On the Establishment of Science Institutes

In response to a request for guidance on the establishment of science institutes, Space Studies Board Chair Claude R. Canizares sent the following letter to NASA Chief Scientist France A. Cordova on August 11, 1995.

The Space Studies Board is pleased to respond to your request of June 8, 1995, for comments on several issues related to NASA's proposed concept of establishing science institutes as part of its Zero Base Review. You requested a rapid response with our initial comments in order to meet your schedule for further definition of the concept and the possible establishment of pilot institutes.

Your presentation to the Board during our meeting of June 8, together with some background material mailed earlier to all members, was the starting point for our deliberations on this topic. Our discussions continued on the following day with the Associate Administrators for Space Science and Mission to Planet Earth and the Deputy Associate Administrator for Life and Microgravity Sciences and Applications. A subset of the Board, together with members of the Future of Space Science (FOSS) Steering Group, also had the opportunity to discuss the proposed institutes with the Administrator, Mr. Daniel Goldin.

Your written request asked for input on three points, which I summarize here: (1) the institute concept and the conditions under which institutes could meet the stated goals of "strengthening the quality of NASA's science and expanding communication and cooperation with the external community (academia and industry)"; (2) the makeup of NASA's proposed "Institute Framework Team" and additional issues it should consider; and (3) lessons learned by the community from its experience with other, existing research institutes.

Given the need for a rapid response, this letter focuses on the first two points, although some of the Board's response is necessarily shaped by the combined experience of our members with existing institutes, as requested in point (3). In addition to space scientists, the members present during our discussions included individuals with experience with Defense Department and industrial laboratories. This response draws on the Board's assessment of the roles and missions of NASA center scientists contained in my letter to you of March 29, 1995 (the Center

Science Letter). Please note that the following observations are based on our understanding of ideas and plans still in a seminal state, with many important details not yet filled in.

At the most general level, the Board believes that the formation of science institutes, under the management of external academic or industrial research entities, and for some carefully selected portions of NASA science, may contribute to the stated goals. It will be a challenge to NASA management, to the affected centers, and to their non-government partners to ensure that the adopted structures and processes achieve the goals stated in your letter, namely, to strengthen the quality of NASA's science and to expand communication and cooperation with the external community. The Board assumes that any plan for establishing science institutes would be part of a larger science plan that considers how national space research goals will be met by the sum of NASA's science activities, including both civil service and non-civil service components. Key elements of this plan would be charters for each institute that are broad enough to permit the institutes to take advantage of their independence from NASA but focused enough to implement their assigned roles in the overall science plan. These charters should be customized to each institute, and there must be incentives for each institute to adhere to its charter. Planning should also reflect a realistic appraisal of prospects for future funding (especially from non-NASA sources) for institute activities.

The Board's Center Science Letter states that the most important mission of NASA scientists is to "bind NASA's immense engineering and technical capabilities to the still larger and more diverse industrial and academic research communities across the country and the world." It further states that "this binding requires that NASA have world-class scientists who, as a group, combine both . . . internal and external functional roles . . . and are sufficiently tightly integrated into NASA's engineering and technical infrastructure." That letter identifies key examples of external and internal functions for NASA scientists and then describes four principles or qualities of NASA science that would support the stated mission. In brief, these qualities are (i) scientific excellence and depth, (ii) sufficient scientific breadth, (iii) firm integration into NASA's technical and engineering infrastructure, and (iv) interdependency among NASA centers and with the external community.

Certain internal and external functions described in the Center Science Letter, such as participation in policy formulation and selection of external investigators, are properly the province of government employees, but should not be vested in field centers in order to avoid real or perceived conflicts of interest vis-à-vis outside scientific competitors. It is therefore the recommendation of the Board that these functions be retained by Headquarters, where they would be discharged by government employees.

Considering the proposed institutes in terms of the four principles or qualities presented in the Center Science Letter, the Board offers the following observations and recommendations:

(i) SCIENTIFIC EXCELLENCE. The major motivation given for establishing science institutes is to enhance scientific excellence. The Board believes that a proper institute structure could well contribute to this goal. Process is also important: plans should be openly developed, widely understood, and methodically and consistently implemented. Otherwise, uncertainties and turmoil during the transition could degrade current scientific quality by driving the best (and therefore most employable) scientists out of NASA and its research programs.

(ii) SCIENTIFIC BREADTH. Institutes with well-defined charters could fit into an overall NASA science activity that meets the agency's requirements for breadth across the relevant disciplines. It is unclear whether interdisciplinary research, a valued by-product of scientific breadth, would be better enabled at the proposed institutes than in-house at the centers.

(iii) INTEGRATION. Achieving tight integration into the NASA engineering and technical infrastructure may prove more difficult for external institute personnel than for in-house civil service scientists. At least in the pilot institutes under discussion, the scientific activities to be collected in external institutes are not the main focus of their parent centers. In such cases, where the science programs may be less reliant on the primary technical infrastructure of the parent center, the need for, and potential benefit from, tight integration are reduced. On the other hand, many of the functions identified in the Board's Center Science Letter entail field center scientists strongly influencing or even directing activities in key engineering and technical areas. Where institute scientists are expected to exercise these functions but are viewed as "contractors," those roles could be compromised. It might be useful to find existing examples where non-government scientists have successfully taken leadership roles in relation to a government laboratory. (The Jet Propulsion Laboratory is not such a case, since there the entire center is staffed with non-civil servants.)

(iv) INTERDEPENDENCY. Greater interdependence between centers and the outside community might be achieved if the institutes can maintain firm ties to both. It is less clear how institutes would strengthen interdependency among centers or work to soften a center's insularity or defensive posture. The Center Science Letter recommends that "NASA should strive to assure that the centers themselves and their senior managers assume greater responsibility for a healthy partnership with the external industrial and university community." Formation of institutes should not be allowed to diminish this ongoing responsibility.

With respect to your second point, the composition of the "Institute Framework Team," the Board strongly supports the suggestion that such a team have vigorous external participation. Any plan for establishing institutes will stand or fall on its details, and we have provided some issues for the Team's consideration. Independent perspectives from outside NASA should have an important role formulating those details and addressing these issues.

As you know, the FOSS study is addressing science organization within NASA in a

more comprehensive manner, including the question of science institutes. The final report of the FOSS study will include consideration of your point (3). Every attempt is being made to expedite completion of this report, as Mr. Goldin requested, and we hope that it will help make a significant contribution to the NASA reinvention process.

We hope that these brief comments are helpful and look forward to additional discussions on these important issues at future meetings.

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