Why EPA Wasn't Prepared for the Gulf Oil Spill

By David L. Lewis, Ph.D., Former EPA Research Microbiologist[†]

In 1998,

the U.S. Environmental Protection Agency transferred me to the Department of Marine Sciences at the University of Georgia, in part, to investigate potential oil spills that could contaminate the Gulf Stream. To my knowledge, I was the only scientist at EPA who was concerned about the potential for a catastrophic blowout from an offshore rig in the Gulf of Mexico. My EPA assignment agreement stated that my research would apply to "petroleum products that may travel great distances in oil spills and outfalls in marine environments."

EPA Science Achievement Award (2000) presented by Administrator Carol Browner

Unfortunately, I never had a chance to do the study. EPA worked with UGA to stop my research because of articles I published in *Nature* revealing gaps in EPA science.[1,2] Top EPA officials during the Clinton Administration transformed the Office of Research & Development (ORD) into a political tool to support EPA policies and protect certain industries. My research was a top-priority target. EPA Administrator Carol Browner indicated to one Clinton appointee that she opposed what was happening, but said she was "overruled at the highest level."

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How EPA prevented my oil-spill research

At UGA, I wanted to isolate strains of marine bacteria capable of breaking oils and dispersants down to non-toxic byproducts, and have the bacteria freeze-dried and stored for injecting along with inorganic nutrients directly into leaking undersea pipelines. Thus, as oil plumes develop, they would be permeated with “super bugs” and the nutrients they needed to biodegrade crude oil and dispersants. Intense high-pressure and cold temperatures in deep ocean currents would keep the super bugs in a state of dormancy for decades or centuries, until they are upwelled in coastal areas in other parts of the world. **[Fig. 1]**

My primary area of research at EPA was biodegradation of organic chemicals in terrestrial and aquatic environments. The Science Achievement Award presented by Carol Browner was for my "research demonstrating that major environmental changes may substantially alter the relative persistence of the enantiomers of chiral pollutants."[2] Many of the organic chemicals found in crude oil are *chiral* − meaning their molecular structures are mirror images (*i.e.*, "left-" and "right-handed"). The risks that chiral molecules (*enantiomers*) pose to public health and the environment depend on which enantiomers are present and at what concentrations.

The research on chiral pollutants conducted by my coworkers at the Marine Biological Laboratory in Woods Hole, MA and me demonstrated that microorganisms biodegrade organic chemicals to different enantiomers, depending on various environmental conditions, such as temperature and the type of nutrients present. In addition to developing strains of marine bacteria that could rapidly degrade the contaminants found in crude oil and dispersants, I wanted to determine which combinations of microorganisms, dispersants and nutrients would produce the least harmful biodegradation products.

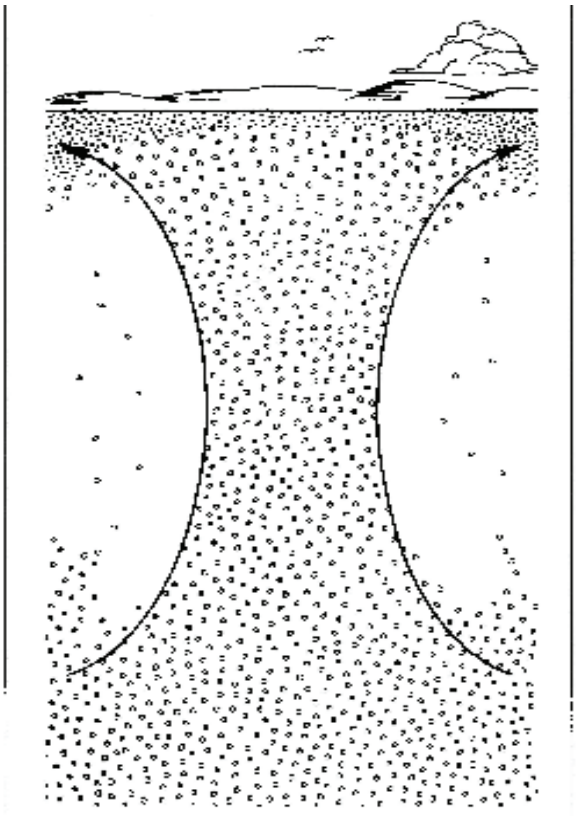


Fig. 1. Microorganisms travel in cold deep-sea currents in a state of dormancy until surfacing at upwellings. Lewis & Gattie (1991) *ASM News*.

Microorganisms have different biodegradation pathways in which various biodegradation products are formed. For example, malaoxon, which is a biodegradation product of the common pesticide malathion, is ten times more toxic to fish than malathion itself. Biodegradation products have other adverse effects as well. Some of the biodegradation products of DDT, for example, are carcinogenic (cause cancer). Understanding the biodegradation rates and pathways of crude oil

and dispersants is important to understanding the long-term impact of the Deepwater Horizon event on the environment. It is also needed to assess the economic impact this disaster will have on the fishing industry.

Because half of the world's fisheries depend on upwellings as their primary source of marine fish, upwellings are as economically important to the fishing industry as wetlands. Phytoplankton (marine algae) suspended in the water column feed on nutrients upwelling from deep ocean currents. In turn, fish feeding on algae blooms undergo a population explosion. A key unknown is what effect crude oil, dispersants and their biodegradation products will have on phytoplankton and fish breeding in upwellings when these contaminants begin to surface in the coming years and decades. Even parts-per-million concentrations of some contaminants could have significant adverse effects.

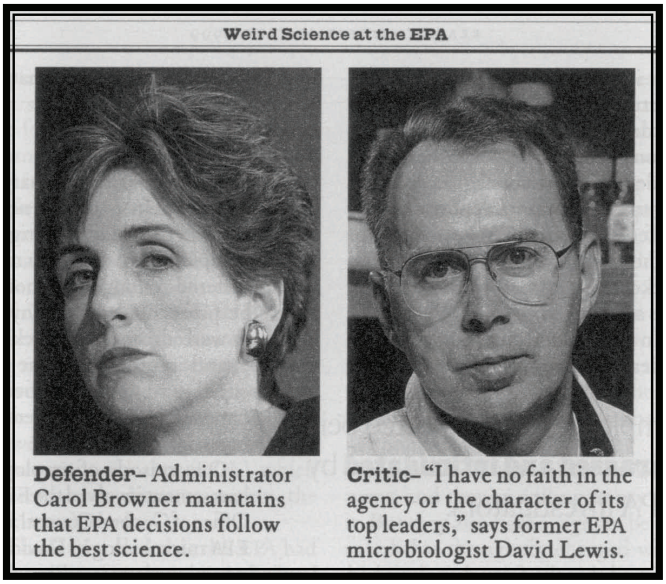
When I published my 1996 *Nature* commentary about the politicization of ORD, the ORD Deputy Assistant Administrator, Henry Longest, cut off my research funding and gave me two options. I could either transfer to UGA and retire from EPA afterwards, or I could remain under his direct control at EPA.[3] As soon as I transferred to UGA, Longest prohibited me from collaborating with other EPA scientists. Access to these scientists and EPA equipment was crucial to me going forward with the research on biodegradation of oil and dispersants in the marine environment.

After Longest cut off my research funding, I used my personal savings to conduct what little environmental research I could concerning the potential impact of municipal wastewater products (biosolids) applied to land. Even this research was halted under pressure from Longest's former employees in the Office of Water, who met with industry executives and put pressure on UGA.[4] As a result, UGA's Department of Marine Sciences eventually cut off my access to laboratory space and took away my office. This prevented me from being involved with assessing and cleaning up the Deepwater Horizon disaster − which, ironically, UGA's Department of Marine Sciences has taken a lead in researching.

In 2003, EPA unilaterally processed my retirement from federal service before I could serve out the remainder of my federal employment.[5] My local laboratory director, Dr. Russo, issued the following statement: "Dr. Lewis' involuntary termination over his research articles was not supported by the local lab management in Athens. He was an excellent researcher and an asset to EPA science." In 2008, *Nature* published an editorial supporting my UGA research after a multi-university study confirmed the results that my coworkers and I published.[6] Blackballed by government, industry and academia, however, I have remained unemployed since EPA terminated me. I was the only research scientist at EPA to publish first-authored papers in *Nature* and *Lancet*. But that work was only the beginning of what I considered to be my most important research concerning public health and the environment, which will now remain undone.

Politicizing ORD

In the 1990s, EPA's Office of Research & Development (ORD) employed a growing number of world-class scientists who were developing a broad understanding of environmental processes, including how to deal with potential environmental catastrophes such as the Deepwater Horizon event.



***Reader's Digest*, June 1999**

Under EPA Administrator Carol Browner, research scientists and their local laboratory directors became the target of federal prosecutors as part of a national witch hunt carried out by former EPA Inspector General John Martin. Martin was under pressure from Sen. John Glen and Rep. John Dingell to prosecute EPA managers and contractors for contract abuses.[7, 8] To facilitate his investigations, Martin rewrote the performance standards of his field agents. To maintain satisfactory performance ratings, they had to increase prosecutions; extra points were given for garnering congressional and media attention.

Mac Long, an EPA chemist in Athens, GA, and his wife were awakened late one night as a U.S. Attorney and one of Martin's agents knocked on their front door. To Mac's shock and horror, they wanted him to wear a hidden microphone to entrap our laboratory director, Dr. Rosemarie Russo. Should he refuse, they vowed to prosecute him for policy violations that his supervisors allegedly committed when they approved EPA funds for his Ph.D. research at Montana State University. The plan was for Mac to question Russo when she took a smoking break outside the building. To protect him from bodily harm, Georgia Bureau of Investigation agents would be hiding behind shrubbery and jump out at the first sign of trouble. Mac flatly refused; and the U.S. Department of Justice promptly prosecuted him for allegedly "benefiting from the wrongdoing of an unnamed third party." Upon the judge's advice, Mac and his wife mortgaged their home and settled the case instead of risking devastating fines that would financially cripple them for the rest of their lives.

This story was repeated at EPA research laboratories throughout the United States. Armed federal agents shoved scientists in their chairs and threatened them with imprisonment if they refused to wear hidden microphones to entrap their lab directors. A scientist in Duluth, MN told me that he planned to divorce his wife so that she could keep their home if he was sent to

prison. One lab director targeted in Gulf Breeze, FL died of a heart attack while under investigation. Federal judges eventually dismissed the charges in several cases working their way through the courts. Like Mac Long's case, the other cases involved false allegations and conflicting Agency policies written by different organizational units at EPA headquarters, which were micromanaging research laboratories in the field.

While Martin was working with the Department of Justice to turn up prosecutions and keep his job, Longest and other top ORD managers saw this as an opportunity to transform ORD into a tightly controlled political tool of EPA's Senior Executive Service (SES) employees. Political appointees, for the most part, come and go with each new administration. Although they wield a lot of power, they cannot function without the support of SES administrators and the cadre of senior-level professional staff below them in Washington, DC. Science at EPA became strictly business between political appointees and the SES. Both groups parlayed with industry and academia to further their own interests and EPA's field scientists were expected to produce whatever "science" was needed to support EPA's policies and protect certain industries. To accomplish this goal, Longest and others transformed ORD from a collection of small, quasi-independent environmental research laboratories dispersed throughout the United States to a more manageable − and more politically controllable − handful of national mega labs. (*See below*: Lewis, DL. *Nature*, 1996)

For my part, I organized an effort at EPA's research laboratories across the country to collect evidence on the abuses of Martin's field agents and wrote to EPA Administrator Carol Browner in June of 1995. In a 9-page letter, I explained what was happening to ORD. When Browner failed to respond, I began meeting with my local U.S. Representatives, John Linder and Charlie Norwood, to learn how Congressional oversight committees deal with EPA regarding ORD and science in general. Both congressmen were dentists before running for office and were familiar with my research at UGA on HIV transmission in dentistry, which led to the current heat-sterilization standard for dentistry. Because of my track record in affecting public policy, Norwood and Linder gave me direct access to the leadership of both Houses of Congress that few, if any, other EPA scientists working in the field outside of Washington, DC have ever experienced.

When I published the 1996 *Nature* commentary about major gaps in EPA's science programs and the growing politicization of ORD,[1] Speaker of the House Newt Gingrich met with me in his office in Washington to discuss my final draft. He looked at me and said: "You know you will be fired for this, don't you?" "I'm willing to be fired," I replied, "but I hope to avoid prison." After watching Martin's agents and U.S. Attorneys go after EPA research scientists, I was dead serious about hoping to stay out of prison. The commentary was widely covered by national media outlets. Gary Lee of the *Washington Post* told me that Carol Browner left messages on his phone complaining

about her side of the story not being told. He reminded her that she never responded to his requests for an interview. Later on, at a meeting with Browner, Lee suggested that she meet with me and hear me out. She said she would consider it, but never followed up. Twelve years later, the Union of Concerned Scientists published a survey showing that ORD had indeed become highly politicized − 889 of approximately 1,600 EPA scientists reported that they had experienced political interference in their work over the previous five years.[9]

Martin continued to tear apart ORD; but, by 1996, federal judges had begun throwing out the charges Martin's agents had filed against EPA laboratory directors and others. So I packed up my documents and met with Senior Editor Trevor Armbrister at his office with *Reader's Digest* in Washington, DC. I also met with Jeff Nesmith in the Washington Bureau of the *Atlanta Constitution*. As soon as they heard the story and saw the documents, they were committed to covering the story. In December of 1996, I notified EPA headquarters about the upcoming national news coverage. Martin resigned the following month.

After consulting with Henry Longest, ORD Asst. Administrator Norine Noonan removed Dr. Russo as my local laboratory director for approving my 1999 *Nature* article, which raised concerns about an EPA regulation. But, in 2000, Congress held hearings into retaliations against Russo and me. As a result of the hearings, Congress passed the *No Fear Act* to protect federal whistleblowers. The Senior Executive Association, a non-profit organization representing federal managers in the Senior Executive Service, secured last-minute changes, which prevent government managers from ever being adversely affected by the law.[10] In other words, they are free to continue retaliating with impunity. Noonan, per Browner's instructions I assume, reversed Russo's removal as laboratory director shortly after Browner testified at the hearings in 2000.

Browner, however, did nothing to stop Longest's plans to terminate me. At an awards ceremony in 2000, she paused to talk with me in detail about my research as she presented me with EPA's Science Achievement Award. My impression was that she would have done something to stop the politicization of ORD if it were in her power to do so. As an aside, the Science Achievement Award was unique in that the recipients were chosen by a panel of scientists outside of EPA. After 2000, EPA changed it to where EPA would select future recipients.

No science organization could possibly withstand what Longest and others did to ORD during the Clinton Administration. Many of ORD's best scientists left for other jobs; others took early retirements. One of ORD's top research chemists who retired remarked to me: "I'm so embarrassed when I meet people at scientific meetings and they ask where I work. I just tell them I'm an adjunct professor." Some, like me, were forced out. Robert Kuehn, a law professor at the University of Alabama, used my case as one

of many examples where attacks on environmental scientists are carried out partly "to send a warning signal to other scientists about the adverse consequences that may result if they engage in similar unwelcome work."[11]

As if to confirm Kuehn's conclusions, an assistant director with EPA's National Exposure Research Laboratory congratulated me on my last day at EPA for a National Academy of Sciences report that supported some of my recent findings. "I just hope others will continue the work," I replied. "No way," he said, "not after what happened to you." Similarly, one of ORD's highest ranking and brightest scientists (now deceased) said he wanted to tell me things that transpired at ORD Headquarters to further certain agendas, which he said will be very costly to America down the road, both economically and environmentally. He said he had been waiting to see what EPA did to me before he passed that information to anyone else.

In the *Reader's Digest* article by Trevor Armbrister, I was quoted as saying: "I have no faith in the agency or the character of its top leaders." I was referring to Longest and others, including some of the political appointees who were key players in politicizing ORD. For the sake of illustration, I will briefly comment on two of EPA's top leaders who I had in mind when I commented to *Reader's Digest*. One, of course, is Henry Longest, who retired soon after terminating me in 2003. The other is Robert Perciasepe, who is currently serving as EPA Deputy Administrator under President Barak Obama.

Henry L. Longest, II. Longest was a Deputy Asst. Administrator in the Office of Water before laterally transferring to ORD as Deputy Asst. Adm. for Management. In 2003, he distributed Margaret Wheatley's book, *Turning to One Another*,[12] at ORD leadership meetings. The cover bore ORD's seal of approval for leadership training. Wheatley urged environmentalists to abandon *Western* science in favor of what she calls *New Science*. Abandoning Western science, she taught, initially leaves scientists in a state of confusion called the *space of not knowing* and the *abyss*. While traveling through this abyss, Wheatley says, scientists must shed their religious beliefs and sexual inhibitions. Then they will emerge from this abyss of total ignorance discovering that they feel closer to nature and one another.

That same year, Longest gained notoriety in the *Washington Post* when someone leaked a questionnaire, which he had the Naval Postgraduate School in Monterey, CA administer to ORD employees.[13] The survey, called the "Appreciative Inquiry Research Study," questioned ORD employees about their religious beliefs and probed their romantic feelings. Employees protested the survey, which required that they type in their names when completed; and Longest withdrew it.

Longest wanted ORD employees to agree or disagree with various statements, including:

I am a very flirtatious person.

A higher power is looking out for me.

When I'm attracted to someone, I am overwhelmed by desire.

I regularly attend religious services.

I can think of several personality traits that turn me on sexually.

I've often imagined being sexual with a friend, colleague or acquaintance.

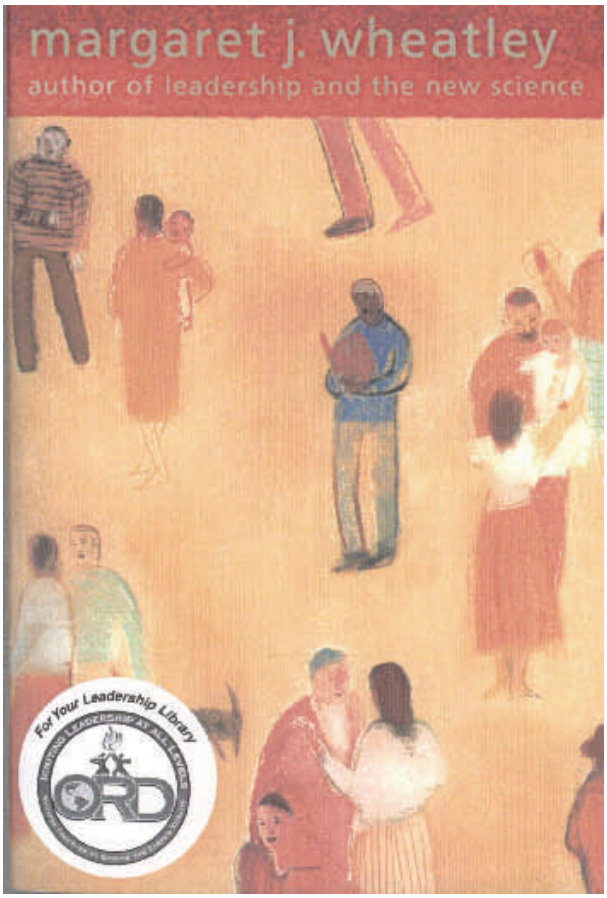
Almost everybody has something sexy about them.

I have dated a lot of people.

I have difficulty talking to attractive persons of the opposite sex.

I become self-conscious when using public toilets.

I get nervous that people are staring at me as I walk down the street.



Margaret Wheatly's book, *Turning to One Another*, distributed by Deputy Asst. Adm. Henry Longest with ORD's seal of approval on the cover

When I received a copy of the survey to complete, my impression was that it looked a lot like someone trolling the organization for sex.

Robert Perciasepe. During the Clinton Administration, Perciasepe was Assistant Administrator for EPA's Office of Water (OW) and then Air and Radiation. He was a key player in OW's use of industry trade associations to circumvent ORD's efforts to close gaps in the science used to support land application of sewage sludge.[4] OW's efforts to thwart ORD included the illegal use of federal grants and cooperative agreements to support EPA policies. The funds, mainly congressional earmarks raised by big industry associations, were used to publish scientific research supporting EPA policies and attacking opponents. Attacking opponents included distributing false allegations of scientific misconduct against me to stop my research at UGA.[4]

Perciasepe established an unofficial organization within EPA, called the Biosolids Incident Response Team (BIRT), which covered up adverse health and environmental effects associated with Longest's policies on biosolids, which I was investigating at UGA. The head of BIRT, Robert Brobst, even used an EPA grant to publish false and fabricated data in the scientific literature to support these policies.[4] Perciasepe, therefore, played a key role in shutting down my research at UGA during the Clinton Administration and preventing me from investigating oil spills that stood to contaminate the Gulf Stream. President Obama brought Perciasepe back to EPA in 2009 and elevated him to Deputy Administrator.

The Blame Game

Clearly, the federal government was not prepared to deal with Gulf oil disaster; and, whenever a national disaster occurs, people want to know who to blame. Former President Bill Clinton advises that we should worry about that later.[14] According to Clinton, we should first stop the leak. After that, the most important thing is keeping the oil away from the shores. Then we should focus on minimizing the damage once the oil reaches the shore. "The fourth most important thing today," Clinton says, "is to figure out who did what wrong and hold them accountable, whether it was somebody in British Petroleum or somebody in the U.S. government. And I'll do that, but let's do one, two and three first."

To me, that's like saying: Let's stop all the murders in Chicago and then start looking for the murderers. Everyone knows it doesn't work that way. The trail grows cold, evidence disappears, tracks get covered. What BP did in the Gulf is the subject of a federal criminal investigation. President Clinton knows that, and his argument to clean up the Gulf before we hold people accountable has a resoundingly hollow ring. Much of the foundation for what we are up against was laid by his administration. When ORD was undergoing radical politicization under the Clinton Administration, I met with a Clinton appointee and pointedly asked: "Have you talked with Carol Browner about this?" His precise answer, which I will never forget, was: "David, I have been around and around with her about this; and she said that she is being overruled at the highest level." That, of course, would be President Clinton. Putting ORD under the thumb of politicians in Washington and big industry destroyed its ability to avert major environmental disasters such as the Gulf oil spill.

Like the cozy relationship between big industry and regulators at EPA,[4] the same situation exists at the Minerals Management Service, which oversaw BP's drilling operations in the Gulf. We have a system of government where elected officials with restricted incomes are wined and dined by multi-billion-dollar corporations looking for ways not to be regulated. Presidents appoint the heads of federal regulatory agencies. These people, in turn, look to SES employees to do their bidding. Federal officials are told what to do and when to look the other way. Insiders who may blow the whistle are silenced by whatever means necessary. This is what became of ORD under President Clinton. And, this is why my career was ended while Henry Longest, an SES employee, was presented Presidential awards at Rose Garden ceremonies.[15] It's a system that former President Bill Clinton apparently does not want anyone looking into until all of the problems in the Gulf are resolved, which, of course, will not happen in our lifetimes.

The Politics of Corruption

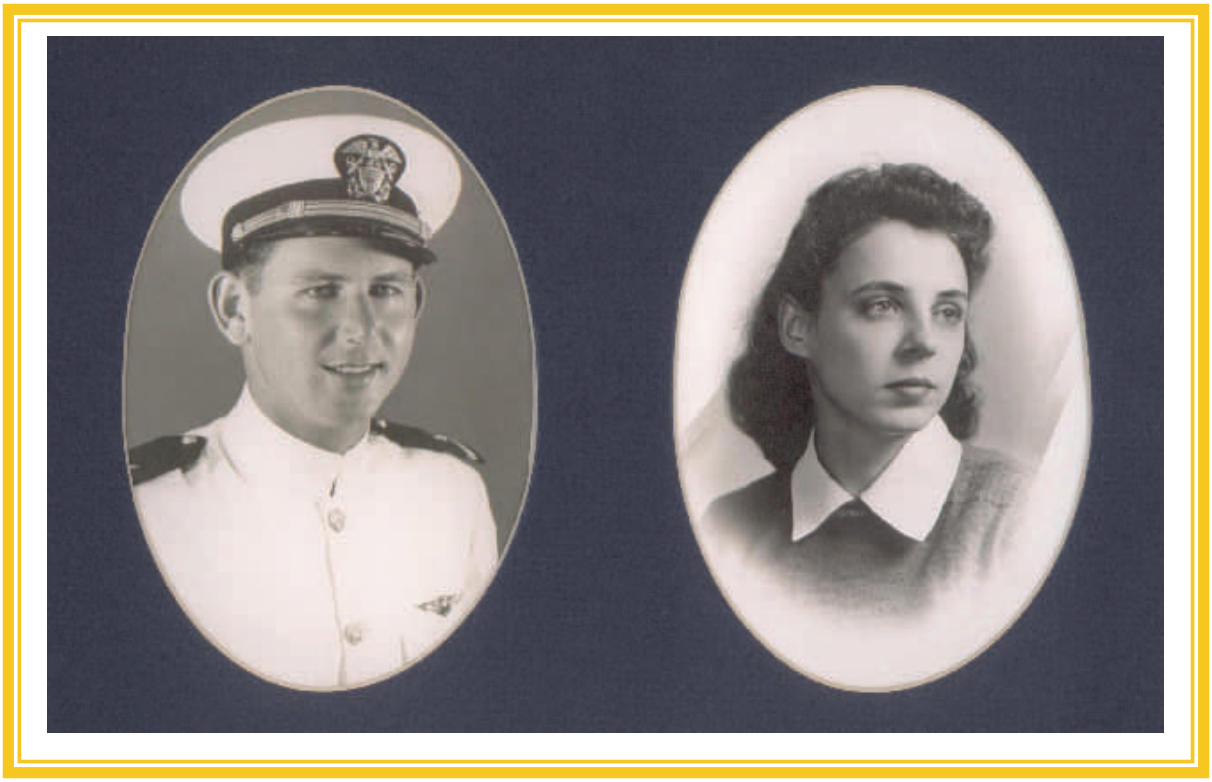
Each new President struggles to set priorities and accomplish goals while working with a system of government that is becoming increasingly corrupt as time passes. And, it seems like everyone promises to stop corruption when running for public office, and then does little to nothing when elected. Government employees who speak out are squeezed out; and Congress and the courts are doing little to protect them. Notwithstanding, Congress has become increasingly concerned about the deteriorating state of ethics with scientific research. This, according to a National Science Foundation workshop, is partly due to the "the close coupling of commerce and academia."[16]

The federal government, however, has the most control over big science. Top officials in the federal government from the President down can and do from time to time become the main driving force behind the overall corruption of science. I had great hopes that President Obama would clean up EPA and get ORD back on track. By bringing back Robert Perciasepe from the Clinton Administration and elevating him to Deputy Administrator, however, improving the state of EPA science is clearly not a prority. Browner, I assume, was responsible for resurrecting Perciasepe. So what does this mean? I doubt that it means that she is still being "overruled at the highest level" so far as what happens at EPA.

One thing is clear. Browner's mantra concerning the Gulf oil spill − *We have the best minds working on it* − isn't the whole story. The federal government's inability to prevent, or even cope with, the unprecedented environmental catastrophe in the Gulf of Mexico has Carol Browner's name written all over it. As EPA Administrator, she looked the other way while President Clinton politicized science within the Agency. This includes all of the research that EPA outsources to private corporations, other government agencies, non-profit organizations and academic institutions. EPA has a very large impact on environmental science throughout government, industry and academia. It often determines which research is done − and which is not. At best, all that Carol Browner can say about the government's efforts to end the crisis in the Gulf is that the best minds *left* are working on it − after the Clinton Administration gutted ORD and deprived EPA of some of the best scientists and engineers in the world. This includes some who were searching for the very answers EPA needed to prevent the Deepwater Horizon disaster and, failing that, to effectively deal with the consequences.

Newsweek's Contributing Editor, Julia Reed, was taken aback when President Obama angrily remarked that he was "looking for whose ass to kick." "He should look behind him," she said, referring to the federal bureaucracy in Washington.[17] Depoliticizing science at EPA and elsewhere in the federal government needs to be on the President's list of priorities. He cannot

make progress toward developing viable alternative sources of energy and protecting public health and the environment without creating the kind of science that can make it all possible. Much of this science will require resources that only the federal government has at its disposal; but it can never be produced by a corrupt federal bureaucracy. Once it is manipulated and controlled to protect the financial and political interests of certain parties within government, industry and academia, what may be called science is, in reality, not science at all. It's called marketing. It's just using people with science and engineering degrees to promote government polices and the interests of certain industries and academic institutions to an unwary public. That's *all* it is − nothing more, nothing less.



Lt. and Mrs. H.W. Lewis
Circa 1950-53

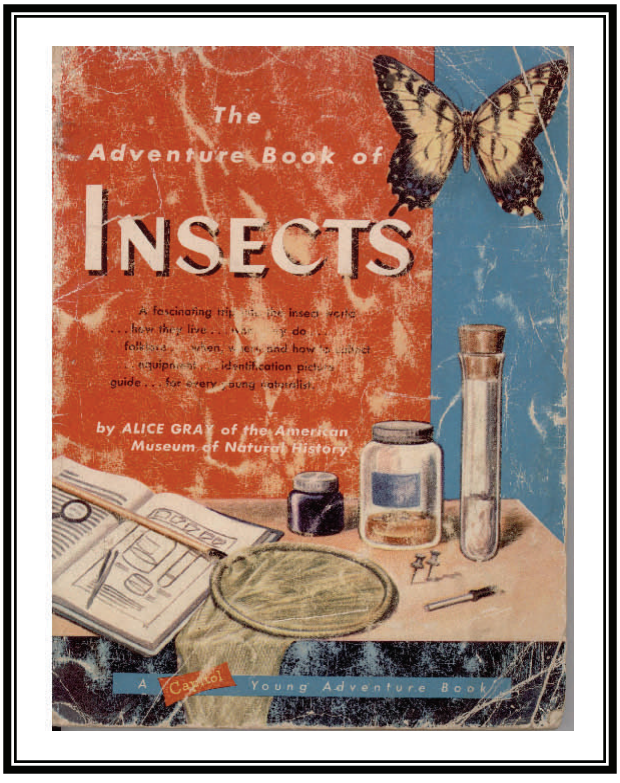
I learned a lot about public service from my father. He left the United States in the late 1930s to train with the Canadian Royal Air Force so that he could help with the war effort in Europe. Air Marshall William Avery Bishop pinned on his wings and he transferred to the RAF in London. When America joined the war, he entered the U.S. Navy and started training to fly PBYs at the Naval Air Station in Pensacola, FL. He served throughout WWII and the Korean conflict and became a flight instructor as an all-weather-flying expert − a distinction very few pilots earned.

I also learned a lot about public service from my mother. After raising five children at home, she got a job as director of the day care center at Morningside Methodist Church in Thomasville, GA. Throughout the many years that she worked there, she used all of her salary to help young mothers in need. I only learned of this after my mother passed away last year. At the cemetery where she was laid to rest next to my father, the grounds overflowed with the mothers of those whom she called "my" children. They came to say goodbye to the one who loved and cared for them as her own until the day she died.

I never knew my mother or father to tell a lie, or to treat another person unfairly. The character traits I learned from them − courage, honesty, and self-sacrifice − were just the basic minimum requirements for becoming a scientist and public servant. Without these, all of the higher education and hard work that came later would have been for naught. These same virtues are abundantly shared by my wife and our two sons. Both of our children have a strong sense of public service and want to become scientists. One is searching for a Ph.D. program in genetics or cell biology; the other plans to take a year off from Harvard Law School to take graduate courses in genetics and biochemistry. Our story is one that is multiplied throughout every corner of America, from inner-city neighborhoods to rural farms − from North to South and East to West. It is the strength and future of a great nation, passed from generation to generation. It is entrusted to the government, not to suppress or silence, but to protect and draw from its virtues, and make them its own.

I have loved science since the time I was a small child. The same is true of sculptors, actors, musicians and others who have been doing what they do best since the age of four or five. It's what they were meant to be in life; and nothing else can make them happy.

My high-school chemistry teacher, Mrs. Nesmith, always told me that the things people worry about most never happen to them. It's true. It's usually what they never thought about that gets them in the end. When I first went into science, I never thought that publishing research that the government didn't like could bring an end to my life's work. It certainly wasn't that way when I first began working at EPA. Disagreeing with one's bosses, even the ones in Washington, was not something that got research scientists into trouble.



A book my father gave me when I was about 10 yrs old

In the early 70's, our hero was a whistleblower, although we never thought of her that way. Her name was Pat Kerr, and her issue was whether phosphates in laundry detergents caused algal blooms in lakes and rivers. Algae are limited by carbon, not phosphorus, she argued. Phosphorus allows bacteria to grow and produce CO_2, which, in turn, causes algae to bloom. But some of her bosses at EPA saw it differently. Then one night Johnny Carson had as his guest Eddie Albert, the star of the CBS hit TV series *Green Acres*. When asked about his interest in the environment, Mr. Albert commented about phosphates and algal blooms. Then he added: "But 'Doctor' Kerr at EPA says that phosphorus doesn't stimulate algae." Pat's funding never suffered; and, in the end, she turned out to be right.

Jesse C. (Mike) Woodham, III and me using a high-altitude test chamber for our high-school science project courtesy of Moody Air Force Base. Mike became a commercial airline pilot and currently directs the Thomasville Regional Airport in Southwest Georgia.

In the military service, soldiers must take orders. But in civil service, dissent − even open dissent − is a critical resource. This is especially the case whenever public health, national security or other vital national interests are at stake. The days of EPA and other federal agencies tolerating honest dissent from within appear to be gone, and may never return. If so, it is a sign of insecurity, and of an uncertain future — not strength.

Scientists in Name Only

Should EPA prohibit its scientists from publishing data that are unsupportive of the Agency's policies and unprotective of certain industries? In science, the selective publication of data to support a certain viewpoint while concealing data that contradict that viewpoint is considered scientific misconduct. Science, as most everyone knows, is intentionally designed to eliminate bias and has an uncertain outcome, while marketing is inherently biased and has a predetermined outcome. Likewise, the scientific method aims to answer a particular question correctly. The purpose of marketing is just the opposite, which is to persuade others to accept a particular answer, which is oftentimes intentionally misleading or knowingly incorrect. Science is grounded in full disclosure, while marketing often involves deception. Scientists who publish selective data to protect certain policies and vested interests are scientists in name only.

Deepwater Oil Plumes: A Threat beyond the Horizon

Tony Hayward, CEO of British Petroleum (BP), says: "The Gulf of Mexico is a very big ocean. The amount of volume of oil and dispersant we are putting into it is tiny in relation to the total water volume."[18] This isn't true, however, when it comes to submerged oil plumes that become entrained in the Gulf Stream or other deep ocean currents. Most of the oil blowing out of the Deepwater Horizon is mixed with dispersant and will remain submerged in the Gulf. Sooner or later, it will find its way to the Gulf Stream loop current; some of the emulsion probably already has. When these plumes enter the loop, it will be like millions of gallons of oil and dispersant dumping into a slow-moving river. They will meander through deepwater currents of the Atlantic Ocean until they approach land where they will upwell to the ocean's surface years and even decades later.

Crude oils are highly complex mixtures of hydrocarbons, including *asphaltenes* (*e.g.*, phenols, fatty acids, and porphyrins - the breakdown products of heme and chlorophyll), *resins* (*e.g.*, pyridines, quinolines, sulfoxides), *saturates* (*e.g.*, methane, mineral oil, paraffin wax) and *aromatics* (*e.g.*, benzene, xylene). Once they contaminate the environment, microorganisms will break down (biodegrade) these constituents at widely different rates depending on the environmental conditions. As early as 1977, Colwell and Walker concluded: "oil which reaches the deep-ocean environment will be degraded very slowly by microbial populations ... certain recalcitrant fractions of the oil could persist for years or decades."[19]

Eventually, the oil and dispersant, along with their biodegradation products, will upwell off the coasts of Newfoundland, Greenland, Northern Europe and West Africa. Certain biodegradation products will be more toxic than the oil and dispersant themselves. Some of the oil, dispersant and biodegradation products will reenter the Gulf of Mexico; and some will be transported to the eastern coasts of South America. To reach South America, the contaminants follow a branch of the Gulf Stream that sinks to the bottom of the North Atlantic and flows southward along the Eastern Coast of the United States. **[Fig. 2]**

A major difference between the Deepwater Horizon event and the Ixtoc I blowout in the Gulf of Mexico in 1979-80 is that the current influx of crude oil is mixed with a dispersant to keep the oil submerged. Small amounts of crude oil occur as a natural contaminant in the Gulf; and their effects are well documented. But no one knows how massive amounts of oil emulsion distributed in the water column will affect the marine environment. What we do know is that it will cause much, if not most, of the oil coming from the Deepwater Horizon to be exported out of the Gulf of Mexico and upwelled years from now in environmentally sensitive areas on all sides of the Atlantic Ocean.

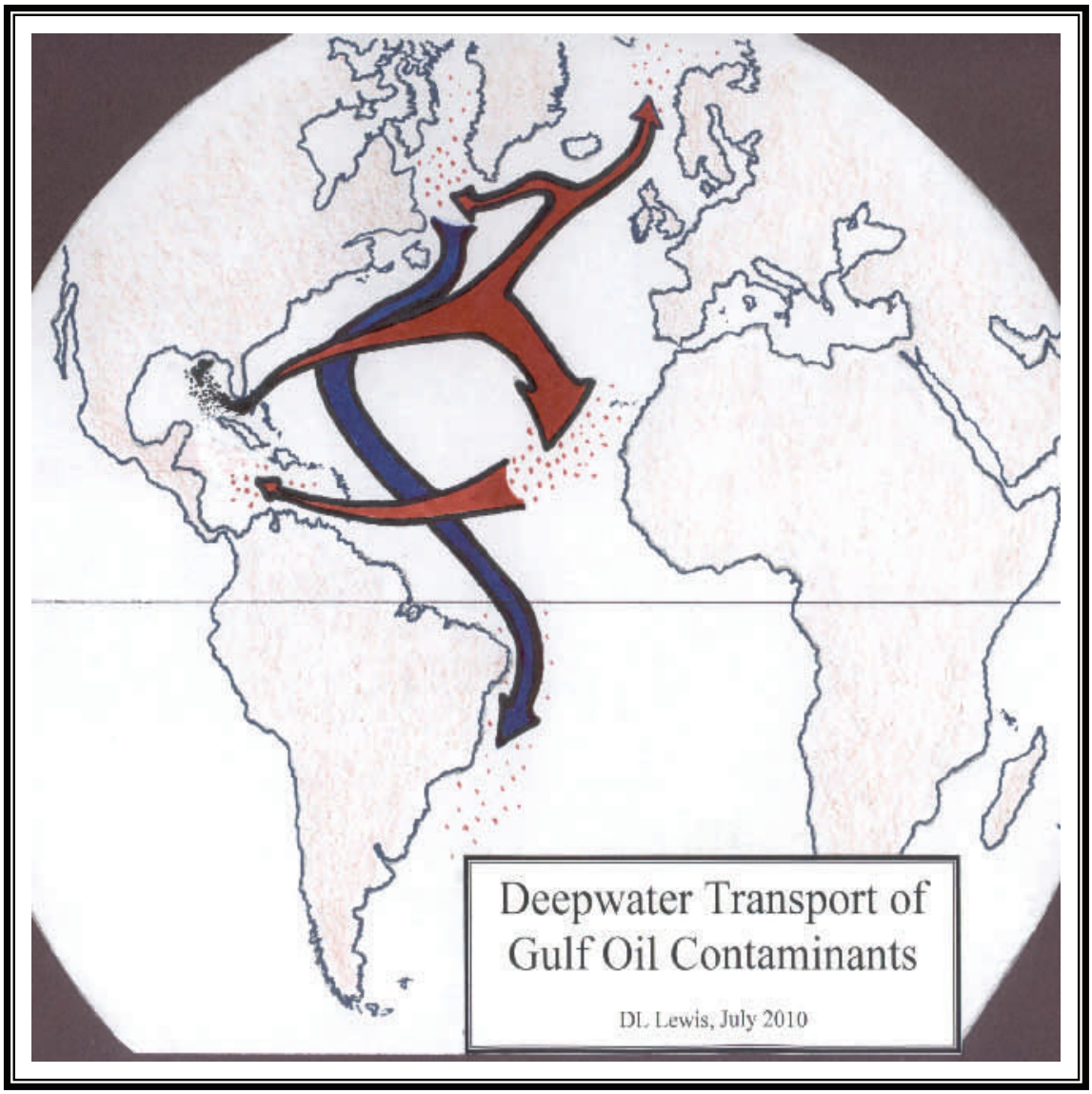


Fig. 2. Future upwelling areas (red dots) of Deepwater Horizon oil emulsion contaminants off the coasts of Newfoundland, Greenland, Northern Europe, West Africa and eventually around South America via the returning Gulf Stream and North Atlantic Deepwater (blue arrow).

Faulty Blowout Preventers

The chances of an offshore drilling rig exploding are extremely low. When it does happen, blowout preventers (BOPs) are designed to stop oil leaks; but they failed to work on the Deepwater Horizon. The costs of servicing a floating ultra-deepwater rig to replace faulty or malfunctioning BOPs can exceed $1 million.[20] Consequently, although BOPs have a substantial failure rate, there is a significant financial incentive against servicing them. In response to the disaster in the Gulf, Congress is working on the Blowout Prevention Act of 2010, which will require offshore drilling companies to ensure that their blowout preventers are working.

Catastrophic events often reveal weak links in a system of which only certain specialists working in an industry have any knowledge. When I investigated how six patients in a Florida dental practice contracted HIV from their dentist, I worked with manufacturers of dental equipment to understand how dental drills and other air- and water-driven dental devices actually work. Conventional wisdom was that blood and other patient materials couldn't possibly contaminate internal areas of these devices because air and water were constantly flushing them clean.

Not satisfied with this explanation, I acquired some used dental drills from a major dental supply company and tested them under laboratory conditions. It became apparent that clinically significant amounts of debris and fluids could be sucked into the devices during drilling or polishing teeth and then be blown back out when the devices are reused.[21] Attachments used to polish teeth, called prophylaxis angles, are shared among dentists and patients and could potentially explain how HIV was transmitted dentist-to-patient in Florida. When I visited dental repair shops to see what internal parts of used devices looked like in real practice, I found boxes of these parts covered with lubricants containing visible amounts of blood, pulverized tooth material and bits of tissue. Technicians working in the repair shops were already aware that seals in the devices, which are designed to prevent leakage, often fail.

The U.S. Navy and Air Force investigated our published findings, confirmed them, and then advised that dental drills (high-speed handpieces) and equipment used to polish teeth be heat-sterilized.[22] Nevertheless, the American Dental Association pleaded with EPA to put an end to my frolicking foray into dentistry; and the CDC dismissed any concern that HIV could survive high-level disinfection even if dental devices became internally contaminated. When my research team put that bit of conventional wisdom to the test, we were all shocked to find that oils and greases used to lubricate dental devices could protect HIV from being disinfected. We demonstrated that HIV-infectious blood can collect inside handpieces and their attachments, escape disinfection, and sporadically eject in sufficient amounts to potentially infect subsequent patients. [23, 24]

Based on our results published in *Lancet* and *Nature Medicine*, manufacturers quickly improved the design of the devices and the CDC and most public health organizations worldwide adopted a new standard of infection control. All items entering the oral cavity during dental practice must now be either heat-sterilized or discarded after each use. Since then, I have carried out similar studies of flexible endoscopes, such as colonoscopes used with colorectal cancer screening.[25] After testing these devices under laboratory conditions and visiting manufacturers and repair shops, I discovered a design flaw that presents a risk of transmitting infections.[26] I also took this same approach in my environmental research. For example, when EPA assigned me to work with the Undersecretary of Agriculture in Florida, I questioned the conventional wisdom associated with the reliability of certain devices (lysimeters) commonly used by federal and state agencies to collect environmental samples. My suspicions concerning the inaccuracy of lysimeter data were confirmed in laboratory and field tests; and the State of Florida adopted a design change that my coauthors and I recommended.[27]

In 1998, I certainly didn't know much about blowout preventers on offshore oil rigs. But, as part of my research concerning the potential for massive oil contamination in the Gulf of Mexico, I wanted to learn how these devices work and how reliable they are. I have always dealt with the mechanical engineering end of things when addressing such issues. Had I been allowed to undertake the work that EPA assigned me to do at UGA's Department of Marine Sciences from 1998-2002, I feel confident that I would have discovered that blowout preventers are substantially unreliable; and I would have begun working with the Minerals Management Service and Congress to fix the problem.

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