- Young, O. R., A. Agrawal, L. A. King, P. H. Sand, A. Underdal, and M. Wasson. 1999. "Institutional dimensions of global environmental change (IDGEC) science plan." Report of the IHDP, Bonn.
- Young, O. R., and G. Osherenko, eds. 1993. *Polar politics: creating international environmental regimes*. Ithaca: Cornell University Press.

Biographical Sketch

a. Professional Preparation

Stanford University	American Studies	BA, 1981
Harvard University	Public Policy	MPP, 1985
Harvard University	Public Policy	PhD, 1992

b. Appointments

Associate Professor, Department of Political Science, University of Oregon, 1999-present
Visiting Associate Professor, Center for Environmental Science and Policy, Stanford University, 1999-2001

Assistant Professor, Department of Political Science, University of Oregon, 1993-1999

c. Publications

(i) Publications closely related to the proposed project:

Ronald B. Mitchell. "A Quantitative Approach to Evaluating International Environmental Regimes." *Global Environmental Politics* 2:4 (November 2002), 58-83.

Ronald B. Mitchell and Patricia M. Keilbach. "Situation Structure and Institutional Design: Reciprocity, Coercion, and Exchange." *International Organization* 55:4 (Autumn 2001), 891-917.

Ronald B. Mitchell. "Sources of Transparency: Information Systems in International Regimes." *International Studies Quarterly* 42:1 (March 1998), 109-130.

Ronald B. Mitchell. "Empirical Research on International Environmental Policy: Designing Qualitative Case Studies." Ronald Mitchell and Thomas Bernauer. *Journal of Environment and Development* 7:1 (March 1998), 4-31.

Ronald B. Mitchell. "Regime Design Matters: Intentional Oil Pollution and Treaty Compliance." *International Organization* 48:3 (Summer 1994), 425-458.

(ii) Other significant publications:

Ronald B. Mitchell. "International Environmental Politics." In Handbook of International Relations. Editors: Thomas Risse, Beth Simmons, and Walter Carlsnaes. Sage Publications, forthcoming 2002.

Ronald B. Mitchell. "International Environmental Common Pool Resources: More Common than Domestic but More Difficult to Manage." In Anarchy and the Environment: The International Relations of Common Pool Resources. Editors: J. Samuel Barkin and George E. Shambaugh. SUNY Press, 1999, 26-50.

Ronald B. Mitchell. "Managing Compliance: A Comparative Perspective." Abram Chayes, Antonia Handler Chayes, and Ronald B. Mitchell. In Engaging Countries: Strengthening Compliance with International Environmental Accords. Editors: Edith Brown Weiss and Harold Jacobson. MIT Press, 1998, 39-62.

Ronald B. Mitchell. "Discourse and Sovereignty: Interests, Science, and Morality in the Regulation of Whaling." *Global Governance* 4:3 (July-September 1998), 275-293.

Ronald B. Mitchell. Intentional Oil Pollution at Sea: Environmental Policy and Treaty Compliance. Cambridge, MA: The MIT Press, 1994.

d. Synergistic Activities

Videotaped and developed international environmental politics course for use in Stanford University's Distance Learning Initiative (<http://sdlr.stanford.edu>) for use in 2002 at seven Russian universities (Amur State, Petropavlovsk, Southern Ural State, Ural State, Yaroslavl State, Tymen State, and Moscow Higher School of Economics).

Teach course on International Environmental Politics in which all students write papers evaluating an environmental treaty's effectiveness.

Collaborated with Harvard's Global Environmental Assessment Project to train graduate students in evaluating impacts of global environmental assessments on international policy.

Member of Committee on the Human Dimensions of Global Change of the National Research Council, 2000 – present; and Member of DIVERSITAS Task Force, International Council for Science, 2001.

e. Collaborators & Other Affiliations

(i) Collaborators

Frank Alcock, Duke University
Thomas Bernauer, Swiss Federal Institute of Technology (ETH)
Walter Carlsnaes, University of Stockholm
David Cash, Harvard University
William Clark, Harvard University
John Duffield, Georgia State University
Patricia Keilbach, University of Colorado, Colorado Springs
Urs Luterbacher, Institut Universitaire de Hautes Etudes, Geneva
Edward Parson, Harvard University
Thomas Risse, European University Institute
Beth Simmons, University of California, Berkeley
Detlef Sprinz, Potsdam Institute on Climate
Arild Underdal, University of Oslo
Oran Young, Dartmouth College

(ii) Graduate and Postdoctoral Advisors

Abram Chayes, Harvard University (deceased)
William Clark, Harvard University
Robert Keohane, Duke University

(iii) Thesis Advisor and Postgraduate-Scholar Sponsor

R. Charli Carpenter, University of Oregon and Drake University
Scott Crosson, Bonora D'Andrea Consultants, San Francisco
Coleen Fox, Dartmouth College
Ronald Helms, Western Washington University
Patricia Keilbach, University of Colorado, Colorado Springs
Yoko Nagase, Lawrence University
John Tullius, Central Intelligence Agency
David Waguespack, State University of New York, Buffalo
Stefanie Wickstrom, Central Washington University
(total advised = 9; total sponsored = 0)

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION University of Oregon Eugene				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR [REDACTED]				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-mos.		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. R [REDACTED]							14,489
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	2.00	14,489
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL ASSOCIATES				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (0) GRADUATE STUDENTS							0
4. (4) UNDERGRADUATE STUDENTS							10,200
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							24,689
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							6,450
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							31,139
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							0
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS	\$		0				
2. TRAVEL			0				
3. SUBSISTENCE			0				
4. OTHER			0				
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS			0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							1,000
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							6,000
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							7,000
H. TOTAL DIRECT COSTS (A THROUGH G)							38,139
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) F&A (Rate: 49.0000, Base: 38139)							
TOTAL INDIRECT COSTS (F&A)							18,688
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							56,827
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 56,827 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME [REDACTED]				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY PROPOSAL BUDGET YEAR 2

ORGANIZATION University of Oregon Eugene				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-mos.		Funds Requested By proposer	Funds granted by NSF (if different)
		CAL	ACAD	SUMR			
1.		0.00	0.00	2.00		15,213	
3.							
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00		0	
7.	(1) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	2.00		15,213	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL ASSOCIATES	0.00	0.00	0.00		0	
2.	(0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	0.00	0.00	0.00		0	
3.	(1) GRADUATE STUDENTS					16,426	
4.	(4) UNDERGRADUATE STUDENTS					16,065	
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0	
6.	(0) OTHER					0	
TOTAL SALARIES AND WAGES (A + B)						47,704	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						10,486	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						58,190	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT						0	
E. TRAVEL							
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						805	
2. FOREIGN						0	
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS \$ _____					0	
2.	TRAVEL _____					0	
3.	SUBSISTENCE _____					0	
4.	OTHER _____					0	
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS		0	
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES						1,040	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0	
3. CONSULTANT SERVICES						13,728	
4. COMPUTER SERVICES						0	
5. SUBAWARDS						0	
6. OTHER						7,489	
TOTAL OTHER DIRECT COSTS						22,257	
H. TOTAL DIRECT COSTS (A THROUGH G)						81,252	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) F&A (Rate: 49.0000, Base: 73763)							
TOTAL INDIRECT COSTS (F&A)						36,144	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						117,396	
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)						0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 117,396 \$	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME				FOR NSF USE ONLY			
ORG. REP. NAME*				INDIRECT COSTS AND JUSTIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION				FOR NSF USE ONLY		
University of Oregon Eugene				PROPOSAL NO.	DURATION (months)	
					Proposed	Granted
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR [REDACTED]				AWARD NO.		
				[REDACTED]		
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-mos.	Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR
1.	[REDACTED]			0.00	0.00	2.00
2.						
3.						
4.						
5.						
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)			0.00	0.00	0.00
7.	(1) TOTAL SENIOR PERSONNEL (1 - 6)			0.00	0.00	2.00
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)						
1.	(0) POST DOCTORAL ASSOCIATES			0.00	0.00	0.00
2.	(0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			0.00	0.00	0.00
3.	(1) GRADUATE STUDENTS					17,411
4.	(2) UNDERGRADUATE STUDENTS					11,246
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0
6.	(0) OTHER					0
TOTAL SALARIES AND WAGES (A + B)						44,631
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						10,731
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						55,362
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)						
TOTAL EQUIPMENT						0
E. TRAVEL						805
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						805
2. FOREIGN						0
F. PARTICIPANT SUPPORT COSTS						
1.	STIPENDS \$ _____					0
2.	TRAVEL _____					0
3.	SUBSISTENCE _____					0
4.	OTHER _____					0
TOTAL NUMBER OF PARTICIPANTS (0)						
TOTAL PARTICIPANT COSTS						0
G. OTHER DIRECT COSTS						
1.	MATERIALS AND SUPPLIES					1,082
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					0
3.	CONSULTANT SERVICES					9,951
4.	COMPUTER SERVICES					0
5.	SUBAWARDS					0
6.	OTHER					8,013
TOTAL OTHER DIRECT COSTS						19,046
H. TOTAL DIRECT COSTS (A THROUGH G)						75,213
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
F&A (Rate: 49.0000, Base: 67200)						
TOTAL INDIRECT COSTS (F&A)						32,928
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						108,141
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)						0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						\$ 108,141 \$
M. COST SHARING PROPOSED LEVEL \$				0	AGREED LEVEL IF DIFFERENT \$	
PI/PD NAME				FOR NSF USE ONLY		
[REDACTED]				INDIRECT COST RATE		
ORG. REP. NAME*				Date Checked	Date Of Rate Sheet	Initials - ORG

SUMMARY PROPOSAL BUDGET

Cumulative

ORGANIZATION University of Oregon Eugene				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-mos.		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1.				0.00	0.00	6.00	\$ 45,676
2.							
3.							
4.							
5.							
6.	()	OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)		0.00	0.00	0.00	0
7.	(1)	TOTAL SENIOR PERSONNEL (1 - 6)		0.00	0.00	6.00	45,676
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0)	POST DOCTORAL ASSOCIATES		0.00	0.00	0.00	0
2.	(0)	OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)		0.00	0.00	0.00	0
3.	(2)	GRADUATE STUDENTS					33,837
4.	(10)	UNDERGRADUATE STUDENTS					37,511
5.	(0)	SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)					0
6.	(0)	OTHER					0
TOTAL SALARIES AND WAGES (A + B)							117,024
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							27,667
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							144,691
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL							1,610
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							1,610
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1.	STIPENDS	\$	0				
2.	TRAVEL		0				
3.	SUBSISTENCE		0				
4.	OTHER		0				
TOTAL NUMBER OF PARTICIPANTS (0)				TOTAL PARTICIPANT COSTS			0
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							3,122
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							29,679
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							15,502
TOTAL OTHER DIRECT COSTS							48,303
H. TOTAL DIRECT COSTS (A THROUGH G)							194,604
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)							87,760
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							282,364
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.j.)							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 282,364 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME				FOR NSF USE ONLY			
ORG. REP. NAME				INDIRECT COST RATE DETERMINATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Proposal Budget And Budget Justification

The total budget request for this three year project is \$282,364 of which \$194,604 is total direct costs and \$87,760 (31.08%) is indirect costs. Total costs for the first year of the project are \$56,827.

A. Senior Personnel (\$45,676)

[REDACTED] PhD, Principal Investigator: [REDACTED] is an associate professor in political science at the University of Oregon and will provide the theoretical and analytic leadership for the project, will work closely with the statistical consultant in conducting analyses, and will assign tasks to and otherwise manage the graduate and undergraduate research assistants. [REDACTED] will devote considerable non-teaching time to the project during the academic year which is not budgeted for. He will work on this project 100% of his time during two summer months each year, with each year budgeted at two-ninths (2/9ths) of his academic year salary. [REDACTED], or a monthly rate of [REDACTED]. No other senior personnel will be involved with the current project. [Note: Glenn Deane, the statistical consultant, is a senior scholar but is budgeted as a consultant under Other Direct Costs, below.]

B. Other personnel (\$71,348)

1. *Post-doctoral associates*: No post-doctoral research associates will be funded under the current project budget.

2. *Other professionals*: No other professionals will be funded under the current project budget.

3. *Graduate student (\$33,837)*: During years 2 and 3, a graduate student will help design, develop, and test the regression models by which the various IEAs will be evaluated and compared. The graduate student (from either economics or political science) will be selected for their training and skill in econometric modeling with the expectation that the student's dissertation interests would be coincident with those of the project. Working with this project would help hone that student's research skills and provide both experience and data that could be used as part of their dissertation. The graduate research assistant will be hired at .40 FTE (16 hours per week) during the academic year and at 0.75 FTE during the summer (30 hours per week for 10 weeks). AY2003-2004 salary rates of \$23,840 are increased by 6% in years 2 and 3. No graduate student will be hired during year one since this year will be dedicated to data collection which will be done by undergraduates under the direct supervision of the principal investigator [REDACTED] and the statistical consultant (Deane).

4. *Undergraduate students (\$37,511)*: In the first year, four undergraduate students will be trained and begin coding IEA text using coding manuals and procedures already developed by the principal investigator. Initial experience suggest that training requires approximately 100 hours (one 10-week term at 10 hours per week). After students are fully trained on practice agreements and their reliability has been verified, they will begin coding the IEAs that will enter the final dataset. Past experience suggests each IEA takes approximately one hour to code accurately. There are currently 750 IEAs in the dataset planned for coding. Twenty percent (20% or 150 IEAs) will need to be double coded to provide ongoing verification of inter-coder reliability. Thus, after training, 900 hours (900 codings at 1 hour per coding) will be required to

complete the codings. The two best coders will be chosen to complete the coding work during the remaining terms of year 1 and all terms of year 2 (2 coders, 10 hours per week, 10 weeks per term, 5 terms, for 1000 hours). Training four coders but using two will allow the project to select the most reliable coders for the project and permit replacing those coders if either leave the project. The two remaining undergraduates will work closely with the principal investigator during the balance of the first year and throughout the second year to identify environmental indicators relevant to as many of the IEAs as possible and to assemble datasets of these indicators. Procedures for systematically contacting treaty secretariats and reports on particular IEAs will be developed and refined. These undergraduates will also develop "regulatory histories" for each IEA using techniques already developed with undergraduates at Stanford and the University of Oregon. Summer support for two research assistants is requested in the summers preceding academic years 2 and 3 with students collecting and cleansing data for the project and, in year 3, in assisting with statistical runs of the models. These students will assist with conducting analyses and work with the PI and the statistical consultant to interpret the results. During year 3 of the project the research assistants will be reduced to 2 since, by that point, data collection will be complete and the focus will have shifted to analysis. Project research assistants will work 10 hours per week during academic terms and 30 hours per week during summers. Wages of \$8.50 per hour in AY2003-2004 are increased by 5% per year.

5. *Secretarial-clerical*: None.

6. *Other*: None.

Total salary and wages for all personnel are \$24,689 for AY2003-2004, \$47,704 for AY2004-2005, and \$44,631 for AY2005-2006, totaling \$117,042 for the project period.

C. Fringe benefits (\$27,667)

Fringe benefits for the PI are budgeted at University of Oregon rates of 41%. Academic year fringe benefits for the graduate student are budgeted at 1% of salary plus insurance and fees during the academic year based on an AY2003-2004 rate of \$781 per term times four terms increased by 5% per year, with summer fringe benefits budgeted at 1% of salary. Academic year and summer fringe benefits for undergraduate assistants are budgeted at 5% of salary in all years.

D. Equipment

None.

E. Travel (\$1,610)

Travel costs include two three-day/two-night visits to Eugene by the statistical consultant Glenn Deane in summer 2004 and in summer 2005. Costs include \$520 for airfare from Albany to Eugene, 2 nights lodging at \$90 per night lodging, and 3 days per diem at \$35 per day.

F. Participant support costs

None.

G. Other direct costs (\$48,303)

Consultant services (\$29,679): The budget reflects statistical consulting support to be provided by Glenn Deane, Associate Professor of Sociology and Director of the Computing/Statistics Core, Center for Social and Demographic Analysis, SUNY-Albany. Deane has been a co-Principal Investigator and statistical consultant on seven major grants from the National Institute of Health, the National Institute of Child Health and Human Development, the National Consortium on Violence Research, and others. Most relevant to the current project, Deane has worked on a grant and published with Myron Gutmann on "Population and Environment in the US Great Plains." During year 1, Deane will work with the PI to structure data collection procedures and methods so that data facilitates the immediate analytic goals of the project and the broader goals of making the data useful to future users of the dataset. During year 2, Deane will work more extensively with the PI to design, build, and test models to shed light on the substantive questions of the project, while engaging the challenging methodological issues posed by the project's efforts to compare the effects of regimes that have quite different initial metrics for their dependent variables. During year 3, Deane will help in guiding the running of the models developed on the data collected and assist in interpreting the results. Deane will be hired for 15, 30, and 20 days in the first, second, and third years, respectively. Deane will hire a statistical programmer to work on the project for 100 hours during the summers of years 2 and 3. The budgeted amounts reflect Deane's consulting rate of \$400 per day and the programmer's rate of \$12 per hour, both increased by 4% per year.

Supplies (\$3,122): Supplies include books, other documents, Xeroxing, telephone and fax calls, mail costs, computer supplies (toner, etc.), and other materials required for library research, document collection, and ongoing communication with other scholars in the field. These costs are budgeted based on \$1,000 in AY2003-2004 with 4% per year increases subsequently. These costs, especially telephone, fax, and mail costs, will facilitate close contact with the statistical consultant and with IEA secretariats, located in such places as Kenya, Switzerland, Austria, the Netherlands, and elsewhere. The budget includes graduate student tuition costs.

Other (\$15,502): Tuition for the graduate student research assistant is included for AY2004-2005 and AY2005-2006 using an AY2003-2004 rate of \$2,333 per term for three terms, increased by 7% per year.

H. Total direct costs (\$194,604)

Total direct costs requested are \$38,139 for AY2003-2004, \$81,252 for AY2004-2005, and \$75,213 for AY2005-2006.

I. Indirect costs (\$87,760)

Indirect costs consist exclusively of University of Oregon related indirect costs. Indirect costs total \$87,769 for the project based on a rate of 49% of total direct costs less tuition.

Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: [REDACTED]	Other agencies (including NSF) to which this proposal has been/will be submitted.
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Support: Current Pending Submission Planned in Near Future *Transfer of Support

Project/Proposal Title: **Comparative analysis of the effectiveness of environmental treaties**

Source of Support: **American Philosophical Society Sabbatical Fellowship**

Total Award Amount: \$ **40,000** Total Award Period Covered: **09/15/02 - 06/15/03**

Location of Project: **Eugene Oregon**

Person-Months Per Year Committed to the Project. Cal: **0.00** Acad: **6.00** Sumr: **0.00**

Support: Current Pending Submission Planned in Near Future *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: \$ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: Current Pending Submission Planned in Near Future *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: \$ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: Current Pending Submission Planned in Near Future *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: \$ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: Current Pending Submission Planned in Near Future *Transfer of Support

Project/Proposal Title:

Source of Support:

Total Award Amount: \$ Total Award Period Covered:

Location of Project:

Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

FACILITIES, EQUIPMENT & OTHER RESOURCES

FACILITIES: Identify the facilities to be used at each performance site listed and, as appropriate, indicate their capacities, pertinent capabilities, relative proximity, and extent of availability to the project. Use "Other" to describe the facilities at any other performance sites listed and at sites for field studies. USE additional pages as necessary.

Laboratory: Not applicable.

Clinical: Not applicable.

Animal: Not applicable.

Computer: Not applicable.

Office: Personal office in Department of Political Science, University of Oregon, will be available on a full-time basis to the principal investigator.

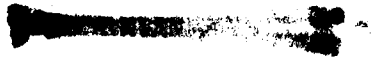
Other: Not applicable.

MAJOR EQUIPMENT: List the most important items available for this project and, as appropriate identifying the location and pertinent capabilities of each.

Not applicable.

OTHER RESOURCES: Provide any information describing the other resources available for the project. Identify support services such as consultant, secretarial, machine shop, and electronics shop, and the extent to which they will be available for the project. Include an explanation of any consortium/contractual arrangements with other organizations.

University of Oregon computing services will provide web hosting for the database that is part of this project.





UNIVERSITY OF OREGON

Wednesday, January 15, 2003

Paul J. Wahlbeck, Program on Law and Social Science
National Science Foundation
Washington, DC

Dear Dr. Wahlbeck,

This letter accompanies my submission of an NSF proposal entitled "Analysis of the Effects of Environmental Treaties" to summarize my revisions of that proposal in response to reviews of an earlier version (NSF Proposal #0213878) submitted in January 2002. Although the project goals remain unchanged, the proposal has been extensively revised in response to comments from the NSF reviewers and colleagues, and in collaboration with Glenn Deane, the statistical consultant who has agreed to work with me on this project.

Reviewers of the earlier proposal suggested several significant changes. Reviewers 3 and 6 as well as the Law and Social Science Panel Summary all suggested providing a stronger theoretical framework within which to set the proposal. In response, I have completely restructured the proposal to lay out a framework within which explanations of variance in environmental outcomes are seen as stemming from four categories of variables: environmental problem characteristics, country characteristics, international context characteristics, and international environmental agreement characteristics with specific variables identified in each category. The relationships among these variables and environmental outcomes is structured more clearly than in the previous proposal as well, including addressing endogeneity problems directly.

Reviewers 1, 3, 4, and 5 all expressed concerns about the specification and clarity of the independent and dependent variables of the study as well as about data quality issues. In response to these concerns, the present proposal is much more explicit about both the conceptual content of both types of variables and provides more detail regarding the procedures that will be used to code or collect data and the strategies that will be used to ensure that issues of data quality do not undermine the validity of the project's findings. In particular, on this count, I have followed up on the suggestions of the reviewers to introduce procedures to ensure inter-coder reliability, including an extensive training period, use of data produced only by trained coders, and ongoing procedures for evaluating and ensuring that all data coded is produced by coders who have demonstrated high inter-coder reliability scores.

Following suggestions from several reviewers, I have enhanced the statistical modeling by engaging Glenn Deane as an active participant in, and statistical consultant to, the project. Deane has been a co-PI or statistical consultant on several other nationally funded projects, the most relevant to this project being his work with Myron P. Gutmann on a grant entitled "Population and Environment in the US Great Plains," funded by the National Institute of Child Health and Human Development - Population and Environment Division from 1995-1999, including continuation funding. I have worked with him to revise the approach to modeling to reflect concerns expressed by reviewers. The new models control more explicitly for exogenous factors, include country characteristics, and explicitly address the endogeneity issues raised by reviewers 3 and 4. Proposal supplementary documents include a letter confirming Deane's willingness to consult to the project and his a biographical sketch of his relevant scholarship.

Throughout, I have revised the substance and prose of the proposal to respond to both the specific concerns raised by the panels and reviewers as well as to the spirit of those concerns. I appreciate the time you, the NSF, and the reviewers will take in assessing this project's appropriateness for NSF funding.

Sincerely,

[Redacted signature]

DEPARTMENT OF POLITICAL SCIENCE

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*An equal opportunity, affirmative action institution committed to cultural diversity
and compliance with the Americans with Disability Act.*

**DEPARTMENT OF SOCIOLOGY
UNIVERSITY AT ALBANY -- STATE UNIVERSITY OF NEW YORK**

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FAX 442 - 4936

GDD@ALBANY.EDU

[REDACTED]
[REDACTED]
Department of Political Science
1284 University of Oregon
Eugene OR 97403-1284

2 January 2003

[REDACTED]

I am writing to confirm my willingness to serve as a consultant on your project "Quantitative and Comparative Analysis of MEAs."

Sincerely,



Glenn Deane
Associate Professor and Director of Graduate Studies
Department of Sociology
Associate Director
Lewis Mumford Center for Comparative Urban
and Regional Research
University at Albany, State University of New York

Biographical Sketch

Glenn D. Deane

a. Professional Preparation

The College of William and Mary	Sociology/Philosophy	A.B. 1980
The University of North Carolina, Chapel Hill	Sociology	M.A. 1988
The University of North Carolina, Chapel Hill	Sociology	Ph. D. 1993

b. Appointments

1999-present	Associate Professor
1993-1999	Assistant Professor (Lecturer, 1991-1993) Department of Sociology University at Albany, SUNY
2002-present	Associate Director Lewis Mumford Center for Comparative Urban and Regional Research
2000-present	Director of Computing and Statistics Core Center for Social and Demographic Analysis
1992-2000	Center Associate Center for Social and Demographic Analysis

c. Publications

(i.) Publications closely related to the proposed project:

Land, Kenneth C., and Glenn Deane. 1992. "On the Estimation of Regression Models with Spatial Effects Terms for Large Samples: A Two-Stage Least Squares Approach." Pp. 221-248 in Sociological Methodology 1992, edited by Peter V. Marsden. Washington, DC: American Sociological Association.

Deane, Glenn, E. M. Beck, and Stewart E. Tolnay. 1998. "Incorporating Space into Social Histories: How Spatial Processes Operate and How We Observe Them," International Review of Social History, Supplement 6, 43:57-80. Also reproduced in New Methods for Social History, edited by Larry J. Griffin and Marcel van der Linden (1999).

Messner, Steven F., Glenn Deane, and Mark Beaulieu. 2002. "A Log-Multiplicative Association Model for Allocating Homicides with Unknown Victim-Offender Relationships." Criminology 40:457-480.

Deane, Glenn, and Myron P. Gutmann. "Blowin' Down the Road': Investigating Bilateral Causality Between Population and Environmental Change in the U.S. Great Plains." Population Research and Policy Review (forthcoming).

Deane, Glenn. "'Mark One or More Races...': A Simple Method for Statistical Analyses Involving Multiple Race Identifications." (under revision Sociological Methods & Research)

(ii.) Other significant publications:

Deane, Glenn D. 1990. "Mobility and Adjustments: Paths to the Resolution of Residential Stress." Demography 27:65-79.

Bearman, Peter S., and Glenn Deane. 1992. "The Structure of Opportunity: Middle-Class Mobility in England 1548-1689." American Journal of Sociology 98:30-66.

South, Scott J., and Glenn D. Deane. 1993. "Race and Residential Mobility: Individual Determinants and Structural Constraints." Social Forces 72:147-167.

Deane, Glenn. 1996. "Parents and Progeny: Inheritance and the Transition to Adulthood in Colonial North Carolina, 1680-1759." History of the Family: An International Quarterly 1:353-374.

Felson, Richard B., Steven F. Messner, Anthony Hoskin, and Glenn Deane. 2002. "Reasons for Reporting and Not Reporting Domestic Violence to the Police." Criminology 40:617-648.

d. Synergistic activities

In May 2001, Deane was an invited participant in an "Advanced Workshop on Spatial Analysis in Social Research." The objective of this workshop, jointly sponsored by ICPSR and the NSF-Funded CSISS, is to establish a dialogue between leading methodologists in spatial analysis and in the mainstream social sciences, in order to (1) facilitate the dissemination of state of the art spatial analytical techniques to the methodology in political and social research; (2) assess the importance of spatial analysis in general, and spatial data analysis in particular to social science methodological questions; (3) promote the application of state of the art spatial analytical techniques to substantive research questions in political science and sociology and/or to important social science data sets.

e. Collaborators & Other Affiliations

(i.) Collaborators:

Luc Anselin (University of Illinois, Urbana-Champaign), Robert D. Baller (University of Iowa), E. M. Beck (University of Georgia), Ingrid C. Burke (Colorado State University), Kyle Crowder (Western Washington University), Nancy A. Denton (SUNY-Albany), Richard B. Felson (Pennsylvania State University), Myron P. Gutmann (University of Michigan), Darnell F. Hawkins (University of Illinois, Chicago), Anthony Hoskin (Albright College), Steven F. Messner (SUNY-Albany), William J. Parton (Colorado State University), Nelson A. Pichardo (Central Washington University), Lawrence E. Raffalovich (SUNY-Albany), Scott J. South (SUNY-Albany), Heather Sullivan-Catlin (Kean University), Stewart E. Tolnay (University of Washington)

(ii.) Graduate Advisors:

Glen H. Elder, Jr. (University of North Carolina, Chapel Hill), Judith R. Blau (University of North Carolina, Chapel Hill), Rachel Rosenfeld (deceased), Robert E. Gallman (deceased), Peter S. Bearman (Columbia University)