After The Fact

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Summer 2001

Open Reading Frames: the Genome *AND* the Media

Mike Fortun

An "open reading frame," or ORF, in DNA terms is a sequence that doesn't have a stop codon that would halt transcription. In other words, ORFs are those portions of the DNA sequence that are *expressed*, and as we now know, that often means expressed in more than a single, simple, unified, linear way. ORFs also require extensive annotation – the kind of ancillary reading and writing notes, like the marginal illuminations in a medieval manuscript, that provide sense, order, and new interpretive openings to the main text.

It's worthwhile to watch similar effects in the domain of genomics and the media. In the past twelve months, the media has paid seemingly endless attention to genomics, educating and entertaining scientists, historians and anthropologists of genomics like myself, investors, and anybody else. Narratives and concepts about genes, genomes, genome projects, and genomic companies are necessarily coded and framed – they couldn't work otherwise – but those frames don't halt further writing and reading. Reading keeps on going, and what's inside the media read-

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Special Insert: 2001 ISIS Federal Facilities Cleanup Workshop

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Science Away from the Camera's Eye

By Heidi Lenos and Scott Tundermann

The Spring 2001 ISIS seminar series carried the news, but not the way CNN does. What we see in the media, although it can be shocking, does not always tell it like it is. Three of our excellent speakers this spring gave us a critical look at recent headlines, sharing a similar theme of oppression and silence imposed by society on the under-privileged and glossed over by the media.

Take, for example, the ever-growing crises of violence in schools and inner cities. Is it peer pressure, fear, greed, or the inherent weakness of the human spirit that causes us to harm others? In his talk on "Perpetrators and Bystanders," Ervin Staub connected today's violence to the most powerful modern example of organized hostility—Holocaust perpetrators—and the question of how ordinary people become involved in harmful acts. One of Staub's main ideas was that such acts stem from the devaluation of society and the disregard for indigenous cultures and the under-privileged. In that light, it's no sur-

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Letter from the President: Welcome to *AtF*

Having promised "science for the 21st Century" for some time now, ISIS entered this year with programs and projects that truly exemplify our socially responsible, environmentally protective mission. Of course we have not yet won the fight—the news is full of issues relevant to ISIS, ranging from the revival of space-based warfare through the almost daily revelations of industrial and military pollution to the current push for an oil- and nuclear-powered energy policy—which signal a need as great as ever for conscientious science. As this issue of *After the Fact* shows, though, ISIS is up to the challenge, stronger than ever and ready for action—as always, based on careful thinking and not without a consciously experimenting approach.

That approach has led our projects to the strength and credibility they now enjoy. Take the Secoya Survival Project in Ecuador: the Aquaculture Initiative expects to have a well-established protocol for sustainable Amazon aquaculture by the end of this year, while the ground-breaking Code of Conduct and agreement for oil exploration with Occidental Petroleum have given the Secoya important leverage in their dealings with the oil company. This issue of *AtF* features a photo essay on the work the Secoya are now doing to monitor the oil workers' activities in Secoya territory for environmental infractions of the exploration agreement. The monitoring teams identify problems and bring them to the dialogue table between OISE (the Secoya organization) and Occidental. The process doesn't guarantee that every complaint is satisfied, but as the photo essay shows, it has caught and addressed a number of infractions that would otherwise have gone unchecked. It's a remarkable kind of involvement for an indigenous group in the Amazon.

As we go to press, Project Director Jim Oldham is in Ecuador to support those activities and to take steps on the next stage as the *Secoya* Survival Project transitions into ISIS's Amazon Project. What that means is that our approach has caught the attention of a number of other indigenous groups around the Amazon as well as the NGOs who support them. We're expanding our activities to include collaborations and information exchanges with groups who have needs similar to the Secoya's—sustainable food supply, negotiations with multi-national extractive companies, or both. ISIS's work with the Secoya may have some insights and some lessons learned to share with Amazon groups who are considering developing a Code of Conduct like ours or who want to exchange know-how on fish-farming techniques—and we can certainly gain from their input as well. It's very satisfying for ISIS to have achieved successes with our way of doing science in the world *and* to have a chance to share ideas and successes with others.

As Jim himself pointed out (via email from South America) after reading a draft of this letter,

> what we really should talk about is how willing we are to make mistakes, how we and two Peruvian partners in the exchange are trying to look at each others' projects—warts and all—to make them all better, how we don't want to provide one answer for Amazonian aquaculture but rather a series of questions and possible answers. The same goes for the Code, which is an unfinished and imperfect document. That others are coming to us for help in writing their own codes is a chance to collaborate to make it better, to get new perspectives (perhaps work with communities in a stronger position to reject oil development rather than just negotiate for better terms), to start again knowing more about oil company objectives and tactics and our own strengths and weaknesses. And the claim we should make is that the Code is a tool that helps; we made it happen and we know we can make it better because we know better than anyone all that is wrong with it.

Other than a diet rich in fish, Icelanders may not have a lot in common with rainforest inhabitants. As Fellow Mike Fortun writes, however, the need for careful science is at least as great in Reykjavik as it is in the Secoya village of San Pablo. Mike has been watching the saga of deCODE Genetics and the Health Sector Database, and in this issue shares with us some observations about how the media interacts with—and sometimes overlaps—the scientific work taking place, defining what we know about genomics as much as the actual science does. With a little more skepticism and a little less scientific bravado, he points out, we might have a very different impression of what's going on… and what gets to go on might be different, too.

After the Fact is published semi-annually by the Institute for Science and Interdisciplinary Studies. We invite you to submit your comments and writing to *After the Fact*. Contributions may be made on paper or disk, addressed to the editors at ISIS, 893 West St, Amherst MA 01002; by email at isis@hampshire.edu; or by fax at 413-559-5611.

We reserve the right to edit contributions for clarity and/or space considerations or to decline to print them altogether. Copy and disks will only be returned if sent with a SASE.

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That same critical thinking about science and policy made this past semester's ISIS seminar series an especially incisive one. Whether in the case of our culture's alarming prevalence of violence (particularly in schools), or the case of apparently progressive family planning organizations with potentially eugenicist missions, or the case of the obfuscatory and ambigious actions of the US government waging a "drug war" over the farms and villages of Colombia, the story in the news is really not the same as the picture revealed by critical analysis and in-depth investigation. The series' success was also marked by popularity: "standing-room only" crowds greeted the appearance of Lynn Margulis and other prominent speakers at these talks. Series Coordinator Heidi Lenos recaps this year's "scientific exposés" starting on this page.

The main star of this summer's *AtF*, though, is our *National* Federal Facilities Cleanup Workshop, to be hosted by the MilWaste Project on July 13-15. Project Coordinator Jeanne Stevens has put together a special insert section on the Workshop at the center of the issue. In addition to telling the story of our plans for the Workshop and the burgeoning National Technical Experts Network, the insert ~~???~~.

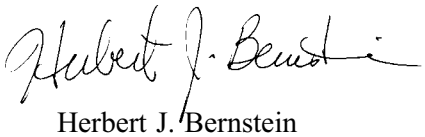
So welcome to this summer's issue of *After the Fact*—I hope you find it as thought-provoking, exciting, and rewarding as has been the work on which it reports. This important work, however, can only go forward with your interest and support. That support is essential for every ISIS effort.

Our Board's 2001 budget set a $20,000 goal for the current quarter, *i.e.* for contributions from this appeal. Each project, as well as the larger programs (such as our writing, speaking, and seminar series), needs support for its work.

Almost every foundation or government agency imposes restrictions and matching conditions on their grants. But your contribution goes directly to the most pressing unpaid need of our work itself. Please give as generously as you can: use the donation envelope at the center fold or contact us at ISIS for more information.

Thanks for your continued support; have a wonderful summer and early fall.

Sincerely,



Herbert J. Bernstein
ISIS President

First glimpses of aquaculture exchange visit to Peru

These are the first few pictures from Jim Oldham's most recent trip to South America, which included an exchange visit with aquaculture projects in Peru (as well as hosting the Peruvians in Ecuador).

Top left: a fish-farming family in Iquitos on the Amazon River collects samples from their fish pond to measure growth rates.

Bottom left: the family displays a variety of native aquaculture species.

Top right: Redy Centeno, aquaculture tecnician for ASPRODE, holds an adult Paco (*Piaractus bracypomus*), a highly-valued river fish in Amazonia.

Bottom right: Armando Piaguaje, a Secoya fish farmer, looks closely at young fish being raised in simple wood and plastic holding tanks while other participants discuss the methodology.

Open Reading Frames

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ing frames gets shaped by the annotations on the edges and even by what's outside. I'm interested in the margins of stories, and in biological, social, and economic phenomena that get pushed to the edge of visibility.

Let me give you an example from Richard Preston's wonderful *New Yorker* (6/12/00) profile of J. Craig Venter and Celera Genomics, with one of the most direct opening lines in any genomics article ever: "Craig Venter is an asshole." (These are somebody else's words here at the outermost edge of Preston's article, but they establish a frame that runs around the entire article) But it's later in the article that Venter is quoted saying "my view of biology is 'We don't know shit.'"

I am *so* grateful when writers elicit these kinds of marginal utterances from their scientific subjects, and I immediately put them into my teaching files. My undergraduates recite to me all the ebullient, oversimplified, over-optimistic, over-deterministic things about genomics and the Human Genome Project (HGP) that they have sucked up from various media outlets, mostly cable TV and the internet. They get positively defensive when I try to open up any hole in their certitudes about the superhuman powers that genes and genomes exert on all aspects of our lives. So it's great to be able to throw them a quote like this, authorized with Craig Venter's name, and ask them to reconcile it with what they think they know about biology.

What would the world be like if appreciation of our ignorance were installed at the center of our knowledge and media frames?

What I hope happens is not the simple reversal of "gee, I thought we knew everything about our genes and now I know we don't know shit." In some ways, I don't want them to be able to reconcile the statements at all; I want it to bother them that we know things about genes that are incredible compared to what we knew even five years ago, <u>*AND*</u> we don't know shit. As Venter wrote about the "complete" (it wasn't) sequencing of the human genome in *Science*: "In organisms with complex nervous systems, neither gene number, neuron number, nor number of cell types correlates in any meaningful manner with even simplistic measures of structural or behavioral complexity. Nor would they be expected to; this is the realm of non-linearities and epigenesis."

What I hope for is some understanding of a frame and its margins, and at least an opening to the question: what would the world be like if appreciation of our ignorance were installed at the center of our knowledge and media frames, and immodest scientism and egoism inhabited the margins? What would television look like, what would science look like, what would ethics look like in a culture in which the aesthetics or affects attached to both knowledge and ignorance were reversed? A biology oriented more toward non-linear effects and epigenesis may be an important part of such a shift, and this should be an area where life scientists and historians/anthropologists of the life sciences might learn a few reading strategies from each other.

The Faces of Companies

Here's Venter on the cover of *Business Week* with an ancient Greek expression hovering in the space over his head. The identification of the genomics company with its CEO happens often in the media. Part of this personalization effect is that a guy's face looks better on the cover of your magazine than some high-tech stripmall building in Rockville. But there was certainly some "taking it personally" between Venter and Francis Collins, director of the National Human Genome Research Institute. The sentiment on the public side of things seemed to be more "that asshole did it to us" rather than "the genomics political economy that we helped establish years ago by funding the HGP infrastructure to keep America competitive has now come back in the form of Celera Genomics to bite us in the ass…" Just as nonlinear and epigenetic effects so often get collapsed and reduced into "gene x causes trait y," a very complex political economy of bioinformation and biomaterials gets collapsed into "Craig Venter."

And let me stress again: it's not so much a question of right and wrong readings here. Craig Venter *is* Celera Genomics within some limited reading frames, as surely as gene x causes trait y within some limited reading frames. But that doesn't preclude other ways of reading that can be just as truthful and necessary. Perhaps it's best to say: Celera Genomics, like all good nonlinear systems, both is <u>*AND*</u> isn't Craig Venter, and it's always the unresolvable tension of the AND that is so productive–in organisms, in the life sciences, in economies–and in history.

Now I'd like to shift territories to a different identification between a genomics company and its CEO, one framed by a series of old and contemporary Viking myths invoked by deCODE Genetics, operating in Iceland, and its volatile CEO and founder Kari Stef-ansson. These myths, particularly the parts depicting the supposed isolation and homogeneity of Iceland and its

population, have been reiterated consistently in both the Icelandic and international media, and have been vital to deCODE's efforts to leverage itself into the competitive global genomics economy.

As readers of *AtF* may recall from my last article, deCODE is a US corporation (though often called an Icelandic company, to deCODE's advantage with its Icelandic constituents) founded in 1996 by Stefansson with $12 million from US venture capital firms associated with Harvard and the University of Chicago. With virtually no record of gene discovery research, Stefansson leveraged international attention when he secured a five-year promise of $200 million in payments from the Swiss company Hoffmann-La Roche in February 1998 – at the time the largest deal ever between a genomics company and a major pharmaceutical company.

When deCODE presented its plan to build a Health Sector Database in Iceland, there followed nine months of public and private wrangling and politicking, to which, with the accompanying media frenzy, Stefansson and deCODE (the two are even more impossible to separate than Venter and Celera) like to point as signs of democratic debate (more on this below) – conveniently leaving out the fact that they had tried to sidestep any debate at all by rushing the first draft of the plan through the Parliament at the very end of the spring 1998 legislative session. The Icelandic Parliament finally passed the Health Sector Database Act (also drafted by Stefansson and deCODE's lawyers) in December 1998, collecting the medical records of every Icelander and granting a 12-year exclusive monopoly to one anonymous licensee – deCODE. The Database will cross-link the health records with a computerized version of the well-maintained genealogical records of Iceland and a database of new genetic information from blood samples gathered by Icelandic physicians (at least some of whom are deCODE shareholders).

A book could be written about the complexities of these events, which I'm currently doing. So here I'll just pull out a few strands that illuminate the particularly volatile intersections of genomics and the media that emerged in Iceland, but which may also tell us something about genomics more generally.

Presumed Consent

The Health Sector Database was enacted on the principle of "presumed consent": every Icelander living and dead was *presumed* to have given their consent to place their medical records in the database, and individuals were then granted the new right to "opt out" of the database – although they could not opt out their dead relatives, even though they share some of the same genetic information. The graph here charts the number of opt-outs, but it also charts some of the social and media forces in these events. The number of opt-outs rises steeply at first, and then abruptly slows down in June 1999, as most Icelanders mistakenly assumed that this was the cut-off date for opting out. The Icelandic media did little to correct that misunderstanding, even as it broadcast numerous optimistic stories that boosted deCODE's share value on Iceland's "grey market." In January 2000, deCODE was formally granted the license to the database, and the opt-out rate increased again as a new round of media coverage occurred and people were reminded of the ongoing reality of the matter. It now appears to be leveling off just as it approaches 20,000 people or 7% of the population, perhaps a reflection of the fact that people are just plain tired of dealing with it all.

I'll come back to the Icelandic media in a bit, but let's turn briefly to the international press, which also brings us back to the question of Iceland's isolation and the genetic homogeneity that is supposed to be associated with it.

Homogeneity

The homogeneity or purity of the Icelandic population was never so much a question as it was simply assumed to be true, on the basis of some mythic understanding reinforced by deCODE press releases.

"Natural born guinea pigs"
"the most homogeneous population on earth"
an "island so inbred that it is a happy genetic hunting ground"
"largely blue-eyed, blond-haired populace"
"a nearly homogeneous population..." "...carrying nearly the same genetic codes as the Viking explorers who settled here more than 1,100 years ago" ...with "little immigration to muddy the genetic pool over the centuries"

The headlines and soundbites here from the international press indicate the prevalence and power of this assumption, summed up most strikingly in this cover from *Mother Jones* that purports to be critical of the Icelandic-deCODE project

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Open Reading Frames

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even as it uncritically repeats its most tendentious and exoticist claim: Iceland is a nation of blonde, blue-eyed babes (and, presumably, hunks).

What continues to puzzle me is why this reading frame was never opened up by reading it against another quasi-mythic image so readily available in pop culture. Bjork, Iceland's other famous media-hyped personality, has sold a lot of records, including 1997's *Homogenic* and its utter and complete ironization of the pure, natural, homo-genic Icelander. Why didn't a single journalist, anywhere, ever even ask the opening question: *what's up here? How do we know what the characteristics of the "typical Icelander" are?*

Bjork, bearer of pure Icelandic genes

It's a question that can be approached via more rigorous avenues than those of pop music – although it's also a question that can't be fully settled. In contrast to deCODE's homogeneity claim, through an analysis of both mitochondrial DNA and a genome-wide set of 300 microsatellite markers, Einar Arnason and two other Icelandic population geneticists have argued in *Nature Genetics* that, in comparison to other Scandinavian and European populations, Iceland is among the *most* heterogenous – surpassed only by Spain and Turkey in some measures of genetic difference.

It's also a good question as to what difference the degree of genetic difference in a population makes when it comes to genomics-based gene discovery projects applied to entire populations. Estonia, for example, now argues that its more heterogenous population will not only serve as a better platform for gene discovery, but because it represents the actual heterogeneity of Caucasian populations better than Iceland does, it serves as a better proving ground for the testing, marketing, and sales of future pharmacogenomics-based drugs. (Many drug and genomics companies target Caucasian populations since, on average, they tend to have more money or better insurance.)

At any rate, it's clear that deCODE held out the bait of a uniquely homogenous population, and journalists and investors in Iceland and the US took it on faith. In multiple media stories, on investment web sites, in deCODE's own registration statement with the US Securities and Exchange Commission, the "unmuddied" quality of the gene pool was the big selling point that distinguished this otherwise undistinguished company from the genomics pack.

And like every other genomics company, deCODE issued a continual stream of press releases trumpeting its latest achievements and discoveries: the mapping or isolation of markers or candidate genes "for" – in the familiar and inaccurate shorthand – for conditions including pre-eclampsia, osteoporosis, Alzheimer's, and most recently schizophrenia. But the later publication of some article in the scientific literature substantiating these claims appears with far less frequency in the case of deCODE than with companies like Celera, Millennium, Human Genome Sciences, and others. With deCODE, one gets a press release, and little after that to substantiate it.

Story Stocks

Like the homogeneity line, that too has worked quite well thus far – especially in Iceland itself. In the two years before deCODE's July 2000 IPO on the NASDAQ exchange, the state banks of Iceland bought shares of preferred stock in the company. The banks pumped up the good news about deCODE and its supposed discoveries via the Icelandic media, and then resold the preferred stock they had bought, ever more valuable with each news story, to the genome-enthusiast Icelanders. A total of 11.1 million shares of deCODE were traded on the so-called "gray market," pre-IPO. Some 6,000 Icelanders bought stock at prices between $30 and $65 per share; by contrast, deCODE opened on NASDAQ in July 2000 at $18 and now trades around $7 after continuous volatility. Many of the Icelanders took out second mortgages or other forms of bank loans to buy into the national enterprise. The securities laws have now been changed in Iceland to preclude exactly the kind of activity that went on in the case of deCODE and the state banks.

The Iceland story is a particularly volatile example that indexes the importance of stories in the media-enhanced volatilities characteristic of the whole genomics scene. Biotech and genomics stocks are some of the best exemplars of what are called "story stocks" on Wall Street: stocks whose value, even more so than "regular" stocks, is contingent upon the narrative spun around them. (The name "story stocks" dates to 1994, when "certain stocks for which an intriguing argument could be made – called story stocks – began responding largely to chat-room comment and newsletter hype" (Browning 2000).)

The genomics companies, like their dot-com cousins, depend on intriguing narratives of open-ended futures for their speculative value. In his book *Irrational Exuberance*, economist Robert Shiller has described how speculative bubbles since the tulip-mania of the seventeenth century have been blown up by narrative-dependent anticipations, and how that process has always required the media for its production. In Shiller's analysis, one of the most important features of the great speculative bubble of the late 1990s (if, indeed, it was a bubble) was the intensification

of this media effect in the economy. This was an important feature in the genomics economy, with the daily and even hourly obsessive attention to genomics stock values through on-line news and stock services; and a multiplicity of narrative forecasts, projections, and other anticipatory stories channeled through television, newspapers, and magazines.

Informed Consent

I have one more story illustrating the vital effects that occur at the margins of the media and the speculative economy of the late 20th century. This story – about evolving definitions of informed consent – places genomics within a larger context of people's (including scientists') attitudes toward and participation in biomedical research, and changing principles and protocols of informed consent.

It comes from our own US National Bioethics Advisory Commission, in a discussion not of genomics per se, but about what will happen to informed consent protocols in an era in which many US citizens have come to expect and demand access to the newest, most experimental drug therapies – a trend that will undoubtedly intensify in the age of pharmacogenomics and its promise of individualized drug treatments – as we anticipate drugs of the future. The story illustrates the subtle but powerful ways in which the publicity-generating machines of biomedical research and the current speculative climate in the stock market work at the margins of scientific imagination and practice. It also illustrates how scientists themselves can often be the most sensitive readers of these open reading frames

Getting into a clinical trial for an experimental drug or treatment had gone from guinea-pig suspicion to the most sought-after, "best" medical care available.

In one of the Commission's public meetings, the bioethicist Jeffrey Kahn spoke about informed consent, and the changes in the biomedical research environment since the days of the Belmont Report which codified many of those processes and principles in the 1970s. Kahn addressed a wide range of issues, including the change in social expectations in the US whereby a clinical trial for an experimental drug or treatment had gone from guinea-pig suspicion to the most sought-after, "best" medical care available. His presentation left Stanford geneticist David Cox with two related questions.

First, asked Cox, "why do you think it is that we have switched in this format from protecting people to everyone clamoring for the benefits? Where are those benefits and why has that come about? I have my own views but I would be very interested in yours." The second related question, Cox continued, was "if this is more in the context of explaining to people that they are partaking in a risky situation, which I actually think is exactly what the process is about, then why would anybody want to do it?"

Kahn answered in terms of historical and social complexity: the 80s and 90s gave us a "mixed up" "cocktail" of AIDS activists demanding the reconfiguration of clinical trials and inclusion in them, women with breast cancer and other conditions similarly demanding greater attention to and direct involvement in research on women's health issues, and other large-scale changes in the culture of biomedical research. As a result, Kahn suggested, experimental biomedical research and its speculative treatments had become not only a normal part of the health care system, but a normal expectation.

Cox agreed with Kahn's narrative, but then added some of his own views as he had promised earlier in the discussion. The geneticist Cox knew his own culture better than the bioethicist Kahn, or simply felt more at liberty to critique it in public:

> I would have added one other thing: I think over the past 10 years the research community has become extremely adept at their own public relations…to the point where even they believe it...[A]nd there is some truth to it but not on the time scale that it is represented. So it is long-term gains, not short-term gains. It is like the stock market. We should have some stock people actually doing this for us... I really think that things have changed in my view. I think you are right not because the process of consent has changed but because the players have changed... what the game is to get people to enroll.

Scientists like David Cox can help all of us read the margins – of organisms, of research communities, and of stock markets. He tells a brief story about indirect links, feedback loops, partial or emergent truths, compelling public relations, and other non-linearities that give rise to raised expectations among all participants in the game – the people taking drugs, the researchers that develop drugs, the people who invest in the corporations that make drugs. I'd call this changed game that Cox describes the game of speculating on, and within, complex systems – if only because we can't seem to escape these two words, complexity and speculation, at this historical moment. It's in this complex game of speculating on drugs-of-the-future that the need for the frame shift that I spoke of at the beginning – centralizing an appreciation of our ignorance, nudging our scientific and social optimism more toward the margins – might be most urgent and necessary.

You certainly don't need me to tell you that this is an exhilarating time in the life sciences – a time of non-linearities and epigenesis in which the linearities of something like the Central Dogma – DNA codes for RNA codes for protein – would sound like a crude

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Listserve, Workshop for NTEN's First Year

By Jeanne Stevens

In this issue of *ATF*, we are pleased to bring you an in-depth report of our exciting new program, the National Technical Experts Network (NTEN), and the upcoming NTEN-sponsored national workshop, *Federal Facilities Cleanup Workshop & Citizens' Forum*. This event, to be held at Amherst College July 13-15, is the first of two major national focus group workshops dedicated to researching the best way to design and structure the NTEN.

But first, a quick look back…

By now, many *ATF* readers are familiar with the concept of the NTEN: a large-scale national network to link all of the different types of 'experts' involved in military waste cleanup. But where did the NTEN vision originate? How did ISIS arrive at the idea that a network of experts, linking citizen-experts and citizen-scientists with professional experts and others, is crucial to creating better cleanups?

The NTEN evolved in part out of the lessons learned and insights gained by ISIS staff during more than seven years of work in national coalitions, regional analyses, and local activity—the latter as technical assistants on the Restoration Advisory Board (RAB) at Westover Air Reserve Base in Chicopee, Mass. Working with concerned citizens, local scientists, and military and regulatory members on the RAB at Westover has always taught us powerful lessons and advanced our institutional understanding of the practical, on-the-ground issues in the vast problem of military environmental pollution.

Of course, the NTEN also developed out of looking beyond our local project to the cleanup of nuclear and toxic waste sites at federal facilities nationwide. When ISIS staff haven't been reviewing technical documents or working to facilitate undergraduate research projects with our collaborators at the Five Colleges, we've participated in, facilitated, and observed public dialogues about the cleanup of military pollution nationwide. We have observed and analyzed both the cleanup success stories and the restoration mishaps.

This process was greatly helped in 1997 when we convened the *Northeast Federal Facilities Cleanup Workshop* and continues today as we develop the national program, NTEN. It was confirmed in 1999 when several grassroots groups and a couple of national citizen participation organizations met at a national conference on Monitored Natural Attenuation and designated ISIS as the lead organization for developing such a network. The formation of the NTEN is informed and improved through our collaborative research with environmental scientists as they work on military waste projects and with concerned citizens as they work to identify the technical resources necessary to participate on their RABs, Citizen Advisory Boards (CABs) and Site-Specific Advisory Boards (SSABs).

As citizens, we meet other advisory board members, ask a lot of questions, and listen to their stories. As scientists, we ask why the science behind cleanup has not kept pace with what is clearly our nation's most daunting environmental catastrophe, a problem that pervades nearly every area of the United States.

We know that with well over 1,000 military bases, each on average containing dozens of contaminated sites, there is an enormous need for human effort to both accurately and equitably address this issue. Cleanup of these federal facilities is now in place, but implementation can be very difficult. And while great strides have been made in the cleanup since the process began, much more still needs to be done.

The ISIS vision for cleanup recognizes this colossal need for human effort to create better and more equitable cleanups. We believe that the scientists are essential to this goal and that *young scientists*, especially, must be broadly trained to understand the interdisciplinary dimensions of their work—to be educated to listen to those with the site- or context-specific knowledge and to work in service to communities affected by military pollution. Through the links created by the NTEN program, ISIS is creating forums for the exchange of this varied knowledge. Those forums primarily include the ISIS-NTEN listserve, in "beta" trials since February 2001, and two national focus group workshops, one this July in Amherst, Mass. and the second next year in California.

The ISIS-NTEN Listserve

The ISIS-NTEN listserve is an electronic bulletin board dedicated to online discussion of technical information: how to get it, use it, and analyze it. The ISIS-NTEN listserve includes lessons learned in the area of military environmental cleanup, tools and information resources, citizen expert and citizen scientist support (with respect to technical issues), and discussion on new science needed to respond to various cleanup issues and concerns. It provides the cleanup community with a unique opportunity to network and communicate with other individuals about technical cleanup topics, share case stories, ask for help from other experts, and answer the technical questions of others. The listserve also functions as an electronic bulletin board to communicate announcements about relevant conferences, workshops and citizen forums. To join this forum, sign up for the ISIS-NTEN either online at isis.hampshire.edu/mil/application.html or by emailing isis@hamphire.edu.

While the listserve is still only in its inaugural phase, messages posted include those that reflect the pressing need for a national network of technical experts. One of the first postings

was an inquiry from a United States Geological Survey (USGS) scientist currently developing a Geographic Information System (GIS) to be used in the economic analysis of the closure of military bases. The inquiring scientist was tasked with analyzing Institutional Controls (IC's) and asked for statistics on times-to-failure for IC's (or of other remediation measures) and of the consequences of IC failure, including financial and other losses.

A flurry of referrals and suggestions quickly answered this posting, including responses from a state assistant Attorney General, a lawyer who referenced relevant studies performed by a law institute, and a toxicologist who clarified an earlier reference to a report released by a non-profit research group.

A later posting from a 'citizen-expert' who lives near the Badger Army Ammunition Plant in Wisconsin expressed a desire to network and work with others about heavy metal contamination, a serious problem in her community. This posting illustrates the need for a trusted and knowledgeable source of information and experience with the problems found at bases all over the country. As the NTEN listserve moves past this preliminary phase, we feel the network can and should grow to fulfill that need—on a wide variety of topics.

The Federal Facilities Cleanup Workshop:Technical Information (FFCWTI) & Citizens' Forum

The upcoming *Federal Facilities Cleanup Workshop: Technical Information (FFCWTI)* at Amherst College on July 13, 14 and 15 is the first in a series of ISIS focus group workshops dedicated to researching the best way to define and structure the NTEN. A keynote panel will open the workshop Friday evening, followed by two full days of presentations, case studies and break-out sessions.

At the *FFCWTI*, participants will debate and analyze the problem of military contamination and the resulting threat to human health and the environment. They will also examine the roles of independent scientists, college professors, and knowledgeable citizens in active cleanup through improving the understanding of technical issues among advisory boards at DoD and DOE installations. We hypothesize that informed and networked scientists, especially among those who have the skills and expertise to effectively communicate to the public the risks posed by hazardous substance use and release at military installations, can suitably communicate with advisory boards and increase their understanding of the risks at hand. Well-informed citizens are a key component in guiding federal facility cleanup programs and maintaining regulatory oversight.

These focus groups are aimed at exchanging information and expertise so we can research how technical experts might better advise their communities and advisory boards on risks, appropriate remediation and cleanup methods, and the like. Participants will include college professors, community members, stakeholders and scientists involved in DoD or DOE cleanup activities and advisory boards, as well as DoD, DOE, EPA officials and representatives from state and local governments.

At the programmatic level, the workshop will consist of plenary sessions focused on matters of general interest and smaller breakout groups focused on more specific issues. Currently, topics to be covered include:

- Risk Assessment Analysis
- Technical Information Needs
- Unexploded Ordnance (UXO) & Ranges: Options and Opportunities
- The Role of the Citizen-Expert
- Finding the Resources in Diverse Communities
- Role of States & Tribal Governments in Cleanup
- Using the Web to Find Information
- High Level Nuclear Waste Disposal: Yucca Mountain
- Privatization & Early Transfer
- New Science for Effective Cleanup

(see the workshop agenda, pp. 10-11).

The *FFCWTI* will also include a Citizens' Forum, to be held the day prior to the workshop, from 9 AM until 5 PM on Friday, July 13th. We have organized this event to facilitate networking among citizens prior to the main event. We believe it is important to provide citizens with an opportunity to meet in advance in order to get "at least in the same volume if not the same page," as one leader of a national citizens' group once put it. We are planning this event after the model of the very successful Citizens' Caucus session at our regional conference in 1997, which offered concerned citizens access to education, support and training before the conference. By the time the official conference began, these citizens were better-informed and ready to participate in workshop sessions and break-out groups. Currently, the separate but related Citizens' Forum event at our July 2001 workshop will cover:

- Four case study presentations
- Working Outside the RAB
- Technical Information Needs: Where to get technical assistance & what kinds are needed
- Environmental Justice & Cleanup
- Policy Implications for Military Waste Cleanup

And last but certainly not least, we are pleased to host a youth group at this workshop, which includes a cadre of young leaders directly affected by public health threats posed by the military installations in their communities and who work on these issues at the grassroots level. The purpose of the workshop's youth component is to connect these young individuals, ages 15-25, with experienced technical and citizen scientists working on real environmental problems in training and networking that can support them back in their own communities. The participants will have workshop mentors to work with them during and following the event.

For more about NTEN, the listserve, or the *FFCWTI*, contact us at ISIS.

FFCWTI 2001 DRAFT AGENDA - Amherst College, July 13-15

CITIZENS' FORUM FRIDAY, JULY 13

Citizen Forum Case Studies

Lunch & Youth Forum presentation

Presentation of Four Case Studies

- *Vieques*
  - Robert Rabin
- *Lawrence Livermore National Labs (LLNL)*
  - Isaac Trotts
  - Andreas Toupadakis
- *Aberdeen Proving Ground (APG)*
  - Cal Baier-Anderson, University of Maryland, Baltimore
  - Ted Henry, Toxicologist
- *Massachusetts Military Reservation (MMR)*
  - David Dow
  - Susan Walker, Association for the Preservation of Cape Cod

Concurrent Sessions:

- ***Working Outside The RAB****: facilitator-led discussion on Restoration Advisory Boards (RABs) that are 'broken,' RABs that no longer exist, and other problems*
  - Sandra Jaquith – Rocky Mtn Arsenal Site-Specific Advisory Board
  - Chavel Lopez, Southwest Public Workers Union
- ***Technical Information Needs****: where to get technical assistance & what kinds of technical assistance are needed*
  - Susan Falkoff, Watertown Arsenal
  - Jim Okun
  - Edward Lorenz, M. Vickery, G. Smith, S. Finnegan, Alma College
  - Tara Thornton, Military Toxics Project (MTP)
  - Aimee Houghton, Center for Public Environmental Oversight
- ***Environmental Justice and Cleanup***
  - Sterling Golgogeron – Alaska
  - LeVonne Stone, Fort Ord Environmental Justice Network
  - Doris Bradshaw, Defense Depot Memphis TN Concerned Citizens Committee (DDMT-CCC)
  - Delores Herrera, AVANZAR
- ***Policy Implications for Military Waste Cleanup***
  - Dan Mulqueen – Rocky Mtn Arsenal Site-Specific Advisory Board

Introduction to the NTEN: Needs Assessment

- Institute for Science & Interdisciplinary Studies (ISIS) staff

Traditional NA closing

- Sterling Golgolgeron

FEDERAL FACILITIES CLEANUP WORKSHOP: TECHNICAL INFORMATION

FRIDAY, JULY 13

Evening Reception

- Welcome/Introductions, Gregory Prince, Hampshire College President
- Keynote Remarks, Hon. John Olver (First District, MA)

SATURDAY, JULY 14

Keynote and Introduction Cleanup

- Herb Bernstein, ISIS)
- Senator Edward Kennedy – invited

Technical Assistance on the Restoration Advisory Board/ Community Action Group:

What is the difference between being a technical advisor to a citizen group and a citizen active in the group? What if the community group is different from the RAB? What are the communication issues among RAB members?

- Cal Baier-Anderson, University of Maryland, Baltimore

- Edward Lorenz, Pine River Citizen Superfund Advisory Committee
- Dan Mulqueen, Rocky Mountain Arsenal Site-Specific Advisory Board

Concurrent Sessions

- Role of States & Tribal Governments in Federal Facilities Cleanup
  - Vicky Peters, Attorney General's Office, State of Colorado
  - Mark Harding – invited
- Massachusetts Military Reservation (MMR) Overview: UXO and Ground Water Contamination
  - Ellie Grillo, Mass. Department of Environmental Protection
  - Susan Walker, citizen expert, Assoc. for the Preservation of Cape Cod/ David Dow, citizen-scientist
  - Robert Gill or Jan Larkin, MMR

EPA Presentation: Using the World Wide Web to Get Technical Info

- Carlos S. Pachon, EPA Innovative Technology Office

Concurrent Breakouts

- International Range Cleanup:
  - John Lindsay Poland, Fellowship for Reconciliation (Panama)
- Panel on Privatization and Early Transfer:
  - Anne Callison, citizen scientist
  - Derence Fivehouse, Chief Counsel, AFCDA/LD
- EPA Training: Using The Web To Access Technical Information
  - Carlos S. Pachon, EPA Innovative Technology Office

Military Cleanup: Finding the Resources in Diverse Communities

- Chavel Lopez, Southwest Public Workers Union, San Antonio, Texas
- Delores Herrera, AVANZAR, Albuquerque, New Mexico

Land Use Controls Interactive Presentation

- Aimee Houghton, Center for Public Environmental Oversight (CPEO)

SUNDAY, JULY 15

Panel on UXO and Ranges: Cleanup Options and Opportunities

- Lenny Siegel, Center for Public Environmental Oversight (CPEO)
- Bonnie Rader, community co-chair, Former Lowry Bombing & Gunnery Range (Buckley Field)

Concurrent Sessions

- Cleanup Issues at a Remote Site: Savoonga Native Village, Alaska
  - Pam Miller, Alaska Community Action on Toxics
  - Sterling Golgolgeron, Native Village of Savoonga
  - Ron Scrudato, State University of New York at Oswego
  - John Carpenter, State University of New York at Albany
- High Level Nuclear Waste Disposal: Yucca Mountain
  - Randel Hanson, Arizona State University
  - Judy Triechel, Nevada Nuclear Waste Task Force
  - Steve Frishman, Tech & Policy Coord, NV Agency for Nuclear Projects
  - Abe Van Luik, Yucca Mountain Project

Panel on Risk Assessment: What is risk and how is it determined, managed and mitigated?

- Ted Henry, Toxicologist
- Saul Bloom, Arc Ecology
- Marilyn Null, Deputy for Community-Based Programs, SAF/MIQ

A New Science for a New Millennium (Intro. by Herb Bernstein, ISIS)
Researching the Role of Science, Science Education, and Scientific & Technical Information Access in Toxic & Nuclear Waste Cleanup.

- Marcus Raskin, Institute for Policy Studies
- Merv Tano, Internat'l Institute for Indigenous Resource Management
- Kathy Abbass, Rhode Island Marine Archaeology Project (RIMAP)

Sharing Our Resources:
How to include all stakeholders in effective, efficient and democratic cleanup – a moderated open forum

Semper Vigilante: Environmental Monitoring of Occidental Petroleum

On March 13, 2000, the Secoya people signed an agreement with Occidental Petroleum Co. (OXY) allowing the company to carry out oil exploration in their territory. The agreement gave OXY permission to drill four exploratory wells and to do "3D" seismic testing in return for infrastructure and development projects, an investment fund, and a small payment to each Secoya family. Negotiated under a Code of Conduct designed to protect the Secoya right to participate in matters affecting their territory, the agreement called for the establishment of a Secoya Monitoring Team to oversee oil work in the territory. ISIS provided technical and financial support for the creation, training and ongoing work of the team.

OXY sub-contractors built and prepared two drilling platforms in Secoya territory by July 2000, *Cocaya Centro* and *Cocaya 1*. Drilling of *Cocaya Centro* took place in August and September, after which the drilling rig was moved to *Cocaya 1* for October and November. The first well was found to be non-productive, which led to the phase of abandonment and restoration; the second, *Cocaya 1*, produced some oil but alone is not commercially viable.

Throughout 2000, monitoring teams spent from 12 to 18 days in the field each month, visiting both drilling platforms to review work and ensure compliance with environmental regulations and the agreements made with the Secoya.

The work of OXY and their contractors was found, in large part, to be in compliance with Ecuadorian environmental regulations and OXY's own environmental management plan. However, over the course of the year the team raised and responded to a variety of significant concerns related to oil work.

Unauthorized cutting of access trails and failure to bring workers in by helicopter stopped after a site visit by the team.

Trees cut outside the platform area for trail construction, or for no clear reason (tree shown by Gonzalo Payaguaje, President of San Pablo), are not easily replaced, so OXY paid a penalty to the community and pledged to prevent further such actions.

The platforms themselves showed other areas of concern. Monitors warned of damaged liners in the pits for drilling wastes (top left), which OXY replaced shortly before drilling started. They also raised concerns about possible flooding if, once full, these open pits receive heavy rains. Worker camps (top right) are a source of garbage and contaminated water (bottom left); the monitors identified unacceptably high levels of contaminants in camp effluents. A stream unnecessarily blocked at the perimeter of the platform (bottom right) was cleared after monitors called attention to it. As oil work progresses, our goal is to increase the teams' technical capacity to monitor a wider range of environmental parameters and the effects of seismic testing and actual drilling production.

Some of these issues have been addressed directly in the field; most have been taken up by the OXY-OISE Oversight Committee or the broader *Mesa de Dialogo* (discussion table). Some have been resolved, others require further discussion, and some will influence OISE requests for procedural changes for future wells. The most notable outcomes include:

- Both OXY and the president of OISE (who negotiated with a sub-contractor outside the Oversight Committee, in violation of the Code) publicly admitted error regarding the use of trails for platform access.
- A plan was established for applying sanctions in the case of excessive environmental damage.
- OXY paid a penalty to OISE for unauthorized cutting of trees outside platform area.
- The oil workers have increased attention to the treatment systems for camp sewage and gray water.
- OXY repaired the damaged lining in the waste pit prior to starting drilling.
- OXY has increased efforts to educate workers and subcontractors about the Code of Conduct and other agreements with OISE through meetings with Secoya leaders for subcontractors, the use of signs at the work site, and the creation of a video about the Code.
- Communications between OXY and OISE have improved, as the company now provides weekly reports on the status of work in Secoya territory.

Even under the best circumstances, a drilling platform has a major impact on the rainforest. A central goal for monitoring is to ensure that, as oil work ends, the wells are properly closed and platforms are returned as closely as possible to their original condition. Already the monitors have called attention to the unauthorized use (transplanting) of plants from inside Secoya territory for the restoration of the abandoned *Cocaya Centro* platform and to the poor survival rate of these plants. These results call into question the proposition that the damage from platform construction can be easily reversed and suggest the need to rethink the technologies being applied by the oil company.

In the coming months, a new round of seismic testing will add to the work of the monitoring team. oversight of an expanding range of oil activities from localized platform reforestation and more widespread seismic testing to the potential long-term drilling for production, will require more training and significant commitment from the monitoring teams and their advisors. Despite our important accomplishments, the work is far from over.

Camera's Eye

from page 1

prise to see that violence is prominent in impoverished inner cities; is the same force at work in the case of suburban teenagers in public schools?

Or in the Third Reich in Germany—a powerful movement with a dominant leader where the temptation to join was almost irresistible, especially given the depths of German poverty after the First World War. While there can be no excuse for the violence of these crimes, Staub's area of study sheds important light on the reasons for violence and some ways to avert it.

Staub also pointed out that perpetrators of a crime are sometimes included in a very prestigious group of people, as was the case with the Crips and the Bloods in Los Angeles and with Hitler's Reich. Hitler believed intensely in what he was doing and praised even his lowest-ranking troops for doing "very important work." Is reassurance that what we are doing is right and noble all we need in order to obey unquestioningly? If our noble work happens to be genocide but we receive positive feedback, at what point do we question it? In the face of rare reassurance and unprecedented hope for a better life, where do moralistic impulses fit in?

In another take on the plight of the underprivileged, Betsy Hartmann, the director of Hampshire College's Population and Development Program and a Hampshire professor, gave a talk titled "Quality and Quantity: Population Control and the Survival of Eugenics." She discussed the "designer baby" phenomenon, through which affluent parents define and command the state of the genetic art in their quest for "perfect" children (safe from diseases and, while we're at it, tall and thin with clear skin). Their financial influence keeps genetic research moving away from those who could benefit the most: people with genetic disorders and other less profitable needs. The science follows the money, and eugenics is essentially a scientific means of social control.

Hartmann is also very interested in family planning and indicated that there is subtle pressure among family planning agencies to encourage women to take birth control as an only option. Regardless of the intentions, this single-mindedness serves in a way to curb population growth among underprivileged and immigrant populations. The birth control movement that began in the 1930's was intertwined with the eugenics movement and was framed as a feminist movement, giving women options and education regarding their sexuality and freedom. It has been suggested that the movement was not so much a way to curb population growth but rather a way to curb the growth of certain undesirable populations. An extreme example of institutional influence on family planning is the Ralph Case in the early 1970's when two young black teenagers were sterilized without their consent or knowledge. The federal high court stated that many minors had been sterilized using federal funds under the threat of losing welfare benefits in the US. How do we reconcile a well-intentioned program to prevent abortions, abandoned babies, and over-sized, impoverished families with a *de facto* eugenic effect of population control? The answer in the media, and many American households, is that we don't even try.

Wars are always a popular media focus—summer blockbuster audiences are drooling over *Pearl Harbor* as we write. But ever since the Vietnam war, it's been clear than the picture in the press is very selectively chosen. So it is with the *Plan Colombia*, America's purported drug control scheme in Colombia. ISIS co-hosted a series of events this spring featuring San-Ho Tree, an expert on the *Plan* at the Institute for Policy Studies, and Kate Harris and Tad Montgomery, local "Witness for Peace" volunteers who recently traveled to Colombia to see more clearly than the government-released press clippings.

While the vaunted "war on drugs" rages in Colombia, there is a less-known war waged on the Colombians themselves and their land. Money that is purportedly going to end the import of drugs to the US from South America is going to the Colombian military and, in part, to spraying herbicides over the coca fields which are, of course, adjacent to the crop fields which sustain the local families. The farmers are told that they can only grow legitimate crops. But when all of their crops are being sprayed and they can make more money from selling coca, there is little incentive.

As long as coca remains in demand and as long as US funds are being used for military equipment and training instead of addiction treatment programs and farm aid, coca will continue to grow and crops will continue to be sprayed, causing illness and poverty for many Colombians as well as many other farther-reaching effects. The paramilitary, despite its involvement in the drug trade, is responsible for extreme brutality and human rights violations in Colombia, while purportedly being supported by aid packages passed by Bush. Occidental Petroleum, a big supporter of the Colombia Plan, has laid claim to land in Northeastern Colombia which is inhabited by an indigenous group, the U'wa. Occidental's support of the Plan is transparently connected to their designs on the U'wa land. If they are successful in their lobbying for the Plan, it will pose a major ecological and health threat to the U'wa people.

In the end, the standing-room-only popularity of the ISIS seminars this spring raises another interesting question: if the thinking public is so eager to probe these dilemmas of under-privilege and abuse, why do the media report so superficially on such important topics? As in each speaker's example, the answer is probably much more complex than the story we're likely to see.

Open Reading Frames *from page 7*

joke, best forgotten, if only it hadn't been so incredibly productive for so many decades. It is a time in which, as Ognjenka Vukmirovic and Shirley Tilghman write in a recent issue of *Nature Biotechnology*,

> It is hardly a coincidence that many universities and research institutes, including our own, are making major investments in multidisciplinary life-science initiatives to explore the complexity of living things. Organisms are networks of genes, which make networks of proteins, which regulate genes, and so on *ad infinitum*. The amount of complex data that will be generated, and the need for modeling to understand the way networks function, will ensure that disciplines outside of biology will be required to collaborate in this problem, if the ultimate goal to deconstruct such networks is to come to fruition.

It's that *ad infinitum* part that I find most interesting and inviting. For the complex, non-linear games of genomics today, we're going to need equally complex stories and analyses that truly do continue the series, if not ad infinitum, then at least well "outside of biology": networks of genes which make networks of proteins which are channeled through networks of machines sold by networks of corporations which are supported by networks of investors with networks of expectations fed by the major media networks which will eventually sell those networks of genes. My hope is that opening the reading frames in such a way will keep future Icelands from happening, and help bring the many promises of genomics to fruition.

Drawn from a March 2001 talk at Princeton co-sponsored by the Lewis-Sigler Institute for Integrative Genomics & the Center for Human Values.

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