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SCIENCE ON TELEVISION: A WRITER'S OBSERVATIONS ON CONTENT AND QUALITY

An Interview with Timothy Ferris

[Author of nine books on astronomy, physics, and the history of science, twice winner of writing awards from the American Association for the Advancement of Science and the American Institute of Physics, a former newspaper reporter and editor of Rolling Stone *magazine, Timothy Ferris has also produced two widely praised science documentaries for PBS—*The Creation of the Universe *and* Life Beyond Earth*, the latter airing on Nov. 10, 1999. A few weeks later,* ScienceWriters *interviewed Ferris by telephone at his home in San Francisco—HJL].*

SW: Someone once said that trying to show science on television is like trying to show what a mountain climber experiences by using a camera across the valley. The viewer sees distant movement but gets nothing of the experience. I assume that you don't agree.

TF: I'm reminded of Jungfraujoch, the village in Switzerland where tourists sit out on the decks in front of the resort hotel and view climbers on Mt. Eiger through telescopes. That's looking at climbing from across the valley, and that does not in itself impart the experience of climbing Eiger. Yet, even if science on television were limited to that remote a contact with science, that could still be sufficient to arouse an interest in science and to lead some of those spectators to become climbers themselves. That's what, in fact, happens in Switzerland all the time and that's what happens with science programs on television. I'm old enough now to hear from people with careers in science who tell me they were first set on the road to a scientific career by seeing something that I had done on television. So they're having the experience even though their initial view was from afar. And I think it's equally significant when people who aren't in science tell me that those programs nevertheless were significantly enriching to their lives.

SW: I was thinking of something Steven Weinberg said in mourning the loss of the Superconducting Supercollider: how much he missed the excitement of the old days when physicists went rushing down the hall almost every week to proclaim a new discovery of some sort. Can science programs ever convey that kind of gut excitement?

TF: One of the great strengths of television is its ability to arouse emotion. Television is weak at conveying information and strong in creating memorable emotion, and that can include the excitement of doing science. The trick in film, as in the written word, is not to *describe* the excitement, or show someone feeling excited, but to make the viewer feel excited himself. That can be done in film, but it's not easy. You can't do it just by pointing a camera at someone who's recounting how excited they all were when they discovered a supernova.

SW: Any recollections on when you had been able to do that?

TF: It's difficult to single out instances, but it's my guiding precept in doing these films. I want the hair to stand up on the back of my neck. If it doesn't move me, it's unlikely to move the viewers. We could talk about Kirosawa and Kubrick, because it is from films like theirs that I get my inspiration, and not so much from other science films. I'd be delighted if every week I could turn on my television set

Howard J. Lewis is the editor of ScienceWriters.

PHOTO: JOHAN PIETERSE / DESIGNER: DAN BURRIS

and see a science program whose ideas I could steal, but unfortunately that's not the case, so I have to look more widely.

SW: Do you find it necessary to script interviews in advance?

TF: I've not done any scripting in advance that I can recall. For a SETI [the Search for Extraterrestrial Intelligence] sequence in *Life Beyond Earth,* I set up an interview with Paul Horwitz at Harvard. There were highly qualified SETI people here in California, but I chose Paul because he was unequivocally optimistic and could be counted on to make a strong case for SETI, which is what we needed at that point in the film. I wanted someone who wasn't qualifying things, who would swing for the bleachers, and I wanted him at the Harvard radio telescope because of its modest scale, in order to show that SETI doesn't have to be big science. Once there, I probably indicated to Paul that he should feel free to express his views. But that's about as far as I would go in that direction. I did prepare interview questions in advance, of course.

SW: What do you think are the major strands missing from the present fabric of science on television?

TF: Quality. Way too many shows are made without enough money, not enough time—and, sadly, without enough talent on hand. One of the reasons I make such a fetish of production values is because I'm out to convey, among other things, that science is elegant, that it's co-o-o-ol, that it doesn't have to look shoddy. Every time you run a picture of some unfortunately dressed laboratory technician against a blazing white linoleum floor in front of a computer screen, you're conveying a message about science—that it has the emotional or stylistic ambience of a dentist's office. That's not likely to attract people who have the most acute taste, and those are the people I'm after. I don't know why we don't have a half-dozen elegant, richly produced, high-end science shows a year, but we don't….

SW: You once said: "There are always going to be people who violate the conventions of prior efforts to communicate, and if talented and caring people who are accurate in what they report aren't some of the people doing that, then it will only be the schlock producers and writers who expand the envelope, and that doesn't strike me as a good resolution. Somebody is always going to try to be daring—film a dance troupe or bungee jump with an IMAX camera to demonstrate something—and if the conscientious people aren't among them, then it's all going to be schlock."

TF: I think we're in constant danger of driving good people out of serious documentary filmmaking. It's like architecture: A bad building not only takes up space, but it means that a good building wasn't built on that space. To give you an example of the sort of things that go wrong: One common error occurs when producers decide on form before content. They make a decision to make a 13-part series before they've figured out whether they actually have 13 parts worth of content. Another common problem is simply a lack of daring. Some programs start out with goals so modest that they're almost certain to be achieved—and that seems to me to be a terribly timid way to spend millions of dollars.

SW: Where does the timidity lie—in the producers, the funders, networks…?

TF: Ultimately, you have to blame the people who made the film. No one made them do it. It's a symptom of mediocrity. If you're excessively frightened of failure, then you're unlikely to achieve anything new. I always feel that you should be trying things that have high risk and concomitantly high excitement. If you're not close to failure, you're probably not that close to

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success, either.

SW: Who should be involved in science on television that is not now involved?—corporations, foundations, production groups…?

TF: Corporations, particularly corporations that are involved in scientific or engineering enterprises. My impression is that it's harder to raise corporate money for science on television than it used to be. Many of these corporations have developed a kind of lean, mean attitude that's quite shortsighted. Those same corporations are the first to complain about the shortage of first-rate scientists and engineers in the marketplace. If they want that kind of fruit in their orchard, they need to plant years in advance.

> Television is weak at conveying information and strong in creating memorable emotion…

SW: How large is the potential audience for science films given the nature of our educational system? Or do you think that is not really a factor? Walter Goodman, in his *New York Times* review of your program, said: "Perhaps an audience within the range of broadcasts from Earth could intercept them, even though the news reaching distant creatures might be eons old, because the farther they are from Earth, the longer the transmission would take." If Goodman felt that had to be explained to his *New York Times* readers, what chance does a television program have?

TF: To me, what's important is not how much people know about science after watching a science show, but how excited or interested they are about learning more. It's very difficult to assess audiences. The premiere of *Life Beyond Earth* was seen by five million people. *The Creation of the Earth* has been on prime time every year for 14 years, and has reached considerably more. I know that some of those people had not been interested in science before they saw these films; a few of them have told me so. The question of reaching wider audiences depends on making science more of a presence on television. One thing that has retarded this effort has been the self-assured and—in my opinion—wholly ignorant assertion on the part of many television professionals over the last 25 years that the public—as they call it—is not interested in science. If you ask them how they know this—well, they just know it. Yet, every time the public gets a chance to express themselves, science turns out to be one of the three or four things they say they would like to see more of on television. And I think they'd be watching a good bit more of it if so much science they saw on television wasn't so boring. I can't sit through most of the scientific documentaries I see on television, so I can hardly expect someone who lacks any prior interest in science to be terribly arrested by them.

SW: Is it essential to have the stated backing of a scientific institution for fund-raising purposes?

TF: Neither of my films had any such backing, but I have the impression that, though not essential, it's helpful. The imprimatur of the National Science Foundation can assure potential funders that the producers aren't flakes. We go through periods in which high-quality science shows with a long shelf life, like [Jacob] Bronowski's *The Ascent of Man*, are relatively popular, and then we go through a period like the last decade or so, when such programs were out of fashion, and the common wisdom was that everything was supposed to look like MTV—short attention span, jazzy, and cheap. Lately, it has dawned on some organizations that there's money to be made on long-shelf-life quality documentaries about science, and that's benefited some of the people who make those kinds of films. But one shouldn't underestimate how tough it is to raise money for serious documentaries that don't scream sex and violence. One hopeful new element is that foreign markets are now generating more support for good documentary films on TV.

SW: How can an otherwise talented science writer with little or no television production experience break into the field? What are the necessary qualities of such a person?

TF: Intellectual stubbornness, patience, imagination. There are outfits like WGBH in Boston where you can go and get some experience. People have gone through that and become independent filmmakers. Looking at it from the other side, if you're going to make a film, in my view it should express a single individual's point of view. There has to be one person who stands up and says, "If you like this film there are fifty people responsible, but to the extent you object to it, the buck stops here—I'm the one who will answer for everything that's in this film." And the reason for that is not that one person may be any better at it than the next person, but that ultimately there has to be one pair of eyes, to keep things in focus. Many projects have been ruined because they're run by committees; any time there's someone to blame, you can point to the next person over. David Brinkley once told me the one thing you have to remember about television is that it has a small audience—one, two or three people in a room. It's much easier for one person to talk to that small audience than it is for a committee.

Sometimes students get hung up a little too much on training. The technology of filmmaking in my view is not that complicated, and almost any student in the United States is now within a long arm's reach of a decent video camera—so get started. Go out and make a film. Cut it and see what happens. It may be awful, and then figure out what was awful about it, and what you liked, and go make another one. You don't have to spend years acquiring degrees and worrying about how, if you ever do make a film, it's going to get distributed. Just make one good thing and your life will tend to sort itself out—as Spike Lee demonstrated with *She's Gotta Have It*, a film made on so low a budget that some of the scenes were shots as stills because

Lee ran out of money for film stock. There's plenty of imagery on the Internet. What you need most is an imaginative idea and the skill and discipline to write something beautiful from it. Then work from the writing. This is not a business, in my view, of working from the images to the words, as is often taught. It's more the other way around.

SW: One executive producer of science films for television said that the "stories of the people who are conducting the experiments are an important element of the program's grander story line." How difficult is it to persuade scientists to let the camera into their personal lives?

TF: I haven't taken the camera into the personal lives of any scientists that I can think of. It seems to me that the issue of scientists being human has been resolved—that we science writers have won that one. I don't think that people feel that scientists are robots any more. So, personally, I don't find it particularly interesting to point out that the scientist running this X-ray experiment has a husband and family at home and here they all are sitting around the dinner table. I don't think there's anything wrong with that approach, but it doesn't enliven me personally.

SW: You don't think that the extraordinary abilities of these people might be less awesome if the viewer recognized that they had some characteristics in common?

TF: No, I don't. I really like to hear the brilliance and see the wonderful personality of the scientist directly. If some terrific person is talking straight into the camera and I'm looking at him or her, I'm going to get something of what that human being is like. To my taste, there's way too much time spent in many science films watching someone load up a sports utility vehicle and drive it up to the observatory and chat from behind the wheel on the way up about what they had for lunch.

> Way too many shows are made without enough money, not enough time…

SW: How do you deal with a scientist who feels that his colleagues won't take him seriously if he participates in a television program?

TF: Envy is a problem in academic life. First-rate scientists who show up on television learn that when they go to work the next morning there's going to be some second- or third-rate scientist sniping at them—either to their faces, or, much more often, behind their backs. That's the price scientists pay when they move into the public arena, and yet a number of them have chosen to do it. There were a few I really wanted who were reluctant to appear and I had to drag in, and I'm glad I did. I don't think it hurt them, and it benefited millions of viewers. □

THE PAINFUL BIRTH AND LASTING GLORY OF SAGAN'S 'COSMOS'

by Keay Davidson

The *Cosmos* television series is the achievement that finally fixed Carl Sagan's place in the celebrity firmament. The 13-part series was eventually seen by more than 400 million people and became a spectacularly successful book (still in print today). From the broadcast of the series on, his face was immediately recognizable to the generations of Americans who huddled in their living rooms raptly glued to their TV sets for each episode.

Cosmos was in many ways emblematic of Sagan, as both a scientist and a person, and the series was so compelling to so many for the very reasons Sagan was compelling. Indeed, he was arguably the most captivating feature of the series. With his striking, strangely halting, and melodic voice and his emphatic gestures, he was the perfect scientific sage on screen, the entrancing visionary who could reveal the marvels of the universe, from the smallest grain of sand to the most distant stars.

The man who set Sagan on the road to *Cosmos* was Gentry Lee, his associate from the *Viking* missions. In October 1976, a month after the second *Viking* landing, Lee approached Sagan on the steps of Von Karman Auditorium at Caltech's Jet Propulsion Laboratory in Pasadena. Lee told Sagan that they should set up a private company to make television shows and movies about science. "I wanted Carl Sagan Productions to become the Walt Disney of science and technology," Lee says. Lee wanted to share "the excitement and wonder" of space with the public. Sagan, he said, "was very wary. Carl was not, and never could have been, associated with organizing large tasks. It's just not the way his mind works."

Sagan's wariness is understandable for another reason. He had always been scornful of television. In speeches, he always drew a laugh by pointing out that humans had already transmitted their first electromagnetic greetings to the stars—television images of Roy Cohn, the Beverly Hillbillies, and the like. Yet Sagan knew that television was essential to persuade the masses of the value of scientific exploration.

Sagan also believed that television coverage of science could lure the public away from its unhealthy fascination with pseudoscience and irrational belief systems. Whatever happened to the dream of television as an educational tool for the masses?

Sagan and Lee formed Carl Sagan Productions. On Oct. 25, 1976, Sagan received the following note from his secretary regarding a call from KCET-TV in Los Angeles:

Keay Davidson is science writer for the San Francisco Examiner. *Excerpted with his permission from* Carl Sagan: A Life, *published by John Wiley & Sons, Inc.*

> Greg Andorfer, Manager of Program Development for KCET, would like to speak with you to see if you would be interested in acting as host-presenter to a series of 13 one-hour presentations entitled *The Heavens*, along the lines of [Jacob] Bronowski's *Ascent of Man*. This would be for PBS Network. The series would explore man's responsibility to explore the unknown.

Sagan wrote back on Oct. 31, expressing an interest in the project. He and Lee reached an agreement with KCET to develop a 13-part series that would air in the autumn of 1980. The series would mimic Bronowski's series in trying to present its host's unitary vision of life, science, and society.

Sagan, his companion Anne Druyan and his longtime secretary, Shirley Arden, moved to Los Angeles for the venture. They had no idea what a rocky journey they were undertaking.

Sagan and Lee scouted for a director. After interviewing candidates, they selected the British director Adrian Malone. Malone's star then shone brightly: he had recently directed *The Ascent of Man*, which Sagan had admired. *The Ascent of Man* won an Emmy award for Best Documentary Program and the Screen Writers Guild Award for Best Television Program, plus the Silver Award for best documentary from the Royal Television Society in Britain.

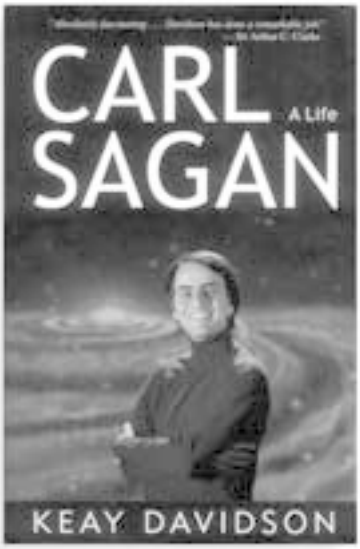
What Sagan did not sufficiently heed was that Malone had been not simply director of *The Ascent of Man* but also its coauthor and perhaps expected to play a similarly creative role on *Cosmos*. But Sagan was someone who liked to control *everything*. Trouble lay ahead.

Remarkably, on the opening week of the *Cosmos* production, its star was absent. Sagan was on a romantic trip to Paris with Annie Druyan. For the first time in his life, the consummate careerist had allowed himself to be waylaid by love. Malone was furious. He had assembled the entire production team and had scheduled meetings to go over the content, and Sagan was an important person in this part of the planning.

The torrid passion between Sagan and Druyan amazed their friends and family. Lee would later have serious differences with Druyan, but around her, he acknowledges, Sagan "seemed much happier." In terms of his personal happiness, "there is no question that Annie was the greatest thing that ever happened to him. She was his fantasy woman….He was totally blinded by her love and affection." Under the influence of his love for Druyan, Sagan became even more confident and assertive.

The intensity of Sagan and Druyan's relationship seems to have been a mixed blessing for those working on *Cosmos*. Druyan had been intimately involved with the early planning for the series, as Sagan and Gentry Lee formulated the basic concept, and Sagan wanted her to be a part of the production. He saw to it that she was added to the staff.

Collaborative creative projects are notoriously fraught with tension, from both the stress of time pressures and the difficulties inherent in weaving competing individual visions into a seamless whole. When two of the members of a creative team are in the midst of a passionate affair, those tensions are inevitably exacerbated, but such mutually supportive passion can also produce great creative results. Both were the case with *Cosmos*.



By some accounts, Druyan also made many significant contributions to the script of the series. She shrewdly suggested making one of the heroes of the series the ancient female scientist Hypatia. Having been schooled in the classics at Chicago, Sagan was receptive, and the result was one of the most compelling historical figures of the series—a historical role model for young women interested in science and an anticipation of the heroine of Sagan's novel *Contact*.

On the other hand, Druyan's influence on Sagan and the series also caused some resentment. Gentry Lee felt that Sagan relied too exclusively on Druyan's judgment. He describes Sagan's reliance on Druyan as "addictive dependence." And he says that "she became his interpreter of nonscientific things. I think he felt he was not as good at reading people as she was."

Indeed, he was not, and on the *Cosmos* set, the off-putting qualities of Sagan's personality—perhaps due to the enormous pressure he felt—became especially pronounced. Lee had long familiarity with Sagan's abrasiveness, which was often completely unwitting—a result of his insensitivity to social niceties. Lee notes, for example, how Sagan would offend KCET staffers by implying that they didn't know what they were doing. "Carl found himself startled by other people's responses to him because he did not tune into what other people were saying," Lee recalls. "When I would explain to him that he had irritated somebody on *Cosmos*—had said something that was demotivating rather than motivating—he would look astounded."

Sagan was not, however, the only member of the *Cosmos* team with a healthy ego. Malone was a highly successful television director—a winner of big awards. He expected to exercise a great deal of control over the series, and it was inevitable that he and Sagan would rub one another the wrong way. During the shooting of the opening scene on the idyllic, flower-dappled cliffs at Monterey, California, both Sagan and Malone became so angry that they wanted to fire each other. But they couldn't: Lee had presciently specified in their contracts that neither could fire the other. Both of them called Lee "in the middle of the night" to complain about the other. Why? "Insufficient obeisance,"

Lee says, laughing. "It was typical of the kinds of disputes that existed on the set….For the whole last part of shooting, they wouldn't speak to each other."

Certainly, some of this clash of personalities was fueled by anxiety—this was a huge undertaking on a tight schedule, and Sagan was the one who would be its public face. He must have felt the strain of this responsibility, and he must also have been highly cognizant of the impact the show would have on his reputation. Journalist Roger Bingham, who visited the set, reported on production stresses exemplified by "some of Sagan's more obvious displacement activities—extravagant throat-clearing before takes, fussiness about the placing of the cue-card light, the way he 'constantly delves into other people's jobs,' as one of the team puts it. Sagan is a man who likes to be in control."

Sagan's desire for control, in fact, led to a *Cosmos* crisis halfway through the project. He was swamped by work—the show, writing projects, residual Cornell duties, editing *Icarus*, litigating the end of his second marriage. Yet, like a paranoid CEO, he was unwilling to delegate authority to others. Consider the following comments from a memo in which Shirley Arden reports on a call she received from Gentry, dated Feb. 27, 1979. It shows that the stresses on the production—then at its halfway point—were so severe that it almost came to complete collapse.

> Gentry says you told him you were going to prepare a list of issues you feel need to be discussed. He asks (strongly) that your list contain only generic issues, no personal ones.
>
> [The staff] *all* want *Cosmos* to go forward. But the hang-up is their belief that you are holding on to authority in areas where you have no *time* or *energy* to do it. (Note that they do not question your ability to do it, only time and energy.)
>
> Gentry feels we can all work together—your help is badly needed to assure the team that you will give them authority where they need it and are qualified to carry it through. Gentry feels a compromise can be brokered *IF* there is evidence on your part that you believe the people are competent and that you are willing to give them written/verbal—in any case, *clear*, authority in areas where you will not have time to participate.

The amount of responsibility that Sagan was trying to juggle at this time was, in fact, staggering. NASA continued to face repeated assaults on its budget for robotic space missions, and the agency saw Sagan—the nation's best-known space scientist—as its savior. His office files show that he received requests to lobby Congress to support NASA's budget. Meanwhile, at Cornell, his old colleagues struggled to get in touch with him and get him to deal with student matters, to edit leftover articles for *Icarus*, to let them know when he would return from the land of palm trees and beaches to the snow-ringed Finger Lakes. Among Sagan's scientific colleagues old envies turned to jealousy and resentment. As much publicity as Sagan had brought to Cornell, some professors grumbled that he didn't fulfill anywhere near his just teaching load.

Despite all of the stresses on the production, *Cosmos* came together steadily, and in the end, Gentry Lee says, everyone involved was proud of it, "with the possible exception of Adrian Malone." Toward the end, Malone said over and over to people working on the series, "This is his show. Not my show."

> Sagan believed that TV… could lure the public away from its unhealthy fascination with pseudo-science and irrational belief systems.

Cosmos was scheduled to broadcast on Sunday, Sept. 28, 1980. A big media campaign (big by PBS standards) preceded it. News media received a fat promotional package touting the show as "the culmination of almost two years of filming and videotaping at more than 40 locations around the world and more than three years of planning and executing exciting and scrupulously accurate special effects." Wonders of the universe "will be seen through the window of the specially-designed 'spaceship of the imagination.' Free of hardware or gadgetry, the spaceship, with its translucent skin and control panel of colorful spectral crystals, travels near the speed of light as Dr. Sagan takes viewers to realms previously known only by telescopes and robot explorers."

The publicity worked wonders, and the premiere of *Cosmos* was a media event. A few weeks after the first episode, Sagan appeared on the cover of *Time* in a manufactured photograph showing him standing on the "shores" of the galaxy, next to the headline "Showman of Science." The *Time* article, by science writer Frederic Golden, called Sagan "the Prince of Popularizers, the nation's scientific mentor to the masses." To that majority of Americans who had never heard of Sagan before, Golden made him sound refreshingly appealing for a scientist: "In the casualness of turtleneck jersey and chino pants, his butcher-boy haircut tousled by the wind, Sagan sends out an exuberant message: science is not only vital for humanity's future well-being, but it is rousing good fun as well."

But Golden also put his finger on many scientists' less appealing perception of Sagan, commenting that even some of Sagan's scientific supporters had to admit that he didn't have the patience for serious experimental research. "Nor has he come close," Golden wrote, "to the kind of breakthrough work that wins Nobel Prizes."

Golden also captured the controversy that had swirled around Sagan among his scientific colleagues for his whole career. "Watching with wonder—and no

doubt a little envy—the whirling star named Sagan," Golden commented, "some of his colleagues feel that he has stepped beyond the bounds of science. They complain that he is driven by ego. They also say he tends to overstate his case, often fails to give proper credit to other scientists for their work, and blurs the line between fact and speculation." The reception of *Cosmos* reflected, in fact, all of the long-standing contradictions in Sagan's life. The phenomenal commercial success of the series—reputedly the most successful PBS series before or since—was in large part a response to Sagan himself and his quirky yet compelling entrancement with the wonders of science. On the other hand, the series was something of a last straw to many scientists, to whom Sagan sealed his fate by making the series. To them, he was from then on first and foremost a showman who simply could no longer be regarded as a serious scientist. Even given the resentment so many scientists felt for the series, however, the scientific community could not deny that they had never had a huckster quite like this. Other scientists had become so famous that they were household names, Albert Einstein and Linus Pauling, for example, but no scientist had ever so stirred the public's interest in science itself. As Frederic Golden wrote in *Time*, whether grudgingly or not, "most scientists, increasingly sensitive to the need for public support and understanding of research, appreciate what Sagan has become: America's most effective salesman of science."

Of seven letters published by *Time* magazine in response to Golden's cover story on Sagan, three were friendly, four hostile. A Texas viewer said that Sagan is "a genius" and added (somewhat extravagantly), "He is to astronomy what Einstein is to physics and what Pythagoras is to mathematics." But an Indiana viewer griped that Sagan's "type of presentation imbues science with the razzle-dazzle of show biz and reduces it to bubblegum mentality."

Sagan's scientific colleagues reacted diversely to *Cosmos*. His old associate from RAND, W.W. Kellogg, said that he "never missed an episode of *Cosmos*. Carl was a source of great pride and joy to me." But astronomer Jay Pasachoff, who had known Sagan at Harvard, thought *Cosmos* was "atrocious, embarrassing in terms of the treatment of some of the material—the spaceship console, for example."

Dale Cruikshank, who had been at Yerkes when Sagan was there, recalls how he and his colleagues watched the show, "and we'd sit there and just have a wonderful time making fun of Carl." He found Sagan's idiosyncratic manner of speaking—the punched consonants, the hand gestures, the beatific gazes toward the sky—off-putting. "The pace was so plodding and slow. Then there are these occasions when he's in a spaceship and he'd have this big panel of crystals that are glowing and he waves his hands over the crystals…we thought that was just really hokey. And of course, there's the laborious pronunciation of certain words, including 'billions'…."

However, Cruikshank admired other aspects of the show: "We thought the techniques he used to explain complicated issues in science were great, because he had found new ways to demonstrate and explain very difficult concepts that other people hadn't found good ways to explain."

Sagan's very persona also troubled some viewers. *Time* magazine perceived "more than a few milligrams of arrogance…the camera lingers too often on the Sagan profile. His lyrical language sometimes lapses into flowery excess, and occasionally *Cosmos*' galloping pace straggles to a crawl." John J. O'Connor wrote in the *New York Times*: "On several levels, obviously, *Cosmos* could be subtitled 'The Selling of Carl Sagan'….Some viewers may find Dr. Sagan's brand of exuberance irritating. He can sometimes sink in a sea of exclamations: 'How lovely are trees!,' or 'What a marvelous cooperative arrangement!'" In addition, "some of the details border on the ludicrous…a succession of decidedly goofy grins."

Toward the end of the series, O'Connor of the *New York Times* declared that *Cosmos* "has established itself as a phenomenon demanding, in varying degrees, admiration, substantial reservations and serious objections." O'Connor said that the show's ratings make it "among the most popular of domestic series" produced for PBS. O'Connor also complained that the rest of the series had continued to be overdominated by "Dr. Sagan's profile….Dr. Sagan tends to play too forcefully the role of 'merchant of awe.' His favorite adjective is 'astonishing.'" O'Connor noted that even Sagan's fan Johnny Carson had recently done a spoof on the *Tonight Show* in which Carson portrayed Sagan saying he expected to earn "billions and billions of dollars" from *Cosmos*.

Yet for all the criticisms, the show was a cultural triumph—the most ambitious science series ever aired on U.S. television, one that set a new standard in textual clarity and visual dazzle.

Sagan's book version of *Cosmos* was published shortly after the series aired, and it became a best-seller, staying on the list for 70 weeks.

Overall, critics liked both the show and the book, although the latter fared better in their estimation. The *New Yorker* said that *Cosmos* "will come as an often charming, sometimes eloquent surprise to people who may have been put off by what they have seen of the [TV] series…Very few scientists would have had the nerve to write a book like this, with all its possibilities for disaster. Sagan has done a remarkably good job."

However, the historian of science David H. DeVorkin, of the National Air and Space Museum, cited in *Sky and Telescope* what he called the series' "little blunders and frequent historical howlers." He said that Sagan, like the nineteenth-century French astronomy popularizer Camille Flammarion, relied on "lurid romanticism."

Some assessments of *Cosmos* raised more intellectual issues. Some scientists protested Sagan's focus on the life of Johannes Kepler, the seventeenth-century mystic who corrected the basic flaw in Copernicus's

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WHAT CHALLENGES DOES THE NEW CENTURY HOLD FOR SCIENCE WRITERS?

[As ScienceWriters *prepared to edge into a new century, it invited replies to a single, broad question: What new challenges will confront science writers in the coming century, and how best can they prepare for them? Several members were ready to give the matter some thought and one, Dennis Meredith, announced that he had already given the matter considerable thought. His detailed prognosis follows immediately. Dennis is director of the Office of Research Communications at Duke University in Durham, NC. Following his take are brief essays on the subject from Laurie Garrett, medical writer at* Newsday *in New York City, and Tabitha M. Powledge,* ScienceWriters' *freelance columnist.]*

DENNIS MEREDITH ON THE "E-FUTURE" OF RESEARCH COMMUNICATIONS

While the explosive growth of the Internet has certainly had an impact on science writers and scientists, the next decade will bring nothing less than an historical discontinuity in writing, publishing and communication among scientists. I believe that advances in information technologies will serve to empower and enrich writers, drastically weaken the influence of traditional publishers, and mark the beginning of the end of the domination of paper books, magazines, newspapers and scientific journals.

For the sake of our profession and ourselves we should be well-prepared to make the change, for the Internet offers enormous advantages in communicating ideas. Those who insist on pining for the familiar sensory comforts of a paper book or magazine might well consider the environmental and energy costs of the print communication infrastructure. What's more, print communication inevitably restricts circulation of ideas and even produces social inequity. No print publisher, bookstore, or public library can possibly achieve the instant worldwide distribution of information afforded by the soon-to-be-ubiquitous Internet. (The medium has already grown incredibly fast, from 28 million U.S. users in 1997 to a projected 85 million users in 2002. See the statistics at **www.e_land.com/estats/nmsg_usf.html**.) Nor can any print publication equal the ease with which the Internet allows information to be interconnected. A mere mouse-click can launch a user from one idea to a related idea nestled in a computer continents away.

Among the most important results of advances in communications technologies will be an explosion in the electronic book, or e-book, industry, which for the first time will link the world of the Web with the world of publishing. (Excellent background on e-books is available through About.com at **publishing.about.com/business/publishing/library/bl_epublish.htm**, and the eBook '99 conference Web site at **www.itl.nist.gov/div895/e-book99/index.html**. The latest news on e-books is available at **www.e-booknet.com**.)

Among the young industry's key software advances was the adoption last year of the Open Edocs Standard (**www.opene-book.org/**) for e-books, to avoid potential problems of incompatibility. This standard allows writers and publishers to format their works just once for access by all electronic reading devices. The industry has also created excellent software for selling, downloading, and even lending e-books that preserves copyrights and makes unauthorized copying extremely difficult, if not impossible. For example, later this year Microsoft will introduce the Microsoft Reader software (**www.microsoft.com/reader/**), with its ClearType™ font-rendering technology that promises displayed text with the resolution of print.

Even with such software, e-books face major hardware problems to be solved before they can really become ubiquitous. Today, reading online usually means sitting at a desk with eyes glued to a computer screen, scanning a relatively blurry display—not a fundamentally pleasurable experience. However, the recent introduction of portable electronic book readers such as the Rocket eBook and the Softbook mark the beginning of a trend that will profoundly change that experience. While these first e-book readers—with their high cost, short battery life and modest data storage capacity and screen resolution have limited appeal, they do represent viable initial products, and over the next decade will overcome their drawbacks.

For example, the problem of limited reading time between charges will be solved, not only by improved batteries, but also by the development of "bi-stable" computer displays. In these displays, the image elements can exist in either of two stable states—either dark or light—without drawing power. In practice, this bi-stability means that once an image appears on such a display, no energy is required to maintain it. The most well known bi-stable displays are electronic paper invented at Xerox (**www.parc.xerox.com/epaper/**) and E Ink being developed by the E Ink Corporation (**www.eink.com/**) of Cambridge, Mass.

The Xerox "gyricon" paper consists of tiny beads, dark on one side and light on the other, immersed in oil-filled cavities and free to rotate. Applying a pattern of voltages to the paper, delineating for example a page of text, causes patterns of beads to rotate to show

either dark or light sides, thus forming the image of the text. Xerox has partnered with 3M to begin manufacturing the electronic paper.

The E Ink technology involves imprinting on a paperlike plastic sheet an ink containing millions of tiny microcapsules, each containing white particles suspended in a dark dye. Applying electric fields to the ink-coated sheet causes the white particles to move either to one end of the microcapsule, where they make the surface appear white, or to the other end, where they are hidden by the dye, making the surface appear dark. As with the electronic paper, patterns of voltages representing a page of text will produce a text display on the sheet. E Ink has joined with Lucent Technologies to further develop their product.

Besides advanced display technologies, the next decade will also see enormous increases in computer data storage capacity and higher Internet connection speeds via both wired and wireless connections. What's more, hardware prices will continue their steady drop.

The result of such advances by 2010, says Dick Brass, Microsoft V.P. for Technology Development, will be "Popular eBook devices [that] weigh eight ounces, run for more than 24 hours, offer beautiful non-backlit displays, are available in flexible/foldable form factors, and hold more books and magazines than most university libraries. They cost less than $100 and are often given away free with the purchase of several books or a magazine subscription."

In addition to portable e-book readers, high-definition video displays will also serve as another more comfortable way to view electronically published materials. Over the next decade, as television evolves from analog to digital technology, people will use integrated television/computers not only to watch video, but also to browse the Web and read news, features, and books. And, of course, general-purpose laptop and palmtop computers will continue to improve in storage capacity, battery life, and display quality, offering another venue for online publications.

Besides being instantly available worldwide in unlimited quantities, e-books and other electronic works will also be inherently cheap. With no printing costs and essentially no transportation or storage costs, an online book will cost $10 or less, by most estimates. Also, given the lower production costs of e-books, royalties to authors can be higher, perhaps around fifty percent of the purchase price. And, of course, these royalties may be paid on larger sales, as the e-book industry grows worldwide and as Internet use continues to skyrocket. Writers will not only be able to profitably sell books, but also individual articles, with online royalties as low as a few cents per sale, adding up to significant income when collected from a worldwide readership.

> …advances in information technologies will serve to empower and enrich writers…

All these advantages of electronic publication mean the blossoming of online multimedia—combining print, still images, audio, video, virtual reality simulations and Web links—largely at the expense of paper media. Microsoft's Brass predicts, for example, that by 2020, 90 percent of all publications will be electronic.

Given the potential income from online publishing, writers must first and foremost jealously guard the electronic rights to their works—as forcefully advocated by the National Writers Union (**www.nwu.org**), the American Society of Journalists and Authors (**www.asja.org**), and the Authors Guild (**www.authorsguild.org/electronicrights.html**). An important mission of the NASW should also be to protect its members' electronic rights and to help members avoid having to walk away from a sale, as some writers have been forced to do, to avoid giving up those rights.

Electronic Reporters and PIOs

Freelancer Jane Stevens advocates that newspapers train reporters in all beats to use digital video cameras as naturally as notepads. An integral part of newsroom strategy, she asserts, should be thinking visually and producing multimedia stories for the Web in addition to their print reports. Similarly, she believes that television stations and networks should hire reporters adept at integrating multimedia into broadcasts and Web sites, as have CNN, ABCNEWS.com and MSNBC.com.

Stevens also emphasizes that PIOs could use the Web and multimedia to progress far beyond the news release in communicating their institution's research. Rather than releasing isolated news "chunks" of research with minimal perspective, PIOs could become storytellers like their journalist colleagues, she says. They could create online multimedia explanations of a research topic that not only illustrate how it fits into an overall framework of knowledge, but also more clearly communicate their institutions' areas of strength, and even aid in educating students and faculty colleagues.

Evidence that Stevens practices what she preaches can be seen in her stories, including the *New York Times*' "Dispatches from the Deep" (**www.nytimes.com/library/cyber/week/dive_index.html**), and the Discovery Channel Online's "From the Cradle to the Wave" (**http://www.discovery.com/stories/nature/otters/otters.html**), "The Chilling Fields" (**www.discovery.com/exp/antarctica/antarctica.html**), and "Creatures from the Deep" (**www.discovery.com/stories/nature/creatures/creatures.html**).

Role for NASW

Given such an inevitable rise in multimedia, I believe that the NASW should take a highly active role in helping its members master these tools by sponsoring seminars, online courses, demonstrations and other educational opportunities. For example, new distance-learning sites such as Hungry Minds (**www.hungryminds.com**) would enable NASW to produce its own courses; and such course-development software as Blackboard.com (**www.blackboard.com**) simplifies the creation of online course material. The NASW could also make its Web site a distance-learning portal linking members to recommended online courses and tutorials on multimedia and other topics of interest to members. For example, the Web site Webmonkey (**www.webmonkey.com**) includes excellent free tutorials on many aspects of multimedia development.

The rise in multimedia and the resulting revolution in our profession also suggest that we should redefine ourselves as more than just science writers, but rather as science *communicators*. And I will use "e-book" to mean any substantial piece of work that includes not only text but other media as well.

> …we should redefine ourselves as more than just science writers, but rather as science communicators.

Besides the tools of multimedia production, communicators also now have the means to distribute their works directly to customers through the Web. Software for reading e-books and managing their sale and downloading will enable communicators to publish their own works, or to form online publishing cooperatives to compete with commercial publishers. These cooperatives would enable communicators to choose editorial, publicity, and other services to benefit their own interests, rather than those of publishers. And, such online cooperatives could challenge commercial publishers to raise royalties and improve treatment of communicators.

Professional communicators who want to publish independently might even find it necessary to join reputable cooperatives to maintain their credibility, and thus marketability, among readers. After all, once a large commercial market arises, the mass of low-quality information on the Internet will only increase. Amidst a rising tide of e-dreck, both readers and communicators will look to online publishers that they can trust as dependable sources of excellence.

In fact, the potential importance of such cooperatives suggests to me that the NASW might even consider launching its own commercial, nonprofit online publishing venture on behalf of its members. After all, what constitutes a more natural consortium of science communicators than its professional association? Such an NASW venture could act as both a publisher of NASW members' electronic works and as a central collection of links to works they wish to publish on their own. The site could support a range of editorial and financial services, including the collection of fees that might range down to a few cents for the sale of individual articles. Of course, the same potential for sponsoring online publishing also exists for other writers' groups, from the Authors Guild to the American Medical Writers Association.

Besides empowering communicators, the coming dominance of electronic publishing will enormously increase the availability of science news, overcoming the bottleneck represented by current media. My experience with EurekAlert!, in particular, clearly revealed the wealth of well-written stories about interesting and important research advances that do not make it through the media. Never before has it been so obvious how limited the media are in serving the public with science news.

The Web offers one solution—a new integration of the products of science journalists, PIOs, and scientists to provide more comprehensive research news to the public and the scientific community. Such integration must first recognize that the products of each of these professions possess complementary strengths and weaknesses. Journalistic reports can include the independent perspective of other scientists, and an accessible, literary style that institutional news releases currently don't have. And until the multimedia revolution happens that Jane Stevens advocates, news releases will remain relatively narrow statements from an institution's perspective on a specific piece of work.

On the other hand, news releases do have an advantage in that they nearly always contain more detail than do news reports. And, in my view, they are consistently more accurate and precise than news reports in describing a scientific advance. (I suspect this point will bring objection from some of my journalist colleagues, but the fact remains that news releases are invariably fact-checked by scientists, while news stories are not.)

Scientific papers are, of course, the most precise and complete accounts of a research advance, but they are often arcane to researchers in other fields and certainly to many important-to-reach policy-makers.

The Web could allow these three complementary science-information sources to be integrated in several ways. For example, research institutions and news services such as EurekAlert! could post not only news

releases but also direct links to the relevant scientific papers, as well as to subsequent news reports. Collecting in one site a selection of links on a given research advance would allow all audiences to satisfy their information needs.

Certainly, news publishers would never allow their online reports to be directly linked to news releases, but they might accept linking their news reports to scientific papers, which in turn could include links to their institutions' news releases. And while most scientific journals today would not likely allow public links to their papers, I believe the next decade will see a rapid evolution toward multimedia online journals that could open up scientific communication to the public as never before.

Online journals, I believe, will also profoundly affect how we science communicators do our jobs, making it critically important for us to understand their implications.

> …electronic publishing will enormously increase the availability of science news…

The rise of strictly online journals will come from the simple fact that print scientific journals, like print media reports, constitute serious bottlenecks to scientific communication.

Indeed, if scientists were to reinvent scientific communication for the Internet, it might consist of a vast network of linked scientific reports, complete with multimedia, as needed, posted on researchers' Web sites. The reports would adhere to agreed-upon formats and safeguards, and would be made public after whatever peer review or editing the authors deemed appropriate. Researchers would inform the scientific community—and the public that largely pays for their research—of their new findings by submitting links to their reports to any interested scientific societies. The societies would post the links on their advertiser-sponsored Web sites, and once made public, the reports would be accompanied by updates and a running public dialogue among the authors and their colleagues. These postings could also include links to any news releases on the work produced by their institutional PIOs, and subsequent links to news articles as they appeared.

Of course, such a radically different scheme for scientific communication would create profound consequences for scientific journals, peer review, professional organizations, tenure, and our own profession of science communication. But since this article has already caused the death of too many trees, space doesn't permit me to explore those consequences, so I must leave it to you to contemplate them. Besides, I can't figure them out myself.

Finally, while this article might seem radical to many, it may even turn out I've been too conservative in my predictions, as was *Popular Science* when it wrote in 1949:

> "Where a calculator on the ENIAC is equipped with 18,000 vacuum tubes and weighs 30 tons, computers of the future may have only 1,000 vacuum tubes and perhaps weigh 1-1/2 tons."

(Many thanks for their editorial help to Merry Bruns, Bob Finn, Jon Franklin, Earle Holland, A'ndrea Elyse Messer, and Jane Stevens. And thanks for the final quote to Ira Flatow and his book *They All Laughed*….Of course, the longer Web version of this article, at **www.nasw.org**, features the URLs as more convenient links—DM.)

LAURIE GARRETT SAW MORE BAD THAN GOOD IN HER CRYSTAL BALL

Anybody who thinks they can crystal-ball 30 years out is a fool, but I'm willing to look a decade ahead and risk having to eat crow at the 2010 NASW meeting by making three forecasts. Two are bad news, one has the potential of being very nice. You decide.

First, the bad.

The corporate consolidations of the news industry that began with haste in the 1990s will cement further in the next decade. I predict that virtually every large newspaper (readership over 250,000), broadcast or cable outlet and Internet major news source will be owned by one of 15 or 20 corporations, worldwide. Very few news organizations will escape. And many companies that seem large today (i.e. Knight-Ridder, Gannett or Westinghouse Broadcasting) will be swallowed up by humongous infotainment megacorporations. The world's population will be hard-pressed to find truly independent news sources.

I predict that this will have several direct impacts on science reporters. First, the copyright and resale problems many of us have already felt will worsen. Second, the marketplace will shrink because the numbers of corporate info-buyers will decline: If Disney directly or indirectly already owns 20 infotainment companies, imagine a decade from now when Michael Eisner's successor has his claws wrapped around 200 companies, and enforces a single-buy policy. It will mean that a freelancer who today can sell various versions of the same basic story to three different outlets will then sell only once, and wring his/her hands while 200 outlets air, e-mail or publish the same story—with no additional payoff to the "content provider."* This consolidation will also decrease competition between information providers, which is never good for quality journalism. Lack of competition breeds lowest-common-denominator news coverage,

*Does anybody else find that term utterly loathsome and demeaning? Were Shakespeare, Dickens, Bronte, and Plato mere "content providers"? Every writer has self-esteem problems, but this goes too far!

200 word stories, lots of TV car crashes and fires in the leads, and the universal broadcast impression that ideas have no place in the news. Since much of science is about ideas, this bodes ill for us.

I also predict that it's going to get much tougher for science journalists to do their jobs because of proprietary information. We have all come up against the journal embargo walls for years, but the new revolutions in science are going to find us up against lawyers. Already, hundreds of genetic sequences and products related to them are held in secret proprietary enclaves hidden not only from our eyes, but from the rest of the scientific community. This is going to get worse. And FOIAs won't get us anywhere because the secrecy won't be inside government: it will be in private biotech firms, pharmaceutical companies, agribiz firms, and so on.

> …it's going to get much tougher for science journalists to do their jobs because of proprietary information.

Here, too, I think corporate consolidations globally are going to exacerbate the problem for us. As all of you have no doubt noticed, the number of pharmaceutical companies in the world is shrinking rapidly, as they merge. Industry insiders tell me there will be fewer than ten corporations left in the pharmaceutical world a decade from now. And these will not be companies that look remotely like contemporary drug makers. *Au contraire.* These corporations are also merging with chemical manufacturers, food makers, and agricultural companies. The goal is to take the fruits of the Human Genome Project and turn them into nutraceuticals, insect-resistant bananas, potatoes that contain malaria vaccines, pharmacogenomics, etc. The pharmaceutical companies tell me that they are reducing the "R" side of their "R&D" expenditures, realizing that small biotech companies and academia are dreaming up the cool products. Better to simply buy the rights and develop the products than to fritter away billions on hopeless searches and basic research. Increasingly, as a result, academic, clinical, and biotech scientists will be signing secrecy agreements, and it will be next to impossible to learn what, exactly, they have discovered or are working on.

Sigh.

But I think there is a ray of hope. The Internet and satellite-distributed direct TV are today's Wild Wild West. Something else is going to crop up. Something even wilder. And there are enough smart people, hungry for REAL news and analysis, to support modest maverick outlets. Think *I.F. Stone's Weekly* meets *Salon* and CNN International, possibly with a touch of *Granta* and *National Lampoon* thrown in for good measure. Anybody interested in such a melange will devour science news.

And there will always be plenty of science news. Ah! That's the best part: the part that makes jumping all the grim hurdles worthwhile. Proteomics, nanotechnology, DNA-based cyberspace, interstellar remote sensing…it will be astounding. And no matter what it takes to get the news to readers/viewers/listeners/Web surfers, I will still be elbowing all of you for a prime seat in the viewing stands.

TABITHA M. POWLEDGE OFFERED THESE OBSERVATIONS AS A FREELANCE WRITER

Professional challenge

Science journalists are poorly prepared to give citizens what they increasingly need: candid investigative reporting on research and researchers. Most of us are in the game because the science fascinates us. So it's explanatory writing and the uncritical gee-whiz style that come naturally. Our audiences, however, have little interest in our carefully crafted expositions. They want to know whether that new, highly promoted drug really is better at getting blood pressure down than its (cheaper) predecessor, and whether St. John's wort works for depression. We all have plenty of evidence by now that capitalism and competition drive even good scientists into corner-cutting and dishonesty about their work. All of this means we need to get a lot better at evaluating our information and our sources and passing those evaluations along. It grieves me profoundly to say it, but science journalists have a lot to learn from political journalists—beginning with major upgrades to our crap detectors.

> Most of us are in the game because the science fascinates us.

Personal challenge

Science, and especially medical writing, will continue to proliferate. Loads of work will be available, especially in those organizations—both commercial and "nonprofit"—where the corridors echo with the sound of grinding axes. But staff jobs in science journalism—full time, with all those yummy benefits—will continue to decrease. So if you want to commit science journalism for media either paper or electronic, gird yourself for life as an individual entrepreneur. You are destined to be a freelance, at least intermittently. Cheer up; freelancing has its pleasures. How to prepare? After deep thought and even deeper personal experience, I conclude that your best defensive strategy is to lobby (successfully) for national health insurance. And hurry up about it. □

Bauds Across the Sea

It may surprise those of you who live outside the U.K. just how much American science stories dominate U.K. science journalism. So much so, in fact, that British scientists are moaning louder than ever that even with Anglo-U.S. projects, it's more often than not the U.S. scientist who gets quoted.

There is a perfectly logical explanation for this. America was first on the Internet and, thus, dominates it (except for the world's best news site, if you will allow me a plug). Surf through the home pages of American universities and look at the links to their science news sections… very impressive. Now do the same for U.K. universities, and the fact is that you will find hardly any of them that put the effort or the resources into press and PR. This is perhaps the most obvious reason why America dominates.

Call almost any American university about a science story and you will be connected to its almost always helpful science writer. I know of no U.K. university with a resident science writer. It is little wonder that in the U.K., Johns Hopkins University gets as much press as Cambridge, and it's all because of the Internet. The Web has allowed the greater resources and commitment put into science communication in the U.S. to be easily available to the U.K. and the world.

These are early days for the Internet. Technology will drive changes so much that the Internet may be very different in 10 years time. It may even be the world's primary mode of communication, science communication included.

Excerpted from an article by David Whitehouse, science editor of BBC News Online in H.M.S. Beagle, *Sept. 3, 1999.*

WHAT MAKES SCIENCE NEWS NEWSWORTHY?

by Susan M. Fitzpatrick

"Our results suggest that a genetic enhancement of mental and cognitive attributes such as intelligence and memory in mammals is feasible."

This sentence, from a scientific paper published in the Sept. 2 issue of the international journal *Nature* by the laboratory of Joe Tsien of Princeton University, ignited a firestorm of publicity. The study, using genetically modified mice (I'll get to the actual scientific findings in a moment), was reported as news by major print and broadcast outlets. *Time*, in a Sept. 13 feature inspired by Tsien's research, asked, "should we use genetics to make people brainier?"

For me, the *Nature* article and the resultant media frenzy raises a more disturbing question. Although the sentence quoted above is provocative, the actual scientific findings, building on several years of research, are not what one could call revolutionary.

What was it about this particular scientific study, as opposed to the hundreds of other important scientific findings published each week, that made it news?

In the Sept. 28 issue of the prestigious *Proceedings of the National Academy of Sciences (PNAS)*, a paper authored by Todd Preuss and his colleagues asserts that their reported finding "is the first documented feature of brain organization…that distinguishes humans from apes, our closest relatives." The authors go on to say that their results "might lead to a more complete understanding of developmental dyslexia."

Is It News?

Sounds controversial and intriguing. Is it news? A reasonable response in light of the reaction to the Tsien study would be to suppose it is. But the findings reported by Preuss and colleagues were virtually ignored by the press.

Before turning to the scientific substance of the two papers, let's look at some of the obvious things that might explain the press' enthusiasm for "smart mice" and indifference to what differentiates humans from apes. Was it due to the scientific prestige of the journals in which the papers appeared? Aficionados of science could argue one way or another, but both *Nature* and *PNAS* are high-prestige journals where scientists communicate cutting-edge research. These two publications are among the handful of journals, including *Science* and the *New England Journal of Medicine*, regularly scanned by scientists, the science media, and the science-savvy public. Was it the prepublication publicity? In both cases, the press was alerted by institutional public relations efforts, including press releases, direct phone pitching to science journalists, and electronic postings. It is true that Tsien's laboratory is at Princeton while Preuss works at the University of Louisiana at Lafayette, but the angle of an important paper published by an institution somewhat off the beaten track could contribute that all-important touch of human interest to the story.

Perhaps it was the relevance of the findings to people? Tsien reports findings on genetically altered mice performing laboratory-based behavioral tasks. Preuss studied the brains of monkeys, apes, and humans. Though each paper represents an important piece of work, neither falls into the "news you can use" category. Neither of the two papers reports information immediately affecting our lives.

Examining the scientific results published in these

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two papers makes the question of how science journalists, and their editors, decide what is and is not news no less perplexing. Both papers would be considered basic science, and each is highly technical. Both are scientifically important but require deep neuroscientific knowledge for the reader to put the results into a meaningful context. Tsien's study builds on a line of research he and his collaborators have pursued for several years. Neurons in the brains of mice were genetically modified to over-produce the normal number of one subtype of receptor for the neurotransmitter glutamate—the NMDA receptor. There exists a substantial body of research implicating NMDA receptors in learning and memory. The genetically altered mice performed better than control mice on some behavioral tasks, including maze running and swimming toward a hidden platform, skills thought to tap specific aspects of the neural systems for spatial memory. To leap from improved performance on the behavioral tasks described in the paper to "intelligence"—with all that word connotes in humans—seems a bit of a stretch.

Preuss, presenting novel, first-time results, used biochemical and anatomical markers to compare the structure of a part of the brain's cerebral cortex important for processing visual information in monkeys, apes, and humans. Malfunction of the part of the visual system Preuss studied has been implicated in developmental dyslexias. His findings, that the cellular anatomy of the human brain differs from that of our closest ape relatives, challenges the bias of neuroscientists who tend to emphasize the similarities rather than the differences between monkeys, apes, and humans. Much of experimental work on brain systems is carried out in animal models, and unless we know precisely how the brains of different species compare, the ability to interpret such work is seriously impaired.

Historically, scientists and journalists have interacted with a certain degree of wariness. The traditional complaint of science journalists is that scientists cannot talk about their results without the excessive use of modifiers and qualifiers. Scientists, fearful that their results would be overinterpreted or misrepresented, were overly reluctant to be interviewed. This reluctance has melted away during the past decade, in part, as a result of large-scale public awareness and lobbying efforts such as those associated with the Decade of the Brain and the Human Genome Project. Scientists are now very aware that outspoken public support for research funding influences federal budget allocations. Universities and research institutes actively promote their scientists, many of whom are polished communicators.

There is a definite upside to all of the "outreach." But this "buzz" also has a downside. Science journalists, flooded with press releases, tip sheets, and media alerts, now seem to be playing the awkward role of information gatekeepers, standing between scientists and a public eager for science *news*. In fact, some science journalists are now seen more in the role of science "spokespersons" and are included as prominent participants at high-profile scientific meetings.

So how does a scientist and her institution, eager for public recognition, stand out above the noise? This brings us back to the original question I raised. How do journalists decide which of the hundreds of scientific papers published each month is news?

Why were Tsien's findings, rather than Preuss', big news? Was it because Tsien used the hot button words "genetic enhancement" and "intelligence" in the same sentence? It's easy work for journalists to hype a coming day when science might engineer smarter kids—regardless of whether such stories accurately reflect the science. Without detracting from the scientific elegance and importance of either study, it seems safe to say that neither paper presented work so "newsworthy" that we, the general public, needed to be made immediately aware of it. To my taste, the Preuss paper seems more amenable to the style of lengthy feature that *Time* devoted to Tsien's research. Understanding how the brains of humans differ from those of our closest biological relatives leads us to complex discussions of what makes us uniquely human. Could that be the difference? Are complex discussions simply harder to hype? Or does it just take more time, more effort, more resources—all in short supply in today's market-driven world—to develop a story that thoughtfully unfolds and takes us beyond the obvious speculation?

News vs. Newsworthiness

Certainly science, scientists, and journalists benefit from the publicity and excitement generated by snappy headlines and full-color feature stories. But does the public? It may be time for those who make the news to reevaluate the criteria they use to judge the newsworthiness of science stories. Scientific findings may not lend themselves to being reported as news in the traditional sense. One scientific finding does not stand alone. Even if it goes against the conventional wisdom, it requires historical context for interpretation. I certainly do not want to go back to the dark ages when scientists rarely felt obligated to inform the public. But perhaps scientists need to regain, if not quite reluctance, a touch of reticence when it comes to pitching their work. Scientists and reporters should also honestly evaluate their motivation for taking certain scientific findings public. Is anyone truly benefiting from the increasingly sensational spin and the escalating extrapolation?

Eventually the public, weary of "breakthroughs" and empty promises, will turn a deaf ear. The challenge is to create science journalism that matures beyond merely capitalizing on the public's enthusiasm for science to generating a true public appreciation and understanding of science. I think we can do it. □

AN UNCOMMON INVENTOR TALKS ABOUT HIS WORK AS A UNIQUE ART FORM

by Jacob Rabinow

[On April 27 last year, Jacob Rabinow, holder of some 300 U.S. and foreign commercial patents and a much honored developer of ordnance systems for the U.S. military, regaled an audience at the Cosmos Club in Washington, DC, with his uniquely personal outlook on the art of invention. He was there to receive the 36th Cosmos Club Award in celebration of his "multitude of achievements." These included the first magnetic computer memory to use a disc instead of a tape for data storage (1954); the first phonograph whose cartridge moved along a straight track rather than at the end of a swinging arm; and his best known invention, a "Reading Machine" (1960), which formed the basis for the reading, sorting, and processing machines now used by post offices and banks. Following is a painfully abridged version of his very personal presentation—HJL].

Many years ago, I worked as a sound man for an auctioneer. He would have liked this crowd….

I think that inventions are an art form. An art form, the dictionaries say, is the technique that produces beautiful things….

Something that does a job neatly, quickly, completely, is beautiful.

I'll tell you about three of my inventions. The first has to do with a lock washer. A lock washer is a very simple little device. I'll explain that in a minute. The second will have to do with a toy. The third will have to do with a knot for a rope….

I'll tell the stories in chronological order, more or less. The period is near the end of the war and at our house is a friend for dinner. He is the chief mechanical engineer for one of the large companies.

They make a "fuze"….A fuze has a kind of Jekyll and Hyde personality. Attached to a rocket or a bomb or a grenade, assuming it's our weapon, it must keep it safe when it is in our hands. However, when you send it against the enemy and it is far enough from our troops, then it should turn itself inside out, change its personality, and now become the trigger that sets off the weapon.

This friend is building such a fuze for some weapon which I don't know. And he has a problem. He says, "The thing that makes my fuze go from safe to dangerous is a screw. The people who assemble the screw have to put the screw all the way into its hole and not tighten it too much. Because, as it flies through the air, the fuze has a little windmill and as the windmill rotates it takes the screw out and when the screw is out, then the weapon is dangerous. The screw is the thing that you have to change. When I tell workers not to tighten the screw too much, the result depends on how strong the worker is. If they are very strong, they tighten it to what they think is a little bit, but it is so tight that the windmill can't take it out; so we have a dud. If I tell them 'OK, tighten it but back off one turn,' they back off three turns, four turns, and that's dangerous. So do something for me so that the windmill can open it without anybody having to use judgment."

Jacob Rabinow at his NIST office

When the dinner is over, I go down to my basement shop and get a lock washer. These things are used by the millions under screw heads so that when you tighten the screw to hold pieces of machinery together, that screw will not come out. When you put the washer under the head of a screw and you tighten the screw, these teeth lie down and behave, but when you try to open the screw, they stand up and jam. This is a shake-proof lock washer.

I had a very cute idea: You make a new kind of washer with teeth that are bent the other way. This is a curious washer because if you try to tighten the screw on it these teeth jam and don't let you. It is no longer a lock washer. Lou says, "That's good because it wouldn't require any changes in the fuze, I can order these by the tens of thousands."

Then the Germans are not very cooperative. They give up the war. The war ends and we never went into production with this lock washer. Now, the thing that is interesting about this is that it's not a logical thing to do. You don't take lock washers and determine what they do logically. You play with it and it suddenly occurs to you that if you use it the other way, the washer that normally prevents a screw from loosening now will prevent it from ever holding tight. I like the invention. I think you now get the feeling of what I like and what I don't like.

The next invention I tell you takes a little longer and it is more interesting. This time the year is 1954-5 and a patent attorney, Max Libman, is my partner and my friend. He says, "Jack, I want you to design something for me. I subscribe to an answering service and when I get home I'm supposed to pick up the phone and call the answering service and get the messages. If I forget to call, that day there is an important message waiting for me. On the other hand, if I usually call them there are no messages. I want you to design for me something that will light a light when the telephone rings so I'll know there is a message."

I say, "That's easy, Max, you take a microphone, an amplifier, a latching relay (which is a kind of a switch)

and when the microphone picks up the sound, the light will light and you will call the answering service." He says, "Bigshot engineer, if I want to use a microphone, amplifier, and relay, a power supply, heat-vented cabinet—I don't need you. I want something cheap and simple that I can build quickly."

I suddenly remember something. I came to America in 1921. I was 11 years old and I had an uncle in New York City who had a candy store. At Christmas they sold toys. There was one toy that interested me. It was a little box about six inches high that looked like a doghouse, made of cardboard. There was a little bulldog, you pushed it into the box very carefully and held your breath and it stayed in. But if you yelled "Rex!" or clapped your hands or touched the table, the dog jumped out. I remember how it worked. On the back of the box were two wires and a little piece of copper touching them. This formed an electrical switch. Whenever the box vibrated from a sound or from someone touching the table, this contact broke for an instant and the dog jumped out. I said, "Max, I think I know how to make your telephone device." Now please understand me—this is 1955 and I saw the dog in 1921.

So the next day, I took a cigar box and made a very poor contact under the cover and used a neon light and a couple of resistors. (Neon lights have property that once you light them they stay lit easily.) I made a gadget that cost, all together, probably less than a dollar. I went to his office. I said "I've got this gadget for you." I put it on his desk and he said, "What happens?" I said, "Tell the telephone operator to ring it." She rang, the light lit. He said, "That's good." When we finished our business, I went home.

No sooner had I got to my office when the phone rang and Max was on the line. I said, "Max, what's the matter?" He said, "You still stink as an engineer. You and your damn light. I can't sneeze. I can't close the door. If I touch the desk or push in the drawer, the light lights. If I open the window and there's a taxi on the street that blows its horn, the light lights." I said, "I'm sorry." So I took it back and another engineer and I modified it so that it counted the sounds. You understand, one sound didn't trip it, it had to be several sounds in succession. But it lost its elegance.

> I think that inventions are an art form. An art form, the dictionaries say, is the technique that produces beautiful things…

I pulled this trick in my head, it was 34 years, and this sort of puzzles me—that the brain can have a mountain of stuff. Imagine all the pictures that you see in your lifetime. Imagine all the smells that you smell. All the things you feel. All the music that you've heard and the words you've heard perhaps in more than one language. Then the brain goes through all this mess that's all collected in some way, and picks out the piece that it wants. When it does pick out the piece, it knows it's correct. That's one thing I can assure you of, that when you solve a problem, the solution is instantaneous. You suddenly see it and you say it's right, it fits. I've heard people who work at artificial intelligence say, "If we only had a bigger memory and a faster computer we will make the computer work like the human brain." The answer is no, the human brain doesn't work like computers. How it works only God knows and he doesn't tell.

The last story I will tell you has a similar vein. I was working at the Bureau of Standards until a couple of months ago. In the old days it was NBS and now it's NIST. Insiders still call it NBS. One of the jobs we had there, and that was the job I was working on, was to evaluate other people's inventions. An Israeli scientist was working with us trying to learn what sort of technique we use to evaluate inventions and how many of them do we support.

This engineer from Israel says he came across an interesting problem. Somewhere in Israel is a bridge over a dry creek and there is a rope hanging from this bridge. The rope is about 300 feet long. In Israel there is a guy who can climb the rope, a mountain climber very good at climbing ropes. He can climb up this rope and stay on the rope as long as he likes because he can attach himself to the rope. He happens to like to get this rope, because the rope is not useful to anybody else now. He'd like to climb, cut off a piece, and come down with it. He has one problem. If he falls more than 20 feet, he gets killed. If he falls 20 feet or less, he's all right. The question is, how much rope can he steal? That's a nice problem. You realize that he can climb 20 feet, cut the rope, fall with it and he'll have 20 feet. A little work and you can get 40 feet. I said, "Let me assume that the guy wants to take the whole rope down."

If you assume that, you can design very fancy gadgets that go up on the rope and by remote-control scissors using radio, you can cut the rope while you are down on the ground. But that's not elegant. The problem is: Can you make a simple device that he can use near the top of the rope, cut off the rope, maybe keep only four feet to hang on as he operates? The rope has to have a knot and as soon as he gets on the ground, the rope knows that he is off. How does it know? The tension releases. I think, what kind of a trick can you use in a rope that if you don't pull on it it's loose, but if you pull on it, it stays tight?

Then I remembered something that I learned in college. When I entered college in February of 1928, the City College of New York, one of the first things I studied was calculus. In calculus they teach you the theory that if you wrap a rope around a pole and hold one end even lightly, and try to pull the other end, it won't move because each turn increases the friction and by the time you get four or five turns, the rope doesn't slide. So if the man is hanging on a piece of

rope that is up under the bridge, he can form a loop while holding the rest of the rope in his teeth. So that he still has the rope going down to the ground. Now if you take this loop and put the end of the rope through it and if you wrap this around the loop very tightly four or five times and take the end of the rope and put it into the loop, and test the knot, you can pull hard and this knot will hold whatever the rope can hold. The climber now can switch to the long piece of rope and climb all the way down to the ground. When he gets to the ground he can let go of the rope and if he shakes the rope, the rope lets go.

So here is an invention that's very clever, which I like very much, and is completely useless. The number of people who climb ropes under bridges with dry creeks under them is negligible. But look what happened in this case. I had to think back 70 years to solve a problem. I've collected a lot of information in my silly head and all this was bypassed somehow or other as I went right to the particular something that I needed.

How does the brain bypass all the useful information you've collected over a lifetime and get to this? This is what an inventor does: He has to have a big mass of information in his head. If he has information only about simple things like baseball, he can only invent things in baseball. But if he has a variety of things like I do because I like variety, he has a choice of a rope, a washer, or a toy dog. □

A few months after Rabinow's Cosmos Club address, he died. The *Washington Post* obituary reads, in part:

Jacob Rabinow, 89, a retired National Institute of Standards and Technology engineer and official who also had worked in private industry and held a variety of patents, died Sept. 11 at Sibley Memorial Hospital. He had cancer.

Mr. Rabinow, who lived in Bethesda, was born in Russia and lived in China before coming to the United States in 1921…In 1934, he came to Washington as a mechanical engineer with the Bureau of Standards, becoming chief of the electromechanical ordnance division before leaving the government to form his own engineering company in 1954.

A decade later, his company was purchased by Control Data. He became a vice president of Control Data and head of the Rabinow Advanced Development Laboratory. He rejoined the Bureau of Standards in 1972 and became chief research engineer in its national engineering laboratory before retiring in 1989. He then did consulting work. He received 230 patents for mechanical and electrical devices.

Over the years, he received numerous awards for his scientific research, including the President's Certificate of Merit and awards from the Bureau of Standards and the Commerce and War departments.

SAGAN'S 'COSMOS' / DAVIDSON

continued from page 7

cosmology—its circular planetary orbits—by replacing them with ellipses. Sagan's Cornell colleague Tommy Gold "quite liked" the show *Cosmos*, but disliked the focus on Kepler. In Gold's view, "Galileo and Newton were so far ahead [of Kepler] in general comprehension." Responding to an objection that Kepler had made Newton's work possible, Gold replied, "No, what Kepler did was to serve up information for Newton on a platter. But if Newton had not been served up this [information]…he would have worked it out in a month by himself…in private life, Kepler was an absolute crackpot." Likewise, the physicist-author Michael Riordan wrote in *Technology Review:* "I only wish Sagan had spent more time with Newton and less with Kepler. For me, the conceptional leap from a few phenomenological rules of elliptical orbits to a universal law of gravitation is by far the greater achievement, one that lies at the heart of modern science."

The inclusion of Kepler may well be considered courageous and worthwhile, however. Kepler "has been strangely neglected and misunderstood," according to the noted science historian Gerald Holton. Kepler was a contradictory character—an astronomer who practiced astrology, a rationalist who speculated about neo-Pythagorean mathematical mysticism and whose mother was persecuted as a witch. By including Kepler, Sagan made an important historical point: scientific ideas occasionally emerge from a pseudoscientific context. Scientists have been reluctant to accept this fact, but it is now received wisdom among many historians of science. It doesn't mean that pseudoscience is "true"—just that (as mentioned earlier) scientists are sometimes right for the wrong reasons.

Sagan may have concentrated on Kepler for another, more personal reason: he may have glimpsed aspects of himself in the astronomer-astrologer. Like Kepler, Sagan was a contradictory figure—a man with one foot in science and the other in imagination, one in logic and the other in Edgar Rice Burroughs. (An astronomer who made money by practicing astrology, Kepler wrote a fantasy story about a voyage to the moon, which he thought was inhabited.) Sagan's handling of Kepler constitutes part of a broader Saganish phenomenon that might be called "covert autobiography," which appears in some of his mini-biographies of great scientists. These superb biographical essays, which appear in a few of his books, emphasize numerous minor aspects of the subject's life, perhaps because, although he never says so, they reminded him of himself. Sagan's detractors might dismiss his taste for covert autobiography as an idiosyncrasy, like his love of epigraphs (with which he jammed his books). Others might attribute it to his egocentricity, to his purported inability to grasp anything external to himself except on his own terms. In reality, he may have been seeking support or consolation for his eccentricities or failings by spotting them in the lives of scientists far greater than he. □

NASW MEMBERS PALAVER ON MILLENNIUM ENDING; MOST GO WITH THE FLOW

by Lee Siegel

No matter what you read in newspapers, see on television or hear on the radio, New Year's Eve 1999 was not the end of the millennium or the century—no way, no how.

"The end of the second millennium and the beginning of the third will be reached on Jan. 1, 2001," said the U.S. Naval Observatory, America's official timekeeping agency.

"This date is based on the now globally recognized Gregorian calendar, the initial epoch of which was established by the sixth-century scholar Dionysius Exiguus. … Rather than starting with the year zero, years in this calendar begin with the date Jan. 1, 1 *Anno Domini* (AD). Consequently, the next millennium does not begin until Jan. 1, 2001."

For the same reason "the 20th century comprises the years AD 1901-2000," so the 21st century does not begin until Jan. 1, 2001, the observatory said on its Internet Web site.

Britain's Royal Greenwich Observatory, the White House Millennium Council, and the U.S. National Institute of Standards and Technology all agree the new millennium and century do not begin until 2001.

Nevertheless, much of the public and most of the nation's news media are enthralled by the turnover from the year 1999 to 2000 and have chosen intentionally to trash the concept of accuracy and simply pretend Jan. 1, 2000 is the beginning of the new century and millennium—despite some rare, grudging acknowledgments of reality.

"Even in this imperfect world the media probably would try to get it right if this were an important issue," said Patrick Wiggins of Hansen Planetarium in Salt Lake City. "But most people—and editors, it is rumored, are people—really think this particularly topic is not important, so it's just easier to go with the flow and adopt the 'odometer syndrome' mentality."

John Bartley, geology and geophysics chairman at the University of Utah, said: "People who really want the third millennium to begin with the year 2000 have only two alternatives—pervert the definition of a millennium such that the first millennium contains only 999 years but other millennia still contain 1,000 years, or add a year 0 to our calendar."

But even the nation's science writers seem to have abdicated to mass sentiment on the issue. In a message sent to an Internet chat site operated by the National Association of Science Writers (NASW), this reporter declared that incessant news reports citing 1999 as the end of the millennium represented "the biggest example of ignorant yahoo-ism by the media."

"If this is the worst media yahoo-ism you've ever seen, you've led a sheltered life," said Sheldon Rampton of *PR Watch* in Wisconsin. "Besides, we're all impatient to get to the next millennium because that's when *Popular Science* says we get to fly around in hover cars and vacation on the moon."

"This particularly horse was beaten to death months, if not years ago," said Michael Lemonick of *Time* magazine. "The truth is nobody outside of us anal-retentive types cares a whit. Tilt at your windmills, though. Someone's gotta do it."

NASW President Joe Palca, a reporter for National Public Radio, declared: "I confess I'm with the public on this one. The millennium is an artifact of the calendar system we chose. It's like celebrating when your odometer clicks over from 999 to 1000. I can't get too excited about the fact that the millennium doesn't officially start until 2001."

Former NASW President Richard Harris, also an NPR science reporter, added: "As any semi-literate soul could surely appreciate by your impeccable logic, the 1990s actually run from 1991 through the year 2000. And 1970 was in the sixties, man! Go sell that to your editor or my 6-year-old."

Diane Boudreau, a writer for the Arizona State University research magazine, said: "Going from 2000 to 2001 just doesn't feel like as big a leap. And next year won't be half as exciting without all the computer glitches and paranoid militia members to stir things up."

Arizona freelance science writer Richard Robinson denounced the Naval Observatory and other pro-2001 millennium advocates as "killjoys."

"If we really are going to keep score on this, we'd better add back in those dozen or so days removed when the Julian calendar became the Gregorian calendar," Robinson said. "The new millennium really begins Jan. 13, 2001. Can't wait to whoop it up then."

Wiggins and several science writers noted that the 2,000th anniversary of Jesus' birth was actually several years ago—exactly when is a matter of debate—and that the start of 2000 in our calendar occurs during the Persian year 1378, the Islamic year 1420, the Hebrew year 5760, and so forth.

"I'm Jewish and am more concerned with the Y6K problem," said Johns Hopkins Medcast Bureau Chief Joel Shurkin. "Only a couple hundred years and I don't feel well-prepared yet."

Maryland freelancer John Ludwigson said he liked the millennium disagreement because "that way we can have two new millennium bashes: one now and another in a year. One party good, two parties better!"

Charles Seife, author of *Zero: The Biography of a Dangerous Idea*, noted the debate over the turn of centuries and millennia is not new. He said that on Dec. 26, 1799, the *Times of London* declared the 19th century began in 1801, not 1800.

In no mood for disagreement, the newspaper said: "It is a silly, childish discussion and only exposes the want of brains of those who maintain a contrary opinion to that we have stated." □

Lee Siegel is science editor of the Salt Lake Tribune. *A shorter version of this story was published in the* Salt Lake Tribune, *Dec. 30, 1999.*

PRESIDENT'S LETTER

by Joe Palca

PHOTO BY KATHRYN AIKEN 1999

Before I got into the journalism game, I was a graduate student in psychology. Like most graduate students, I had to take whatever paying jobs were available to make ends meet. One job that was chronically available was teaching statistics. It's a required course for psych majors, but not necessarily one that most psych students are terribly enthusiastic about, if you get my drift.

I, on the other hand, love statistics. For me, they are the tools that make psychology a science, and not just a collection of conflicting opinions. The idea of being able to detect a real signal out of the noise that is human behavior has always appealed to me. Even now, 17 years after leaving the academic life, I delight in tracking the use, and misuse, of statistics in the pursuit of scientific knowledge. So I welcomed the chance to teach statistics and share my enthusiasm for Gaussian distributions, Fisher's t tests, and Pearson's correlations, even though I knew I'd be facing a tough audience.

Hoo boy, were they a tough audience. Not just uninterested, in some cases, downright hostile. Most of the students in the class resented being required to take what they saw as an irrelevant course. Many were planning careers in counseling or some related field, and couldn't figure out how knowing about means and standard deviations was going to help them in the least.

Well, I launched into the course with all the enthusiasm and humor I could muster, and I will say, with some modesty, that I did a pretty good job of convincing my charges that statistics could be interesting and possibly useful in certain circumstances.

Now, I tell that story not to sing my own praises as a teacher (although I was quite brilliant), but because my class of psych majors had a number of things in common with my NPR audience (or any other audience for popular scientific information), and they also have some important differences that shed light on why, despite claims to the contrary, science journalists are not, and will never be, educators.

Like the consumers of popular science journalism, my students were intelligent and interested in their world. They would pay attention best when my lectures were filled with colorful anecdotes, creative analogies, and the occasional joke or two. I try to use the same approach when constructing a story for my radio audience.

But the difference is, my current audience doesn't have to listen. There's no penalty for flipping the dial. My students were stuck. Like it or not, they made a commitment to completing the class as part of their education. To do that, they had to demonstrate an adequate knowledge of the topic. And to do that, they had to be active listeners, taking notes, working through problems, passing exams. That's what happens in education. It's not a one-way street, where a teacher imparts information and students passively soak it up. They have to chew on the information, review it, practice using it, and be prepared to demonstrate that they really get it.

Of course, I know that what they learned in my statistics class—or any other class—may only stay with them for a short period of time. One hopes for months or years. I suspects days, or in some cases minutes, may be a better scale. But for a time, my students understood something about statistics, and could make informed decisions about how to use them.

I can't make a similar claim for my NPR audience. With science journalism on the radio it truly is a one-way street. There is no chance to review the information in one of my stories or demonstrate that it was heard and understood. Leaving aside the fact that it's slightly ridiculous to assume that I can teach something fundamental about a complicated topic in four-and-a-half minutes, journalism just isn't well-suited to education. All journalism is based on certain assumptions about the audience's ability to understand the message. For science stories, there's frequently a lot of explaining to do, but we assume some knowledge. I've never tried to explain why objects don't fall up, or why the sun shines brightly.

There is a common opinion, frequently espoused by scientists and science administrators that science journalists are failing in their duty to educate the public about science. I hear this all the time, and am frequently asked by organizations how to correct what they see as a deplorable situation. I try to explain that their concerns are misguided. First, I don't believe science journalists have a "duty" to educate the public. But even if they did, they can't.

Curiously, the one person who does get educated when science journalists write about science for the public is the journalist. The process of researching a story, and understanding it well enough to explain it someone else is quite similar to what happens in an academic setting.

The best science journalists can hope to do is inform the public about science, let them know what's going on, what the latest discovery really appears to mean. That's still a valuable exercise, but let's not confuse it with education. □

Joe Palca is currently a Kaiser Media Fellow on leave from National Public Radio. He can be reached by phone 202-244-5693, fax 815-371-1658, or e-mail jpalca@npr.org.

ON THE LISTS

by Bob Finn

One of the things that constantly amazes me about the nasw-x mailing lists is the wide variety of topics we discuss, far too many to be summarized in a 950-word column. When I sit down to write these pieces, my toughest job is choosing which discussions to highlight. Rather than touch fleetingly on many topics, I'll concentrate on just one for each mailing list.

nasw-talk

On Nov. 22, 1999, Nada Mangialetti wrote that the hardest part for her as a newcomer to science writing was cutting. "I'm not talking about 'tightening,'" she wrote, "I'm referring to cutting entire sentences, paragraphs or points of information." She asked for advice and she received a bunch.

John Gever responded with a detailed recipe that involves first writing down the piece's main idea along with its subsidiary points. Next, consider whether each of the subsidiary points is necessary to the main idea. If it isn't, cut it out, regardless of how interesting or cleverly written it is. If the piece is still too long, order the remaining subsidiary points based on how important they are to the main idea, and cut them too, beginning with the least important. If the result fails to establish the main idea, it's an indication that the idea was too ambitious.

David Brand suggested writing the headline before writing the story, "The mere act of being forced to summarize the story in two short lines acts as a brake on verbosity and clarifies the thought processes wonderfully," he said.

Sheldon Rampton prescribed an exercise assigned by his writing teacher, who provided several pieces written by authors such as Ernest Hemingway and had the class cut them by 25 percent without sacrificing any meaning. David Lindley has given his students similar assignments, but he starts with a random *Washington Post* science story and has his students make it into an 800-word piece, then a 400-word piece, and then a 100-word piece. Says David, "Since they're dealing with someone else's words, they were free to be ruthless, and once they'd got the trick of it they could apply the same principles to their own stuff."

You'll find this discussion under the subject heading "Cutting."

nasw-freelance

The policies and procedures for the nasw-x mailing lists (available at **http://nasw.org/swlist.htm**) require that all messages be signed with the author's real name, and I usually enforce that rule pretty strictly. But I'm willing to bend it if there's a good reason.

On Dec. 8, 1999 someone who called herself (or himself) Annoni Mouse posted a plaintive message entitled "when to stop freelancing." In the message The Mouse explained that she has been freelancing for several years, has cracked most of the markets she had targeted, has been able to earn a modest but adequate income, and has written about interesting subjects and interesting people.

"And yet," The Mouse wrote, "it's starting to seem sterile and boring. Most of my work, probably like most freelancers, is done at home, over the phone, and the lack of personal interaction is…well, also getting boring, even with interviewing a Nobel laureate here and there. Friends and family don't lately make up the difference. Ambitions I once had for creativity mostly seem to have been set aside in order to concentrate on making the monthly nut—writing just isn't as much fun at it used to be, especially, it seems, writing for speed. There's little feedback, too, even when I've written for major publications."

Michael Kenward replied, "Three things to deal with: the money, the ennui, and the who you work for. All related." He pointed out that it's not adequate just to earn enough to get by; you have to fund your retirement as well. He pointed out (as did a few others) that "You kill the boredom by finding new markets and things to write about." And he suggested breaking into new markets as another way to kill the boredom, "Think of people who need to know the subjects that you cover but who do not know that they need it." Another suggestion is to cultivate interests outside the office. Deborah Ausman likes to take on volunteer jobs, and Rachel Clark makes a conscious effort to schedule social events—lunch with colleagues at least once a week, for example.

Lisa Bain recalled that she experienced similar feelings as a freelancer, which she attributed to a sense of isolation, in response to which she took a full-time job. Sue Wallace and several others pointed out that having a regular job and freelancing needn't be mutually exclusive. It's possible to find part-time science-writing jobs, some with full benefits.

nasw-pr

On Dec. 24, 1999 Carol Morton wrote, in a message titled "copyright and Web posting – creative solutions," that a Web editor at her institution likes to post copies of copyrighted articles from publications like the *New York Times* on the institutional Web site, "in the spirit of sharing." The editor wasn't happy with her suggestions, which included asking for permission or using a headline together with a link to the article's official site.

Sheldon Rampton put the issue in a nutshell when he wrote, "If those approaches are too time-consuming, maybe he could try robbing liquor stores and using the proceeds to pay someone else to go out and obtain the permissions. He'd still be stealing, but at least it wouldn't be theft of intellectual property." Sheldon went on to list a series of arguments about why copyright theft is bad, after which he wrote, "If these moral and legal arguments fail to sway your friend, here's a practical one: The same technology that makes it easy for him to republish other people's work makes it easy for them to search the Web and catch him red-handed."

Subscribing

If you subscribe to the standard version of the list(s), you'll be sent each list message separately. During periods of high activity you may find that all those messages start cluttering your e-mail box. If this is annoying, subscribe to the digest version, a compilation of about a day's worth of messages gathered into a single e-mail. See **http://nasw.org/swlist.htm** for details.

*Bob Finn moderates the Web site and e-mail lists of the National Association of Science Writers **http://nasw.org/**. His e-mail address is cybrarian@nasw.org.*

THE FREE LANCE

by Tabitha M. Powledge

You've got a book inside you screaming to get out. Maybe your proposal has already made the rounds at agents and publishers, but flopped. Or maybe you haven't had the heart to put a proposal together. You write about science, a serious subject with a small potential market. You are not hopeful about your prospects in a nonfiction industry that's crazy for celebrities and gurus and not much else.

You understand that even if the god Gutenberg smiled on you and offered a contract, the advance would be small, way too small to support you while you're researching and writing. Or suppose you've got a loyal spouse who offers to bring home the bacon while you carve the fat from your prose? Still scary; you've heard all the horror stories about heedless agents and heartless publishers. You're utterly aware that the typical publishing experience is extended misery for the author, even one who eats regularly.

And post-publishing is worse. You know there's an excellent chance that your thoughtful-but-spritely commentary will hardly ever leave the warehouse, that reviewers will spurn it and booksellers return it.

You know all that, but the damn book is still screaming, "Let me out!"

Is there hope on the 'Net?

Well, there might be. If not now, then soon. Perhaps. Eventually.

Most of the cost of getting a book out goes for printing and distribution. The 'Net wipes out printing costs because it substitutes electrons and cheap cables for ink and very pricey paper. Exploited correctly—which nobody has yet quite figured out how to do—the 'Net could also make distribution expenses all but vanish. It costs next to nothing to slap a manuscript up on a Web site, where it is in theory available to anyone with access to a computer and a modem, each precious soul potentially a reader.

You'll still have to figure a way to continue eating while writing. But that will be a snap compared with the toughest hurdle of all: getting those precious souls to come to your site, pay you a little something, and download your baby.

Here is a quick tutorial on an alternative: three Web sites that would love to "publish" your book. Doing business with one of these sites will cost you a little something, which will not surprise you. Authors must also share royalties with the sites, although the author's chunk is huge compared to traditional publishing. Still, if your book takes off, that could cost you a lot compared with putting up your own site, where you would get to keep all the revenue.

The chief question about these sites is how—or whether—they differ from the traditional vanity press. Is this just self-indulgent self-publishing, the kind that generates snickers instead of sales? Or is it the leading edge of what professional book publishing will be like in the 21st century?

Dunno. Neither does anyone else, which is probably why the sites have begun to pick up mentions in the press that verge on respectful.

I'm still dubious. It's not clear to me why collaborating with one of these sites is necessarily a better idea than plunking your golden words onto your own Web site, although they do offer certain logistical advantages.

The chief advantage being that they are already set up to collect the buyers' money. That is a bear to arrange on your own. You would need to make deals with American Express, Visa, and MasterCard, who are inclined to turn up their noses at an individual entrepreneur like you. If you happen to be cozy with a banker—not exactly common in our line of work—you might confer on the realities of the charge-card problem. You would also need to secure your customers' card numbers from prying eyes. Still, if you could pull it off, all the money would be yours.

No point in going through all that, however, if you don't have a plan for generating sales by getting your e-book noticed. The sites won't be any more helpful with this all-important promotional stuff than the conventional publishing industry is. This job will be left to you wherever your book is posted.

When you figure out how to do book promotion well, please share. No, wait. Write a book about it. It will be snapped up by a top agent, auctioned off to a gaggle of money-waving commercial publishers, printed on real trees—and, of course, promoted heavily.

Fatbrain
http://www.fatbrain.com/ematter/home.html

Fatbrain is the best-known of the sites, possibly a tribute to its cool name. It is also the most peculiar. Fatbrain is actually an online bookstore specializing in computer lit for professionals: books, training materials, and print-on-demand documentation for business, finance, math, science and technology experts. It seems to have stumbled into e-publishing on other topics—any other topics—in an effort to build traffic at its bookstore, which is still its main interest. (The store is at **http://www.fatbrain.com/**)

The List: The digital publishing division, called eMatter, publishes not only books, but papers, short stories, book chapters—anything an author or company wants publicly available. Commercial publishers have begun to post book chapters on eMatter to build interest in the entire book before paper publication. Arthur C. Clarke published a short paper there; cost: $2. So already Fatbrain has a more respectable record than the average vanity publisher. But there are plenty of oddities; viz., *Pogrom: A Game of Jewish History.* The medicine-and-health list is indistinguishable from any other publisher's. It includes books on weight training, herbal medicine, and back problems. Also, *Emily's Vinegar Diet Book.* I can't testify to the professionalism of their content because I haven't looked at any of them. You can, however; free samples and summaries are available.

Money matters: $1 monthly to keep your ms. posted on the site. This, Fatbrain says, is to keep out the riffraff. You set the price and split it with Fatbrain 50-50 every time someone downloads your ms.

Nice touches: Once you've posted it, you can edit and revise your ms. whenever. It's the compulsive rewriter's ultimate fantasy. You never have to just stop writing and relinquish it to a foot-tapping editor. Your book is perpetually headed toward perfection.

Promotion help: Consists chiefly of a teaser from a book on book promotion published by—surprise!—eMatter. Which explains that successful book promotion rests entirely with you and includes instructions on writing a press release. The site also includes a list of recommended titles and reviews, although it's not clear who's doing the recommending and reviewing. There's also a list of Fatbrain Best Sellers featuring titles such as *How to Build an Internet Service Company (2nd Edition), Why Companies Fail,* and *How to Have a Baby.* Its number one best seller may,

however, give you pause. Its tautological title: *Solo Explorations in Male Masturbation.*

iUniverse
http://www.iuniverse.com/

iUniverse differs dramatically from Fatbrain because, while a cyberversion is one option, it will also print your book (as a paperback) and make it available to bookstores. Costs stay down because it's printing-on-demand, one copy at a time to fill existing orders.

Another big difference is that last fall Barnes and Noble bought a 49 percent stake in iUniverse—although both companies emphasize that this in no way implies your book will actually get space in B&N stores.

However, I suspect iUniverse is chiefly about getting writers to pay for being writers, a kind of electronic descendant of *Writer's Digest.* In fact, *Writer's Digest* is one of its partners. The site is stuffed with how-tos and courses for writers, most of which cost something. Like the magazine, it mixes upbeat come-ons that are uncomfortably close to Famous Writers School pitches to writer wannabees with genuine professional advice that is serious and sometimes even useful.

The List: Less quirky than Fatbrain's. In fact, on the whole pretty conventional, and definitely no books about masturbation. At this writing they are pushing *Darwin's Lost Theory of Love,* a somewhat off-the-wall interpretation of evolution that was rejected by loads of traditional publishers. But at least it's not creationism. The *Greatest Little Bean Cookbook* features a cheesecake made with kidney beans. Explains the author: "they give it a good color." Red cheescake? Brown cheesecake?

Money matters: iUniverse offers a handful of different "publishing programs." They all seem to pay royalties of either 20 percent (on sales of printed books) or 50 percent (on electronic sales). For new books, the entry-level program costs $99. Another program, "Writer's Showcase presented by Writer's Digest" implies that it is competitive; writers are required to "submit" a manuscript that "could be selected for publication for only $299." Cynical me, I wondered if selection hinges on whether the check clears. But a note declares, "Your payment will not be verified (check cashed or credit card charged) unless your manuscript is chosen for immediate publication." In addition, iUniverse will republish your out-of-print book, either for free or (if you want to update it with a new foreword) $99. It also seems to have taken over the Authors Guild Backinprint service. These options for out-of-print authors could turn out to be particularly valuable. Most books go out of print far too soon. The market may dwindle, but it's still there, and OOP books already possess catalog listings, ISBN numbers, and the other trappings of a "real" book. I noted that Jerry Bishop and Michael Waldholz have chosen to republish *Genome,* their book on the Human Genome Project, with iUniverse.

Nice touches: The site presents itself as a community of writers, with chat rooms, job boards, and many free how-tos. There's also a free, searchable database of agents, publishers, and magazines (**http://www.iuniverse.com/resources/iu_contact/**). It's not clear how complete and up to date it is, and the information is pretty much confined to name, address, and sometimes phone number. Few listings name a contact person.

Promotion help: Lots of free how-to articles, but—predictably—the advice quality varies. Also a Web-site builder. iUniverse also dangles the prospect of getting your book into Barnes & Noble stores via a special promotional program, but repeatedly cautions that there's no guarantee this will happen. Believe it.

1st Books
http://www.1stbooks.com/

Like iUniverse, 1st Books offers both electronic and print-on-demand versions of its books, but it's dedicated wholly to publishing. There are no chat rooms, no courses, no how-to archive. There's also very little information—and no specifics—about its publishing program. After the comparative forthrightness of Fatbrain and iUniverse, 1st Books is pretty unsettling. If you are thinking seriously about self-publishing, my advice would be to forget about this one. See below.

The List: The 1st Books list strikes me as that of an old-fashioned vanity press, pure and simple. Not much chance of gold among the dross, I fear. Health & Medicine titles, for example: *The Greatest Diet Book in the World, Experience a Brand New Body, Autobiography of an Allergic/Asthmatic Survivor, Be Yourself.* A sampling of science titles is even more revealing: *Contrarian Reflections on Newton, Einstein, and Space, Dark-Energy: Source of the Universe, Genesis 2000: A Forbidden Initiatic Version Secret Key to Understand the Mysteries of the Origin and Destiny of the Universe.* Lots of origin-of-the-universe stuff here. I'll look up "initiatic" when I get around to it.

Money matters: Vague generalities only; unlike the other two, no specifics about costs and royalty arrangements. Printing on demand is said to be available for "selected" books, with no information on the selection process. (Determined by money from the author would be my guess.) This unforthcomingness is another reason to think 1st Books is pretty much an online vanity press.

Nice touch: I'm straining for this, but the site does offer several free books for downloading, all out of copyright, mostly 19th century: Jules Verne, Mark Twain, Richard Harding Davis. Most—probably all—of these (and many, many more) can be had from one of my favorite online resources, The Gutenberg Project.

Promotion help: "The 1st Books Library is aggressively promoted worldwide." Uh-huh.

Tabitha M. Powledge can be reached via e-mail at tam@nasw.org.

SURVEY SHOWS MORE NASW MEMBERS USING E-MAIL AND THE WEB

by Shearlean Duke

E-mail use by NASW members has nearly tripled during the past five years. This was one of the findings of a recent survey conducted by academic researchers. Survey data show that e-mail use has expanded dramatically from only 18 percent of NASW members who listed e-mail addresses in 1994 to 80 percent in 1999. The survey also shows that Web use has become a regular part of science journalism.

Shearlean Duke (dukes@cc.wwu.edu) is an assistant professor at Western Washington University and one of the researchers involved in the project. Other researchers include Kim J. Sprecker, Gi-Woong Yun, both from the University of Wisconsin, and Rebecca Dumlao, Ph. D., East Carolina University.

Nearly half of science writers responding to the survey use the Web on a daily basis. Also more than half place their work regularly on the Web. Journalism, electronic mail, and the Web seem like a perfect match, according to Craig W. Trumbo, Ph.D., lead researcher from the University of Wisconsin. So Trumbo and his associates decided to find out how journalists were using e-mail and the Web to go about their business of researching and reporting news. The researchers decided to look at one distinct group of journalists and chose science writers.

Although a number of studies of e-mail have looked at how scientists use e-mail to communicate with each other and with the media, no studies have examined how science journalists use e-mail in their work. When the researchers conducted their first survey among NASW members in 1994, the term World Wide Web had not entered everyday language. The survey was designed to see if a Web site would be an acceptable tool for science reporting.

The 1999 survey followed up to see how NASW members are now actually using the Web. In 1994, 163 of approximately 900 members surveyed listed e-mail addresses. In 1999, fully 80 percent of members listed addresses. Both e-mail and traditional mail techniques were used in both 1994 and 1999 to maximize the return rate. Also, in 1999 a Web site was set up to allow respondents to complete the survey there if they preferred.

The 1994 survey consisted of "active" members of NASW who published e-mail addresses in the membership directory. Of about 350 e-mail users, 163 were active members. The 1994 overall response rate was 59 percent. The 1999 sample consisted of the 68 individuals who completed the 1994 survey and who were still listed as active members. An additional random sample of 292 active members with e-mail addresses was taken from the 1998 NASW directory. A total of 360 members were surveyed. The response rate was 72 percent. Key findings:

- Among users, e-mail traffic has nearly tripled over the five years of the study, from an average of about eight messages a day to about 30 a day.
- Patterns of e-mail contact have not changed a great deal. Contact with local supervisors and local sources increased slightly as a percentage of all e-mail while other categories held steady.
- Use of e-mail for both social and task purposes has increased.
- Task use of e-mail was marginally dominant over social use in 1994. But in 1999 the dominance of task over social use increased.
- In 1994 most science journalists had contacted scientific sources by e-mail. In 1999 nearly all have done so.

The Web has become a regular part of science journalism, with nearly half of science writers making use of it on a daily basis. Just over half of the science writers surveyed have their work regularly placed onto the Web.

Enthusiasm for the use of the Web in science journalism is most strongly predicted by a positive evaluation of the Web as an innovation. This "favorableness" toward the Web as an innovation is a function of a positive orientation toward the quality of Web information, trust in the sources behind Web information, and individual characteristics of innovativeness.

To conclude the study, researchers are also conducting follow-up telephone interviews with a selected group of NASW members who volunteered to be interviewed. Comments from members will be used anonymously in articles the researchers plan to publish in communication and research journals. Some of the preliminary findings from these interviews show that respondents believe that the World Wide Web (particularly e-mail) is changing the way they work. For example, e-mail allows journalists to communicate more efficiently with sources. As one respondent says, "It has expanded the time available to communicate. And people can communicate with us. It makes it easier for people to keep you informed."

As researchers continue to analyze their data and publish findings, they promise to keep NASW members informed about the project. "We really appreciate the cooperation from NASW members," Trumbo said. "And we believe our findings will be of great interest to both journalists and researchers."

For more information about the survey results, members can contact Trumbo at cwtrumbo@facstaff.wisc.edu.

EVERYTHING YOU KNEW AND A LOT YOU DIDN'T IN THE AP STYLEBOOK

by Keith Shelton

Reporters and editors around the country use the *Associated Press Stylebook* (Norm Goldstein, editor) to look up style: abbreviations, bylines, capitalization, datelines, etc.

However, there are many aspects of the *Stylebook* that are notoriously underused.

One actually can get a pretty good basic education by reading the *Stylebook*—and it is one word in the wire service's style.

How else are you going to learn how many bytes are in a kilobyte?

Or how the Ku Klux Klan is organized?

Or that the lion's share is not a majority, but all or, at least, the best and biggest portion?

There is reference material aplenty in the *Stylebook*: the proper names of organizations and unions, and how to convert from Celsius to Fahrenheit (as well as the fact that the temperature scale was named for Gabriel Daniel Fahrenheit, the German physicist who designed it).

Keith Shelton, journalist-in-residence at the University of North Texas, has been consulting one stylebook or another for 45 years as an editor and writer for an assortment of newspapers, mostly in Texas and Oklahoma. "Everything I ever needed to know I learned from my Stylebook," Editor & Publisher, *Aug. 31, 1999. Reprinted with permission.*

There are entries that define: a "blizzard" (a storm with wind speeds of 35 mph or more and considerable falling and/or blowing of snow with visibility near zero); the acronym "ZIP" in ZIP code (Zoning Improvement Plan); and the prefix "giga-" (which denotes one billion units of a measure).

Others tell you the difference: between (or among) carat, caret, and karat. Lectern, podium, pulpit, and rostrum. Mean, median, and norm. Palate, palette, and pallet. Pardon, parole, and probation. Between oral and verbal. Pica and pico-. A trustee and a trusty (call your local bank trustee a trusty, and you've got problems).

There are answers to questions about spelling: OK. Kibbutzim (the plural of kibbutz). Masters Tournament (but master's degree). MIG. Milquetoast. Mind your p's and q's. Pikes Peak (no apostrophe). Smokey Bear (no the). Josef Stalin. Straitjacket. Videocassette recorder (two words, but the acronym is VCR).

And, of course, the *Stylebook* offers endless explanations in answering other questions, such as: How are the magnitudes of earthquakes measured? How do you compute when Easter falls? How are gallons converted to liters (and vice versa)? How big is an Olympic-size pool? How are Arabic names handled? Chinese names? Korean names? Where does the Orient end and the Occident begin? When is a motor an engine? When is daylight-saving time (not savings time)? Who are the members of OPEC (and what does the acronym stand for)? What is artificial intelligence? What is the Commonwealth of Independent States? What is Conrail? What is the European Union? What are the names of the Great Lakes? What is Legionnaires' Disease? What is Parkinson's disease? What are the Seven Wonders of the World (not including the *Stylebook*)?

One can learn how to do polls and surveys, how to find out the number of barrels in a metric-ton oil spill, what the major religions are all about, and how to handle religious titles.

There is information about trademarks—the difference between a trademark and a service mark—thermos has lost its trademark, Xerox hasn't, and it's Seeing Eye dog.

The *Stylebook* even tells me what I can't do: I can't say temperatures got warmer or cooler because they just go up or down; I can't say someone was drowned unless someone else did it to him or her; and I can't say Canadian goose, because it's Canada goose.

I can, however, save some time: I can write Teamsters instead of International Brotherhood of Teamsters, Chauffeurs, Warehousemen, and Helpers of America.

There is history in the *Stylebook*, too. It tells me: when Prohibition took effect (Jan. 16, 1920), when the two Germanys were reunited (Oct. 3, 1990), what happened at Hiroshima (target of the first atomic bomb dropped as a weapon), and about the historical ages (such as the Bronze Age, from 3500 to 1000 BC).

And there is plenty of trivia: Graham crackers were named for Sylvester Graham, a U.S. dietary reformer; Mach number came from Ernst Mach, an Austrian physicist; Skid Row originated as Skid Road in the Seattle area, where dirt roads were used to skid logs to the mills, and the phrase eventually became a synonym for the area where loggers gathered, usually among rooming houses and saloons; and the funny mark in San(reverse apostrophe)a is the way you spell the capital of Yemen (although how you set that in type, I don't know, and even the *Stylebook* doesn't tell me).

One can learn how you calculate the day of an assassination if the victim is shot one day and dies the next (it's the day of the shooting). Where the West begins. When V-J Day is (there are two). What exactly is a Tommy gun. The islands that comprise Guadeloupe. About the origins of Yellow Journalism. Or the difference between a Waf and a WAF, a Wac and a WAC, a Wave and WAVES.

So don't pooh-pooh (Page 162) style or the Grim Reaper might get you (under "personifications," Page 157).

1999 SCIENCE-IN-SOCIETY JOURNALISM AWARD WINNERS ANNOUNCED

Coverage of the controversy over salt in the diet, a national laboratory under siege in its community, and startling visions of the apocalypse earned reporters top honors in the 27th annual Science-in-Society Journalism Awards program, presented by the National Association of Science Writers.

Dan Falk, a radio freelancer writing for the Canadian Broadcasting Corp., a reporting team for *Newsday* newspaper, and Gary Taubes, a contributing correspondent for *Science* magazine, were honored for their insightful and compelling work.

Awards are given in three categories—broadcast, magazine, and newspaper—with $1,000 and certificates going to the winners.

Falk, a freelancer, was recognized for his story "Visions of the Apocalypse," aired by the Canadian Broadcast Corp. The hour-long program explores apocalyptic views throughout history and examines the relationship of science to current apocalyptic thinking spurred by the approaching new millennium. Judges praised the story for its thoughtful, innovative, and provocative handling of a timely subject. The story aired Dec. 30, 1998.

The *Newsday* team was honored for its ambitious series "Science Under Siege." Over a six-month period in 1998, the newspaper covered the struggles of Brookhaven National Laboratory and its surrounding community in light of environmental contamination from the prestigious lab's research activities. After a radioactive leak was detected in a nuclear research reactor and the U.S. Department of Energy fired the contractor who had operated the lab for 49 years, *Newsday* opened a bureau inside the facility. In great depth, the team of staff reporters examined the lab's operations, its relationship with neighbors on Long Island and the extent, cause, and health implications of chemical and radioactive leaks. In a compelling and highly readable fashion, the reporters made a complicated issue accessible and understandable while providing valuable insights.

Gary Taubes, a correspondent for *Science* magazine, received an award for his story "The (Political) Science of Salt." Through extensive reporting and scrutiny of the history of salt research and its conflicting findings, Taubes took the measure of this popular seasoning in the American diet. Especially noteworthy was the level of critical examination, including interviews with some 80 researchers, clinicians and administrators around the world. The article was published Aug. 14, 1998.

The awards were presented at a NASW reception on Thurs., Feb. 17, in Washington, DC.

NASW holds the awards competition annually to encourage and recognize outstanding investigative and interpretive science reporting in both print and broadcast

media. It honors probing coverage that explains why an issue involving science matters to society.

More than 100 entries were received in the award program. These were reviewed by the NASW Science-in-Society Awards Committee, cochaired by Joel Shurkin, freelancer and bureau chief for Johns Hopkins Medical Institution, and Karen Watson, senior science producer for Discovery Channel Online. Members of the judging panels were Josh Fischman, *U.S. News & World Report;* Laura Garwin, *Nature;* David Kestenbaum, National Public Radio; Usha Lee McFarling, Knight-Ridder national bureau; Elizabeth Pennisi, *Science;* and Ivars Peterson, *Science News.*
(source: news release.)

REGIONAL GROUPS

by Suzanne Clancy

Northern California

NCSWA held its annual holiday dinner in December at a local microbrewery. Glennda Chui from the *San Jose Mercury News* spoke about her experiences covering summer 1999's earthquake in Turkey. Chui discussed factors, such as building construction techniques, that may have contributed to the earthquake's destructiveness, and described the difficulties encountered filing stories amid the devastation and chaos. She also talked about the conflicting emotions that scientists and journalists cope with in disasters—the excitement of covering large, important stories while facing people who've lost everything and for whom one can do almost nothing.

Puget Sound

PSSWA met in November for a lively discussion of issues surrounding online health care information. Panelists for the session, titled "Click Twice and Call Me in the Morning: Health Care on the Internet," included David Ansley, medical editor, OnHealth.com; Hugh Maloney, M.D., Minor & James Medical, and medical director, Information Services at Providence Medical Center; Carol Ostrom, ethics and values writer, *Seattle Times;* and Alex Gramling, managing editor, Drugstore.com. The discussion is archived on the PSSWA home page, **www.psswa.org**.

New York

In November, SWINY hosted a "Meet the Web Editors" featuring a panel of eight Web-site editors. The audience of 50 writers, many of them students or in the early stage of their careers, received a wealth of information on Web outlets for health and science topics, breaking into the market, whether knowing HTML coding is necessary, writing tips, negotiating rates, and judging when an opportunity might be worth accepting low pay. The later evoked heated debate during the question period.

Suzanne Clancy, Ph.D., is science writer at The Salk Institute in La Jolla, CA. Send information on regional meetings and events to clancy@salk.edu.

Washington, DC

In November, three professional historians introduced DCSWA to the vast historical and archival resources available in the Washington, DC area and beyond. Since this information is timeless, and much of it is not indexed by the popular Internet search engines, DCSWA has put some of the links to it, plus brief descriptions of the speakers, on our Web site (**www.nasw.org/dcswa**).

The December meeting was a holiday party. In January, DCSWA hosted a panel of experts on the current state of the evolution-creationism debate. The speakers described recent efforts to water down the teaching of evolution in public schools and explored how the U.S. differs from other nations on this issue. Speakers included Jon Miller, professor of social science at Northwestern University and a prominent science literacy pollster; Gerry Wheeler, physicist and executive director of the National Science Teachers Association; John Haught, professor of theology at Georgetown University and author of *God After Darwin*; and Ken Miller, professor of biology at Brown University and author of *Finding Darwin's God*.

OUR GANG

After two years in Jakarta, Indonesia, **Diana Pabst Parsell** returns to the Washington, DC, area. For the past 16 months she was an editor and writer for the Center for International Forestry Research in Bogor. Previously, she was a language consultant and editor of the Sunday science pages for the *Indonesian Observer*. Other work included writing magazine articles for Ford Foundation Report, editing for UNICEF and other clients, and editing and managing publication of a 320-page book, *The Jakarta Explorer*, as part of volunteer activities with the Indonesian Heritage Society. E-mail: parselldb@aol.com; home page soon on the NASW Web site.

Gary Schwitzer has left the warmth of New Hampshire for balmy Minnesota. He has accepted the position of editor-in-chief for the Mayo Clinic's new consumer health Web site (currently named Mayo Clinic Health Oasis). Reach him at Mayo Medical Ventures, 9th Floor Centerplace, 200 1st Street NW, Rochester, MN 55905, phone 507-284-1429, e-mail Schwitzer.Gary@Mayo.edu.

Michael Riodan, a Guggenheim fellow researching the history of the Superconducting Super Collider, has been awarded the Sally Hacker Prize by the Society for the History of Technology. Riodan can be reached at the Smithsonian Institution, MRC 631, National Museum of American History, 14th Street & Constitution Avenue NW, Washington, DC 20560; phone 202-357-2095.

After four years as *New Scientist*'s Washington bureau chief, **Rachel Nowak** has been deported to Australia for a two-year stint as the magazine's Australasian editor. She moved to Melbourne in January, and will be returning to the U.S. periodically. Meanwhile, any NASW members making a trip Down Under are very welcome to contact her at rachelnowak@reedbusiness.com.au.

Carol Ann Rinzler's book *Nutrition for Dummies* has been named one of the ten best health books of 1999 by Amazon.com.

Freelance science writer **Daniel Pendick** has accepted the position of executive editor at Grolier, Inc. in Danbury, CT. He will be editing the *Popular Science Annual* and two encyclopedias for young people, *Lands & People* and the *New Book of Popular Science*.

IN MEMORIAM

ELEANOR NEALON

Eleanor O'Donoghue Nealon, 59, director of the National Cancer Institute Office of Liaison Activities and a leading cancer patient advocate, died of breast cancer on Oct. 22 at her home in Bethesda, MD. She had been a member of NASW since 1974. A native of Washington, DC, she worked as a journalist and medical/science writer from 1971 to 1977 and later as director of public relations at Georgetown University Medical Center. She joined the NCI in 1981, acting for four years as speechwriter for the director, and then directing the Press Office and the Cancer Information Service.

In 1994, she created the Office of Liaison Activities—a new model for direct interaction and collaboration between the cancer advocacy community, especially minority communities, and the scientific community. She also wrote numerous magazine and newspaper articles and educational materials and coauthored *Living with Surgery: Before and After*, and *What Are Clinical Trials All About?*—a widely distributed publication for cancer patients considering undergoing a clinical trial.

In recognition of her role as patient advocate, NCI Director Richard Klausner announced the establishment of the Eleanor Nealon Extraordinary Communicator Lecture Series, "because she cared so deeply about cancer patients' and survivors' needs and concerns, rights and views….The quality of life of cancer patients and their families throughout the country has been enormously improved because of her abiding commitment and hard work."

[Based on NCI press announcement]

EDWARD O. BROWN III

ScienceWriters has learned of the death of Edward O. Brown III. He had been an NASW member since 1956.

NOTICES FROM DIANE

Dues

Dues must be in by the end of March or your name won't be included in the 2000 membership directory.

Science-in-Society Award

Watch the mail for the Science-in-Society Award entry form. Deadline for submitting an entry is July 1.

Victor Cohn Medical Science Writing Award

Named in honor of former Washington Post science and medical reporter Victor Cohn, this new award will be presented for the first time this year. See the announcement on page 31 for criteria and deadline information.

Workshop Tapes

Tapes from the 2000 NASW workshops are available. Visit the NASW Web site (**www.nasw.org**) for topics and order information.

Insurance and Car Rental Discounts

A reminder that group insurance plans and discounts from major car-rental agencies are available to NASW members. Visit the NASW Web site for more information on these member benefits.

LETTER

In response to Earle Holland's article "Ohio State Launches Preemptive Strike in Lab-Animal Protest" (*SW*, Fall 1999):

Think Galileo.

A busload of young people tours the country to stand up for what they believe in. How preposterous. Good thing Ohio State was ready and able to squash those pesky protestors, especially that "girl" with the neon-orange hair (nudge, nudge, wink, sniff). How dare they question the ways of science? What a hoot to humiliate the whole nasty lot of 'em on TV.

I'm a big fan of science. For 13 years, I've made a good living writing about it. I'm also a fan of the First Amendment. I have this sentimental notion that discussion and debate should be encouraged, not stomped out by institute-orchestrated media.

Now, back to Galileo. There's another radical rascal (though I'm not sure of his hair color) who challenged the tenets of the establishment. Maybe the powers-that-were should have listened, instead of trying to shush him. Maybe we are not the center of the universe after all (nudge, wink).

Laura Rongé
Freelance

"Things take indeed a wondrous turn when learned men do stoop to learn…"—Bertolt Brecht, Galileo

COMMENTARY

PROFESSIONALISM— A CHALLENGE TO NASW

by Rob Logan

Last summer, I heard a number of public relations executives within influential federal science agencies and private research foundations show little interest in sharing years of evaluation research about their communication efforts with peers. They were equally lethargic about participating in intra-professional efforts to improve working relations with journalists or best-practices workshops set up by public affairs and public relations peers.

Besides emphasizing primary obligations to their institutions, the officials seemed oblivious to the concept that striving for professionalism within and between journalists and public relations—public affairs practitioners might be foundational goals for science communicators.

After the presentation, several other science public relations and public affairs authorities who saw the proceedings confirmed that the attitudes were not isolated and in some quarters might be prevailing.

I asserted neither science journalism nor science communication are formal "professions." But when the concept of striving toward professionalism, seeking common values, and working to improve intra-professional relations

Rob Logan, Ph.D., is a professor, associate dean, and director of the Science Journalism Center at the University of Missouri School of Journalism. He is a member the Research/Roadmap for Communication of Science and Technology for the 21st Century working group funded by the NASA/Marshall Space Flight Center.

seem outside the boundaries of key players in the field, NASW has a challenge. It also seems important to discuss with a wider peer audience: What are the consequences to journalists, scientists, public affairs, and public relations officials when attitudes about professionalism vary significantly?

Before discussing challenges and strategies, let's briefly consider how striving for "professionalism" is different from a "profession."

The U.S. Labor Department defines a profession as having prescribed educational standards, licensing, and internal enforcement of performance standards by its members. Licensing alone, mercifully, omits American journalists. It is just as rare that representatives in science museums, universities, companies, science-driven federal agencies, public interest groups, journalism organizations, or persons in major journals and museums meet common educational thresholds and are overseen by peers in other organizations.

While the entire science communication "community" shares little of the rigor that permits physicians, attorneys, accountants, engineers, and architects to hang a shingle, I doubt the reduced status bothers most of us any more than scientists (who are rarely embarrassed to discover they are not professionals either.)

It was sociologist Walter Goode who listed values that converge when non-professions in areas such as science strive for professionalism. Goode noted:

1. Persons think independently and inquiringly about internal standards, norms and judgments. Orthodoxy is reevaluated.
2. Members have a certain expertise that laypersons do not have.
3. Members believe in some solidarity with others and believe it is socially and parochially therapeutic to present their standards and values to the general public as well as other occupations.
4. Members can meet minimum entrance standards and there is intra-occupational sharing of baseline expectations.
5. Members can force others out of the occupation if they do not meet threshold standards.
6. Members have an informal code of ethics guiding their conduct.
7. Members participate in a system of rewards (honorary or monetary) for persons who conduct themselves, or perform their work notably.
8. Members share in a discrete and substantive body of knowledge available to current and future members.

Few journalists embrace numbers 4 and 5 above, and many will fault others. However, there are routine practices within NASW (such as this publication, the annual AAAS workshops, and awards) that partially strive toward Goode's notion of professionalism.

Despite different roles in and out of the newsroom, many NASW members seem to share an informal set of common values that include:

- Using a professional organization or a group more than an employer as a reference group to set goals and aspirations.
- Serving the public interest and fostering a belief in public service.
- Possessing a sense of calling about the field of public understanding of science, which reinforces and complements a belief in public service.
- Defending autonomy; the ability to make independent decisions, challenge the status quo and organize work.
- A belief in self-regulation juxtaposed with governmental or social controls.
- Helping peers consider competence and improvements in levels of performance.
- Seeking professional discussion about these issues and enhancing educational opportunities.

The saddest element in last summer's testimony was the indifference of influential persons within the field to some of these ideas. Their indifference hurts because the pace to improve inter-professional issues will slow without shared socio-professional commitments.

For NASW, a lack of striving for professionalism is more than a pothole or a detour—the road disappears.

I do not suggest that fostering a social-professional conscience is easy. But it seems important for NASW to acknowledge the problem, discover its extent and consider some fresh outreach efforts.

The trajectory of the field, its altitude, seems to require a discussion about underlying attitudes.

The barriers to effective communication of science to citizens may eclipse the topics of recent NASW workshops such as embargoes, access to scientists, relations with scientists, disclosure of conflict of interest, improving writing, and editing techniques, etc. We might ask: Is public understanding of science an overriding value or not? Is striving toward professionalism desirable? What are NASW members willing to do to expand peer participation?

It also seems relevant for science journalists and educators (who may be further along in considering these issues) to recognize that public relations and affairs organizations are an integral part of science communication's welfare, the values that underlie professionalization may not be widely socialized within this group, and programs to support training and development of public relations and public affairs personnel are important to the field's progress.

In the future, I hope to hear more science agency officials proudly put the public first. I trust NASW might better cultivate an atmosphere where communication executives are encouraged to take this position and to foster peer cooperation.

Meanwhile, I listed some professionalism characteristics above to spark a dialogue about common goals for science communicators, to which I hope readers will contribute.

My university colleagues would do well to work on these issues. What about others?

BOOKS BY AND FOR MEMBERS

By Ruth Winter

***Database Nation: The Death of Privacy in the 21st Century* by Simson L. Garfinkel (NASW), published by O'Reilly & Associates.**

Garfinkel, a freelance and columnist for the *Boston Globe*, writes that 50 years ago, in *Nineteen Eighty-four*, George Orwell imagined a future in which privacy was decimated by a totalitarian state that used spies, video surveillance, historical revisionism, and control over the media to maintain its power. Those who worry about personal privacy and identity—especially in this day of technologies that encroach upon these rights—still use Orwell's "Big Brother" language to discuss privacy issues. But the reality is that the age of a monolithic Big Brother is over. And, yet, the threats are perhaps even more likely to destroy the rights we've assumed were ours, according to Garfinkel. He says, "Today's threats to privacy are more widely distributed than they were in Orwell's state, and

they represent both public and private interests." He predicts in his book that over the next 50 years "we'll see new kinds of threats to privacy that don't find their roots in totalitarianism but in capitalism, the free market, advances in technology, and the unbridled exchange of electronic information." Ralph Nader labeled his book: "A graphic and blistering indictment." For more information, you can call Garfinkel at 617-876-6111 or e-mail him at: simsong@vinyard.net.

Getting Back **by William Dietrich, (NASW) published by Warner Books.**

Set in the year 2048, *Getting Back* is both a backpack adventure story in the ruins of Australia and a meditation on the tension between wilderness and civilization. Dietrich, a former science reporter for the *Seattle Times,* writes the world's population has doubled and is run by a capitalist consortium called United Corporations. Australia has been depopulated by a bioengineered plague and been secretly turned into a gigantic wilderness area in which society's malcontents can test themselves. A mysterious outfit called Outback Adventure picks a select few volunteers, drugs them, deposits them unconscious into the Australian desert, and challenges them to trek on their own, without maps, guides or help, to the east coast and "exodus." Dietrich says: "It's the ultimate outdoor adventure. There's a catch: whether the adventurers can truly get back, whether they want to get back at all, and who they share the continent with…The book, a parable about current trends, is an examination of the benefits and costs of our technological domination of the planet." He notes that when he has his science-writing hat on he writes natural history pieces for the *Seattle Times* and freelances for other publications. You might take an example from Dietrich and use your science-writing expertise to expand your creativity and produce science fiction. There is a big market for it and who would be better qualified to make the underpinnings of science fiction plausible than a member of NASW? Dietrich, who has made the transition successfully, can be reached at 360-588-0118, or wdietrich@msn.com. Publicist for his book is Tina Andreadis at 212-522-6798.

Astronomy for Dummies **by Stephen P. Maran (NASW), published by IDG Books Worldwide, Inc.**

The first science book in the extensive "For Dummies" series, *Astronomy for Dummies* tells how to take up the hobby of astronomy and how to enjoy its practice through such new developments as:

- Backyard telescopes that point themselves
- Desktop planetariums
- Eclipse cruises that take you to the scene of a celestial phenomenon
- Telescope motels that cater to amateur observers.

Maran, an active research astronomer, freelancer, and the press officer for the American Astronomical Society, also summarizes astronomy and astrophysical knowledge, from constellations to quasars, in this, his tenth book. Guest authors Ron Cowen and Seth Shostak, contributed three of the 18 chapters. Also included in the book are:

- Useful Web sites, where the reader can find current images of the sun
- Visiting hours at observatories, status reports on space missions
- The opportunity to join in the Search for Extraterrestrial Intelligence.

The publicist for the book is Celia Rocks at Rocks Communications, (828) 322-3111, CeliaRocks@aol.com, 1015 2nd St. NE, Suite 211, Hickory, NC 28601. Maran can be reached at (301) 656-7331, steve_maran@compuserve.com.

Furious Earth: The Science and Nature of Earthquakes, Volcanoes, and Tsunamis **by Ellen J. Prager (NASW) published by McGraw-Hill.**

We live on a planet whose fertile land, oxygen-rich atmosphere, and bountiful sea sustain life. Yet, it is the same earth whose awesome fury can cause devastating loss of life and economic disaster. Prager's premise in her book is that we will never control the furious earth, but through our scientific understanding of its nature, we may be able to prevent tragic and costly losses. She writes that the book is not about death and destruction, but what we have learned through research, often in the aftermath of disaster, and how science is helping to prevent future catastrophes. Prager is a former US Geological Survey scientist now working freelance to bring earth and marine science to the public. In this book she works with three experts—Kate Hutton (seismologist), Stanley Williams (volcanologist), and Costas Synolakis (tsunami specialist)—to bring the latest science in earthquakes, volcanoes, and tsunamis to the layman. It is written in an easy-to-understand style, rich with analogies, illustrations, and aimed at anyone curious about the earth or teachers looking for updated and easy to read material. Prager has two upcoming books: *Sand,* a children's book to be published by National Geographic and *The Oceans,* to be published by McGraw-Hill. PR for *Furious Earth* is Karen Auerbach at Karen-Auerbach@mcgraw-hill.com or contact Prager at elprager@aol.com.

What Are The Odds? Chance In Everyday Life **by Mike Orkin published by W.H. Freeman and Co.**

A professor of statistics at California State University, Hayward, Orkin is an authority on gambling and game theory and has served as a consultant for government and private agencies. He points out in the book that we live in a world of uncertainty and variation, a world that expresses itself in a cosmic mosaic of ever-changing patterns. Some of these patterns may be generated by predictable processes, others by change. It's often difficult to distinguish between the two. In addition to discussing strategies both for games of chance and everyday interactions, he addresses some interesting questions such as:

- If the chance of winning the lottery is so bad, why are there so many winners?
- How come some chance events seem nearly impossible, yet happen frequently?
- Does "survival of the fittest" contradict the notion that chance is a crucial factor in evolution?
- When should you cooperate, and when should you be nasty?

Can't you just hear Regis Philbin saying, "Is that your final answer?" to the last question?

The PR for the book is Jeff Theis at 212-561-8221 or at jtheis@whfreeman.com.

The Complete Idiot's Guide to Online Health and Fitness: the authoritative guide to the healthiest sites on the Internet **by Joan Price and Shannon Entin, published by Macmillan Computer Publishing.**

This book aims at helping consumers find, evaluate and productively use online information. It covers dozens of subjects including exercise, diet, weight loss, healthy cooking, mind/body, sports performance, fitness travel, cus-

tomizing fitness programs, kids' health, disease, mental health, and other topics. The authors—health writer and motivational speaker Joan Price and Shannon Entin, publisher and editor of *FitnessLink*—show readers "how to find credible information without falling prey to the many online schemes and pill pushers." "People are frustrated by the rise of sound-bite health and fitness and the constant flow of conflicting information," says Entin, an ACE-certified fitness professional. Among the clues the authors give are truly useful Web sites that offer valuable information and emphasizes facts rather than opinion and testimonials. If the site is selling anything, ask yourself how that may be influencing the content. For more information, review copies, or interviews with the authors, contact Shannon Entin, shannon@fitnesslink.com, 609-397-7664 or Joan Price, jprice@sonic.net, 707-874-2285.

***Windows into the Earth: The Geologic Story of Yellowstone and Grand Teton National Parks* by Robert B. Smith and Lee J. Siegel (NASW), published by Oxford University Press.**

University of Utah geophysicist Bob Smith and *Salt Lake Tribune* science editor Lee Siegel explore the violent geologic forces that sculpted and continue to shape the Yellowstone-Teton region, particularly cataclysmic volcanic caldera eruptions and violent earthquakes, including the magnitude-7.5 Hebgen Lake quake that triggered a huge landslide and killed 28 people in 1959. They relate the region's disasters to two primary forces: basin and range stretching of the West and the upward movement of molten rock from the Yellowstone hotspot. They discuss the potential for future volcanic disasters generated by the hotspot and for major quakes on the Teton fault, then end the book with two chapters of geology-oriented driving tours for visitors to the two parks. Siegel says, "This is not some damn rock book. It's about violent, sexy geology." Contact Siegel at 801-272-3331, e-mail lsiegel@sltrib.com. Publicity for book is Russell Perreault, director of marketing, Oxford University Press, (212) 726-6032, rap@oup-usa.org.

Send a review copy and material about new books to 44 Holly Drive, Short Hills, NJ 07078 or e-mail ruthwrite@aol.com. Include the name of the publisher's PR and appropriate contact information as well as your preferred way to have members get in touch with you.

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SW bulletin board

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SW bulletin board

NORTH TO ALASKA

The National Federation of Press Women (and Men) invite NASW members to the Top-of-the-World Communicators Conference Sept. 7-9, 2000, in Girdwood, Alaska, and to pre- and post-conference tours to Barrow and Nome, respectively. Science and technology will be emphasized on the 3-day professional-development tour to Barrow, the northernmost, year-round inhabited town in the United States (some say North America). The schedule includes briefings by research scientists, engineers and Inupiat Eskimos involved in science and education activities. Interviews arranged upon request and availability. The cost is only $400 because the National Science Foundation's Office of Polar Programs is assisting with round-trip airfare between Anchorage and Barrow for 40 science writers. For details e-mail Dalene Perrigo at dtperrigo@aol.com or visit the Alaska Press Women Web site www.akpresswomen.com.

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• Media Tools and Effects. Joann Rodgers, Johns Hopkins Medical Institutions
• Improving Medical Journalism. Carl Johan Sundberg, Karolinska Institute
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More information visit www.svls.se/media.html or contact the Swedish Society of Medicine, P O Box 738, SE-101 35 Stockholm, Sweden; phone +46 (0) 8 440 88 78; fax +46 (0) 8 440 88 84; e-mail annie.melin@svls.se.

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