The development of a strain of grass pea that is safer to eat in the large quantities consumed by some poorer populations in Africa highlights the point that "research for the long-term relief of hunger in Africa must contemporaneously address issues of toxicology as well as those of plant science and nutrition." The recently released plan from the National Marine Fisheries Service for saving endangered salmon of the Columbia River is discussed by several of those involved with the issue. And an international collaboration to establish thyroid tumor tissue banks in the three states most directly affected by the Chernobyl nuclear accident is described.

Aiding African Agriculture

As Conway and Sechler state in their Editorial "Helping Africa feed itself" (*Science*'s Compass, 8 Sept., p. 1685), "Now is the time for the Western scientific community to apply its knowledge, in genuine partnerships with African scientists, to help Africa escape the tyranny of hunger." One such partnership began in the 1980s with the creation of a worldwide consortium of scientists focused on development of a safe strain of the grass pea (*Lathyrus sativus*). This is an environmentally tolerant plant with a high protein content that is cultivated by poor farmers without tillage or inputs in the Greater Horn of Africa (*1*) where famine has been a recurrent phenomenon, a topic discussed by Broad and Agrawala in the same issue in their Policy Forum, "The Ethiopia food crisis—uses and limits of climate forecasts" (p. 1693). These efforts culminated in the development of grass pea strains with low concentrations of a neurotoxic excitant amino acid (β-*N*-oxalylamino-L-alanine) that can cause a crippling disease (lathyrism) in poor communities where grass pea is heavily consumed (*2, 3*).

Studies conducted by African scientists of various disciplines, working with Western colleagues, played a key role in the grass pea research effort. This model of international and cross-disciplinary collaboration should now be applied to cassava (*Manihot esculenta*), a drought-resistant root crop that feeds at least 200 million people in sub-Saharan Africa. This, too, is an indispensable and environmentally tolerant food plant for Africa and elsewhere, but the tuber is protein-poor and contains cyanogenic glucosides that yield significant concentrations of cyanide in the consumer (*4*). Although the effects of this diet on development are not understood, dietary dependence on cassava may result in an irreversible spastic paraparesis in children and adults that is clinically comparable to lathyrism (*2*). In sum, therefore, research for the long-term relief of hunger in Africa must contemporaneously address issues of toxicology as well as those of plant science and nutrition.

Valerie S. Palmer
Third World Medical Research Foundation, Portland, OR 97201, USA. E-mail: twmrf@aol.com
John Tor-Agbidye
African Society for Toxicological Sciences, Jefferson, AR 72079, USA. E-mail: JToragbidye@nctr.fda.gov
Peter S. Spencer
Oregon Health Sciences University, Portland, OR 97201, USA. E-mail: spencer@ohsu.edu

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Many Plans, One Bottom Line: Save Endangered Salmon

The News Focus article "Can science rescue salmon?" by Charles C. Mann and Mark L. Plummer (4 Aug., p. 716) is an admirable attempt to condense one of the nation's most complicated resource management debates into a concise, readable article. However, in its brevity the article is potentially misleading regarding several critical points.

The authors give the impression that the National Marine Fisheries Service (NMFS) simply preferred the analysis performed by its own scientists over that of the general scientific community ("the fisheries agency listened to its own scientists"). In conducting the Cumulative Risk Initiative (CRI) analysis, NMFS scientists adopted a different approach than that used by the Plan for Analyzing and Testing Hypotheses (PATH) for a number of reasons.

First, CRI scientists (as well as independent reviewers) were troubled by the overly optimistic results of PATH analyses. For example, PATH showed that every management option considered, including no action (that is, continuing current hydropower operations), achieves the 100-year survival standard used by PATH: no populations would go extinct. Second, whereas PATH focused on two evolutionary significant units (ESUs) in the Snake River, the CRI examined 11 ESUs across the entire Columbia Basin. By comparing the status of salmonid populations in the entire Columbia Basin, the CRI sets the stage for establishing conservation priorities. Third, the CRI is analyzing the feasibility of reversing salmon decline through a broad range of actions, which were only cursorily discussed by PATH. These feasibility studies will best be accomplished by adaptive management, which, in turn, will provide the empirical foundation for CRI. The work of the CRI has been extensively peer reviewed by the Independent Scientific Advisory Board (a panel of well-known scientists with expertise in salmon) and the editorial process of peer-reviewed journals.

Finally, although Mann and Plummer include the sidebar piece about "the other H's" (harvesting, habitat degradation, and hatchery misuse) (p. 718), those few words in comparison with the much longer discussion of dam breaching reinforces a pattern of Columbia Basin salmon science, which attempts to determine whether management to mitigate one isolated risk factor can eliminate the peril faced by salmon.

CREDIT: B. SWEET/AP

Currents of controversy over how to save salmon of the Columbia River.

There are too many culprits responsible for the threatened status of salmon to look for single-factor solutions. Although science may not resolve political wars and deliver the "Holy Grail," the testing of multiple hypotheses with carefully collected data will provide a basis of what actions can rescue salmon from the brink.

Peter Kareiva
Phillip S. Levin
Michelle M. McClure
Fish Ecology Division, Northwest Fisheries Science Center, NMFS, 2725 Montlake Boulevard East, Seattle, WA 98118, USA

Mann and Plummer portray the debate over dam removal on the Snake River as one that has divided the scientific community; however, I think that portrayal is in-

accurate. As the scientist who organized a letter from more than 200 scientists in the Northwest that was sent to President Clinton in March 1999 (mentioned in *Science*, 23 Apr. 1999, p. 574), I am convinced that the majority of scientists who are most familiar with this issue support the idea that the salmon cannot be recovered with the lower Snake River dams in place. The Idaho chapter of the American Fisheries Society (AFS) approved by a margin of 92 to 8% a resolution stating that dam removal was a necessary action if Snake River salmon are to be restored. The Oregon chapter of AFS unanimously approved a similar resolution.

Perhaps George Frampton, acting chair of the White House Council on Environmental Quality, summarized the scientific debate best when he said recently, "We know that dam breaching is the single most effective thing we can do for these runs and that it may be necessary" (*1*).

Scott Bosse
Idaho Rivers United, Post Office Box 633, Boise, ID 83701, USA. E-mail: sbosse@idahorivers.org

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Mann and Plummer's article contains several errors and misrepresents the motivations and actions of American Rivers, a nonprofit river conservation organization that advocates bypassing four federal dams on the lower Snake River in Washington State to save imperiled salmon and steelhead runs.

First, American Rivers did not and does not "scoff" at the CRI analysis. We have been working with CRI scientists to bring clarity to the scientific debate and ensure that salmon recovery efforts are grounded in the best available science. An example of such efforts was a public scientific workshop we co-sponsored with the CRI scientists to discuss areas of agreement and disagreement. Second, with Trout Unlimited, we hired Gretchen Oosterhout to critique the CRI analysis to ensure that the science informing the ultimate decision was sound, not because we saw the CRI as politically motivated. The CRI analysis was modified in response to several of her criticisms. And third, www.removedams.org is not an American Rivers Web page, contrary to the statement in the article. This page is maintained by the Save Our Wild Salmon Coalition, of which American Rivers is one of many members. We do have our own Web site at www.americanrivers.org, which contains many references to the CRI.

As for the authors' statement that harvest reductions and "protecting habitat in other ways" is as likely to be effective for Snake River fall Chinook salmon leaves unanswered the critical question—effective at what? Harvest reduction may stave off extinction, but it will not result in healthy, self-sustaining fall Chinook populations. A recent study by the U.S. Geological Survey and Battelle Pacific Northwest Laboratories found that recovery of Snake River fall Chinook will require restoration of their spawning habitat in the mainstem of the Snake River, and that bypassing the four lower Snake River dams is the best way to accomplish that objective (*1*). The Clinton administration's draft salmon recovery plan will not result in any significant improvement in mainstem spawning habitat.

There is no doubt that CRI is a positive contribution to the body of scientific information available to decision-makers developing a comprehensive recovery plan for Columbia Basin salmon. But the CRI analysis does not change the strong scientific evidence that recovering all four ESUs of imperiled Snake River salmon requires bypassing the four lower Snake River dams. In fact, it is consistent with that conclusion.

Justin Hayes
Rob Masonis
American Rivers, 1025 Vermont Avenue, NW, Washington, DC 20005, USA. E-mail: jhayes@amrivers.org

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Response

Because the letter cited by Bosse was released months before either the PATH or CRI groups—the two biggest research efforts—wrote their final reports, it cannot be treated as convincing evidence of a well-informed scientific consensus. The same applies to the Idaho Fisheries Society vote in June 1999. And Frampton, also cited by Bosse, has failed to reach consensus with himself: on 12 September he told Congress that "breaching the Snake River dams may not be essential to recovering these runs, and probably would not be sufficient" (*1*).

Regarding the letter from Hayes and Masonis, we regret attributing the remove-the-dams Web page to American Rivers. Hayes and Masonis contend that American Rivers does not "scoff" at CRI's arguments. However, the American Rivers Web site erroneously declares that the CRI concluded "dam removal alone would save endangered fall chinook and steelhead, and must also be part of any strategy designed to save endangered runs of spring/summer chinook" (*2*). The CRI's actual argument—that methods other than dam removal may

be the best way to preserve Columbia Basin salmon—is described on the Web site as "without merit" (*3*).

Charles C. Mann
Mark L. Plummer

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Thyroid Tumor Banks

A large increase in thyroid carcinoma incidence among those exposed as children to the high levels of fallout from the nuclear accident at Chernobyl in 1986 has been reported (*1*). This increase was noted about 4 years after the accident and is continuing (*2*). Tissue from these tumors that is not needed for diagnostic purposes is a valuable research resource, representing a large number of tumors directly related to exposure to the same mutagen at the same time. It is important that knowledge that may be of general benefit to humankind and be of value in responding to future nuclear accidents is not lost.

The governments of the three states most affected—Belarus, the Russian Federation, and Ukraine—have joined with the European Commission, the U.S. National Cancer Institute, the Sasakawa Memorial Health Foundation of Japan, and the World Health Organization to create a tumor bank for thyroid tumors in each of the three countries. The project is coordinated from a center in Cambridge, United Kingdom. Nucleic acids will be extracted from tumor tissue and from normal thyroid and will be available for study (*3*). DNA from blood is expected to become available at a later date.

The tumor bank organization at present holds DNA and RNA extracted from ~200 thyroid tumors from patients who were younger than 19 at the time of the accident; the incidence of thyroid tumors is expected to increase considerably in the next few years. Only tissue not needed for diagnosis and obtained with full ethical permission will be used. An international group of pathologists has provided an agreed diagnosis for all extracted tumors.

The establishment of these tumor banks is intended to lead to work that will increase our understanding of the biological effects of radiation and of thyroid carcinogenesis, and provide an example of international collaboration that can be followed in other situations.

G. A. Thomas[1]*
E. D. Williams[2]†
University of Cambridge, Project Manager[1] and Chairman,[2] Scientific Project Panel of the International Cooperation to Establish Post Chernobyl Thyroid Tissue, Nucleic Acid and Databanks

Members of the Scientific Project Panel: D. V. Becker,‡ Cornell Medical Center, New York, USA; **T. I. Bogdanova**, Institute of Endocrinology and Metabolism, Kiev, Ukraine; **E. P. Demidchik**, Minsk State Medical Institute, Belarus; **E. Lushnikov**, Medical Radiological Research Centre, Russian Academy of Medical Sciences, Moscow; **S. Nagataki,**§ Radiation Effects Research Foundation, Japan; **V. Ostapenko**, Research Institute for Radiation Medicine and Clinical Endocrinology, Minsk, Belarus; **A. Pinchera,**† University of Pisa, Italy; **G. Souchkevitch,**‖ World Health Organization, Geneva, Switzerland; **M. D. Tronko**, Institute of Endocrinology and Metabolism, Kiev, Ukraine; **A. F. Tsyb**, Medical Radiological Research Centre, Russian Academy of Medical Sciences, Moscow; **M. Tuttle,**‡ Memorial Sloan Kettering Medical Institute, New York, USA; **S. Yamashita,**§ Atomic Bomb Disease Institute, Nagasaki, Japan.

*To whom correspondence should be addressed at Thyroid Carcinogenesis Research Group, Strangeways Research Laboratories, Worts Causeway, Cambridge, CB4 8RN, UK.

†Representing the European Commission.

‡Representing the National Cancer Institute, USA.

§Representing the Sasakawa Memorial Health Foundation, Japan.

‖Representing the World Health Organization.

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2. E. P. Demidchik *et al.*, in *Radiation and Thyroid Cancer*, G. A. Thomas *et al.*, Eds. (World Scientific Publishing, Singapore, 1999), pp. 51–54; M. Tronko *et al.*, in (*2*), pp. 61–70; A. F. Tsyb *et al.*, in (*2*), pp. 59–88.
3. Further information is available at http://www.srl.cam.ac.uk/nisctb/facts.htm

The First Predictions

In the Random Samples item "Fine-tuning an award" (25 Aug., p. 1285), the astronomer P. J. E. Peebles is described as "a theorist who predicted the remnant of the big bang in the form of microwave radiation." Although this is technically correct, he is not recognized as the first to make this prediction. Peebles in 1965 recreated the discovery of Ralph A. Alpher and the late Robert C. Herman, who in the late 1940s published two articles in which they predicted the presence of the radiation and its approximate temperature (*1*).

Robert L. Fleischer
Department of Geology, Union College, Schenectady, NY 12308, USA. E-mail: fleischr@union.edu

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CORRECTIONS AND CLARIFICATIONS

Reports: "The global spread of malaria in a future, warmer world" by D. J. Rogers and S. E. Randolph (8 Sept., p. 1763). In Figure 1, panel A was printed as a duplicate image of panel B in an earlier version of the figure. The correct panel A and final version of the figure are shown on the next page, depicting the present-day global dis-