

After The Fact

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Science for Survival: Nurturing Aquaculture in the Amazon

By Jim Oldham

ISIS has a multifaceted vision of reconstructive science, one piece of which we call Science for Survival. I recently looked up an explanation of the concept in an early grant proposal:

At the time of the forming of ISIS, discussions with Dr. Bhasker Vashee, international economist and policy analyst, led to the notion of "science for survival," a combination of indigenous knowledges necessary to survive the onslaught of modernity with the best of high-technology ecological solutions. Preserving old traditions and combining them with the newest science in creative ways is the goal of this project...

It was the opportunity to put this notion into practice that led to the formation in 1996 of the Secoya Survival Project, which I direct. Our work in Ecuador since then, particularly our collaboration in aquaculture with the Secoya, has been based on the idea that the combined resources of a traditional culture and modern scientists can find solutions that neither could alone.

When the Secoya told us they were interested in fish farming, and had begun building fish ponds but were uncertain how to proceed, we agreed to work with them. Our belief was that the Secoya knowledge of local fish species, climate conditions, and their own dietary needs, joined to our consultants' knowledge of hydrology, fish husbandry, and research techniques, would be a powerful combination for developing an aquaculture of native Amazonian fish. We also hoped that our Indigenous Aquaculture Initiative would benefit from two very different world views: the Secoya's respect for the rainforest and

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Military Cleanup: NTEN on the Road

By Jeanne Stevens

In recent issues of *After the Fact*, news accounts from the trenches of the Military Waste Cleanup Project have included initial reports about the latest focus of the project, the National Technical Experts Network (NTEN). What began as a vision several years ago has evolved into a concrete project over the past two years as ISIS staff outlined specific research goals and secured funding support from the U.S. Environmental Protection Agency (EPA). In this issue, we are pleased to announce that the next phase of the NTEN project is officially here and it's going on the road.

The NTEN, as you may recall, is a national network that unites scientists and knowledgeable citizens working in military cleanup to exchange information, expertise, and ideas to help each other address the daunting technical and regulatory issues of environmental cleanup. These individuals may include citizen-scientists, environmental scientists, high school teachers, professors at local universities and community colleges, environmental activists, librarians, and editors and journalists from local newspapers. We believe creating links among these individuals

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Letter from the President: Welcome to *AtF*

Welcome to another *After the Fact*. It's been an exciting time period at ISIS since we last wrote to you, some (but not all) of which is reported in the articles on the coming pages. This issue showcases several of the ways in which ISIS's unique approach to making science responsible in our increasingly complicated world can be truly varied and powerful, educational and enjoyable. Through active projects and ongoing research, seminars, and writing, we put scientists together with science analysts and other citizens in novel ways to work for effective understanding and intervention on some of the most complex problems we face as we enter the next century. Here's some of what we have to share this time:



The history and evaluation of the Secoya indigenous aquaculture project is a perfect example of ISIS as a modern-day "house of experiment," learning and growing in its work. Jim Oldham's article takes a candid and constructive look at some of the effects of our science-for-survival approach to aquaculture. By having traditional ways of knowing inform scientists, we hope to develop a technology that works appropriately within the context of rainforest culture. In turn, the technicians and scientists from our culture will learn—and value—something we hope they bring back into their own work. This is the very spirit of the deeper ISIS mission: using the experiments of ISIS projects to affect our own work in and with the sciences. And it helps flesh out the vision of defining science through community needs and demands: a more responsive and democratic form of science.

Back at home, our seminar series this fall took on a more light-hearted spin: a film series described on page ten by Heidi Lenos and Catharine Bell-Wetteroth, two wonderful ISIS folks with new roles this fall. As always, the series was a prime, public-oriented effort to get the ISIS word out. We used mainstream Hollywood movies both to address tough questions about how the sciences work in our world and to look at how our world portrays the sciences in its most accessible forum. From *Sneakers* to *Bladerunner* to *Pi*, these hits have stimulated rich discussions to help ISIS spread a greater and more complex understanding of the sciences that we shape and that shape us. Again, ISIS's mission is at the foundation of what might seem at first glance a tangential activity.

Energy Choices Project Coordinator Scott Tundermann reports on the reconstructive possibilities within marketing science and consumer research: advertising that helps Mother Earth. Our project pursues a "repositioning" cam-

paign to portray green energy as the hot, with-it, and sexy Next Thing while simultaneously undertaking the reconstruction of the science of marketing-related consumer psychology. As the project progresses, it comes across the inevitable practical and strategic quandaries every project faces. Scott's article (on page seven) discusses the ins and outs of town-based electric-power purchasing blocks (called aggregates) in the Massachusetts context, and the implications for our next steps.

Our Military Toxic Waste cleanup project, now in its second month of national funding, is underway with the networking effort central to our vision of a science-based, community-directed cleanup. The idea is that active citizens, assisted by their own citizen-scientist members, can best oversee the military and the complex steps necessary to remove the "threat at home." Coordinator Jeanne Stevens has been building our NTEN network of several kinds of experts. Her article connects her outreach and research into people's struggles with complex technical matters to the learning we've gained from the scientists, teachers, and other citizen experts we've met at recent conferences all over the country.

As always happens, there are other ISIS activities not represented by an article in this issue of the newsletter. The quantum physics project boasts two sabbatical appointments for me: as a Scholar at the Institute for Theoretical Physics in Santa Barbara and with Charles Bennett's group at IBM Watson Laboratories. Meanwhile, *the* best article on quantum teleportation appearing in *Scientific American* was written by another collaborator of mine. We are currently developing the history-of-science component with Joan Bromberg, who has come up with a detailed plan for exploring the transitions that led to quantum information theory as a separate sub-discipline.

ISIS Fellow and *AtF* mentor Mike Fortun has been making good use of

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Back issues and more at
<http://isis.hampshire.edu>

his fellowship at the Institute for Advanced Study in Princeton, getting back to his writing and research with this reprieve from teaching. Some of his always enjoyable and insightful work will help fill the pages of the new ISIS journal, whose second issue (the first as a publication independent of the newsletter) will "hit the stands" in March.

Of course, we have no complaints about being too busy to encompass all aspects of our work in a single issue of *AtF*. Our loyal readers will just have to wait for the next one to get the rest of what's been going on!

The activities and projects we report on here, indeed the entire ISIS approach, present a wonderful response

Of course, we have no complaints about being too busy to encompass all aspects of our work in a single issue of After the Fact.

to the complexities and problems of modern science. Our program has finally reached the stage *this year* where the scale and impact of our efforts are national and bio-regional: while they have helped thousands of people in the past, with your help we can reach tens or even hundreds of thousands of people in affected communities next

year. For example, the Secoya work, with its historic "code of conduct" for an international oil company working in the rainforest and its blend of new and old sciences, has elements for emulation and distribution throughout the Amazon; and our military waste cleanup project

will be going national and has already contacted leaders and experts from installations whose pollution threatens hundreds of thousands in neighboring communities. We count on you to be a part of these efforts. Please use the tear-off sheet on page 11 to contribute what you can, whether earmarked for a specific project or in general support of the Institute as a whole. Put a few of your dollars to work making science safer and wiser for our world.

From all of us at ISIS, best wishes for the holidays and a wonderful new year. We'll write again soon.



Herbert J. Bernstein
ISIS President

Science for Survival

from page 1

Evaluating results

tradition of living lightly on the land, and our scientifically based belief in the importance of preserving diversity and applying the precautionary principal to our own work.

Since 1997, we have provided technical advice to the Secoya regarding pond construction; training in pond management, fish handling, and the like; and material aid ranging from PVC piping to fingerlings (baby fish) for stocking in ponds. The project has emphasized the importance of working only with native fish. This avoids the negative ecological consequences of introduced species, such as tilapia, the African cichlid. Also, Secoya knowledge of native fish enhances the project and local species better meet their cultural and dietary needs. We have actively discouraged the importation of aquaculture techniques involving the heavy use of purchased inputs such as cement or factory produced fish food.

Now, some three years after we started, we need to ask how we are doing. Over 100 families, in the five participating Secoya and Siona villages, have built fish ponds and begun to farm fish. I never know the exact number because the project grows on its own, with families imitating their neighbors and cousins teaching cousins. While the Secoya have been stocking ponds with wild caught and nursery raised fish as the ponds became ready, just over a year ago we stocked some 50 ponds with the fruit eating fish, cachama (*Colossoma macropomum*). We now can evaluate not only social factors such as community interest and participation, but also technical questions such as pond stability and fish survival rates.

Preliminary data from pond surveys and fish farmer interviews indicate that the project faces a number of challenges. First of all, we still have not eliminated pond failure due to poor siting or inadequate construction. A sur-

vey of 19 ponds in two villages found that 6 of them had their dams breached by heavy rains. Even among ponds that aren't breached, the tough climate conditions of the Amazon are a challenge for our low tech approach to pond construction.

It is a struggle to design an earthen pond that can both withstand heavy rains and retain enough water in the dry season. The work begins with identifying a site that has a continuous flow of water year round yet will not have excess water in the rainy season (or allows for diverting some of the heavy flow). Then it requires careful construction of a dam, with spillways to let excess flow pass and prevent erosion. One also needs to protect against seepage through the dam or pond floor in the summer months.

If materials were made available only at the rate our consultants and local experts could evaluate sites and oversee pond construction, we certainly could do better. By expanding the project more slowly, we could more easily en-

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sure that each pond is adequately constructed. However, scientific site evaluation requires a minimum of a year to determine high and low water flows. (In the Amazon rainforest, it isn't unusual for what is a trickle of water in the dry season to rise a meter or two in a matter of hours when the rains come.) People have been understandably impatient to start.

This is the other side of the rapid expansion coin. Individual families move ahead, making decisions based on training they have received, neighbors' advice, and their own knowledge of seasonal shifts in hydrology. Often this works well; sometimes it fails. The approach may appear unscientific, but it responds to participant demands.

One could argue that there are problems with this approach from a development perspective as well. Won't people get discouraged if their hard work is not rewarded with good returns? Won't they give up on a project where the technology appears to be flawed? These are important questions, especially given that dam failure isn't the only obstacle we face.

In the survey of 19 fish farmers mentioned above, we found that 9 of the 13 whose dams weren't breached still had significant fish losses due to either pond drying in the summer or to excess flow in rainy months. And, as the pie charts show, those fish that survived pond conditions suffered high rates of predation. Finally growth rates for the fish (fed primarily garden sur-

plus and foods such as insects collected from the forest) were low: average weight for harvested fish was 1 pound, which is at the low end of expectations for cachama at one year of growth.

As noted above, part of the explanation for less than ideal results can be explained by over-eager participants. On the other hand, many project shortcomings can easily be attributed to a project philosophy guided to a great extent by me, others in ISIS, and our team of consultants. Low growth rates could easily be addressed by introduction of commercial feeds, for example. Predation might be reduced by chemical sterilization of ponds.

I think it is fair to say that many of project participants would welcome such "innovations" (really transfer of standard technology) rather than waiting to develop local solutions. In fact, the project balances on a delicate compromise between the immediate goals of families that want to quickly see farmed fish contributing to their diets, and the longer term goal of ensuring that the fish farming methodology we develop is sustainable economically, environmentally, and socially.

The project could get better fish growth with commercial feeds but, in an economy where the majority of families still have no permanent cash income, it is unrealistic to think that aquaculture using this approach would be economically sustainable. Instead we are working with the Secoya to improve our use of local resources, with a goal of on-site production of a nutritionally balanced, easy to handle, feed. The predation problem also requires study and a local solution. Our immediate first response is cage culture of the smallest

stages of the fish, when they are most vulnerable. This will prevent losses while we follow up on other observations.

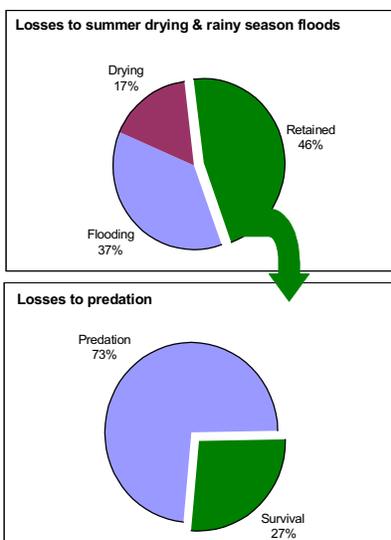
Initial evaluations of some of the ponds suggest that some of the predators, rather than being removed from the ponds, should be seen as a protein source in their own right, a locally available species that, under the right conditions, can be raised in aquaculture. The short term setback represented by the loss of many cachama may actually lead back to free local resources. Whether this hope will pan out remains to be seen, but it is a path to investigate.

Better than tuna

It is important to note that, however many challenges we face, the Secoya have already made important gains. They may not have eaten as many cachama in the last year as we had hoped, but many families did add this fish to their diet. Even with high losses described above, the cost per pound of harvested fish, based on total cost of all cachama purchased for 19 fish ponds, is less than half that of the cost for canned tuna fish, a typical purchase for a Secoya household that has no meat from hunting or fishing.

If we eliminate from the equation the 6 ponds whose dams failed (making the assumption that this problem can and will be eliminated with some additional work and training) the cost drops to less than a third that of tuna. This means that, once the minimal, one-time cost of establishing a pond is met, the project can be maintained by the Secoya themselves even at the current levels of production.

Obviously, this is only a start. Ultimately, the investment per pound of fish should drop to 5-10% of what tuna costs, as survival and growth improve. And the financial benefit is only part of the picture. Fresh cachama is highly preferable to canned tuna for reason of taste, nutrition, and its role in traditional dishes. Also, recovering food self-suf-

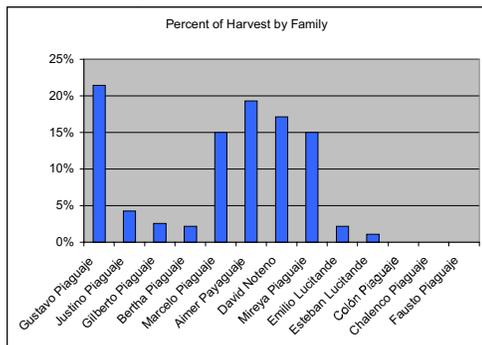


efficiency is an important part of maintaining Secoya culture.

Of course, there are non-cash costs to aquaculture as well: labor, and the local foods. One of the concepts behind the project is that it *should* tap the rich local resources available; if used sustainably *these are free* to the local people. As far as labor goes, we actually are working to increase that input significantly. Currently many families practice a very non-intensive approach to aquaculture, often visiting their ponds less than once a day. This fits well with the diversified traditional economy, and Secoya reliance on natural resources, but it also is an important part of the explanation for low yield--which leads to a comparison of results by family.

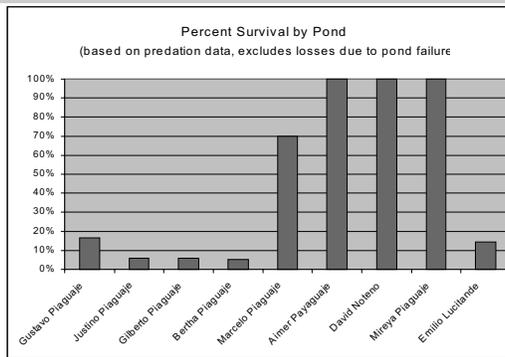
Inequality is good

Another positive aspect of our preliminary results is the range of success of the Secoya fish farmers. As the bar



graph shows, of the thirteen families we have been looking at, five harvested 87% of the total take of fish from all the ponds. Another five families harvested the remaining 13%, and three families harvested nothing. If this were to be the permanent state of things, the inequality clearly would not be a good thing. However, for a project trying to improve technologies this is an excellent indication that current methodologies do have the potential to yield significantly better results than project averages show.

Predation impact was also widely skewed, with some ponds showing extremely high rates and others no significant predation.



(There may be some under-reporting of predation: it is interesting that all families that report few or no losses to predation had some losses to other causes such as flooding or drying, whereas all that had no other losses noticed significant predation. Some losses attributed to other causes may in fact be undetected predation. Still, the extreme range of experiences is curious.)

Clearly there is a lot of opportunity to improve the project by identifying best practices among our own aquaculturists. But the benefits of the wide ranging results go beyond the opportunity for more successful ponds to serve as a model for the others.

In complex systems experiments such as ours, with many variables, the variety of outcomes makes it easier to parse out the importance of different factors. Our "experiment" is not one where we can eliminate variables to address them one at a time. Instead of a set of replicate fish ponds, we have some hundred families each hoping to maximize benefits from their own fish pond. We need to look now at differences in everything from pond conditions to each family's management practices to understand and improve on the results we are seeing.

This is where the many ponds come in. The project has allowed the Secoya to build lots of ponds and some have failed. Why is this good? Because now we have more than one hundred sets of results to study and more than one hundred fish farmers observing and analyzing the results. And, each time we get something right, one hundred

families will be experts who know why it is right. As experts, they will be capable of responding to future problems.

All this is not to say that there aren't problems or a need to adjust our approach. One conclusion is that our attempts to provide technical assistance to as many people as possible may be spreading our technical advisors too thin.

It may be time to focus on working closely with a smaller group of the established Secoya fish farmers, the "community innovators" who initiated the project, to identify the best solutions to common problems.

Perhaps our community of fish-farmer scientists can't or shouldn't include all project participants. ("Community" is a term whose meaning we sometimes debate at ISIS; here I use it to refer to those who are collaborating to answer the many questions related to designing Amazonian aquaculture). Those who don't want to put the effort into experimenting, who would rather simply apply a proven technology, have that right. But rather than importing an inappropriate technology, we would rather support local innovators in developing an indigenous technology that can then be transferred to their more cautious neighbors. In the process, we challenge the all-too-common preconception in so many communities that scientists and other experts have all the answers.

Broader objectives

It may appear that Science for Survival represents little more than a participatory approach to solving technical questions related to fish survival. As discussed above, the participatory approach to solving technical problems is an important piece of it, but it doesn't end there. The concept has important implications for cultural survival as well. Blending traditional knowledge with modern science widens our concept of what makes our project successful and

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Science for Survival

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our methods appropriate. Aquaculture is judged not just in terms of how much protein it produces but also how it contributes to survival of cultural traditions; not just how quickly the fish grow but also how well fish management practices fit into Secoya daily life.

One recent opportunity to look at such issues was a fish collecting trip to the Cuyabeno Wildlife Reserve to the north of Secoya territory. The reserve includes flood zone lakes, whose water levels and fish populations rise and fall with seasonal rains. They were a traditional fishing area for the Secoya and other indigenous groups in the region long before the Reserve was created. The rich and diverse community of fishes includes many that are excellent candidates for aquaculture.

In October, the project obtained permission from the Ministry of the Environment to organize a fishing trip to the Cuyabeno to collect wild fish to bring back to stock in Secoya fish ponds. A group of 30 people from two villages traveled to the lakes in two motorized



While collecting fish for their ponds, the Secoya cooked and ate together. They also used the opportunity to take home a large catch of smoked fish for later use.

Secoya participants were also recapturing some of their traditional customs

that are not commonly seen nowadays in Secoya territory. For example, families bathed together in the river at the end of the day and then cooked and ate communally rather than in nuclear families. The next morning, the women expressed joy at the good catch by putting on their best clothes and painting their faces. The

entire experience allowed the participating families to give new purpose to a traditional practice, the seasonal fishing expedition, that is becoming less common due to a combination of factors ranging from loss of traditional territory to introduction of new economic activities.

Of course, the blending of science and traditional knowledge involves a two-way flow. We challenge scientists to look at and learn from traditional practices but we expect them to do this with a critical eye. Another consultant saw another aspect to the fishing trip which

he described as a trip to the supermarket. He was concerned that the large catch from two days of fishing by experts (women, men, and children demonstrated equal skill) could have an excessive impact on the site where the fish were collected.

This observation challenges the assumption that, just because indigenous populations have not destroyed the environment in the way modern society has, their activities are necessarily ecologically benign. The lakes, rivers and forests are the supermarket for rain forest peoples, but long term hunting pressures by indigenous communities can sometimes change species make-up. Now, with rapid population growth—due to immigration into the rainforest by Ecuadorians from the coast and the Sierra—local resources are being



Stocking the larder the traditional way: is this sustainable in modern times?

shared by more and more people. Even though similar fishing parties were possible in the past, their relative impact may be greater now in an area that has suffered impacts ranging from oil spills to deforestation.

This is, of course, one of the driving forces behind developing indigenous aquaculture in the first place: to increase food supply while reducing pressure on diminishing wild stocks. The challenge for the project is to evaluate the impacts of traditional fishing practices to determine under what conditions they can be safely used to stock ponds. Science for Survival offers a chance to use both modern and traditional criteria to evaluate our methods as well as our results. 



Secoya families collect fish for their fish ponds and store them in a floating cage.

dugout canoes and spent two days there fishing and collecting fish to bring back to their aquaculture ponds.

As one of our consultants reported, fish weren't all that was caught. The

Energy Aggregates: if we build one, will they come?

By Scott Tundermann

The Energy Choices Project at ISIS is made up of a few basic components. As many readers know, our analysis says that the most important impediment to widespread sustainable energy use is the culturally-influenced, subjective way in which people make energy choices. In an attempt to use the social sciences of advertising *for* the environment instead of to its detriment, we have outlined a long-term plan to identify test markets, research who the decision-makers are and what their choice factors are, and experiment with several "repositioning" messages to evaluate their effectiveness. Repositioning means not just a clever sales pitch but a shift in the product's relationship to the market: take for example the once-obscure folding scooter, now a must-have accessory for everyone.

While several sectors of energy use are suitable for such an approach, our first round of work has targeted utility electricity, as the industry is restructured in Massachusetts and ever-more other states. In what we at ISIS thought was something of a moment of inspiration, we decided to use town aggregate districts as test markets—they'd be easily-defined groups with already-established channels of communication. Unfortunately, we miscalculated: the aggregates don't exist. Yet...

Let's take a step back for a moment. What are these aggregate districts, anyway? The idea is simple, and it's based on the fact that large electricity customers (e.g. huge industrial facilities, a Raytheon or a General Electric) can negotiate with their energy producers for cheaper rates because they're such an important part of the producers' loads—lose your biggest customer and a painful bite comes out of your revenue. The average residential customer or small business, on the other hand, doesn't have that clout. The producer

wouldn't even notice if one of those customers stopped buying power... *unless* that customer were acting with enough other small customers to represent a significant *aggregate* power customer. Aggregation is the way for small individual utility customers to have negotiating leverage like a big company.

Most states with electric industry restructuring legislation provide for aggregation options. In California, anyone who so desires can opt to join his or her local electric aggregate. Sounds great, but it gets better: in Massachusetts, residents and businesses in an area (usually defined by town) are automatically part of an aggregate that forms unless they opt *out* of it. (Seems a bit shady for a committee of a few people to aggregate a whole town of customers, but the utilities have always been organized by town borders and will continue to maintain the transmission lines for people's homes and businesses, so it's only at most a matter of changing which supplier gets paid for the electricity these aggregate customers use.)

Even though Massachusetts was among the first states to restructure its electric utility regulations, there is to this day no way for a customer to actually buy green electricity—none of the energy companies with sustainably-generated electricity products have been licensed to sell in Massachusetts (largely because of the assumption that the standard electricity rate is too low for green options to compete, which of course misses the point entirely). So the aggregation opportunity is an important one for people who want to choose green electricity—again, they can't buy it on their own, but as part of an aggre-

gate they may have the leverage to pull in a green provider.

So it becomes clearer why town aggregate districts would be such ideal test beds for green energy repositioning messages: not only are they clearly delineated, they're the most viable avenue at present for utility customers to exercise a green electricity choice. In addition, Massachusetts towns have made a few historical examples of progressive energy choices: Holyoke established its own hydropowered municipal utility, Gardner took part in an early solar panel installation project, Princeton has its familiar wind turbines.

The problem is that, in spite of how aggregate-friendly the legislation is, almost no town energy aggregates exist to date. Have the towns lost the drive to make good energy choices? One disgruntled county administrator told us that she'd been chasing every lead she could and that, until the standard price goes way up or the cost of green energy comes way down (or both),

Town aggregate districts would be ideal test beds for green energy repositioning: not only are they clearly delineated, they're the most viable avenue for utility customers to exercise a green electricity choice.

nothing's going to happen—in other words, that it'll be five years before anyone gets motivated to set up energy aggregates.

There have been fits and starts. Barnstable County has an aggregate, because they're Cape Cod and they're being very careful about every aspect of municipal planning for their community. Easthampton and Haverhill both have aggregation plans awaiting review before the state regulatory committee. Amherst considered aggregating their municipal properties but decided to hold off in the hopes of including the whole town, but then couldn't muster enough interest to get

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National Technical Experts Network

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will provide some of the support and resources necessary for effective and expeditious cleanup.

How and when exactly did thoughts about the NTEN begin? And more importantly, what makes this network dissimilar from other networks in the field of military environmental cleanup?

The NTEN evolution began about four years ago when ISIS first began to take notice of the investigative efforts and data-hounding habits of certain concerned community members in our own region. It became obvious that these individuals have a site-specific knowledge and a truly holistic, long-term understanding of the complex issues surrounding their respective local bases.

We began to wonder, here at the ISIS office, if every base has someone like Paul Zanis, a concerned citizen living near the Upper Cape's Massachusetts Military Reservation (MMR). Zanis' legendary investigative efforts to locate unexploded ordnance (UXO) on and near the 22,000-acre MMR, continue to astound the military, the U.S. EPA, and individuals living in residential communities near where munitions have recently been found. One of these areas includes a site where 1100 mortar rounds, some of which were still live, were found in 1997. The UXO was located only a few hundred yards from a housing development.

Zanis is an example of one type of citizen expert we hope to locate nationwide: someone who has been a resident near the base for many years, who has lived and worked in communities near the facility, someone who may have even played on and around the base. We believe the insights and hard-won

lessons of these individuals are an invaluable resource to other citizen stakeholders. In addition, we want to recruit concerned citizens who have had to become experts at wading through detailed reports, even if that expertise was not always by choice. And of course, we also want the trained citizen-scientists, the professors and community col-

lege instructors, including their students, who serve their own communities as independent expert help.

While other networks exist in

the field of military environmental cleanup, the NTEN is unique in its focus on linking citizen experts with scientists, professors, and teachers as independent "internal consultants" to active concerned groups. The essential resource of citizen context expertise must be tapped to effectively assist other individuals mired in military pollution in their communities; this will occur through networking, exchanging the technical information and sharing those lessons that were so hard-won. The NTEN seeks to collaborate with and

work alongside other military cleanup networks to achieve the most effective cleanup that is possible. Concerned citizens should always have a major say in environmental cleanup as these individuals provide the context expertise. These experts are essential to the NTEN.

Now that we know who will comprise the NTEN, it is important to discuss what membership in this network will involve. The cornerstone for the project is research into the most effective ways to link all of the different types of experts with scientists. We will accomplish this using several approaches, including NTEN focus group conferences, educational research into pilot college course projects, and continued investigation into how people get their technical assistance.

The first NTEN focus group conference is scheduled for early next summer. This will be the first of three national conference workshop sessions, to be held in geographically diverse locations throughout the United States, that will provide a forum for information exchange between experts and scientists. The exchange will include debate and discussion among approximately 35-45 participants, including analysis of the

These individuals have a site-specific knowledge and a truly holistic, long-term understanding of the complex issues at their bases.



Citizen activists from around the country gather at events like the Contaminated Military Bases Network Conference in San Diego to share experiences and solidarity.

problems of military contamination and the ensuing threats to human health and our environment. To this end, the conferences will seek to examine the various roles that independent scientists, college professors, and knowledgeable citizens can play in active cleanup through improving the understanding of risk among advisory boards at DoD and DOE installations. *We will announce the date of this first focus conference workshop in the coming weeks.*

We will also be researching the best college curriculum necessary to train environmental scientists (and informed citizens) for military cleanup efforts. This will include, of course, efforts at the Five Colleges (Amherst, Hampshire, Mount Holyoke, and Smith Colleges, and the University of Massachusetts at Amherst), and other institutions with the direction and advice from the NTEN focus group workshops. At the crux of our analysis will be exactly *how* these course projects benefit affected communities and responsible authorities at polluted military sites, since these projects could and should be assisting citizen stakeholders assess human health and safety risks from pollution in their neighborhoods.

The remaining question is how we will continue to research the means by which concerned citizen stakeholders obtain technical assistance. We believe the most effective way to accomplish this task is to continue to sign up more individuals for the NTEN. Thus far, the process of signing up citizens for the NTEN has afforded us the opportunity to interview a diverse collection of individuals about their site-specific stories and particular technical assistance needs. Through listening to the various accounts of military environmental cleanup nationwide and linking current needs with the amassed intellectual resources of the NTEN, we intend to inform decision makers about this ideal combination of assistance and cooperation that is essential to effective and expeditious cleanup.

Calling all Experts!

If you are one of the many types of experts we have been describing, the MilWaste Project wants to hear from you! As we build the National Technical Experts Network (NTEN), we have found it useful to interview some of the varied stakeholders involved in military environmental cleanup, from the citizen experts and local teachers to the technical experts who work as advisors.

Current survey questions address computer proficiency (including internet usage), networking resources, communication on Restoration Advisory Boards (RABs), Citizen Advisory Boards (CABs), and Site-Specific Advisory Boards (SSABs), available technical assistance versus current needs, and the educational resources being utilized in communities nationwide. When applicable, our questions address both the most rewarding and most frustrating experiences experts have had regarding all of these subject areas.

We look forward to compiling this information and using it to create the most effective NTEN that is possible. If you would like to discuss any of these topics in greater detail and/or would like to nominate an individual for NTEN membership (including yourself!), please contact the MilWaste Project Coordinator at (413) 559-5582 or jstevens@hampshire.edu.

ISIS staff members were recently invited to the US EPA's Technical Assistance Grant (TAG) Workshop, in Nashville, where we took the first steps to research NTEN possibilities. This event, which focused on technical assistance for federal TAG recipients and their consultants working on Superfund sites, offered us an opportunity to meet individuals from all over the country who are working to clean up military toxic waste sites. Those federal facilities included Aberdeen Proving Grounds (MD), Watertown Arsenal (MA), and Lawrence Livermore (CA) and Oak Ridge (TN) National Laboratories.

As part of our nationwide recruiting efforts, ISIS staff have been attending a number of conferences, including

- *Contaminated Military Bases Network Conference* in San Diego, CA (Military Toxics Project)
- *Department of Defense's Environmental Cleanup Stakeholders Forum* in St. Louis, MO (DENIX)
- *3rd Annual Western Massachusetts Environmental Organizers' Conference*, South Hadley, MA

At every conference we've worked to introduce as many people as possible to the idea of the NTEN and to invite those who are interested to put them-

selves on our list.

As we continue participating in these important events, we look forward to meeting and working with individuals from various local grassroots organizations and their scientific allies and self-educated experts (all the people at the front lines of environmental restoration) in the near future. We intend to recruit NTEN members via a large-scale project introduction and invitation mailing to be distributed by the EPA in the coming weeks. If you would like to learn more about the NTEN and/or receive this informative mailing, please contact MilWaste Project Coordinator Jeanne Stevens at ISIS.

Wish us luck and we'll keep you posted on NTEN developments! 🐾

YOU CAN HELP

To support essential education and outreach services for the NTEN, or to help make any other ISIS activities thrive, use the form on page 11 and send your tax-deductible gift today.

ISIS THANKS YOU!

ISIS at the Movies! The Fall '00 film & discussion series

By Heidi Lenos

Even the most socially-conscious scientist enjoys a good movie from time to time, and ISIS decided to indulge that hankering this fall with a blockbuster film and discussion series. Of course, it isn't all fun and games at ISIS, so we wrote up a list of movies thick with tricky questions about the role of science in our world. That list and a case of microwave popcorn later, the film series was off and running.

The fall film series brought together people who are concerned about where science and technology are taking us and whether this direction will serve or harm our society. But beyond this classic ISIS bent was the interesting twist of how Hollywood portrays those issues. The films included *The Matrix*, *Good Will Hunting*, *Silkwood*, *Gorillas in the Mist*, *Lorenzo's Oil*, *Sneakers*, and *A Civil Action*. Most of us are familiar with these films and their science-based stories, but we may not have taken the time to explore what they could imply if they were our real lives rather than the film world. Indeed, our lives are enough of a whirlwind of scientific activity with which we rarely have time to fully reckon.

Hollywood may not have the most lucid grasp on reality, but our daily bombardment by pop culture images is part of what defines our reality. Film reflects society, and vice versa. It is not difficult to be lulled by these glamorized visions of the past and future of technology. So what do these films say about our society's understanding of how science really works in our world?

Catharine Bell-Wetteroth, a fourth-year Hampshire student writing her thesis about science and religion, facilitated the discussions after each film. She was there to pose insightful and thought-provoking questions, both about life in an age

of nuclear power, medical breakthroughs, environmental degradation, and quantum teleportation and also about the all-too-telling images of our world these films show us in their distorted reflections.

The goal for the discussion series was to initiate dialogue about the ways in which potentially life-changing or earth-shattering science is portrayed in mainstream culture. Popular films reach wide audiences and often have strong social and environmental messages, but they are often ignored or overlooked in the superficial entertainment of going to the movies (especially by people who don't work for a science institute!).

Our audiences brought up and discussed a variety of good questions. Some dealt with the motivation for technological discoveries and whether science and morality catch up with one another (or does one evolve faster than the other). One point brought up after *Pi*, an excellent film about a sociopathic mathematician, was about the obsession with new information. The extreme case would be someone so single-minded in the quest for certain information that if he ever attained the coveted knowledge, he would have nothing left to live for--

life would be devoid of meaning. On some level, we may all be similarly driven by the things we don't know, and we rely on that uncertainty to propel us to discovery. It's certainly a more substantive thought than most posed as the crowd is shuffling out of the theater.

It may not be possible to change the way people look at scientific images in the mainstream, but the film series was also an opportunity to reflect upon science in pop culture society and ask whether some of the ideas brought up in the films will make life better for us. What would a quantum computer mean for privacy? Could the wrong people get hold of pentagon files? Will we be sending solid-matter "faxes" one of these days? Is nuclear power really the answer to an energy crisis?

Like the ever-present challenge to make real each character's motivation, we are compelled to ask whether the real-world impetus to study science is fame and fortune, curiosity, or perhaps the quest to save humanity. Too often there is not enough "why" in science and only "how." The classic *Bladerunner* muses on how our own implacable drive for powerful technology might ultimately undermine our quality of life.

Of course, few would deny that a great many scientific advancements have vastly improved the lives of many. The point is that it should be obvious that we all need to be informed about changes that may affect our lives--but is it? We cannot rely only on those with scientific prowess to make the "right" decisions regarding the future of science and technology.

Between weighty questions about the power of science in our world and the nagging awareness that filmmakers color the portrayal of science's effects, going to the movies may never be the same. 



The ultimate scientific puzzler... do androids dream of electric sheep?

ISIS News Shorts

New Faces at ISIS: The second half of 2000 has brought two new members to the ISIS team. **Jeanne Stevens** came on as the Coordinator for the Military Waste Cleanup Project in August when Peter Ruiz-Haas left the position to begin grad school in Oregon. Jeanne is a Long Island native who's been working in Arizona for the past couple years on archeological/biological environmental impact research. Her training was in environmental studies and ecological anthropology at SUNY Binghamton. Jeanne will be coordinating the NTEN campaign as well as maintaining our technical assistance work and all the other pieces of the project.

Heidi Lenos, another Hampshire grad at ISIS, is our new Administrator. Previous Administrator Sarah Miller had to abbreviate her time at ISIS on behalf of her law degree; Heidi is putting in her time at ISIS during her years off between undergrad and med school (in

the fine tradition of ISIS's very first administrative staff person, Elizabeth Motyka!). Heidi's contributions to ISIS include not only administrative genius but coordination of our seminar series as well (see facing page).

Please join us in welcoming both Jeanne and Heidi to ISIS and wishing their predecessors the best of luck.

Reconstructive Science Journal Underway: Beginning this March, ISIS will have a new publication in semi-annual rotation--our still unnamed Journal, previewed with this past summer's issue of *AtF*. We're in the process of gathering articles and making decisions about content, format, distribution, and so on.

If you have some writing you'd like to see published in a science studies journal or if you know any likely prospects, please let us know. And to make sure you receive your copy of our limited run, drop us a line!

Thanks to our generous friends who have given since July 2000 (donors over \$100 in bold):

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Energy Aggregates *from page 7*

the bigger plan off the ground.

In short, aggregation hasn't passed its infant stage. For the Energy project, this could mean one of a couple things: that aggregates are a dead end and we shouldn't waste any more time, or that they're still the best way for anyone to exercise a green electricity preference and we just need to adjust our approach to be part of making aggregates happen rather than just using them to test our subsequent efforts.

The question of what green energy choice(s) we'd like our audience to make has always been a topic of debate within the project. On one hand, any green choice is fine—a smaller car, a solar panel, a sweater instead of a higher thermostat setting. On the other, we need to give people some concrete direction, and we need to be able to assess the effectiveness of our efforts in some quantifiable way. So we have to target some specific actions. We've focused on the issue of utility electricity because restructuring seems like a timely opportunity, but it turns out that choosing green electricity is not so simple. Should we carry on if the only

choice is “help organize an aggregate for your town and try to negotiate for green electricity supply?” It's a very different level of action than “call the utility and switch to green.”

Meanwhile, the transportation sector is in several ways an easier fish to fry, as oil prices climb and SUVs become both more popular and more outrageous. And the cultural positioning of automotive choices is much more active and apparent than the passive invisibility of utility energy. It's not to say that we should ignore the utility sector, but it behooves us to emphasize other directions as well while electricity remains such a difficult one to address. It's certainly not the only worthwhile area for our attention. In addition, we will be looking into other sectors: consumer goods, home efficiency, civic planning... there are dozens of aspects of life in which energy choices could be significantly reoriented.

As our intended first round of work proves to be a much more involved process than we'd hoped, requiring choice development before we get to choice encouragement, we can turn our efforts to other, more readily-available options as we continue to address the needs in the surprisingly stubborn utility sector.

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