



Advocates, adversaries, and adjuncts: the ethics of international science journalism from a US perspective

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ABSTRACT: The traditional image of journalists as adversaries of the establishment is sometimes blurred by the complex relationship between reporters and scientists, particularly in developing countries where advancing science and technology is seen as essential to economic growth, and journalists, intentionally or not, may become advocates for this national goal. The changing nature of media technology, coupled with intense market pressures, is further complicating the role of science journalists as many have become affiliated with research organizations: institutional adjuncts providing information directly to the public. While it is difficult to develop a single set of ethical standards that can be applied globally—or that can address the new realities of modern science communication—existing models suggest that peer pressure can be an effective method of policing journalistic misconduct, even on an international scale.

KEY WORDS: Science journalism · Advocacy journalism · Ethical standards · International communication · Media

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INTRODUCTION

The first half of 2008 may have been one of the worst periods in the history of US American journalism. According to the Columbia Journalism Review, during this 6 mo stretch, 'newspaper revenue went into free fall...Gannet, the country's second largest newspaper chain, saw its second quarter advertising revenue drop 13.5% from a year earlier and announced it would cut 1000 jobs from its newspapers; the New York Times Media Group dropped 9.5% in ad revenue. Profits fell; layoffs followed buyouts. The *Atlanta Journal-Constitution* cut almost 200 jobs—8% of its total workforce. The *Wall Street Journal* eliminated 50 editorial positions. The *Chicago Tribune* announced cuts of 120 newsroom jobs, 14% of its staff. The *Los Angeles Times* will lose 135 jobs, the *Baltimore Sun* 60, the *Orlando Sentinel* 52. In the month of July 2008, some 1000 American newspapermen and women were told to find other employment' (Love 2008, p. 26–27).

The good news, if there is any in this sad accounting, is that few of those losing their jobs were science journal-

ists. The bad news is that those jobs had been already lost in earlier layoffs, when specialty writers—science and environment writers; music, book, and art critics—were among the first casualties of the cost-cutting crisis.

US newspaper circulation—and advertising lineage—continues to fall precipitously, with overall revenues dropping by nearly 8% in 2008 (Project for Excellence in Journalism 2008). Magazines face similar problems, as the US public increasingly turns to television, and particularly the cable networks, for its news. Unfortunately, while science and technology news has always been a solid staple of quality print journalism, commercial television in the US has never been very interested in covering science—except for the weather, especially floods and hurricanes, and occasional space activities, especially if they involve catastrophic failures. This means that science news is being squeezed out of the US mass media.

A Pew Trust survey of cable television published in early 2008 showed that if you watched 5 h of cable on a typical day during this election year, you'd get 35 min of politics, 36 min of debate over US foreign policy,

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26 min of crime, 12 min of disasters, 10 min of celebrity news, and, sadly enough, less than 1 min of science news (Project for Excellence in Journalism 2008). So it is no wonder that only about 11 % of Americans can name a living 'role model scientist', and that most of those name either Bill Gates or Al Gore (Holden 2008).

Given the small—miniscule, really—role that science and technology plays in the modern news mix, at least in the USA, it seems almost irrelevant to discuss the ethics of science journalism. Just getting one's story on air or in print would seem challenging enough, let alone trying to address any broader ethical issues.

Still, in many other parts of the world, especially in those countries with booming economies and rising literacy rates such as China, India, and Brazil, newspaper readership is not only surviving, but thriving. In India, for example, general newspaper circulation is rising by 5 % per year. *The Times of India* alone has grown by 10 % in the past year and, with 3.5 million copies printed daily, has arguably the largest circulation of any English-language newspaper in the world.

In addition to the growth of traditional or 'old' media, developing countries are also adopting newer forms and adapting them to their own cultures. As Fareed Zakaria of *Newsweek International* reported, 'India has 18 all-news channels of its own, and the perspectives they provide are very different from those ...in the western media' (Friedman 2008).

One of those different perspectives is that on science and technology. Because science and technology have been such major contributors to the growth of these emerging economies, news coverage naturally reflects the importance of these subjects to both the people and the governments of these countries.

Obviously, governments prefer to promote the benefits of development and underplay the downside of rapid, unplanned and uncontrolled growth, such as rampant corruption, excessive consumerism, industrial pollution, population displacement, environmental degradation, and economic disparities. On the other hand, the public, especially those members who are benefiting from development or hope that they will, is hungry for news of positive achievements, of research that will improve their lives and health, and of technology that will enhance the economy and their own incomes.

In such an atmosphere, science journalists face interesting and challenging ethical dilemmas: Will they, because of their own natural interests and professional experience, become enthusiastic advocates for scientific research and, by extension, adjuncts to governmental efforts to advance national goals? Or will they, if allowed, become adversaries of the governmental, industrial, and military interests that benefit from

allowing the darker aspects of science and technology booms to go unchecked?

THE ADVOCATES

If you are a science journalist, it is hard not to be enthusiastic about science and an advocate for its place in society. The excitement of being part of a discovery, perhaps reporting it for the first time, of witnessing something new and different and wonderful, is very seductive.

In addition, the very task of explaining a complex and complicated process or concept in simple, understandable language is so difficult and demanding that one often has neither the time nor the inclination to go beyond the immediate results and look for broader, more long-term implications. Moreover, the bond between reporter and source in science writing is perhaps more intense than in any other journalism genre, particularly because the writer is so dependent on the scientist, who is often the single source for the story, for not only the basic facts but for a guarantee of their accuracy.

In Europe and the US, enthusiastic and unquestioning advocacy for science is not uncommon, but it is usually tempered by several factors: a tradition of using multiple sources, an unlimited pool of equally qualified and sometimes contrarian experts, a highly competitive academic community, and peer pressure from fellow journalists pursuing the same story.

However, in developing world countries with clearly defined (or at least perceived) national science and technology policies, there is little reason to dampen a reporter's overly enthusiastic embrace of science's wonders and potential. When reinforced by the rush that comes with writing popular stories that elicit a positive public reaction, almost immediate feedback, and establishment approval, reporters can easily become uncritical cheerleaders for science—even without any official prodding.

Media cheerleaders are not limited to the developing world, of course. A classic case of press seduction is the love affair that developed between US space reporters and the US National Aeronautics and Space Administration (NASA) during the early days of human space flight. From Project Mercury right up until the loss of Space Shuttle Challenger, most US reporters chose to overlook technical flaws, operational glitches, and full-blown errors, happily accepting the NASA storyline that such problems were just part of the risk—and adventure—of being an astronaut.

Did this constitute an ethical lapse? Not necessarily. But it certainly was sloppy reporting, and those beat reporters who covered the space program paid a price for their bad practices: within moments after the Chal-

lenger exploded into a million pieces, the NASA press operation was locked down and reporters who depended solely on NASA press releases were locked out. Eventually, the real story behind the shuttle failure was uncovered by outsider journalists drawn from business, politics, and technology.

HOW ADVOCATES CAN TURN INTO ADJUNCTS

The space shuttle example shows how easy it is to turn independent, possibly overly enthusiastic, advocates into adjuncts, i.e. semi-official spokespeople for government agencies and promoters of national policies. In Western democracies, science journalists at least have the freedom to decry these policies if, through some insight, insider leak or, less likely these days, real enterprising reporting, they learn that the policies are flawed. In contrast, science journalists in many other societies do not have this flexibility and are forced to use the news that is provided by their governments. At the Public Communication of Science and Technology (PCST) meeting in Sweden in June 2008, Jia Hepeng, news coordinator for the Science and Development Network (SciDev.Net, www.scidev.net) in China, noted that 'despite the repeated calls for support from Chinese leaders, science reporting is in the decline... in large part because of how information from science communities is transmitted to the general mass media' (Hepeng 2008). As an example, he noted that 'the news releases produced by science institutes [in China] are more likely to be propaganda to appease scientific leaders rather than to engage the public' (Hepeng 2008).

Sometimes, the propaganda becomes blatant lies. In February 2008, *Nature* magazine reported that an award-winning photograph, showing a herd of endangered antelopes passing safely and serenely beneath a passenger train rushing across a trestle bridge on the controversial Qinghai–Tibet Railway, was a fake. The Chinese government had been understandably pleased when the photograph first appeared, citing it as proof that the railroad would have little adverse effect on wildlife. The photo was widely circulated, appearing in some 200 outlets around the world, and even won a bronze medal in the 2006 Most Influential Photographs Contest sponsored by CCTV, China's state television.

Unfortunately, the photo was in fact a clever computer-generated composite of two separate images, one of the train passing over an empty valley and the other of the herd migrating through that same valley, shot at two different times. A nature expert explained that there is no such thing as 'harmonious coexistence' between trains and antelopes and that they are never seen together. Or, as he put it: 'The photographer fab-

ricated and supplied the image the government badly wanted to see...' (Qiu 2008, p. 1034–1035).

Governments are not alone in using willing journalistic adjuncts. The media itself may sometimes engage in data manipulation for its own ends. A year before the antelope photo story appeared, Cyranoski (2007) reported in *Nature* on a case of fakery on Japanese commercial television. A popular weekly science show called Hakkutsu, broadcast by Kansai Telecasting Corporation (KTV), reportedly faked research results and dubbed false words over the voices of foreign scientists in a program touting the supposed health benefits of the fermented bean paste known as miso. In brief, the show's producers claimed that eating natto, a gooey dish made from miso, could help one lose weight. Unfortunately, when pressed for proof, KTV admitted that most of the data had been fabricated, the attractively slimmed down people shown in television photos were not those who had participated in the experiment, and the purported measurements of reduced fat levels had not even been made at all.

Cyranoski (2007) cited several other dubious programs then under investigation for data manipulation, including one that claimed certain chemicals in lettuce could induce sleep, another on the power of adzuki beans to invigorate the brain, and one on the so-called 'science of face-thinning.' The President of Japan's Science Council argued that council guidelines on academic fraud should apply to anyone doing experiments, even those on TV shows. However, he expressed little hope that TV producers would follow the guidelines. As he so succinctly put it: 'Their goal is not scientific truth: it's ratings' (Cyranoski 2007, p. 805).

Blatant propaganda and outright fakery may be obvious examples of ethical lapses. However, the ethical implications of using self-serving institutional press releases — which are not unknown in the West, by the way, having written some myself — are not as clear-cut. Nor is it clear how to judge the ethics of journalists who may have no choice but to deal with the official party line. Moreover, governments, research laboratories, and industries can also very simply control the coverage of science and technology just by controlling access to information.

This very simple, but most effective, technique of news control was most evident during the Severe Acute Respiratory Syndrome (SARS) epidemic, when the Chinese government either under-reported or completely denied the extent of the illness and its potential global impact. Reporters for state-controlled media — clearly official adjuncts of the government — repeated the official line until the scope of the epidemic became impossible to deny. Ironically, it was the smaller, semi-independent news outlets in China that first challenged the government's official pronouncements.

Media control was challenged again, and quite effectively, during the horrendous 2008 earthquake in China. Simply ignoring government restrictions, media representatives from around China—and indeed, the world—streamed into the stricken area to provide unprecedented coverage of the death and destruction. Alas, that initial openness and transparency was later severely constrained, particularly after embarrassing questions began to be raised about the shoddy construction of public buildings, especially schools. Concern over bad publicity as time for the Olympics drew near also played a role in the renewed restrictions.

THE ADVOCATE AS THE ADVERSARY

It is clear that major changes are occurring in how science journalists see their roles in countries like China, with a gradual shift from serving as 'advocate/adjuncts' to behaving more as 'advocate/adversaries'. In truth, the term 'advocacy journalism', at least as used in the US, has usually applied to those journalists who pursue a single point of view, promoting a cause or an issue not always (but quite often) at odds with establishment viewpoints or official policies. For example, and in all fairness, I should note that the faked antelope photo was originally revealed by just such a group of advocate/adversaries, a Chinese on-line photography forum. Similarly, the Japanese television bean paste scandal was uncovered by Japanese science reporters in the print media who looked skeptically at the data and asked the embarrassing question that led to exposure of the fraud.

With respect to the prospects for democracy in China, Thorman (2008) notes that one 'promising trend is the rapid commercialization of the Chinese press. [...] As independent Chinese publications seek readers and advertisers, they pursue stories that people want to read; [and] like their counterparts in the West, they have discovered that investigative journalism sells' (Thorman 2008, p. 15).

Whether science journalism specifically will benefit from this commercialization is in question. Speaking at last year's World Congress of Science Journalists in Australia, Jia Hepeng noted the increasing marginalization of science journalism in his country. As he put it, market-oriented publishers do not see science stories as having much popular appeal, as opposed to exposes of official corruption or features on ways to improve health, beauty or income. Ironically, then, science coverage in China, even if constrained by what information is supplied through official news releases, may have fared somewhat better under a semi-benign government system. Egikova (2009, this Theme Sec-

tion) notes a similar irony in the coverage of science before and after the fall of the Soviet regime.

By contrast, science coverage seems to be flourishing in the commercialized press of India. The sheer diversity of the Indian popular media and the country's long and protected tradition of press freedom encourage a diversity of viewpoints and a plethora of niche media. Obviously, this also creates an atmosphere conducive to advocacy journalism and, in the areas of sustainable development and environmental protection, Indian advocate/adversary reporters have gained international attention.

Let me cite 2 Indian colleagues, both members of the International Science Writers Association, who exemplify this type of advocate/adversary. Darryl D'Monte and Pallava Bagla are highly respected professional journalists who write on a variety of science and technology subjects, as well as politics and policy issues affecting South Asia: D'Monte for *The Times of India*, among other outlets, and Bagla for *Science* magazine and Indian television. But both men can also be highly opinionated and subjective when writing about the environment, becoming deeply committed advocates for its protection (e.g. www.tehelka.com/story_main.asp?filename=Fe032004Feature.asp, www.boloji.com/wfs3/wfs331.htm). As such, they are often in conflict with powerful governmental, political, and industrial interests, and their reporting—I should say, writing, for it is often more akin to editorializing than reporting—is not ambiguous in any way. It is squarely on the side of the environment.

Even more opinionated and adversarial are the activist journalists of India's Centre for Science and Environment (CSE). Founded in 1982 by the late Anil Agarwal to address the specific problem of air pollution caused by New Delhi's Diesel-guzzling buses, the CSE is now headed by Agarwal acolyte Sunita Narain. Her group's focus has expanded to cover 5 areas of concern: air pollution, climate change, water management, pesticides, and poverty eradication.

The group gained international attention when it took on soft drink giants Coca Cola and PepsiCO. In 2006, a CSE technical analysis showed that 12 popular drinks produced in India contained levels of toxic pesticides up to 36× those acceptable for European bottled water. Four Indian states immediately banned sales of the drinks in public buildings. The subsequent publicity, first in CSE's own magazine and on its website and later in the national and international press, sent Coca Cola sales falling by 18%.

Although basically a cadre of journalists, CSE also maintains a small staff of scientists who conduct the research on which its reports are based. This may not make the group unique, but it certainly makes it hard to define. *Nature*, for example, in a profile of Sunita

Narain in February 2007, alternately referred to CSE as a non-governmental organization, an environmental pressure group, a watchdog, and a lobby group. These are hardly terms one usually applies to journalistic enterprises (Mandavilli 2007).

Does this make CSE's work, or that of D'Monte and Bagla, for that matter, somehow unethical? Not, I suspect, by the standards of most journalists in the developing world. Interestingly, however, this activist or advocacy approach does violate what was once a basic hallmark of US journalism—'objectivity'—a professional standard that supposedly set it apart from that practiced elsewhere in the world.

Basically, the US definition of objectivity means that journalists are politically and ideologically neutral in reporting a story, and the reporter's own feelings, opinions, or beliefs are never apparent. Any such comments or opinions should be left to the Editorial Page writers or Op-Ed columnists. In practice, objectivity has also meant that all points of view on an issue, no matter how stupid or outlandish or downright wrong, should be expressed in a news story. Such an approach was considered fair, balanced, and ethical.

Obviously, objectivity, not to make too fine a point, is really subjective. Each reporter has different ideas of what is fair and just. Moreover, it is very hard to separate oneself completely from any story. To not form some opinion is contrary to human nature, as is distancing oneself emotionally from one's sources. It is especially hard to ignore basic facts or to give weight to obvious falsehoods, and we all know that reporters can determine the tone of a story not only by what they put in, but by what they leave out.

In addition, strictly following the principle of objectivity, especially as preached and practiced in the US, can create a special problem. Clever public relations people and representatives of special interest groups know they can get their own opposing viewpoints into print simply by presenting themselves to reporters as alternative sources or contrarian voices on an issue. Consider this classic example: For years, the US tobacco industry hired its own stable of so-called medical experts who could offer research results that, while not explicitly disputing the evidence that smoking caused lung cancer, might at least cast doubt on those findings. More recently, as Chris Mooney (Mooney 2006) has shown, the oil and coal industries sponsored their own set of scientists who could offer either alternative natural scenarios for global warming, such as long-term solar heating cycles, or who could produce complicated counter-arguments highlighting the uncertainty in climate modeling. The US media's principle of 'objectivity' demanded that these scientists be given time and space equal to those arguing for human-caused climate change. In several instances,

more akin to Chinese government practice, the Bush administration manipulated official reports to gain press coverage reflecting industry or anti-warming views.

Who bears the blame for these ethical lapses? Can one really fault journalists who are following standard (US) practices? And, since there was and always will be some uncertainty in the climate models, might it not be fair to include alternative views? Objectivity, obviously, poses its own ethical dilemmas.

But even tougher ethical questions may emerge as the public increasingly turns to the internet for its news and information. One of the ironies of the so-called 'new media' is that most online news content is now actually supplied by 'old media'. According to the Pew Trust's survey of media, the top online news sites in the US were web pages produced by traditional newspapers—the *New York Times*, the *Los Angeles Times*, the *Washington Post*—plus the online versions of National Public Radio and the 3 national television networks, CBS, NBC, and ABC. Other studies in Europe find similar trends, with the BBC's online version extremely popular among internet users in Britain.

Visitors to these sites simply see the same news they might have read in the printed pages of the *Times* or seen on the flat-screen TVs in their living rooms. Sometimes, as in the case of the newspapers, the electronic formats duplicate exactly the original print versions.

What is troubling for the future of news is that the same studies find that advertising revenue is not following the news online, so the old media—the periodicals and over-the-air broadcast outlets that are already cutting staff—may find it very difficult to sustain their current levels of news coverage.

Alternatives to the current model can already be seen in the inexorable rise of blogs, wikis, and citizen journalism. Unfortunately, most blogs tend to be long on opinion and short on news, with the majority showing no original reporting. Wikis, while supposedly representing the wisdom of the many, too often demonstrate the madness of crowds. And citizen journalism, while great at covering video-rich crime or celebrity news, does not work quite as well for complicated science stories requiring careful explanations and long exposition.

The unique ways in which people use the internet for information gathering may create some interesting ethical problems in the future. Actually, at the present time, only a relatively small proportion of the US public uses the internet as its first or primary source of hard or breaking news. For that, television is still the preferred medium. On the other hand, people seeking specific information about science and technology topics, and especially health questions, increasingly

choose the internet. It has become the prime source for what communications gurus call 'news you can use'. Perhaps not so surprising, those who seek science and technology information demonstrate a good deal of sophistication. Studies show that most people use the same standards as journalists to select credible sources on the web. That is, if they have a medical problem, say psoriasis, they go to the site of a dermatology association rather than the site of a pharmaceutical company, and certainly not the personal blog of someone with similar skin problems. In short, they look for and find unbiased, professional advice, not amateur opinion or industry hype.

For now, most Americans can be reasonably assured of finding such professional advice online. As traditional newspapers have cut back on science news coverage, many former staff writers have gravitated toward news, information, and education jobs with scientific and medical research organizations. Often they serve as web content providers or editors. I'd describe these writers as 'adjuncts by accident'.

ACCIDENTAL ADJUNCTS

Trained and experienced in news gathering and reporting, the current generation of public affairs specialists usually brings a set of generally accepted news values, including some implicit ethical standards, to their new positions at both public and private science institutions.

But what about the next generation of science and technology PR people who will come directly to their jobs without exposure to the values and standards of the traditional newsroom? This is not their fault, of course, since jobs in the media may simply not exist in the future. But the question remains: When the main source of information about a subject is the organization that produced that information, who will monitor the producer? What ethical standards can be applied to this type of science journalism? Who will be qualified to judge ethical behavior? Let me describe one example of a well-intentioned, well-designed, and well-received educational site that has raised these very questions among US science journalists.

Writing in the newsletter of the US National Association of Science Writers (NASW), media consultant and environmental journalist Jane Ellen Stevens described her involvement with 'The Great Turtle Race', a project she called '...a really different kind of journalism' (Stevens 2007, p. 5–6). This web-based program, designed to spotlight the plight of Pacific leatherback turtles, an ancient species now on the brink of extinction, went far beyond traditional journalism—even by modern multi-media standards. In it, Stevens teamed

up with researchers who attached tiny radio transmitters to female turtles to track their migratory patterns. Together they turned the turtle's annual swim from nesting beaches in Costa Rica to the Galapagos Islands into a race that could be followed online in real time by nature lovers around the world (www.greatturtleace.com/).

Computers zeroed out the departure times of each turtle, similar to bikers in the Tour de France, and computer animation allowed individual journeys to be charted on screen. The site had other features: turtle biographies, background information on tagging and preservation efforts, profiles of people involved in saving the turtles, educational materials and blogs, and information on how the public could get more involved in leatherback protection and preservation.

A collaborative effort of 3 non-profit conservation groups, plus Costa Rica's environmental agency and internet provider Yahoo!, the site even attracted businesses interested in their 'green images'. Companies were invited to pay USD 25 000 each to sponsor a turtle, with the monies used to support the tagging and tracking operations.

Thousands of people—teachers, students, environmentalists, conservationists, and journalists—visited the site. Indeed, during the 2 wk race, the site logged 3 million hits from some 650 000 distinct visitors. And an estimated 137 million people around the world saw, heard or read coverage of the race in the international press. Stevens was justifiably proud of the success and her subsequent development of a new web site, sponsored by one of the participating non-profit conservation groups, that will continue to promote the protection of the turtles (Stevens 2007).

The next issue of the NASW newsletter brought conflicting comments from members, reflecting the ambiguity over what is considered 'science journalism' and concern over what shape it may take in the future. On the positive side, Sharon Dunwoody, a professor of science journalism, saw Stevens' program as an indication of 'what will constitute science journalism in the 21st century.' Dunwoody thought this 'kind of multimedia packaging took explanation—something that reporters have always valued—to a whole new level...allowing the audience to follow their favorite leatherbacks around the ocean, in real time, creates intense motivation to learn more about their risky lives...'. As Dunwoody argued, 'If a journalist can match a need to learn with good explanatory content, she may enable audiences to build a much richer understanding of the topic at hand' (ScienceWriters 2008).

Boyce Rensberger, former director of the Knight Science Journalism Program at the Massachusetts Institute of Technology, had a less positive view. Stevens' site might be 'entertainment, even education,' he noted. 'But

it definitely was not journalism'. 'Just imagine what we would say if a similar website, developed with the collaboration of say Exxon-Mobil, were to teach the public about oil geology and the marvel of solar energy captured in prehistoric times and stored underground. [Or] if Monsanto collaborated on a website that explained plant physiology and how it can be modified by spraying the plant with Monsanto's products...' He also questioned Stevens' statement that 'scientific institutions now have an opportunity to hire science journalists to build communities...'. In response, Rensberger asked: 'Are journalists for hire by those they cover? Wouldn't such a hire instantly convert a journalist into a public relations person?' (ScienceWriters 2008).

In short, market conditions in the US and elsewhere are turning many once adversarial science journalists into accidental or unintended adjuncts to special interest groups, some of which are benign and beneficial, while others are not.

If deciding what is good or ethical journalism in the USA is so problematic, how can we expect to do it on an international scale, where standards and values are shaped by widely varying national and cultural traditions? Interestingly, scientists face the same problems in their attempt to investigate international misconduct. A commentary by Boesz & Lloyd (2008, p. 686) in *Nature* noted: 'The rise in cross-border collaborations is making it more difficult to police misconduct'. Unlike journalists, scientists have a long history of international cooperation, as well as experience in relying on the guidance of large multi-national, multi-disciplinary groups, such as the International Council for Science (ICSU), the United Nations Educational, Scientific and Cultural Organization (UNESCO), and the European Science Foundation (ESF). Thus, in 2007, the Global Science Forum of the Organization for Economic Co-operation and Development (OECD) formed a Coordinating Committee for Facilitating Research Misconduct Investigations, representing 14 countries and international bodies. Several working groups have been established to address the issue and the hope is that there will be a handbook on how to approach misconduct cases in international collaborations, as well as a directory of who to call in each country (Boesz & Lloyd 2008).

It probably is too much to imagine that journalists can get organized in a similar fashion, or that clear definitions of what constitutes unethical behavior can be established. Scientific misconduct is not necessarily easier to spot, but at least science has peer review prior to publication. In journalism, peer review usually comes after the fact. Still, peer pressure, even after publication, can be a powerful force in policing science journalism. Two examples, again from US journalism, offer models for how that policing might be done and pressure applied.

First, the Knight Science Journalism Tracker (www.ksjtracker.mit.edu), an online service of the Knight Fellowships at MIT, literally tracks and reports on the daily coverage of major science stories by mainstream media in the US (with occasional looks at how the same stories were covered in other English-language media in the UK, Canada, and Australia). Led by the remarkable Charlie Petit, a former science journalist, the service does not (well, not often) comment on the accuracy or ethical aspects of stories. However, by printing ledes or intros, headlines and appropriate excerpts, and by providing hyperlinks to the full text, it allows other journalists to judge the quality of coverage for themselves.

The second relevant model is the 'Darts and Laurels' feature of The Columbia University Journalism Review (www.cjr.org/darts_and_laurels/). This column surveys the US press to gather representative examples of excellent, unbiased, public service journalism. These are matched against examples of less professional and often unethical exercises in journalism that served a medium, or its owners and advertisers, more than its audiences.

Luckily, international science journalism has 2 forums where both of these devices could be adopted and adapted. The first is SciDev.Net (www.scidev.net). While primarily a source of science news for, by, and about the developing world, it also has several features on its website designed to enhance the professional skills of its journalistic audience, such as guides to science writing and dossiers on specific topics of interest to the developing world. I propose that a new feature be added — similar to the Knight Tracker, but focusing on how the same stories are covered by different news media around the world.

The second forum is the World Federation of Science Journalists (WFSJ, www.wfsj.org), an umbrella group representing some 3 dozen national and regional science journalism associations around the world. Rapidly emerging as a major force in international science communication, the WFSJ sponsors a long-distance peer-to-peer mentoring program and encourages the partnership of established journalism associations with newly formed organizations in the developing world. It also holds bi-annual congresses, at which young new reporters from the developing world can meet their more experienced colleagues in person.

Since the WFSJ also has a lively webpage and an electronic newsletter that is sent out to member organizations, it could easily produce an international version of 'Darts and Laurels'. Again, I propose that such a feature be created, perhaps in cooperation with SciDev.Net, which could provide the basic journalistic raw material through its own tracking service.

I do not think either effort should require much work because, aside from those few and quite obvious ethi-

cal lapses cited earlier, I find most science journalism, at all levels, in all parts of the world, to be of quite high professional quality. Naturally, journalists respond to the ethical standards of the particular cultures in which they live and work, but the recent joining of disparate national groups under the umbrella of the WFSJ has led to an awareness of more universal norms.

In general, I think science journalists can be proud of themselves. They do a tough job in tough political and economic times, with little reward beyond the joy of sharing in interesting, sometimes even important, discoveries. Occasionally, they may even help advance society a notch or two. Both audiences and sources should feel confident in their integrity, sincerity, and dedication, as well as their honest, if not always successful, attempt to get the science right.

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Editorial responsibility: Stephanie Suhr-Sliester, Oldendorf/Luhe, Germany

*Submitted: September 24, 2008; Accepted: January 22, 2009
Proofs received from author(s): February 28, 2009*