Reagency of the Internet, or

How I Became a Guest for Science

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Abstract

Contemporary discussions of globalization concentrate on economic dimensions, neglecting questions about social relationships. This essay addresses the globalization of science as a process, replacing the concept of development with the idea of reagency and focusing on the Guest, an identity associated with specific places. The principal issue is whether the connectivity initiative centering on the Internet is just another development program or whether it is different in character, owing to a projective orientation that changes the relationship between place and identity. Following the conceptual groundwork, two contrasts are drawn in the body of the paper, between Guest Houses at two Kenyan research institutes, and between donor initiatives involving evaluation and connectivity. A minor thread throughout the essay explains the romantic interest in the subject, and my transition from a phony donor to a real one.

Admonish me not, my beloved Father for…sojourning here at Samarkand...I love my native Kandhar and…pine to return. But forgive me…my passion for knowledge. In Kandhar there are no scholars, no libraries, no quadrants, no astrolabes. My star-gazing excites nothing but ridicule and scorn. My countrymen care more for the glitter of the sword than for the quill of the scholar. --Saif-ud-din Salman, as quoted by Abdus Salam[1]

This essay seeks to open a line of inquiry concerning technology and globalization, with specific reference to the question: will the Internet globalize science?[2] More generally, will new communications technology diffusing through distant[3] lands early in this millennium change the structure of science in the long term? The theoretical basis for this question is ultimately simple: the attachment of scientists[4] in less developed areas of the world to scientists in more developed areas would constitute a change in the structure of science as it has existed since the seventeenth century.[5] The focus of this essay is a description of research conditions in Africa that seem conducive to Internet effects and, hence, might be expected to shift with the widespread

[1] Abdus Salam ('The Isolation of the Scientist in Developing Countries', Minerva,Vol. 4 (1966), p. 461-65) quotes this letter of Saif-ud-din Salman to his father in 1470AD, comparing Samarkand to Berkeley and Kandhar to Delhi.
[2] Internet, Web, and Net are used interchangeably to refer to the interlinked network of networks allowing communication and information exchange between computers.
[3] In this essay the term 'distant lands' is used in preference to 'developing areas' or 'less developed countries' for several reasons, including (1) the avoidance of assumptions about what is, should be, or may not be occurring in Africa, Asia, and Latin America; (2) the principal argument that 'reagency' describes the process of intervention better than 'development', and, not least, (3) the desire to perpetuate the old-fashioned and positively charged image that the difficulties of research in Africa are more than offset by high romance.
[4] By 'scientists' I will mean those who are engaged in the business of knowledge production as one of their primary professional activities. Many of those I call 'scientists' could well or better be termed 'researchers', given their education levels and relationship to the kinds of communities often viewed as the scientific core, but the term is still not used widely. A 'scientist' in some developing areas is sometimes a professional with higher education. (When I sought to visit the curator of a botanical garden I was told, 'the scientist is not here.') Generally it is preferable to restrict the term 'scientist' as indicated above, but even this use has the following consequence: a 'scientist' is also an individual working in a small NGO, without a bachelor's degree, who is engaged in the collection of data on a local problem in organic agriculture. Personally, I believe this is a reasonable extension of the term so long as it is made clear.
[5] If the Internet does change the structure of science, it would not be the first time science has flourished in different parts of the globe but a return to the more diffuse conditions of scientific work that existed before 1100, when China, India, Persia, and Arabia as well as other centers were active in the making of legitimate knowledge.

introduction of information and communications technologies. The hypothesis is that by changing the relationship of place and identity, the Internet may 'reagentize' science in less developed areas more effectively than prior initiatives owing to a shift in projective orientation. This shift has very little to do with 'participatory' initiatives themselves.

As scientists were innovators of the Internet,[6] the introduction of this technology in Africa, Asia, and Latin America is a crucial issue for understanding the production and institutionalization of knowledge in a global context. Just as science itself is collaborative both in the sense that knowledge-building is a community activity and in the sense that multiple actors are increasingly required for the conduct of research, the Internet is related to the study of collaboration in two respects: (1) As a technology, computer-mediated communication changes the conditions of physical presence and time delay that previously characterized the production of knowledge; (2) As an initiative, the Internet is a collaboration. First, as a technology designed in the First World for asynchronous interpersonal communication (email) and, subsequently, information retrieval (the World Wide Web), the Internet has dramatically increased the potential for most types of human collaborations, including those focused on the production of knowledge and dissemination of expertise.

But the second respect is the topic of this essay. My starting point is that 'development' is a misleading concept and that 'science' in many of the areas conventionally called 'developing' is a compelling topic of study. I argue here that the Internet, or 'connectivity initiative', is one in a series of collaborations between what were once called the First and Third

[6] It should be emphasized at the outset that the diffusion of ICTs in Africa reflects the standard pattern of innovation in economically advantaged groups such as professionals. To take one extreme case, a 1999 estimate from a Family Support Initiative of the International Development Research Centre, a survey of women in two East African regions revealed that more than 99% had not heard of email (Shanyisa Anota Khasiani, 'Enhancing Women's Participation in Governance: The Case of Kakamega and Makueni Districts, Kenya', in Gender and the Information Revolution in Africa , Chapter 8, ?? http://www.idrc/ca/books/focus/903/11-chp08.html) About one third of these women had never been to school and fewer than half had more than a primary education.

Worlds, but one best viewed in terms of reagency rather than development. Prior initiatives since the Second World War involve limited reagency, but none have the potential of the connectivity initiative. In what follows, I pose a question about science as a global enterprise that depends on replacing the notion of development in order to give a particular interpretation to the question of technology and globalization. All initiatives in less developed areas are agentive in the sense that they trigger chains of interactions among specialized groups of professionals.[7] The question is: will the Internet globalize science by changing the relationship of place and identity from one in which Guests propel initiatives into distant lands to one in which scientists collaborate from distant locations.

Accounts of international collaboration in science, where they concern less developed areas, typically focus on exploitive forms (colonialism), institutional change (capacity building), or formal scientific communication (distribution of co-authorships). Such accounts are 'views from afar', motivated by the discourse of dependency, the institutions of development, and often, the availability of certain databases. The present approach is based on recent concepts of agency and place, giving precedence to the study of identities and initiatives, and focusing on the identity of the Guest as a reagent engaged in the collaborative redirection of effort.

My own identity as a Guest came as something of a surprise—one of those peculiar identities others know before you—but I return to that in the final section. It is only to admit that my own view of the matter is shaped by the experience of coming to be something I was not, and having assumed an identity not chosen, trying to make the best of it. As I became a participant in the process, it seemed clear that 'development' did not describe anything I witnessed. Sometimes a better understanding of process can be achieved without the term ordinarily used

[7] One important theoretical perspective on this process is provided by Tilly's concept of the 'opportunity hoarding' process and its consequences for social stratification (C. Tilly, Durable Inequalities (1998), Berkeley, University of California Press)??

for it. The fascination of new media of information and communication is the different form of sustainability and participation involved. My calendar today, July 18, 2002, is rigorous but rewarding, traversing the Nairobi streets to obtain best prices on switches, cable, and servers for LANs at a university faculty and a research institute. But that is the collaboration of the Internet and its fascination. Its outcome could prevent the scientists at Katumani from the necessity of the trek to Nairobi—and the largely unpredictable but often more significant encounters that might occur with scientists in the First World that may result.

Why the connectivity initiative may be different, and how I became a Guest are one and the same story. In relations between 'developing' and 'developed' areas, Guests are the crucial identities.[8] Guests redirect local flows of activities around global initiatives such as accountability and evaluation, HIV/AIDS, environmentalism, and, recently, telecommunications. Defined as actors that temporarily inhabit certain places in relation to Hosts, Guests are typically members of different national and ethnic categories, represent organizational sponsors with divergent interests, and are characterized by resource differentials. Scientific Guests—like others from multilateral and bilateral donors, universities, NGOs, and government agencies—deposit initiatives, programs, and projects[9] as they interact with Hosts, who modify and adapt their behavior, but not in any consistent way—certainly not in the ways that Guests desire and expect. Guests are described as reagentive, given their capacity to take part in or bring about a reaction. The character of this reagency has recently changed, as the discourse of development has shifted from technical assistance to collaboration and cooperation, participation and partnership. That shift was largely independent of the introduction of new communications

[8] These terms are used here in the conventional way but not often employed in this essay, as they are increasingly irrelevant and theoretically biased with the advent of the Internet.

[9] I use the term 'initiative' to refer to broad action agendas within the institutions of development (e.g., gender, environment, accountability), 'programs' to refer to action plans that are funded or require funding, and projects as the narrow unit of action (a program consisting of a string of projects).

technologies, but participatory ideologies bore an affinal relationship to their introduction, such that connectivity was readily viewed as empowerment.

While the Net is the subject of this hypothesis, I say little about it until the final section for two reasons. First, the readership of this journal is familiar with the features of new communication technologies that are relevant to the present discussion: short time lags between sending and receiving messages; the volume of information available; search engines; new forms and potentials for interaction between scientists and scholars. Second, this essay is about research in specific times and places, but primarily in Kenya and Ghana—one cannot study dreams of the future unless one sleeps.

Let me illustrate with the example of a research institute in western Kenya near Kisumu. In mid 1999, given the nonpayment of bills by the Kenya Agricultural Research Institute, many phone lines to the research stations had been terminated. Some institutes had no lines at all. There are various ways of assessing communication with a particular organization. The first is to ask those that work there. The second is to ask those who have tried to make contact. A third is to try to make contact with particular individuals at the organization, which often yields the most realistic assessment. After sending a letter by courier and traveling most of the day from Nairobi, I arrived at one research station to find that a particular scientist I had come to interview was absent. Perhaps, as I was informed, he had gone to Nairobi—too bad that I had journeyed in the opposite direction. There were few people present. The acting director said there were no phone connections at all. If we wished to return, the best way to contact them would be to call the District Prison located about two kilometers distant, and ask them to deliver a message. There is little need to emphasize that acquiring information or undertaking a collaborative

project in such a place is not simply a matter of Internet chat.[10] The goal of this essay is to provide conceptual and substantive context for the evaluation of the hypothesis that the Internet may globalize science—it is far too early to conduct such an evaluation, at least in the opinion of this donor.

The next section of the essay begins with a discussion of co-authorship studies, takes the critique of 'development' as a given, and suggests its replacement with the concept of 'reagency'. Starting with Emirbayer and Mische's view of agency in its temporal aspect, ideas of identity and place are required to understand how a particular kind of agency is produced in what are often called 'developing' areas. A place of science is considered in the second section of the paper, grounded in Thomas Gieryn's work on place. This is illustrated by a comparison of the Guest House at two Kenyan research institutes. The third section of the paper discusses the Guest as an identity, a visitor who comes bearing opportunity and resources, importing initiatives, programs, and projects into the research institutions of distant lands.

With identity, place, and reagency as guiding constructs, the fourth and fifth sections contrast two programs, one that derives from the 'participation' initiative and one that derives from the connectivity initiative, each of which has been important in the past decade in Africa. They represent, in different ways, the two sorts of collaboration introduced at the beginning of this essay and the important difference in the modes of 'participation' involved. The fourth section describes 'sustainability' and 'participatory' discourse as explicit recognition of the inadequacy of 'development' initiatives, using a brief incursion in research management to illustrate the irrelevance of participatory discourse to sustainability. The fifth section describes the advent of the Internet in my own research and the reagency of connectivity initiatives as one

[10] The savvy reader will note that in 2002 the scientist would be expected by most of his colleagues to possess a mobile phone. The relationship between Internet access and mobiles is complex, but some evidence from qualitative interviews suggests mobiles may reduce Internet use.

of redirection rather than control. The final section asks four questions whose answers are critical to understanding globalizing processes, and explains how I became a Guest for Science.

I. Collaboration, Development, and Reagency

Studies of science and technology in Africa, Asia, and Latin America generally view conditions in relation to Western countries. Leaving aside the colonial past and recent work on the Asian Tigers, studies typically examine science in terms of collaboration and/or development. Those studies that explicitly use the concept of collaboration in the context of less developed areas share a conceptual and methodological foundation. (1) They employ the concept of collaboration strictly in the first sense described above: collaborations are distinct research projects conducted by more than one scientist. (2) They are guided by the availability of bibliometric databases and typically employ measures based on co-authorship. A lengthy series of studies on the topic beginning in the 1970s examines evidence from outputs such as papers, reports, and patents to yield indicators of trends in international collaboration.[11] Often the sole source of information analyzed is the organizational affiliation of the authors. From this affiliation data, comparisons by country and field can be used to show that the frequency of collaboration has increased over time, as well as internationally.[12] An important interest for many of these authors lies in the assumption that collaboration (co-authorship) is a sign of

[11] This work has appeared since the early days of science studies in such journals as Scientometrics (D.B. Beaver and R. Rosen, "Studies in Scientific Collaboration. Part I The Professional Origins of Scientific Co-authorship" Scientometrics 1 (1978), 65-84.) and Social Studies of Science (J.D. Frame, M.P. Carpenter (1979) "International Research Collaboration." Social Studies of Science 9: 481-97). Bibliometric indicators allow construction of measures such as the mean number of authors per article (S.M. Lawani, "Some bibliometric correlates of quality in scientific research" Scientometrics 9 (1986), 13-25), the proportion of coauthored articles (K. Subramanyam , "Bibliometric Indicators of Research Collaboration: A Review" Journal of Information Science 6 (1983): 33-38), or the likelihood of domestic and international co-authorship (Masashi Shirabe and Hiroyuki Tomizawa, 2002, "Likelihood of Overseas Access to International Co-Authorships," Scientometrics 53: 123-129.)

[12] A. Schubert and T. Braun. "International Collaboration in the Sciences, 1981-1985" 1990 Scientometrics 19: 3-10; T. Luukkonen, R.J.W. Tijseen, O. Persson, and G. Sivertsen. 1993. "The Measurement of International Scientific Collaboration" Scientometrics 28: 15-36)

scientific development, maturity, or quality.[13] This assumption also characterizes recent bibliometric studies of co-authorship in the 'underdeveloped' scientific world.[14]

While I think this assumption is wrong, it is not the primary issue. The problem is that they are too narrow in their view of collaboration and too limited by the kinds of data that form the basis of the analysis. Even at the level of the individual research project, jointly undertaken by scientists at two institutions, such data can say nothing about the origin, magnitude, organization, technology, or processes involved.[15] Moreover, they neglect the framework of collaboration implicit in broad initiatives that originate in a small subset of countries, originally colonial, exploitive, and extractive, but more recently 'developmental' in nature. In the area of science and technology these initiatives include direct technical assistance, technology transfer, education and training, local institutional development, the establishment of a system of international agricultural research centers, organizational linking and networking, the management of national agricultural research systems (NARS), participatory rural appraisal, environmentalism, natural resource management, and, from the mid 1990s to the present, 'connectivity' initiatives with the potential to globalize science.

An even larger body of work, both academic and non-academic, is characterized by its reliance on the concept of 'development', a discursive formation related to Cold War political conditions and an interdependent group of institutions organized during the post-WWII period. The notion of development has been effectively analyzed by scholars such as Arturo Escobar, who describes it as an

Historically singular experience, the creation of a domain of thought and

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[13] Beaver and Rosen, op cit, note ??.
[14] Zhang Haiqi and Guo Hong, "Scientific Research Collaboration in China," 1997, Scientometrics 38, 309-19
[15] These five dimensions are discussed in W. Shrum, J. Genuth, and I. Chompalov, The Structure of Scientific Collaborations. Unpublished manuscript.

> action…[defined by] the characteristics and interrelations of three axes…: the forms of knowledge that refer to it and through which it comes into being and is elaborated into objects, concepts, theories and the like; the systems of power that regulate its practice; the forms of subjectivity fostered by this discourse, those through which people come to recognize themselves as developed or underdeveloped.

What is needed is an alterative to do the work of the original notion in more effective ways, without the cluster of connotations and uses that have accumulated, and mindful of current conditions. Part of the problem with the concept is that it has been used to refer to distinctive social processes in areas with widely different characteristics. If it is taken in some kind of 'simple' descriptive sense, it fails. Sub-Saharan Africa, for example, has not 'developed' over the past few decades: of the population in 1997, 94% live in countries where per capita income has 'regressed over extended periods'.[16] This has occurred during a period when the region has received the largest share of foreign development aid relative to GDP in the world and has been repeatedly targeted for massive development assistance by donors and aid agencies.[17] The most cogent use of the term 'development' is in reference to the cluster of institutions and initiatives whose primary activities occur in certain areas of the world, but its use still introduces a strong theoretical bias.

The notion of 'development' needs an overhaul, literally a 're-placement'. I argue for the concept of 'reagency' given its relationship to ideas of time, place, and identity that require incorporation in a framework for understanding the ways in which science and technology are

[16] R.B. Freeman and D.L. Lindauer. 1999. 'Why Not Africa.' Cambridge, MA: National Bureau of Economic Research. Working Paper 6942. (http://papers.nber.org/papers/W6942). In the 1990s, the per capita income level of about one third of Africa's population was below the level achieved before 1960Another 6% was below the level achieved in 1970, 41% below the level achieved by 1980, and 11% below the level achieved in 1990.

[17] The formal institutional of development has been much more effective in setting the discursive agenda than in shaping other sorts of local practices. One university librarian, well-placed in a number of university and donor networks, lost her contextual grounding momentarily, and shifted in mid-sentence from 'installing the [computer] system' to "empowering the users'.

shaped and oriented by social forces in traditionally strong scientific centers. The Internet is reagentive because it offers the potential for collaboration in place, that is, without leaving ones location. For scientists throughout the globe—though the concern here is principally Africa—a new form of participation may emerge that has little to do with ideology but much to do with the interaction of technological and social forms. All initiatives are reagentive in the narrow sense that they broadcast streams of discourse, programs, and projects into the research systems of less developed areas. But they are quickly absorbed by resource-poor social actors.[18] Scientists, while they are in the upper echelon of the social structure, are not different in this respect. The Net is different because it changes the conditions of interaction and the requirement of co-presence. This is radically different than a request for proposals that targets environmental conservation rather than increased agricultural productivity. In that sense the hypothesis of globalized science takes on real meaning.

The original motivation—and still most important aspect—of the development concept is reference to process in time, as a point or sequence of events located within the flow of time. The focus is important for both STS and recent social theory. As Pickering has argued, the critique of traditional sociologies of science depends on a 'heightened sense of time', specifically that analysts should try to understand scientific practice in its temporal unfolding.[19] It is in the same sense that we should seek to understand the potentially globalizing effects of telecommunications technology. Recent work on the concept of 'agency', too, views the temporal dimension as central, focusing on the changing orientations of actors within the flow of time. As in STS, the principle is to examine how the constraining and enabling contexts of

[18] On this point see W. Shrum, 'Science and Story in Development', Social Studies of Science (2000) 30, pp. 95-124. The concept of reagency is intended as a continuum and not a dichotomy. Initiatives can be described as more or less reagentive.

[19] Andrew Pickering, 'The Mangle of Practice: Agency and Emergence in the Sociology of Science', American Journal of Sociology, Vol. 99 (1993), 959-89.

action are sustained by and altered through human agency. Programs and projects of the future are imagined, as their authors interact with the institutions and practices of the present, creating such improbable initiatives as organizational change, the valuation of the environment over food production, and the interconnection of all humans through digital protocols. The complexity of the systems produced by such imaginings mean that they are far beyond the ability of any individual actors to control, as actor network theory has shown.

While it is unproductive to set agency over and against structure, as if one but not the other were the key to understanding social action, it gives equally little guidance to claim they are 'mutually constitutive'[20] or to equate 'agents' with 'actors'.[21] A useful definition is given by Emirbayer and Mische, who characterize agency as a

> Temporally embedded process of social engagement informed by its past (its 'iterational' or 'habitual' aspect) but also oriented toward the future (as a 'projective' capacity to imagine alterative possibilities) and toward the present (as a 'practical-evaluative' capacity to contextualize past habits and future projects within the contingencies of the moment.[22]

What is important for the current argument is their claim that shifts in these agentic orientations provide the analytic leverage needed to analyze the various degrees of 'maneuverability, inventiveness, and reflective choice' that social actors exhibit within the structural contexts of action.[23] But structural contexts involve, at minimum, the presence of social actors that occupy

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[20] Anthony Giddens is generally credited with the former idea (??). Margaret Archer argues that it is impossible to examine their interplay if they have no degree of autonomy 'fallacy of central conflation'. (??)

[21] For the latter, Actors are not agents: ?? E&M: p. 44 there are no concrete agents; only actors who engage agentically (J. Alexander's 'fallacy of misplaced concreteness') with their structuring environments; agency is a dimension present in all empirical instances of action (but neither is it ever completely independent of structure)

[22] (p.963) Mustafa Emirbayer and Ann Mische, 'The Concept of Agency', American Journal of Sociology, Vol. 103 (1998), 962-1023.??

[23] Ibid. 964

various role, positions, or, identities. This is why the notion of 'agency', if it is not simply equated with actor, involves a relational aspect. Emirbayer and Mische's failure to incorporate that aspect leaves us with agency that is free-floating, an 'un-placed' and 'un-identified' concept. That is, we must emphasize the locations where agency operates and add the ability to 'identify' different kinds and degrees of agency, such as the 'reagency' that occurs with the introduction of new information and communication technologies.

Identities enable and facilitate relationships through the recognition of agentive orientations. Here I describe Guests as reagents given their capacity to take part in or bring about a reaction. It is not Guests themselves in whom we are ultimately interested—which is the reason for the prefix—but characteristics of the reagents should be understood, insofar as they affect the reaction. Reagency describes, better than the concept of development, what happens when organizational representatives from afar enter countries with agendas and initiatives. What has happened is that the agentive orientation of the 1990s shifted—and by this I mean in a conscious way—towards a reagency compatible with telecommunications and connectivity as an agenda. It is just such a shift—variously called collaboration, cooperation, participation and partnership—that has 'reagentized' relationships between Guests and Hosts in the practice of science in distant lands. Again, I do not claim that reagency is completely new—only that it is generally limited and ineffective. It is the advent of the Internet that may globalize science through changing the relationship of place and identity that has previously characterized initiatives from afar.

The understanding of agentic orientations—particularly in relation to telecommunications—is facilitated by adding the spatial to the temporal dimension. The process of collaboration depends upon the degree to which such orientations are projective in ways that

encourage, deflect, and retard future interactions. This projective orientation of the Internet is the key to the hypothesis that the Internet may globalize science.

II. Place and Identity

The concept of agency, sensitive to the temporal embeddedness necessary for characterizing shifts in orientation, is deficient in recognizing the specificity of place. Agency, even in the relational pragmatics of Emirbayer and Miche, is always agency towards or in relation to something—people, places, meanings, events. The problem with such theoretical notions of agency is the attempt to universalize, in a strict sense, the properties of a concept so that it can be said to apply flexibly to humans in all times and places. Is it surprising that human actors are oriented to past, present, and future in the flow of time? Of course not. But neither does it aid in the business of understanding the process of socio-technical change in specific times (the present is often a good way to begin) and places (such as Africa).

As recent work in STS has shown, the place of science is important to the ways knowledge is constructed and the authority it bears.[24] This attention takes two primary forms. First, scientific laboratories create purified objects that may be manipulated for inquiry in regular and recognizable ways. Laboratories are places of power, channeling social interests through centers where calculations generate knowledge claims and representations can begin their travels to other destinations. Second, architectural sequestrations facilitate the twin processes of inclusion of appropriate actors and exclusion of 'profane' influences on the practices of knowledge production and the credibility of their claims. For both strands of work, the focus is on the ways in which knowledge is dependent on material structures.[25]

[24] Knorr Cetina 1999; Gieryn 1998; Galison and Thompson 1999; Shapin 1998??
[25] ?? Galison, P., Thompson E (eds). 1999. The Architecture of Science. Cambridge: MIT Press.

Gieryn has conceptualized place in terms of location, material form, and meaningfulness.[26] A unique location in the universe, a place has material form but is distinguished from mere space—the contentless abstraction of geometry—by the practices and symbolic value. Named, identified, and signified by participants—often in different ways by actors internal and external to a social formation—places are more than a 'context' for living and working. How do places come into being and what do they accomplish? Places are made by professionals and powers, people and groups, but they are rarely made by single actors without the interest and involvement of others. What gives places their meaning are the kinds of interactions that typically occur within their material location, which depends crucially on the identities that populate them.

Accounts of science and technology in the US and Europe have long recognized that funding organizations were important to the conduct of science, but frequently treat the acquisition of resources for research as unproblematic. That is, they neglect the places that are the foundations of knowledge, in the sense of providing the resources through which laboratories and inclusions are created. In some areas of the world, resources of any kind take on overwhelming significance. The places they originate, are negotiated, and are transmitted become the key to understanding knowledge, its production and diffusion. Contrast two such places in the research system of Kenya, both under the auspices of the Kenya Agricultural Research Institute.

The Guest House of the National Dryland Farming Research Center sits atop a hill

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Gieryn, Thomas. 1998. "Biotechnology's Private Parts (and some Public Ones)." Pp. 219-53 in Private Science. Arnold Thackray (ed.). Philadelphia: University of Pennsylvania Press.
Gieryn, Thomas F. 2000. "A Space for Place in Sociology." Annual Review of Sociology ?
Knorr Cetina, Karin. 1999. Epistemic Cultures: How the Sciences Make Knowledge. Cambridge: Harvard University Press. Shapin, S. 1998. Placing the View from Nowhere: Historical & Sociological Problems in the Location of Science. Trans. Inst. Br. Geogr. NS 23: 5-12.

[26] T. Gieryn, '2000. "A Space for Place in Sociology." Annual Review of Sociology ?

looking east toward the arid lands of Kenya. Built of reinforced concrete, without frills, its functionality is difficult to notice. The eye is drawn to surroundings of sheer beauty inhabited by humans for two million years. A thorny acacia, with its horizontal spread, covers a young papaya tree, already bearing fruit. The Iveti and Mua hills surround the station, but the highest, Kiima Kimwe ('One Hill'), is disconnected from the rest. In the evening the sound of enyui birds (Kamba) mingles with that of children singing at the station primary school. These are distant sounds, since the staff housing for the 28 scientists spills down the hill from the station, and many of the 220 or so other workers live nearby with their families. They are sounds of community, a community of knowledge workers, in the purest sense of the term. Not only are there agricultural scientists, but carpenters, masons, mechanics, herdsmen and women, milkmen, a bartender, an accountant, clerks, caterers, typists, sweepers, watchmen, subordinate staff for planting and construction, shopkeepers for the butchery, dry goods store, and dispensary. What is called casual labor—but is hardly casual—is employed for digging, weeding, and scaring birds from the research fields. The Guest House stands empty and apart, but when the time comes there is space for eight, with four bedrooms off a hallway, a large common room, two refrigerators, a full kitchen, and hot meals prepared by the staff.[27]

Two hundred miles across the Rift Valley from Katumani is a sister station at Kakamega with its own guest facility. The primary difference in physical structure is that the Kakamega Guest House was built as a four bedroom residence for a U.S. scientist and his family, who was to have spent several years assisting in the development and coordination of work on sorghum and millet throughout the country. In the event, however, he refused the position at the station—and his house—because of its isolation, its distance from Nairobi, Kenya's resourceful capitol. But architectural distinctions between the two Guest Houses are dwarfed by differences in their

[27] Though empty of Guests, it is not unused. Staff can watch videos on the large television during the day.

utilization. Katumani is generally quiet, with clean rooms, and regular meals on request and on time—a working environment for consultants and professionals. Kakemega is noisy. Soukous music blares from the cassette player at midday, even as I tried to recover from mild illness. The rooms are used for storage and not just accommodation. Relatives of the hostess enjoyed a meal of ugali in the dining room, while our group of Guests found none available.

Physical structures matter in terms of the ways they are organized and interact with identities. Two variables are responsible for the difference between Guest Houses, an artifact and a fact. Kakamega, unlike Katumani, has a telephone. Katumani, unlike Kakamega, was still unaffected by the 'staff rationalization' that had just cost the Kakamega hostess her job. It is difficult to collaborate when one faces the immediate prospect of joining legions of unemployed Kenyans. The telephone was put there for Guests who never came. And the 'rationalization' was due to the demands of Guests tired of budget overruns and fed up with a research system that hired more and more staff to provide employment for the families of scientists.

III. Guests

The Guest is an outsider identity characterized by certain features: their distinctive ethnicity, representation, and location. Guests are located in a place designed as transient habitats that may be commercial (hotel), domestic (private room), or institutional (Guest House). Guests belong to a different ethnic or national category—once typically US, British, French, Dutch, or other European, but now often Japanese, Australian, or Chinese. Finally, owing to organizational affiliation, Guests serve as representatives of developed and distant organizational interests. The most important aspect of this representation is not that their interests are divergent from those of the Host—as we will see—since often they are parallel and consistent. Rather, these

organizations are characterized by resource differentials. The central point is that as scientific Guests deposit initiatives and programs (strings of projects), they set in motion processes that are uncontrollable and complex in their effects.

The argument here is that place and agency are intertwined in the process of knowledge production in distant lands, producing the identity of the Guest. As we consider the connectivity initiative, we must keep places foremost in mind and avoid 'cyberspace' like the plague. The segregation of a special identity in buildings designed to accommodate determinate needs (hygienic, security, communicative) recognizes the special significance of Guests as purveyors of resources and activities in the form of initiatives, programs, and projects. Although not unknown in the developed world, the Guest has a generalized relevance in low income areas that is largely missing where scientific resources are generated internally. The two physical structures just considered are designed for particular sorts of social negotiations involving resources. Their existence tells us much about the kind of science that is practiced and the social formations engaged in its production. The Guest House at Katumani sets apart from the community, but just next to the main building of the Centre, built with World Bank funds and opened by President Moi in 1994.[28] There may be no physical sign of their presence—save perhaps the boiled water in pitchers—but Guests are very important at Katumani. They are not understood as the Visiting Scientists of the First World, spending their sabbaticals at another university, learning from and collaborating with colleagues in their field. They are seeds of an entirely different variety, to be cultivated carefully through agronomic practices only partly understood.

Of course, a residence is not the unique locus of interaction between Guest and Host, but

[28] It is noted that the old Visitor's Book was closed out on the occasion of that particular visitor, whose signature requires the entire first page of the new one.

the distinctive linkage between place and identity lends durability to the social structural categories of interest. Guest and Host are engaged in a dependency relationship that is neither hierarchical nor regularized except for determinate periods. To be a Guest is to participate in a system as a welcome but transient identity.[29] A Guest may come as an individual or as an organization. She is not a tourist or traveler, for a tourist simply views the sights and a traveler comes as a questing participant.[30] A Guest creates an expectation—not an expectation, exactly, but a prospect, a promise, a chance. It is not possible to say what precisely that entails—though sometimes the prospect is more specific than others—because Guests have been associated with such a great variety of outcomes in the past. Neither is a Guest a stranger, a Pale Rider who cleanses the town of Evil before departing in a mist, never to be seen again. A Guest may arrive and depart without visible effect. A Guest may be very well known, even an old friend, and may come often. Finally, a Guest is not an Other, or not only an Other, for he is a type that in some respects is well understood. The crucial characteristic of Guests is that they come from Elsewhere, from a context of greater, or perceivedly greater, resources and advantages.

The issue of Guests may well have greater generality, but is here understood specifically as a form of collaboration, arising from an organizational context of knowledge production in which most resources are externally generated. It concerns the ways in which certain kinds of identities, when they come to gain prominence in a research system, alter the ways in which vocabularies of justification are constructed, and conceal the variety of motivations and activities undertaken by scientists themselves. Guests invoke a schema allowing actors in the research

[29] The matter of segregation and the matter of transience are relative to subtypes of Guests—the expat, the careerist, the visiting donor. Segregation of identities occurs for long term Guests as well, such as those whose careers are spent in one or more countries. Areas such as Lenana Road (etc.) in Nairobi.

[30] Wenda Bauchspies has argued based on research in Togo, West Africa, the most important distinction is between individuals that come once, and individuals that return. 'Science as Stranger and the Worship of the Word', Knowledge and Society Vol. 11 (1998), 189-211. Bauchspies provides a crucial analysis of the identity of the Stranger about whom nothing is known, and the search for information in order to categorize and classify.

system to remember, select from their experiences, and recognize the identities of past interactions.[31]

I became aware of the schema invoked by this identity in 1994 during the process of visiting approximately 100 organizations in a variety of research sectors (universities, state research institutes, NGOs, ministries).[32] My own project at this time involved the collection of information from researchers centering on their communication practices using network survey techniques. This effort was funded by RAWOO, the Advisory Council for Scientific Research on Development Problems funded by the Dutch government. Although the council was advisory and did not ordinarily conduct research, they sponsored the study to determine the general conditions of research scientists in areas representing low (Ghana), medium (Kenya), and high (Kerala) levels of development. What seemed peculiar at first was the difficulty—often an impossibility—of making the nature of the study clear to the respondent organizations.

To approach such a varied group of organizations required, in almost all cases, a courtesy visit to the Director or Chair,[33] that involved signing a Guest Book,[34] describing the study, answering questions about RAWOO and the Dutch development agency, discussing the personnel and interests of scientists at the organization. I was repeatedly perceived as Dutch in spite of my obvious American accent and business card, and universally asked about the possibilities for funding—in spite of the fact that I was not a donor, or representative of one. At one university in Kenya, the team explained the study to the Dean of the Faculty, identified the scientists to be interviewed, and received permission. On the way out the door, after we had

[31] ?? The 'internal structure of iteration' described by Emibayer and Mische is invoked " p978 for selective attention, recognition of types, categorical location, maneuver among repertoires, and expectation maintenance??
[32] This project is referenced throughout what follows as the RAWOO study.
[33] The mandatory visit to the Director is not dissimilar to the chief or headman described by Bauchspies, op cit., note ??, p. 191. While the stranger is expected to bring gifts to the chief, the Guest is expected to bring projects.
[34] ??JKUAT Deputy VC visit—13 x 13 names from the time I was in Kenya in late Jan. of 2000 until the time I returned in June of 2001 --- Katumani: on Feb 2, 2000, I counted the names in the Guest book; first entry was Oct. 29, 1992; there were 13 names per page on 42 pages plus four additional names ending with mine

finished the presentation, the Dean stopped me: 'OK, now when do we talk about the money?' In another instance, as the team dispersed to interview scientists at an agricultural research station, the Acting Director of the station drew me aside and provided a small trifold pamphlet listing the activities of his own NGO—if we came from the Netherlands he thought chances were better that we would fund research by his personal NGO than his government research station.

Now that I provide funds for the 'last-mile' connectivity of scientists, the dynamics of negotiations are more complex but also clearer. Hosts are interested in a series of questions: How much money is available? What are the conditions for getting it? What do we have to do? Are there strings attached? Is this a short project or a long one? What are the prospects for subsequent work? How many people can be involved? Who will be the leader of the local team? How much freedom will they have and what do they have to do? Who is really providing the resources, and will they be coming back? Guests, too, have their interests and questions: Is this individual trustworthy? When I provide the funds, is there a way to hold them accountable? For the reagency of the Internet, the most important questions involve the online relationships that persist or fade after departure. The idea of accountability is unimportant to many Hosts, unless the chances of Guests returning are reasonably high.

But in 1994 those questions were far in the future. My daily experience was simply that I was repeatedly drawn into a web of activities depending centrally on the (mis)understanding that I represented a donor with projects to locate, that I was a Guest for Science. The interaction centered around organizational capabilities and interests that could be developed for mutual benefit—that I had no such interests was not crucial, since it was the only way I could be perceived as a visitor to the institute or university. Guests and Hosts engage in repetitive or habitual patterns of interaction, the 'iterative aspect of agency' that give the institutions of

development their present sense of permanence.[35] In fact, what we were doing was administering a questionnaire, albeit a rather complex one, seeking to understand the social context of research in Africa and Asia.

So the fundamental reason that researchers are interested in Guests for Science is their organizational affiliation, their representation of donors.[36] 'Donors', in the broad sense, are organizations that provide resources targeted for a subset of nations defined in a variety of ways. They are typically categorized as multilateral, bilateral, foundations, or nongovernmental organizations. Formerly—this began to change in the late 1980s—funds were channeled through a single government ministry that coordinated the receipt of funds (typically External Affairs, Planning, Cooperation, Budget, or Treasury). Multilateral donors such as development banks or UN agencies receive funds from many countries. The World Bank (International Bank for Reconstruction and Devleopment), in cooperation with the International Monetary Fund, provides loans at low interest with grace periods and long repayment schedules.[37] Agencies of the United Nations are organized by activity rather than region and provide resources directly rather than loans.[38] Bilateral donors are agencies of a national government that cooperate with certain countries directly. Even the largest bilateral agencies, such as the U.S. Agency for

[35] E&M??

[36] One Guest who arrived without her own funds for lodging and meals at an institute without a Guest House, was provided with meals and a room at $50 per night; the Protocol Officer assigned to her carefully observed when she would not be taking her meals at the Hotel, and came to take his own meals there, charging them on the guest room. This took place at an institute where funds had not been available to produce annual reports for approximately ten years.

[37] Soft loans are provided through the International Development Fund. One recent Bank program allocated $500 million in loans for agricultural research in LDCs (1994). Although the terms of the loan are much better than ordinary market rates, they are not grants for the reason that a loan requires a greater recognition of value and a commitment to repay on the part of the recipient. Though the World Bank is the largest, there are many regional Development Banks, such as the African, the Inter-American, the Asian, and the Islamic in additional to the Arab Fund for Economic and Social Development. The European Union and the European Bank for Reconstruction and Development have recently emerged as major additions to the international donor scene.

[38] The best known agencies are UNICEF (children), UNESCO (science and culture), ILO (labor), WHO (health), UNEP (environment), and FAO (food, agriculture, research), which receive funding from the United Nation Development Program. A UN officer in a region where a 'complex emergency' exists such as Somalia may coordinate eight or more agencies.

International Development, pursue narrower agendas than the multilateral donors, often working in countries with which colonial relations were strong, or with particular subject interests.

It is difficult to estimate the proportion of research in Africa that is funded by donors. In 1990, Jacques Gaillard called it 'practically impossible' owing to the large number of external funding sources and the lack of coordination.[39] What no one doubts is that it is extremely high for countries such as Kenya and Ghana. At the high end, some Kenyan sources place the figure at about 90% for major research institutes.[40] Twenty years ago, before the decrease in donor assistance, Eisemon (1982, p.40-41) estimated that foreign-funded research at the University of Nairobi exceeded research funded from domestic sources by a ratio of 10 to 1.[41] As the outgoing Director of the government research institutes in Ghana said in early 2002, 'The government doesn't fund research. We pay only salary'.[42]

Guests are closely associated with donors, but they may also be visiting scientists. Anyone who has visited certain places in Africa, Asia, or Latin America outside the confines of a structured tour will have experienced the instant friend among the locals. That paradigm is elaborated in complex patterns to generate the Guest whose primary identity is organizational. Scientists and technical experts are not only representatives of donors, but they are, or may

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[39] J. Gaillard, 'Science in the Developing World: Foreign Aid and National Policy at a Crossraod', Ambio 19, 348-353.

[40] The 1980 Lagos Plan of Action committed African leaders to set aside 1% of their Gross Domestic Product for R&D by 1990. In mid 2002, the share for Kenya was estimated at .01% (Daily Nation 4 July 2002, Section 2, 1-2).

[41] The donor community in Nairobi is large, owing to the number of international organizations with bases there, and increases because it is a regional center for places like Somalia and the Sudan. Income even in a city as expensive as Nairobi, goes farther than it does in Europe and the US. Although international class hotels are extremely expensive--hence the high per diems in such places--expatriates are given housing and vehicle allowances as well as living expenses. Some who come for are "tour" of two to three years receive a salary in a foreign bank, and never draw on it, saving virutally 100% of their net income. An expatriate community in the thousands (est. of 3000 for Nairobi) can sustain a large number of quality restaurants, nightclubs, and retail establishments. Regular functions--parties, receptions, Sunday brunch on the terrace--are more common than in Western cities. In smaller expatriate communities, where each knows all, newcomers are immediately received in a round of parties and functions. It is easier to make friends than in comparable communities in Europe and America, and the boundaries of nationality and age are much less important.

[42] Personal communication.

become, friends and professional associates that may result in kinship mobility, e.g., an education for one's children in Europe or America. Donors send Guests, of course, but the significance of the former is much less than generally imagined, while the latter are much more important. Donors are organizations that provide resources and financial assistance, while Guests are people who may work for donors, may know people who work for donors, or simply appear, by virtue of their employment, ethnicity, or cultural background, to represent a conduit for resources from Elsewhere. Guests are potential sources of projects, of research, of funds for performing evaluations, for the technical advice that involves the provision of resources and research partnerships. They provide funds.—sometimes directly, from their personal accounts, more often indirectly through recommendations to donors and funding agencies. Guests are friends, points of contact with the developed world, sources of knowledge and hope.[43]

The question arises, what are the benefits of undertaking research activities, if a dominant motivation is the acquisition of resources, and the salary of a scientist is paid, regardless of project activities, by the Government of Kenya? The most important answer is still the activities involved in producing knowledge itself: laboratory and field work. The Mertonian norm of 'distinterestedness' has long been recognized as an ideology with important functions rather than a description of behavior. For an African scientist a project often comes travel. A commodity coordinator, for example, is given a small budget for out-of-station activities, funding trips to other research plots and stations. If he stays at an inexpensive lodging, or even a Guest House at a reduced rate, he can maintain a few schillings for home or himself. A scientist on safari is a

[43] For the institutions of science and technology, Guests are important through the typical interactions involving research in Africa. It is difficult to estimate their numbers at present, but the number of foreign advisors who worked in the public-sector of sub-Saharan African countries in the early 1989s and early 1990s has been estimated from 40,000 to 100,000.((Berg 1993 ; World Bank, 1989)??) One source puts the number of expatriates in Kenya alone at 9000. About 450 were in government positions, while 200 worked in universities and other organizations. Cohen reports this involvement has an annual cost of $3500 million, or 35% of official development aid (1993, p. 474). (Cohen 1992)

shopper as well: for rice in Mwea, chickens in Kericho, sorghum in Kakamega. Since the widespread recognition that formal institutions such as ministries, university bureaucracies, and institutes themselves divert funds from projects, scientists seek direct, personal relationships with Guests, be they visiting scientists or career employees of donors. These personalized relationships are more important to donor-driven funding than the institutionalized, often peer-reviewed and competitive processes that characterize grant-giving in OECD countries. In the next sections, I indicate the social processes set in motion by the identity of the Guest through a comparison of two initiatives. The first illustrates a conventional development initiative that seeks to initiate sustainable and directed processes, while the second involves a new type of collaboration based on redirection rather than control.

IV. Evaluation

Use of the concept of reagency as a substitute for development is intended to highlight processes of interaction in which Guests with particular characteristics import initiatives into the scientific systems of distant locations with little control over the directions these activities take. All donor initiatives eventuate in chains of interaction, but the reagency of these initiatives does not typically exceed the absorptive capacity of the locations involved. It is not that Guests lack good will or that Hosts seek to subvert them. It is rather an inherent feature of interactions characterized by (1) resource differentials between Guests and Hosts and (2) interactions that depend on co-presence, that is, of the participants in social processes being in the same place at the same time. An event history of a particular project will add substance to this claim. The project was part of the general concern with evaluation and accountability. The general program was intended to improve the performance of research institutes in Africa, Latin America, and

Asia, a matter thought to be important owing to the high returns to agricultural research in these areas. Many of these projects were undertaken under the broad discursive framework of participation and sustainability that characterized development in the 1990s.

When the concept of sustainability gained prominence in the late 1980s, its meaning was rapidly extended beyond reference to processes and conditions that could avert environmental degradation. Most development professionals themselves were quite aware that no unidirectional process was set in motion by initiatives, programs, and projects.[44] The broader notion of sustainability bore a close relationship to the concerns of development institutions: most of the initiatives, programs, and projects intended to promote growth and modernization had not become institutionalized components of the locations where they had been started. The ideas of sustainability and participation are intimately related. Neither sustainability in its broad sense nor participation are 'initiatives' in the ordinary sense. They are not a sequence of related programs involving any specific substantive content (like natural resource management—sustainability in the narrow sense) or any sectoral focus (such as the substitution of nongovernmental organizations for state agencies). Sustainability and participation are best viewed as styles for conceptualizing programs and ideologies that pertain to the ways specific projects should be carried out.[45]

This broader concept of sustainability, like the concept of development, refers to temporal processes, but emphasizes continuity (of conditions, processes, activities) rather than growth or change. Donor agencies sought ways of 'sustaining' their initiatives through local practices that would maintain and facilitate the kinds of actions set in place by the programs they

[44] In the science and technology sector, for example, the World Bank's attempt to rejuvenate agricultural research systems through systems of planning and priority setting….. ((see Horton anthology??

[45] Harrison White, Identity and Control: A Structural Theory of Social Action. (Princeton: Princeton University Press, 1992.??

had funded. Two of the most common ways of promoting sustainability were (1) to require mechanisms to ensure that various activities continued after the termination of the funded project; (2) to involve local actors during the design of the funded project itself. In both cases—and these were intended to be interactive—the concept was simple: the participation of the target population—farmers, agricultural scientists, NGOs, local health workers—would themselves render activities or conditions sustainable.[46] In the S&T sector, for example, if a process of research priority setting could be set in motion involving a representative group of nationals—farmers, NGOs, scientists, managers, and other 'stakeholders' in the advancement of knowledge—then their commitment to the process would survive the cessation of program funding. Guests would get 'buy-in' from Hosts, who would 'take ownership' of the project, and be interest and motivated to succeed.[47]

The concern with sustainability coincided with a general downturn in donor support through the 1990s. The language of development funding shifted from 'technical assistance' and 'foreign aid' to 'collaboration', 'development cooperation', and 'partnership'.[48] The concept of the 'counterpart' was used to indicate that both the donor ('sending') organization and the host ('receiving') country were interested in the project. As I sought assistance in interviewing scientists in 1994, I was told that it would be advisable to make sure at least one interviewer in each country was a 'national'—though it would not matter, if this was, say, someone at my own university. Researchers at some international agricultural research centers should not undertake

[46] Interviews with many development professionals in Africa do not indicate much optimism about sustainability in the broad sense.

[47] Generally there are few illusions about the direction of influence in these cases, but there are also clear cut examples of what might be called the 'false consciousness' of organizational discourse. When a departmental review was ordered by the upper administration of one university, one member of the department suggested that a meeting be called so that the faculty could 'take ownership' and 'feel a part of the process'.

[48] By the 1990s, the term "partnership" began to be used to emphasize that North and South would participate on "equal terms" (see the Gaillard reference in K&P 1994 Vol 7, 31-63 "North-South Research Partnership: Is Collaboration Possible Between Unequal Partners.").

projects in the absence of a 'request' by nationals. Such 'requests' are important not only because they are rooted in the model of development cooperation, but because they reflect the mutual dependency that exists between donor and counterpart. They are frequently reciprocal requests, because the counterpart does not know precisely what to request until it is requested by a Northern scientist, who may then justify the project through having a request by the counterpart. It is in this sense that recipients often need and want coaching as to the character of their needs.[49]

An evaluation program illustrates these issues even where a commitment to participation was a central feature of the design. The case involved a program to facilitate the evaluation or self-assessment of performance within the national research systems of countries in Africa, Latin America, and Asia. The initial motivation for the project had much to do Guests themselves, who have sometimes been viewed as a burden to Hosts, owing to the sheer number of donors and agencies involved in the institutions of development and the 'lack of donor coordination.' Jacques Gaillard was one of many who complain of 'the excessive numbers of task forces and individual visits for a variety of aid programs and some small projects'.[50] More important, he notes that 'the more diversified the financing and the greater the number of potential funding agencies, the more time that has to be devoted to receiving and touring representatives of the donor organizations, filing funding applications, organizing fund management along the lines set out in the specific requirement forms and criteria papers of each of the donors, drafting mid-term or final progress reports, participating in evaluation groups, etc.'.

For precisely these reasons one international organization developed an interest in organizational evaluation. Such programs became an organizational concern in the 1980s owing

[49] RAWOO documents from a decade ago.??
[50] Op cit, note ??, p. 351.

to the increased pressure by donors for evaluation and accountability. Based on U.S. and Canadian models, a framework for self-assessed organizational performance was developed, to be administered once a year by participating organizations. It could be used as a baseline for change or even for comparison with similar organizations. Because funds were available from a bilateral donor, the program was initiated with an international workshop, held with leaders from national agricultural research systems in Africa and Latin America. The group made no changes in the framework but asserted that (1) the system should be pilot-tested in several countries, (2) changes would not be implemented until a future workshop was held, and (3) none of the project money would be used for implementation. If research organizations did not choose to implement the framework without outside funds, this would indicate that they were not sufficiently interested for the framework to be sustainable. Early participation of central leaders would ensure their ownership of the project and interest in follow-up activity.

A training team of two individuals was then sent to an African country whose leader had participated in the workshop and volunteered to pilot the instrument. Because the majority of the state research institutes were under the direction of a central authority, there was no question that the directors of individual institutes would welcome the trainers. They shared a routine of Guests who represent donors, scientists, evaluators, and projects. So the team met with institute directors, held meetings, and gave presentations on the new performance system at most of the national research institutes. In most cases, directors exhibited a mixture of trepidation and guarded eagerness—trepidation that another burden of meetings and paperwork would be required by Headquarters; eagerness in case resources were offered by the bilateral donor whom the team could be viewed as representing. To this point no single factor determined the response to the framework.

At each institute, directors or deputy directors asked whether funds were available to 'implement' the management system. Since prior agreements precluded such a use of funds, the framework became a burden. Finally, one institute was selected to pilot the system. But now numerous local variations in organizational practice introduced uncertainties in the application of the framework. The management team split over whether the workshop decision to allow deviations was hard and fast. Was the framework mutable or not? Could the institute add new elements and eliminate unworkable ones? Since no funds could be employed to implement the system—though substantial additional money was available in the budget—the project ceased as soon as the team left. It did not reach into the institution or affect the practice of research. It certainly did not reach extension agents or farmers. It skimmed the management formations, introducing a possibility, an opportunity, a threat. In the end a funded program triggered a workshop, organized a management team, and brief flurries of activity at several remote locations, but did not organize the identities into new formations or initiate persisting conditions.

What is behind a self-assessment of organizational performance? The management team, though it effected no change, was not welcomed only as a possible conduit for funds. As the flow of development money decreased, effectiveness, outputs, and performance became more important themes within long established networks. In principle, a system of self-assessment could have solved an important organizational issue if evaluators were becoming problematic Guests. The self-assessment of performance was a project that derives directly from accountability and evaluation concerns. It was designed as a participatory collaboration among the research systems of the South and an international development agency, with many directors of the systems given an opportunity to make changes in the original scheme. The purpose was to build capacity rather than provide direct and non-sustainable funds for temporary

implementations. The testing process involved a direct request by an African country. Sustainability concerns were built into the project from the outset and discussed at each meeting.

However, the discursive framework of collaboration and participation should not obscure the inherent characteristics of the program: resource differentials and interactions that depend on co-presence. Among the forms of development assistance that have proven most durable over the decades is education and training, the provision of various forms of expertise, often though direct in-situ instruction.[51] Of course, these projects are not specific to the research sector. Since the 1950s many projects undertaken by donors have taken the same general form. A team of trainers or advisors enters a country to conduct a series of seminars and workshops of varying duration to train Africans in certain skills, so that they may take over these activities after the team leaves and the donor may move to other areas.

These projects, according L.S. Wilson, have been 'almost universally unsuccessful'.[52] During the time frame of the project, the advisory roles may be effective, but once the donor leaves, the project ends and the trainees leave or turn to other involvements. In Kenya, Wilson (1993) and Cohen (1992) show that the new alternatives, most of which involve funding by donors of higher salaries than normally provided by the civil service to attract Kenyan staff to donor projects,[53] are also unsustainable, and essentially shift capacity temporarily to projects that

[51] Donors view training as a matter of institutional capacity building. Trained individuals will be better suited to perform their tasks. (Catlett and Schuftan 1994??) They will be better able to participate in research work within their organization. But trainees often view training as a ticket to a better job, a job that is often in another organization. Why would they want to return and remain at a place that they well know has a limited salary scale and poor chances of advancement, outside of the meagre increments provided through time-in-rank. It is often NGOs that are the target of their efforts, and when they think of NGOs, they do not mean grassroots organizations working with peasant farmers.

[52] ??Wilson, L.S. 1993. "Kenyanization and African Capacity 'Shuffling.'" Public Administration and Development 13: 489-99. On the same theme see Catlett, Marcus, and Claudio Schuftan. 1994. "Lessons From Institution Building in Kenya." Public Administration and Development 14: 153-68; Cohen, John M. 1992. "Foreign Advisors and Capacity Building: The Case of Kenya." Public Administration and Development 12: 493-510; 1993. "Importance of Public Service Reform: The Case of Kenya." Journal of Modern African Studies 31: 449-76.

[53] For example, one World Bank project sought to place several economists in a government ministry at salaries of

will terminate.[54] In the case of the collaboration in research management, the participatory framework had a 'freezing' effect, owing to the need to consult collaborators in other countries before making changes. The interpretation of participation given here was not 'participative' in the sense of allowing the country to determine its own fate—but in the sense of allowing collaboration participants to determine the fate of others.

What emerges from this account is that the ideology of 'participation' is irrelevant at best and pernicious at worst to the reagency of initiatives. The identity of the Guest has a powerful impact but its sustainability is based on visits, on interactions, on co-presence. This incident occurred in 1995 before many of its members were connected to the Internet. Could the Internet have made a difference had the consulting group been linked in a discussion group? Surely when the management team disagreed about the extent of mutability of the framework, a simple query could have resolved the issue of the nature of the participation involved? But no matter how successful a collaboration to improve the organizational performance of research institutes will not last long. It will certainly not change the structure of science.

V. Advent of the Internet

Since the beginning of the development era it has been argued that science should be a global endeavor. At the University of Kansas, in the mid 1970s, my first awareness of the sociology of science took for granted that science was a community activity in which communication structure and process were central in the making of knowledge.[55] Fifteen years later, before the advent of the Web, I began to wonder whether, as Stevan Dedijer claimed in 1963, scientists in developing countries 'suffer isolation' from each other and from the

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$3000-$6000, compared to the prevailing wage of $250 per month (Wilson 1993).

[54] Moreover, they do not consider the loss of benefits to the programs where the Kenyans were originally employed.

[55] Refs to Hagstrom, Storer, Ben-David, Merton.??

international scientific community. I was not particularly cognizant that this idea had both an empirical aspect (as a claim about the professional networks of African scientists) and a normative aspect (as an assumption about the kinds of communication that might be desirable). But it was quickly apparent that the isolation assumption was relatively pervasive.[56] Indeed, a large part of the reason for the 1994 RAWOO study of universities, research institutes, and NGOs was curiosity about the social networks of researchers in Ghana, Kenya, and India.

With the development of Hypertext Markup Language and web browsers, the email and information retrieval technology of the Internet could be viewed as isomorphic with the formal and informal dimensions of scientific communication, and attention returned to the problem of isolation. Among the initiatives brought by Guests to developing areas, the Internet has features that render it uniquely interesting. Unlike most other technologies—'appropriate' or not—the component costs of processing information have been falling. Each time I return, my money goes further, buys more switches, more UTP cable. Too—and this is a matter of personal opinion—there is a degree of personal interest in communications that is absent in most other initiatives. It is important to stress that the 'Internet' is not a single technology. The 'Internet', the 'Net', and the 'Web' are shorthand that emphasize the interconnectivity resulting from a variety of initiatives involving what are variously called electronic networks, computer networks, informatics, Information Technologies (ITs), Information and Communications Technologies (ICTs),[57] telecommunications, and even, simply, 'computers'.[58] While the latter terminology

[56] Arvanitis and Gaillard 1992; Salomon et al. 1994; Shrum and Shenhav 1995; Gaillard et al. 1997??

[57] ICTs, the most common term used in the development context, can refer to telecommunications equipment or services, Internet service provision, libraries, commercial information provision, broadcasting, and information services.

[58] The most comprehensive review of studies in Africa is by Catharine Nyaki Adeya, who identified 62 items during the past decade. ("Information and Communication Technologies in Africa: A Review and Selective Annotated Bibliography 1990-2000," International Network for the Availability of Scientific Publications, 2001. http://www.inasp.org.uk/pubs/ict. Of the items that contain major case studies or surveys of ICTs in specific countries South Africa is most often the focus (represented by 14 studies), after which Kenya (12), Ethiopia (9), and

seems peculiar to me, it is nonetheless true that the technological trajectory of the past decade has led many to feel that the presence of a computer is synonymous with connectivity.[59]

But the notion that the Internet might be used for the promotion of science in developing areas is very recent. The 1993 chapter on Africa in UNESCO's first World Science Report makes no reference to communications technology, though its theme is 'transboundary linkages and intellectual intercourse'[60] Abdus Salam himself returned to the theme of isolation twenty seven years after his classic article in Minerva.[61] Reviewing the legacy of the Trieste institutions he helped to found,[62] he mentions only programs of visitation and training, all of which were assumed to involve physical co-presence, modalities 'created to help physicists from the developing world to be able to resist the temptation of migrating'.[63] Salam regretted that his International Centre for Theoretical Physics[64] remained 'essentially a one-off enterprise'. His 1993 review of partnerships and cooperation between scientists in Europe and the Third World contains not a single mention of telecommunications technology as a means of promoting cross-national interaction.

Yet by 1995 the United Nations Commission on Science and Technology for Development began an attempt at an 'exhaustive' review of ICTs in developing countries 'in the

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Ghana & Nigeria (7 each). As indicated at the outset of this essay, and shown by Adeya's annotations, major topics continue to have 'capacity building' emphases, covering information infrastructure, networks, computerization, gender, developing an information economy, information management policy, libraries, electronic publishing/CDs/databases, education, and training, Studies with a socio-cultural or political focus are rare.

[59] Barry Wellman, 'p2031

[60] Thomas Odhiambo, 'Africa', in World Science Report (Paris: UNESCO, 1993), p. 86 of 86-95. The complete omission in 1993 is perhaps not so curious as the single mention in the 1998 Report by Titus Adeboye ('Africa', p. 179 (pp. 166-181)). Though India is now often considered a prime example of Internet development, the first Report, written in 1992-1993, contains only one reference to telecommunications in South Asia.

[61] Op cit. note 1.

[62] These include the International Centre for Theoretical Physics, the Third World Academy of Sciences, and the Third World Network of Scientific Organizations.

[63] Ibid, p. 168.

[64] Salam's discussion of the ICTP makes explicit mention of the Guest House for 100 built by the Italian government.

context of inconsistent arguments on the benefits and risks'.[65] The same year, when the International Council for Science[66] formed a Committee for Capacity Building in Science in 1995 to assist science in developing areas, one of its three principal issues was the 'problem of isolation'. Returning to the independence-era agenda of Dedijer and Salam, connectivity became the new problematic—indeed, it rapidly became the primary initiative in science policy for development. In STS it is now taken for granted that 'problems' are often discovered (in this case, rediscovered) in the wake of their technological 'solutions', and the installation of the Internet rapidly became a central developmental initiative. It would have no central authority and no overall plan. In order for scientists to flourish in Africa, Asia, and Latin America, it was felt that their lack of connections to the formal and informal communication structures of science must be remedied. For me, in the mid 1990s, coding surveys, writing code, reading field notes from my recent emplacement in Africa and India, I often wondered whether I had sojourned to Samarkand or Kandhar. To be sure, there was plenty of knowledge-making underway in the organizations I visited. Whether there were professional networks that crossed national boundaries, and whether there were opportunities to collaborate on local problems under conditions of resource scarcity was another question.

The reason for the puzzle was simple. When computer communication was already widely perceived as a cutting edge communication technology in the US and Europe, the Internet was not high on the list of priorities for scientists in Africa.[67] Fewer than 10% of the scientists we spoke with in 1994 had any kind of access to electronic mail and many of these were in

[65] Arnoldo Ventura, 'National Information and Communication Strategies for Development: A United Nations Commission on Science and Technology for Development Perspective', pp. 45-47.Information and Communication Technology and Development July 18, RAWOO Lectures and Seminar Series Vol. 18

[66] describe?? Mention Leon Ledermann

[67] In the paragraphs that follow, I refer to findings from the 1994 RAWOO study in Kenya, Ghana, and the State of Kerala in southwestern India.

international research centers. Of academic and government researchers, a mere three to four percent had some sort of access. There is no need to emphasize for an STS audience that access is not use. More striking than access was the lack of consciousness. It is not much of an exaggeration to say that electronic communication was wholly absent from the agenda of key research sectors in Kenya and Ghana. Given the importance attached to participatory development by our Dutch funding body, it seemed essential to ask scientists themselves how they viewed the matter of improving their research systems.

As I examined the results in late 1994, I was surprised to find little evidence for any consensus on the importance of the communications I took for granted. When asked directly about electronic communication needs, scientists did not consider this one of their highest priorities. From a list of twenty possible actions, the two concerned with creating electronic communication networks were rated fifteenth and sixteenth respectively. 'Creating international electronic communication networks' received the lowest priority for any of seven actions involving communication, networking, and group linkages. True, Indians were more concerned with electronic communications than Africans in either location, but those in the poorest research system (Ghana) were the least likely to see electronic networks as important. And if that were not curious, scientists in the international organizations in Nairobi were not particularly concerned about the Internet. One said to me in late March of 1994:

> It'll be another white elephant. The donors will come in and try to establish electronic links, then leave and not support the system. It's not that important.

In the years that followed, this 'white elephant hypothesis' has remained with me. Only 14% of these researchers—a very low figure on these type of items—felt that creating electronic communication networks within Kenya was 'very important'. One supposed that if electronic

communication networks were an unalloyed benefit, then scientists at international centers—the only individuals to have regular access to such technology—would rate them more highly. Yet more than one third of them said electronic communication networks were not important.

I wondered: Why did Kerala scientists—most of whom seemed sharp and insightful—not jump on the bandwagon? Why did Ghanaians and international scientists think it might be the next appearance of the White Elephant,[68] perhaps one of those cases, in the opinion of Odhiambo, where Africans should 'look gift horses in the mouth'? There were two main reasons. James Opare, a doctoral student from Ghana who was finishing his Ph.D. in the U.S., had done many of the interviews in his home country. He was certain that his compatriots did not know what electronic communication was—'after all', he said, 'we didn't explain it to them'. What the Internet was in 1994 bore little resemblance to what it has become. A second reason, equally important, was that scientists did rate the improvement of libraries and linkages between relevant social groups highly.[69] Scientists in Africa and India were not confusing ends and means. Whether the Internet could be of any assistance was yet to be seen. The means of communication were not viewed as the ends--information acquisition and networking. In 1994 there was little scientific content on the Web. And many scientists were not at all sure who could be reached by email, or how it worked.

How, then, will the Internet affect the 'isolation' said to characterize scientists in the Third World? If isolation is not simply a state of mind, then it should have a clear interpretation in terms of social networks: isolation is separation from others, a lack of contacts or social interaction. This seemed possible to test. We used data on the 293 scientists interviewed in

[68] Op cit., note 60, p. 91.
[69] SCOT/Bijker reference.The four highest priorities were providing operating funds for field and lab work, expanding and improving libraries, improving communication between researchers and extension, and improving links with international research organizations. Apart from operating funds, the Internet has a potential impact on each.

Kerala, Ghana, and Kenya to examine the extent and character of professional networks. The picture of social networks that emerged was primarily local in character. Scientists had numerous social and professional ties. Most of the professional linkages of scientists in these locations were to others within the national research system. There was nothing surprising about that, but what did it mean?[70]

VI. Futures

The primary issue in discussions of isolation, capacity building, and collaboration within and between distant lands involves the search for a better understanding of the kinds of professional networks and the types of collaboration relevant to the conduct of particular kinds of research. That is, what types of linkages are relevant to the making and reception of particular kinds of knowledge claim. It is curious to argue for partnership, exploitation, segregation, or desolation without a sense of the conditions under which researchers operate in their local, everyday contexts. What I read in the literature were 'views from afar'. Like the piece by Shrum and Shenhav in the Handbook of Science and Technology Studies, such views do not attend deeply (for myself at the time, not at all) to conditions as they are experienced in Africa or Asia or Latin America.[71]

Relationships are part of everyday life, and professional relationships exist in the context of the range of activities that characterize social categories that include Guests, scientists, and research managers in reagentive initiatives. Whether researchers are 'connected' or 'isolated'

[70] This sample included professionals from universities, state research institutes, and NGOs (Wesley Shrum and Patricia Campion, 'Are Scientists in Developing Countries Isolated?', Science, Technology, and Society, Vol. ?? (2000), ??).

[71] When Yehouda Shenhav and I wrote a review essay on 'Science and Technology in Less Developed Countries', for the Handbook of Science and Technology Studies, (1995) Edited by Sheila Jasanoff, Gerald Markle, James Peterson, and Trevor Pinch. Newbury Park: Sage), we reviewed work from 1977 through the early 1990s. Neither of us had spent a great deal of time in less developed countries, and knowledge of the matter was limited to the literature, a classic example of the 'view from afar'

can only be assessed in relation to some criterion. What was to be the standard of comparison for levels of connectedness? It did not make sense to me, in the pre-Internet era, to compare the personal networks of African scientists directly with the personal networks of scientists in the North. I could do it, in some fashion. I had information about the communication networks of a sample of U.S. scientists collected in 1980 for my dissertation. The sample was drawn from the same organizational contexts. We had asked many questions about the frequency of contacts with various sectors. American scientists, for instance, reported more frequent contact with government and business while African and Indian scientists reported more frequent contact with universities and national research institutes. Membership on government committees, advice to NGOs, consultancies, and attendance at project or program review meetings were roughly similar. Even reports of the meetings attended were not radically different: about five per year for US respondents, compared to about three per year for my Southern sample.[72] Given that the US sample was selected using a high productivity criterion—hence relatively elite—while the African and Indian researchers were not, there was no immediate evidence here for any general hypothesis of 'isolation' of scientists relative to those in the developed world.[73] In any case, a comparison of US scientists in 1980 with African scientists in 1994 was nothing to write home about.

Even if I designed a new study, with precisely the same questions, that would not solve the problem. It is never just numbers that matter when you study science in far away lands. You walk a lot, wait a lot. You meet the scientists, talk to people in their offices, discover their children playing near the goats. You learn not just about research on poverty alleviation through improved dairy practices but also that the next Gospel Crusade features 'Six Days of God's

[72] (Shrum 1985: 154-55, 159)
[73] but for the scientists in the private sector

Power Manifest'. Much of what you find is not in your interviews—it is participation in life where you read the Daily Nation and not the New York Times. In the universities, the research institutes, the NGOs of Africa and India there is a different sense of time, of pace as well as place. There is a loveliness and quietude that does not exist in the scientific centers of the North. I could understand how Abdus Salam, just back from Cambridge and Princeton, would find himself 'desperately isolated' when he returned to his native Pakistan.[74] But he had in fact returned to a place with a heavy teaching load and extensive service tasks—something many in the U.S. face as well. The 'feeling of isolation' conflates many issues. Had he come from a different place and a different field, he might have returned to Kenya during a World Bank visit to reenergize the Kenyan Agricultural Research Institute or joined a team of breeders in Ghana working with an international center to develop a new variety of insect-resistant maize. He might well have found that exciting, a new beginning, an opportunity for change. The feeling of isolation is something that members of my own department experience on a regular basis. Since they do have fast access to the Internet, it could just as well be the feeling of inundation characteristic of so many others. The sight of an empty email box can be one of the best feelings in the world!

Computer networks are social networks.[75] The principal argument of this essay is that all initiatives are reagentive, since they transmit streams of projects by means of identities into the scientific systems of developing areas, but only the Internet has the potential to change the structure of science by shifting the relationship between identity and place.[76] There are several reasons to suppose that widespread introduction of new communications technologies could

[74] Op cit., note ??, 167.
[75] Barry Wellman has argued this most forcefully in a series of works dating to the mid 1990s.
[76] The connectivity initiative will not change the source of funds in any direct way, but resources for research do not originate in performing organizations with the exception of the private sector.

integrate researchers in Africa, Asia, and Latin America with those in Europe and U.S., but 'digital divide' issues are very real. I do not know what will happen when the Internet comes to Africa in a meaningful sense—and not in the partial, even trivial sense in which maps of 'connectedness' imply that one can somehow make electronic contact with an African scientist, or that they could 'just download a PDF' file of an essay on the web. However, four concrete issues seem crucial to understanding the effects of new communications technology on the globalization of science.

Are the short term consequences of the interactions facilitated by new communications technology valuable indicators of long term consequences?

Age, Diaspora, and Latecomer effects are the most obvious short term consequences of the nascent Internet connectivity in sub-Saharan Africa. As I was struggling to find Internet cafes in Accra, trying to establish 'line-of-sight' from rooftops for a wireless connection, and trying to discover the university connectivity plan at the University of Ghana, I stumbled across a student run Internet café at one of the residence halls. In late 2001 most residence halls had one Internet café, and some had two. Student demand for Internet connectivity had vastly outstripped that of the university faculty, and "24/7" terminals were often in continuous use. In Ghana and Kenya typing skills are rarely acquired in schools, so the willingness to expend scarce educational resources on relatively expensive connection time is an important indicator of the motivation to utilize these facilities for university students. In the short term, Internet use is an expensive novelty. African students learn how long it takes to download a song—and the music no longer appears free.[77]

[77] A survey of telecommunications in the late 1990s, conducted as background for a World Bank project on connectivity, discussed the use of FidoNet at the Balme Library of the University of Ghana, a store-and-retrieve email system. Since it was a centralized system, it was put in a main university library and students were the primary users. The primary use of the system at the time was to obtain information about graduate study abroad

But keeping in touch with relatives in the African Diaspora is another matter.[78] The Diaspora hypothesis holds that Internet use primarily reinforces contacts between expatriates and their families in the short term. It is important to discover whether the skills and usage habits developed by university students in the short term lead to long term relationships and collaborations in the long term. Just as the primary use of the outdated FidoNet email system was to find ways of leaving local conditions for study abroad, the mechanisms for and consequences of such study generate a small and growing population of Internet-literate researchers. As a global market for scientists and technically trained researchers begins to develop, what can be viewed as 'brain drain' can also be seen as creating diasporas that provide valuable network resources for the home country.[79]

Latecomer Effects are a way of referring to the bridging of the Digital Divide. While this is bridging is often viewed as an unalloyed good, the reduction of inequality in electronic access is not the same as the reduction of economic inequality. For those who have used the Internet for a decade or more, the novelty is gone: email communication is a routinized form of interaction (Ref to AoIR) and web browsing is no longer a form of amusement or amazement. The idea that massive volumes of information are available on the web is as likely to generate feelings of exhaustion as exhilaration, and web 'drop outs' are already a subject for Internet research. For science the key issue is relational: by the time that connections become more available and reliable in Africa, will scientists in the First World be interested in research collaborations of the

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(Seini et al. 1998, p. 4). Early users of new communications technology were not thinking to remain in place. To the extent that is changing, it is critical to understand the dynamics of connectivity projects in local areas.

[78] While there is not a great deal of data available on the issue, one form of evidence comes from the use of African news sites on the web. For example, a spokesman for AllAfrica.com claims that while only 5-10% of users are in Africa, most of the users are Africans in the USA, Europe and Asia. (Akwe Amosu, as quoted by Russell Southwood, (Balancing Act's News Update 113: AllAfrica.com "Allafrica.com carves itself dominant position as African news provider," http://www.balancingact-africa.com/)

[79] UN Development Report 2001. (31).

traditional variety?[80]

Will the Internet change the frequency and character of relationships with colleagues outside the local context?

Beyond the general finding of localized professional networks, two features seemed interesting and important in the 'pre-Internet' data on scientific communication in 1994. First, the professional networks of those educated in the developed world did not look much different than those educated in Africa and India. University professors who had been educated in the U.S. and Europe had no greater contact with Western scientists than those educated locally. It seemed that researchers who went abroad for training were quickly 'reabsorbed' into the local system, and did not maintain any kind of regular linkages with others they had met or worked with during the days as a Master's or doctoral student.

When I mentioned this counterintuitive finding at a conference in early 1999, the individual in charge of a USAID training program declared that they actively promoted continuing ties with advisors and colleagues in the U.S. where the individuals were trained. I returned to Kenya that summer with a list of the individuals trained by the program—scientists scattered at the many branches of the Kenya Agricultural Research Institute. As I went from station to station, I asked each of the graduates about their professional ties: Very few maintained any contact with individuals in the U.S.—apart from an occasional letter of recommendation, or visit by the program supervisor, there were generally insignificant levels of contact. Links to advisors and colleagues were simply lost owing to the difficulty of communication—the example of the prison at the beginning of this essay is an extreme case. Scientific Guests often provide a communications budget for their projects. Some of these Kenyans, who had experienced dialup

[80] Once again, the type of collaboration is important. Data sharing collaborations are different in character than research collaborations.

email connections funded by earlier projects, were no longer able to communicate at all outside their research institute—except by postal mail or courier.[81]

Scientific communication in Africa may be contrasted with the European or U.S. context. First, the costs are relatively high and must often be covered at or near the access point by the individual who sends or receives the communication. Second, the ultimate source of funds is often a Guest, via a research program or project. Many Kenyan scientists have experienced email. Many have had relatively better telephone links in the past, funded by one of the World Bank's attempts to develop or revive national agricultural research systems, or bilateral donors. Natural termination or withdrawal of these projects leave the stations, and the scientists at those stations, without email, fax, or phone links. Professionals have such different utilization patterns for these resources that they often do not know precisely when connectivity was lost. What I experience is <u>not</u> that African researchers do or do not have certain media of communication available. Rather, the constraints on communication in distant lands are more variable than those experienced by Western researchers and depend fundamentally on the identity of the Guest. In such a communication environment, the advent of the Internet could have a significant impact not only on access to information but also on the maintenance of ties to mentors, advisors, and colleagues abroad. But students of science and technology must come to study these constraints firsthand. Owing to project dependence and temporal variability it is <u>useless</u> to read off the level of connectivity from Internet maps.

[81] Telephone connections are sporadic, even in Nairobi, but are typically worse in outlying areas. One of the principle inefficiencies in communications is that the ringing signal is not replaced by a recorded message when the line is disconnected, such that scientists do not actually know if a failure in connection is due to the fact that an individual is not in his office, due to a temporary system overloads, or due to a nonexistent phone line. Since lines are connected and disconnected owing to the vagaries of payment, and are not reassigned or permanently unavailable, a great deal of time may be spent trying to contact people via numbers that are nonworking. In several cases I witnessed, a secretary or scientist spent hours, on and off, trying to call someone at a research station who in actuality did not have a working phone. Mobile phones have become de rigeur for professionals by mid 2002 in Kenya and Ghana.

Will the Internet change the inverse relationship between internal and external linkages?

The second major finding from the 1994 data on scientific communication was the negative relationship between the size of local and international personal networks. For scientists in government and university settings, those with more ties to the developed world had fewer local ties. Conversely, those who were most strongly embedded in local networks had few linkages outside the national arena. Like most findings, it admits of more than one interpretation. Still, it was at least consistent with dependency and policy arguments that scientists with international research interests are drawn away from local affairs. It is also possible that time and energy are limited, and the costs of communication require tradeoffs—the more frequently and intensively one communicates with colleagues in the local environment, the less one interacts with those in the international context.[82]

In the 'classic model' of communication summarized by Thomas Schott, scientific networks operate at three basic levels.[83] At the micro level is a reference group or 'collegial circle' of an individual scientist. An intermediate or 'meso' level is defined in geopolitical terms by a national scientific community. The macro level of analysis is the 'global scientific community' or 'scientific world system'. Writing in the early 1990s, Schott noted that interpersonal ties were more common at the local or national level and for this reason, links between scientists at the global level have been viewed more in terms of shared norms than personal contacts. The Internet may—or may not—create communities of knowledge workers that incorporate Africans in a significant way. To put the question from the African perspective,

[82] The reciprocal effects of local and international communication is a different question that the effects of email of face-to-face interaction. It may be, for example, that email decreases local F2F encounters, but increases cross-national F2F. In Johan's experience ((email for quote)) of interviewing a guy in 1994 and finding out there was a guy ?? he already interviewed doing exactly the same thing, is probably not typical--but illustrates the comm'tion problem

[83] Thomas Schott, (1991, 1993) but see Shrum and Bankston for an alternative view.

can researchers develop synergistic rather than competitive relationships between knowledge contexts?

Clearly, with our present state of knowledge, we do not know what forms those relationships may take. New comparisons of scientists in distant lands with those in the U.S. and Europe will be important. But it may be more illuminating to compare scientists within and among countries in Africa, Latin America, and Asia.[84] Even the false notion of isolation implied that researchers from the least developed countries were the most isolated—that is, there should be some association between the level of scientific development and the professional networks of scientists. If scientists in the U.S. and Western Europe are viewed as working within a global scientific 'center', we would not expect to find scientists in Africa developing professional networks that are somehow equivalent to individuals in those locations. Connections to the center are not the same as connections within it for the simple reason that scientists outside of any physical location have fewer opportunities for face-to-face interactions within that place than those within it have with each other. We must determine what forms of interactivity and patterns of connectivity characterize the networks of knowledge workers in the diversity of scientific contexts that now exist.[85] I wondered again: What would happen if the scientists I once interviewed were online? I was never likely to find out, at the rate things were going in the late 1990s.

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[84] Consistent with the idea that the general context of a social system affects the characteristics of the social networks, research tends to show that economic development is related to the way networks are organized and kinds of resources generated (see, for a good overview, Barry Wellman (ed.) Networks in the Global Village:Life in Contemporary Communities (Boulder, CO: Westview Press, 1999). Highly industrialized societies are characterized by personalized and specialized networks, often based on shared interests, that are less geographically localized and less intensely connected. In less industrialized societies, people must use networks for material resources and daily necessities. Not only are networks more local and tightly interconnected, but direct reciprocity in exchange (the immediate return of favors) may be more common.

[85] The advent of mobile telephony has added a significant new medium of telecommunication in Africa and has the potential to affect the diffusion of the Internet. As Africans adopt mobile phones—primarily used for local and internal communication—they invest resources in cost and time that reduce demand for the Internet—a technology that analogizes internal and external communication, thereby promoting globalization. Utilization of mobiles should, therefore, slow the globalizing tendencies of Internet technology.

Will the connectivity initiative last long enough so that scientists in Africa experience a communication environment similar to scientists in OECD countries?

I have been cautious throughout in making claims about what will happen as the result of the connectivity initiative. Partly that is a preference of scholarship. Mostly it is because the places I know best are those I am most unsure about. This final issue is just a rude query, based on a 'dustbowl empiricist' curiosity, though the answer is fundamental to those that precede it.

What is frustrating about the advent of the Internet is that its consequences for science are so difficult to predict. That, of course, is why it is beguiling as a subject of scholarly interest. Accounts of science in the developing world typically focus on colonialism, capacity building, or patterns of co-authorship in publications. While these studies are valuable, most share an explicit evaluative frame, taking Northern science as a standard or model, assuming science in the South should emulate its institutions, patterns, and values. A significant minority take Northern science as an exploitative, imperialistic residue that should be rejected in favor of indigenous knowledge production systems. This account of science in developing countries has been thematic rather than evaluative, focusing on the identity of the Guest as a reagent engaged in collaborative redirection. Internet technology, by changing the relationship of place and identity, may well do what other initiatives have failed to do, by shifting the projective orientation from one in which interactions end with projects to one in which relationships are developed and maintained.

The argument here is that the connectivity initiative ('collaboration writ large') changes the projective orientation in a different way, by unhinging projects ('collaboration writ small') from the place of action, specifically by de-linking place and identity. The questions here are the first step in developing a new problematic for the social analysis of what many view,

misguidedly, as peripheral science.

The concept of agency reviewed in section one assumes, on the other hand, that the element of projectivity does not equally characterize all cultures, individuals, or institutions. There are notable differences in the particularity of practices embedded in the technologies as well as the collectivities that promote and solicit commitment, differences that have an impact on the degree of 'freedom' or maneuverability that people experience in relation to existing structures.[86] The ideology and practice of modern science and technology involve a projective orientation that emphasizes constant change, an important element in the conventional claim that science is opposed to traditional cultures. This makes it seem, to many observers, that if indigenous cultures would simply adopt a scientific attitude, then certain kinds of change would occur. The Web, on the contrary, is a technological system, a grid of cable and radio waves, and optical fibre, that changes the projective orientation in a different way, by creating (possible) interactions. The Net is very simple: sema sawa ('talk now'),[87] and ('know all') ((email mbatia for translation)).

This shift has very little to do with the 'participatory' initiatives of donors, which are largely undermined by their own condition of contiguity, and even less with 'sustainability'. This essay has sought to re-place 'development'. Donor presence is not donor influence, except in the trivial sense that the presence of any social actor influences the behavior of others in some way. The idea of the market for projects and the vastness of the Third World generate the variability that undermines any such claim of unilateral 'influence'. Counterparts, cooperation, and sustainability are important notions, often promoted as part of the general principle that

[86] Emirbayer and Mische, op cit., note ??, p. 985. Contrary to their claim that an 'internal chordal structure' involving narrative construction, symbolic recomposition, and hypothetical resolution is the basis of projective orientation, the unhinging of identity and place through technological deployment is at the root of projective change.
[87] Ki-swahili for 'talk now.'

developing nations should gradually assume the responsibility for their own development. Such approaches have not eliminated Guests because the identity is based on co-presence. To paraphrase Emirbayer and Mische, those who feel both creative and deliberative in pursuit of benevolent objectives are often highly reproductive of received contexts.[88] But as Guests devolve to the Internet they are no longer Guests—they are locally situated interactive partners.

Well, I was once a 'donor', back in the early 1990s. Imposter I might have been, but this is the point about Guests—an identity is no guarantee of anything. A phony donor is as good as a real one, except for the money. And real donors often come with promises they do not keep. Perhaps I could connect the scientists—at least a few of them—but it had to be soon. Most initiatives have a finite lifespan, their 'sustainability' limited by resources and competing interests, their programs and projects fizzling beyond the funding period. Donors and development institutions have grown weary of direct investment in science and technology, even agricultural research, but the connectivity initiative fires imaginations, funds programs, and fills pockets. Could I try to build the Local Area Networks that link scientists in institutes or faculties with a gateway to the web?[89]

The claim that the Internet is a different kind of collaboration is based on the notion that a functioning system would imply relatively continuous, low-cost access to email and web browsers. One consequence is that users have unprecedented opportunities for social interaction, data sharing, and project collaboration. Put simply, collaboration will not depend entirely on co-presence; the differences between local and distance collaboration will diminish. Such predictions have been common since the beginning of the Email Era and are important to the

[88] (E & M, p. 1008)

[89] Fortunately, as I came to discover, my own small part of the Internet collaboration was funded by the U.S. National Science Foundation—no part of the development matrix.

reagency of the Internet—a focus on future possibilities, on forms of projectivity that emphasize change and the elimination of barriers to cross-national contacts and international scientific collaboration.[90] Researchers elsewhere and anywhere will be able to experience the communication environment of a scientist in the North. As regards resources for knowledge and possibilities for collaboration, there will be no difference.

Set against this projection is the current state of the Internet in many parts of Africa, including Ghana and Kenya. Funds are now available for many types of connectivity, but rarely for other components of the technological system that would provide a functional connection. Most important, computers (or 'Internet-compatible' computers) are rarely provided. Computer purchases were part of an earlier wave of donor support and have begun to taper off, except in the course of specific projects. Often, the allocation of computers has been to administrative and secretarial staff. As one of my collaborators put it, 'we treat it [the computer] like a baby'—with great care, under lock and key—hence, largely unused. Until familiarization and routinization set in, until the Internet becomes a daily occurrence like reading the newspaper or, in the scientific realm, scanning for information, the impact will be quite limited. The Internet is not 'American culture' ((email Agree)), but the culture of regularly checking email and proficiency in web searches is important.[91]

When computer-mediated communication becomes part of everyday life relationships are easier to form and maintain. So the first and most important places are those in which my collaborators do their email, worry me about the budget, struggle to produce texts that describe

[90] Castells, disappearance of distance. Gary Olson. "Distance Matters."
[91] Check your damn email is a culture that some have and some haven't.. so long as web relationships are a separate set of relationships—as implied by the literature on web-based communities and online interaction—they are unlikely to play any large part in the scientific world. when they are part and parcel of one's interpersonal, daily interaction—the relationships will be collaborative in the small sense. wellman's 'global village' review—for hypothesis on the kind of networks likely to emerge.

their experience and their data, and participate in negotiations over who gets what. If I am successful I will no longer be a Guest but a collaborator. The jury will be out on this question for some time. As these last words are written at the Central YMCA in Nairobi, satisfaction is mixed with apprehension. The first hardware purchases were made yesterday—at last I am a real donor and not just a perceived one. But a student has been killed by the police last night, and today there are shouts and shots. The students stone the police barricades near the traffic circle and the windows must be closed to the tear gas. If the YMCA only had email? Guests and collaborators are never out of place.