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**RESEARCH ARTICLE**

Induction of Ectopic Eyes by Targeted Expression of the *eyeless* Gene in *Drosophila*
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**Editorial**

Status of the Department of Energy

Key Republicans have called for restructuring or abolishing the Department of Energy (DOE). In effect this proposal is supported by major studies conducted by two teams of experts from industry, academia, and government. One study was under the auspices of the federal General Accounting Office (GAO). The second, requested by Secretary Hazel O'Leary of DOE, was headed by Robert Galvin, Chairman of the Executive Board of Motorola.

Statements from the GAO indicate that DOE has failed to establish clear and focused missions for its laboratories in the post-Cold War environment. The DOE's day-to-day management has been criticized as costly and unproductive. Laboratory managers have characterized DOE as a micromanagement in many areas, especially in overseeing compliance with administrative requirements.

The report of the Galvin Task Force on 10 major DOE laboratories is extensive and worthy of respect. The DOE gets no kind words, though blame is shared by earlier Congresses. The laboratories receive favorable words and some admonitions. Included in the Galvin report is, "The laboratories' research role is part of an essential, fundamental cornerstone for continuing leadership by the United States... Many of the least exploited investigative paths involve the need for... multidisciplinary teams using sophisticated instruments and tools. It is that role for which the national laboratories are uniquely qualified." The Task Force criticized the tendency of the laboratories to seek to create new missions. Rather it recommended that the laboratories concentrate on national security, energy, and fundamental sciences.

The Task Force stated, "The primary national security mission of the DOE laboratories is to provide for a safe, secure and reliable nuclear stockpile... A vital extension of this mission involves work non-proliferation, counter-proliferation, arms control verification, and intelligence support."

The Task Force asserted that DOE laboratories have failed to pay sufficient heed to future energy needs. "The Task Force generally believes that the highest priority research areas by the Department and the laboratories are in the areas of energy efficiency, conservation, renewable energy sources, and more efficient recovery of gas and oil resources. The laboratories should also continue to be involved in nuclear fission-related R&D."

Annual expenditures for environmental cleanup of DOE sites rose to $6.2 billion in 1994. It is by far the largest component of a $19-billion-per-year budget. Both the Task Force and the General Accounting Office are critical of the quality of the effort. The GAO has stated that DOE has received about $23 billion for environmental management since 1989, but that little cleanup has resulted. The Galvin Task Force cites estimated eventual costs of $300 to $1000 billion, and states there has been a failure to characterize the waste remediation challenge in the many DOE sites and the nature of the risks presented. Little basic research has been conducted, and there has been little rigorous analysis to learn from experience in the field. There has been too much attention to immediate acute problems, a lack of systems approach, a poor priority list with bad choices, and ineffectual, expensive activities. A suggested improvement is to use potential expertise of the national laboratories. Better remediation procedures were devised, massive problems elsewhere, including Superfund sites, would be tackled more effectively. The total U.S. cleanup bill is estimated to be about $1700 billion.

Some of the strongest comments by the Task Force were devoted to governance of the laboratories. Those experienced in industrial R&D can quickly sense the vitality of a laboratory. Members, subcommittees, the Task Force, and the chairman repeatedly visited installations. They observed multiple symptoms of institutional stress. They learned about increasing overhead costs, poor morale, and gross inefficiencies resulting from overly prescriptive congressional management and oversight by the Department. They noted an inordinate internal focus at every level of these laboratories on compliance issues and questions of management processes. The Task Force concluded that "the current system of governance of these laboratories is broken and should be replaced with a bold alternative." It recommended that "the new system not be burdened by creeping micromanagement, non-productive oversight, and institutional fragmentation."

Philip H. Abelson
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NAS Management of RERF

Science reported (M. Balter, News, 3 Feb., p. 611) that the U.S. Department of Energy (DOE) has decided to remove the National Academy of Sciences (NAS) as the co-administrator of the Radiation Effects Research Foundation (RERF) in Hiroshima-Nagasaki, Japan. As stated in that article, we are disappointed at DOE's decision and remain convinced of the Academy's qualifications to manage this activity, but we will help with an orderly transition to a new co-administrator.

Science reported that one of two main DOE concerns with the Academy management of the RERF was "NAS's high overhead costs in running RERF." We have analyzed our indirect charges for the RERF grant and take exception to the DOE view. In the current fiscal year, the rate approved by our cognizant agency is three-tenths of 1% (0.3%) of the total direct cost for RERF. Where we are essentially administering the "flow-through" of a large amount of funds for direct expenditures. More specifically, we are convinced that the Academy charges DOE a total of $60,000 of indirect costs to pass through more than $18 million of funds which provide the bulk of the U.S. share of the support of RERF.

In addition, our approved indirect cost rates for overhead and general and administrative (G&A) expenses are assessed against direct costs related to Academy employees, such as staff salaries, cost-of-living adjustments for American staff at RERF, and moving costs for American staff. These assessments amount to $602,000 on direct expenditures of $1,570,000 (primarily salaries and fringe benefits), or 38%.

Therefore total indirect costs charged to the project of $662,000 on $19,570,000 of direct expenditures amounts to an effective rate of 3.4%. In a period of years when essentially all of the increase in U.S. costs for the operation of RERF is due to the steadily increasing cost of buying yen, the Academy feels that it has been very cost-effective as the U.S. manager of this binational enterprise.

The second major concern of DOE, that the Academy is not equipped to closely align the work of RERF with U.S. university, is also misplaced, in our opinion. We have substantively involved 77 universities, national laboratories, and teaching hospitals in RERF during our management. Moreover, the Academy manages the post-doctoral and predocitoral fellowship programs for federal agencies such as the National Aeronautics and Space Administration, the National Institute for Standards and Technology, the Environmental Protection Agency, the Centers for Disease Control, the National Institutes of Health, the National Institute for Occupational Safety and Health, and DOE.

E. William Colglazier
Executive Officer, National Research Council, 2101 Constitution Avenue, Washington, DC 20418, USA

Suzanne H. Woolsey
Chief Operating Officer, National Research Council

Recent reports (News, 3 Feb., p. 611; ScienceScope, 17 Feb., p. 951) and a letter to the editor (24 Feb., p. 1077) have questioned the motivation and process behind DOE's effort to seek an academic institutional grantee to replace NAS as the U.S. management support contractor for RERF. In light of DOE's past and current commitment to the success of RERF, we wish to correct the errors and misstatements in these articles.

For over a year, we have discussed with the nation's leading radiation scientists and former RERF directors the best ways to preserve the RERF mission despite increasing financial constraints and to leverage its unique capabilities and expertise to train a future generation of scientists. The paucity of researchers equipped to pursue questions about health and ionizing radiation is of great concern to the experts who were consulted and to DOE, whose responsibilities demand a commitment further to the understanding of the health impacts of radiation. The decision to open the RERF management contract to competition among universities was based solely on our desire to strengthen graduate training. DOE has no intention of influencing the RERF research agenda.

The contention that NAS is "uniquely qualified to oversee RERF" is overstated. Under the RERF charter, a binational group of scientific counselors, not NAS or DOE, develops the RERF scientific agenda. This arrangement will not change with a new grantee. The duties of NAS are to identify American staff scientists and candidates for Director and Scientific Counselor and to transfer DOE funds to RERF. For a new grantee, these duties will remain the same.
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Early Cretaceous vertebrates of Niger and the shorter paper by Jacobs et al. (2) on dinosaurs from Malawi are cited as “rare exceptions,” the work of other paleontologists is described as preliminary or based on scanty material. This gives the uninformed reader the misleading impression that little was known about Cretaceous African dinosaurs. However, Strome’s “small fossil collection from Egypt” (which was largely destroyed by an American air raid on Munich in 1944) was the basis for a total of 16 monographs on various groups of fossil vertebrates published between 1914 and 1935, complemented by a 102-page synthesis by Strome (3). Remains of eight types of dinosaurs, including three new taxa, were described, several of them from partial skeletons. This “small collection” compares favorably with the finds reported by Sereno et al. Lapparent’s paper (4) is described as “preliminary paleontological surveys in the Sahara.” These surveys were discussed in a 56-page memoir, in which 11 genera of dinosaurs were mentioned and five new species were named. Admittedly, much of Lapparent’s material, having been collected in the Sahara under the difficult conditions of the 1950s, is fragmentary, but it includes six partial skeletons (of theropods and sauropods). The sauropod described by Lapparent as the new species Rebbachisaurus tamesensis is of special importance in relation to the new material reported by Sereno et al. This taxon is mentioned in Sereno et al. note 20, but not in an appropriate way. The new taxon referred by Lapparent to the Camarasauridae was not based exclusively on fragmentary remains (although Lapparent also referred isolated bones to it); three partial skeletons were mentioned, and the photographs and sketches published by Lapparent show that some of his material was comparable in terms of completeness with the partial skeleton shown by Sereno et al. in their figure 5. It seems likely that the “new species” of broad-toothed sauropod reported by Sereno et al. is in fact identical to Lapparent’s Rebbachisaurus tamesensis, which was found in the same beds in the same general area of Niger. Sereno et al. state that “the assignment to the Moroccan genus Rebbachisaurus is incorrect because there are no overlapping bones”; Rebbachisaurus garasbae was based on a scapula and a dorsal vertebra from Morocco (5), and the material described by Lapparent (4) included both dorsal vertebrae and a scapula (although the latter was not collected). Lapparent (4, p. 38) based his attribution of the new sauropod to Rebbachisaurus on resemblances in the shape of both the scapulae and the dorsal vertebrae. Whether this attribution is correct is admittedly uncertain, but the possibility cannot be dismissed. In any case, under the rules of priority, the specific name R. tamesensis, for which there is a diagnosis (4, p. 38) although no type specimen was formally designated, cannot be simply forgotten.

The paleobiogeographical conclusions drawn by Sereno et al. are moderately convincing, but it is premature to state that the new finds do not “support the existence of a distinct Gondwanan fauna during the Cretaceous”—this may apply to the Early Cretaceous, but the Late Cretaceous is a different matter. The point that there was a connection of some sort between Gondwana and the northern continents until the Early Cretaceous is not new. To mention but a few earlier papers that reached the same conclusion, on the basis of the occurrence of the ornithopod Valdosaurus in the Lower Cretaceous of both Britain and Niger, Galton and Taquet (6) concluded that there must have been a land connection between Africa and Europe sometime in the Early Cretaceous. In 1991, Le Louuff (7) reviewed Cretaceous vertebrate faunas on a world-

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wide basis and concluded that there was a connection that gave rise to an Early Cretaceous "Afr-Euro-American paleobioprovince." The new discoveries announced by Sereno et al. therefore provide additional confirmation of an already widely held and solidly based conclusion.

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References

Response: Olshesky correctly observes that in our paper on the new African theropod Afrovenator the most appropriate name for one of the larger groups containing Afrovenator is Spinosauroidea, rather than Torvosauroidea, even though the former term has not been used in the literature.

Buffetaut and Cuny say that our report on new dinosaurs from Cretaceous deposits in the Sahara is misleading because (i) Cretaceous dinosaurs from Africa are better known than we suggested; (ii) the new sauropod species we described cannot be distinguished from sauropod bones found previously in Niger; and (iii) our biogeographic conclusions concerning Gondwana and the evolution of its fauna are already well established.

First, our knowledge of fossil vertebrates from the Cretaceous of Africa is extremely poor by comparison with South America or any Laurasian continent, where countless articulated skeletons of large and small vertebrates (including dinosaurs) have been described. The theropod and sauropod skeletons described in our report join the few described by Stromer (1), Taquet (2), and Jacobs et al. (3) as the only relatively complete, associated dinosaur skeletons to be unearthed in the Cretaceous of Africa, as we stated. That African Cretaceous deposits are so little explored in no way diminishes the tremendous paleontological and geological contributions of Lapparent (4), whose pioneering work in the Sahara in the 1950s laid the groundwork for all who follow. Nonetheless, our fossil discoveries underscore how little is known from this time period on Africa—something that Buffetaut himself has observed on several occasions (5).

Second, the sauropod skeleton that we unearthed very probably belongs to the same species as some of the disarticulated material described by Lapparent (4). Unfortunately, Lapparent did not designate a type specimen or provide a diagnosis with characters that today would distinguish his material from many other sauropod species. Furthermore, there is no justification for reference of his material to the Moroccan genus Rebbachisaurus, as is the case with our more complete material. In accordance with accepted rules of nomenclature, a new genus and species must eventually be coined.

Last, our conclusions concerning possible land connections between Gondwana and Laurasia during the Lower Cretaceous were based on the absence of "phylogenetic unity among dinosaur groups that persisted on Gondwanan continents during the Cretaceous." We know of no monophyletic dinosaur clades that characterize Gondwanan continents exclusively, as seems to have oc-

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occurred later in the Cretaceous on certain land masses. Our observation is in concert with, but not the same as, previous evidence for a land connection between Gondwana and Laurasia during the Lower Cretaceous, such as the supposed shared presence of a particular ornithischian genus (6) or of particular families in Cretaceous faunas from Africa, Europe, and North America (7).

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Crankcase Art?

Figures published in Science have frequently been an inspiration for my paintings, but when I scanned the already eye-catching report by F. W. Gayle and M. Goodway about the aluminum alloy of the Wright brothers’ aircraft (11 Nov., p. 1015), I was astonished to see a pattern in figure 2B (p. 1016) that depicted 20-nanometer Guinier-
Preston zones which was reminiscent of Piet Mondrian’s paintings Church Façade and Color Planes in Oval. Life imitating art?

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Corrections and Clarifications

In the letter from Howard B. Urmowitz and Roy W. Stevens (3 Mar., p. 1249), the third sentence should have read, “First, they can not only invite, but actively solicit, new ideas and alternative lines of inquiry.”

In figure 1D (p. 680) of the report “Genetic decreases in atrial natriuretic peptide and salt-sensitive hypertension” by Simon W. M. John et al. (3 Feb., p. 679), the size bars to the right and left of the Southern blot were not correctly aligned in relation to the dark bands.
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