PROGRAM REVIEW PANEL

FINAL REPORT - 1992

COOPERATIVE INSTITUTE FOR RESEARCH IN THE ENVIRONMENTAL SCIENCES (CIRES)

REVIEW PROCESS

The Self-Study was initially prepared by a Committee comprised of 8 CIRES Fellows, plus two Research Associates, one Research Assistant, and one graduate student. In August of 1991, some internal criticism of CIRES began to emerge as a result of information developed during the Self-Study. To the dismay of some members of the Self-Study committee, another member was added to the committee at that time and some of this information was deleted from the Self-Study; however, this information was obtained during later stages of the review.

The Internal Review Committee consisted of three faculty members not associated with CIRES, and one Graduate Student studying in another Institute. The External Review Committee had three members--a larger number than usual for an External Review of an Institute--and the visit of the ERC coincided with the regular review of CIRES which is conducted by CIRES annually. The ERC submitted a separate annual review report to the Director of CIRES, as well as the External Review Report which it submitted to the Program Review Panel. The latter report, not the former, together with the Self-Study, the IRC report, and numerous personal interviews, form the basis for the present report.

GENERAL DESCRIPTION AND SELF-STUDY

CIRES aspires to be a community of scholars working to create and maintain a center of excellence in environmental science. This broad subject includes studies of the Earth's atmosphere, cryosphere, biosphere, lithosphere, and hydrosphere. CIRES exists by virtue of a Memorandum of Understanding (last revised in 1986) between the Environmental Research Laboratories (ERL) of the National Oceanic and Atmospheric Administration (NOAA) and the University of Colorado. This Memorandum spells out the different responsibilities of the two parent organizations. Among other things it establishes shared responsibility for administrative costs, and provides for base funding by ERL of the CIRES Visiting Fellows program.

CIRES contributes significantly to the University's Global Change and Environmental Quality Program. Faculty and students from seven academic departments work in CIRES' four major subdivisions:

Atmospheric and Climate Dynamics
- 7 Fellows
- 43 Research Associates
- 39 Professional Research Assistants
- 19 Graduate Students

Cryospheric and Polar Processes
- 4 Fellows
- 5 Research Associates
- 11 Professional Research Assistants
- 7 Graduate Students

Environmental Chemistry and Biology
- 10 Fellows
- 34 Research Associates
- 32 Professional Research Assistants
- 34 Graduate Students

Solid Earth Sciences.
- 13 Fellows
- 10 Research Associates
- 17 Professional Research Assistants
- 33 Graduate Students

CIRES also operates two research centers: the Center for the Study of Earth from Space (CSES, which has 35 faculty, staff, and students) and the World Data Center/National Snow and Ice Data Center (WDC/NSIDC). (Two faculty members are associated with NSIDC.)

Each of CIRES' major subdivisions has a Director with the title "Associate Director." These Directors are appointed by the Director of CIRES after consultation with Fellows. The Director of CIRES, who is now serving his third four-year term as Director, reports to the Associate Vice-Chancellor for Research at UCB. An Associate Director of CIRES has been appointed to aid the Director with CIRES administration.

CIRES' operation is governed by a set of By-Laws, approved jointly by the University and by ERL. The By-Laws establish an Executive Committee, an outside Advisory Committee, and a Council of Fellows. Of the 34 Fellows in CIRES in the Fall of 1991, 24 held faculty positions in academic departments.

CIRES was reviewed by PRP in 1984; since that time CIRES' activity has increased more than three-fold. The number of people employed by the Institute is now nearly 400, and its annual expenditures are approximately $16 Million. CIRES employees are housed in three different locations: in a building (built in 1987) in the central part of the main campus; in two research buildings on the East Campus, and at NIST at 325 Broadway.

The Self-Study presents the results of self-studies by each of the four Divisions. These are paraphrased here.

Atmospheric and Climate Dynamics

This is the largest group within CIRES, and is largely driven by ERL research activities. This research theme has the weakest connection to University teaching and research programs. There is little collaboration with faculty in APAS interested in this topic. There is great diversity of research topics being pursued in this area, but most active individuals have weak ties to the University. CIRES will implement a more deliberate policy of slower growth in this area. A Director for the University's new Atmospheric Sciences Program has been recruited, and two new faculty positions will be devoted to Atmospheric Sciences. This could provide an opportunity for improved interaction with University programs.

Cryospheric and Polar Processes

This division was established in 1991. It includes the WDC/NSIDC center, and the coupling of researchers and students with a scientific data management facility has been very productive. However, priorities developed by the Department of Geography have not taken advantage of the NSIDC facilities or of CIRES strengths. The Director of this Division may retire (in about 2000 A.D.) and a senior recruitment in this area is needed for continuity. The Division's expertise in remote sensing applications is underutilized in the academic arena.

Environmental Chemistry and Biology

Research topics include thinning of the stratospheric ozone layer, and air and water quality. The research centers are in several different locations, and the diversity of topics inhibits scientific exchange. Also, tenure requirements at the University emphasize individual accomplishment and further inhibit cooperative research. A broad strategic approach to planning is needed to identify scientific goals, and the appointment of Fellows, that can bridge gaps.

Solid Earth Sciences

In previous years, this group was the principal strength of CIRES. However the mission of ERL has changed, omitting solid earth geophysics, and CIRES has grown in other areas. The future of this area within CIRES is now of great concern. Several key scientists in this area have recently left the University, and others have left CIRES. Such developments have a significant impact on the undergraduate and graduate teaching programs of the University. CIRES has in the past played a very important role in giving identity and cohesion to this program. The Graduate School presently administers an inter-departmental Ph.D. program in solid earth geophysics.

Personnel Issues

Of greatest concern to CIRES scientific employees was the lack of representation within the organizational structure of CIRES. Support Staff would like more interaction and communication between the different Divisions within CIRES, as the size and number of locations of CIRES' activities contribute to feelings of isolation. Professional development for Professional Research Assistants is an important but neglected aspect of employment within CIRES. Promotion and job security are areas of concern. There are no avenues for Research Associates to participate in and contribute to the management of CIRES, except for interaction with the Divisional Associate Directors. A better personnel management system for Research Associates, to recognize each individual's level of achievement, should be established.

Administrative and Programmatic Issues

It is suggested that CIRES is too broad and needs to focus its efforts in selected research areas; the Self-Study states that CIRES is going through an intensive strategic planning process to set its agenda for the future.

Space

CIRES occupies 50,616 square feet of space at present and pays approximately $500,000 annual rent on this space. It will soon occupy a portion of Ekeley that has been vacated by Pharmacy; CIRES has set aside funds to renovate this space. CIRES asserts that other Institutes and researchers are treated more favorably than CIRES with regard to rental policies. CIRES requests reevaluation of its rental agreements with the University.

Scope

CIRES intends to work toward occupancy of a single building in order to achieve better integration among programs. Several other mechanisms to improve informal scientific exchange among Fellows are being pursued. The Self-Study recognizes the need to focus on the question of future directions for the Institute in the context of an evolution into new areas of environmental science. Despite efforts to formulate an overall plan, growth has occurred in response to opportunities offered by exciting developments in various disciplines, new funding opportunities, and new hiring opportunities. The Self-Study report suggests that CIRES should develop a comprehensive seven-year program plan, addressing the following issues:

- The future intellectual thrust of CIRES
- The future growth of CIRES
- Coordination of CIRES activities
- Role of the Director in guiding the scientific direction of the institute and fostering interdisciplinary efforts to obtain funds.

Financial Support

CIRES receives $700K/year from NOAA in base (pre-determined) funds. Additional incremental funds for salary, travel, and rent support as many as 200 employees on projects specified by NOAA; such individuals work primarily in NOAA buildings and use NOAA facilities. The University provides Academic Year salary to faculty members who are CIRES fellows, and charges rent at a reduced rate for part of the space occupied by CIRES on the East Campus. It provides a large contribution to CIRES through a special Indirect Cost Recovery (ICR) arrangement for the funds obtained through the NOAA Cooperative Agreement; and a portion of the ICR which is realized is returned to CIRES for administrative costs. The result is that NOAA and CU contribute approximately equally to the financial support of CIRES.

Leadership and Governance

The Self-Study summarized expressions of concern about the leadership and governance of CIRES; suggestions varied from decreasing the responsibilities of the Director for day-to-day operations, to requesting more direction from the CIRES leadership. The rapid growth of CIRES has hampered the ability of the Director, and the Associate Directors, to keep in touch with CIRES personnel. There needs to be a more clearly defined policy with respect to the sometimes unavoidable overdrafts in research accounts.

Relations with NOAA

The quality of people that NOAA has been able to hire has been enhanced by the association with the University, and the opportunity to interact with students. However, there is a feeling that NOAA is not as supportive of the needs of the University Community as it could be.

Ethnic and Gender Diversity

Data was compiled by CIRES on the ethnic and gender composition of the Fellows, Research Associates, Staff, and students. Comparison with the percentages of new Physical Science Ph.D.'s in "Digest of Education Statistics, 1990," shows that the number of women among the Fellows, RAs and students was higher than in the comparison group. The proportion of women and ethnic minorities among the staff is high. However the percentages of minorities among CIRES Fellows and Research Associates is low.

Other

The Self-Study suggests that the University should support CIRES programs, including designation of FTE faculty positions, as one means of achieving campus objectives for the Global Change and Environmental Quality Program.

The Self-Study report makes a number of additional recommendations, including:

CIRES should encourage and help CU faculty participate in the development of future NOAA activities;

CIRES should seek more "block grant" funding through federal agencies other than NOAA;

The Visiting Fellows program should be expanded and/or extended to include graduate student assistantships;

CIRES should continue intensive efforts to identify and recruit women and minorities at all ranks, especially the scientific staff;

CIRES should explore funding opportunities for continuation/expansion of its undergraduate research internship program;

CIRES should explore mechanisms to involve more faculty in teaching by directing Independent Study;

CIRES faculty should be encouraged to work with affiliated departments on course development in the environmental sciences.

Evaluation of the Self-Study

Although self-criticism in the Self-Study has been moderated, many important issues are addressed. Numerous suggestions are mentioned which could contribute to improvement. Foremost among the issues facing CIRES are problems related to the rapid, opportunistic growth which has occurred in the last few years in a somewhat unplanned fashion. Many outstanding scientists are associated with CIRES and benefit from resulting interactions with other researchers. Yet there is a general sense of isolation, of being ignored, because of the diversity of interests and the several locations of CIRES activities. For example there is a perception that better services are provided to central-campus facilities, which contributes to feelings of isolation of units which are not centrally located. There is also some perception that CIRES funds are not distributed in an equitable way.

On the other hand, there is some discourse in the Self-Study which is only marginally useful. There is little detail on finances which is presented in useful form. It is not clear, for example, how much CIRES has contributed to start-up packages for new faculty or how such contributions are distributed among research areas. There is very little detail on full-time equivalent positions. There is little information on the number of faculty positions, if any, which are controlled in part by CIRES. No comprehensive plans are presented for replacements of Fellows who are retiring over the next five to ten years. There is no overall hiring plan. There is no plan for growth, emphasis, or de-emphasis in particular research areas which could explain the rapid growth of CIRES in some areas or the shrinkage in Solid Earth Sciences.

The Self-Study recognized "the many contributions that the Director has made to CIRES and the fact that his knowledge of the University and presence on state and national committees has been and would continue to be invaluable to CIRES." However, the energy of the Director is spread very thin over many activities, and there is a perception CIRES would be better off if more attention were focused on CIRES itself.

RESULTS OF THE PREVIOUS REVIEW

1. This recommendation addressed the need to update the original (1967) Memorandum of Understanding, giving major consideration to the long-term interests of the University. This memorandum was rewritten and approved by both parent organizations in 1986, but needs periodic renewal, and this is being pursued.

2. PRP recommended that the Fellows and Director formulate specific procedures for creating, nurturing, and discontinuing programs, and establish a permanent external advisory group. In 1985 CIRES created an outside advisory group, which attends the annual CIRES Program Review and makes programmatic recommendations.

3. PRP recommended that the responsibility of the Director to facilitate the development of designated technical areas of the Institute must be defined more carefully. CIRES responds that an Executive Committee has been created which advises the Director on business matters, allowing the Council of Fellows to concentrate on scientific matters; their deliberations on program development and technical matters are then considered by the Associate Directors, or the Institute Director, for action.

4. This recommendation concerned the need for a building on the main campus. This issue has been resolved by the construction of a building contiguous to Ekeley.

5. PRP recommended that CIRES emphasize the development of relationships with appropriate university Departments, in order to facilitate improved interdisciplinary course offerings and programs. CIRES responds that two new Fellows were appointed who are affiliated with the EPOB department; that hiring new tenure-track faculty in the Departments of Chemistry and Biochemistry, Geological Sciences, and Geography was pursued cooperatively; and that there is strong participation in the development of the graduate program in the Atmospheric Sciences.

FINDINGS OF THE INTERNAL REVIEW COMMITTEE

The following summary of the IRC report mentions only significant issues which are at variance with, or in addition to, issues raised in the Self-Study.

The Internal Review Committee describes CIRES as a very successful, complex research organization. With respect to governance, the IRC reports that although any Chair or Director will have some detractors, the IRC was concerned about the perception by some within CIRES that they are not free to speak their mind on issues without some repercussion.

The IRC reports that those staff on the central campus who report to the Director and Associate Director are a very dedicated and professional group that has a strong sense of loyalty to the Director. Other staff likewise have a strong sense of identity with CIRES, but the issue of the distance between the units was a common theme. The CIRES staff believe that they do not get much cooperation from the Department of Human Resources at UCB; there was a strong impression that Human Resources would not work with CIRES in a positive and supportive mode to ensure the best quality and service.

Communication with the many CIRES graduate students, scattered throughout the campus, needs improvement. The rather hierarchical structure of CIRES tends to exclude graduate students; there is a lack of official standing for graduate students within CIRES.

Research Associates (PostDocs) have a fundamental role in the research effort in CIRES. Research Associates generate a substantial fraction of the total research income within CIRES, yet they have no role in terms of governance and future research opportunities. No briefing or orientation of new Research Associates occurs so that they could have a clear grasp of the mission of CIRES and of their rights within and responsibilities to the University and/or to NOAA. The process for annual review of Research Associates is unstructured and variable throughout CIRES. The linkages between Research Associates and appropriate academic departments is variable and unclear. There needs to be a better defined career path for these researchers. This is a problem for RAs in other Institutes as well as in CIRES and needs to be addressed on a campus-wide basis.

Rapid growth, scattered locations, and diversity of interests contribute to a lack of unified sense of direction and absence of a set of shared goals. The Director is aware of these problems and is taking some steps to improve the situation. It is important that the Director place major emphasis on providing leadership and focus for CIRES. Improved cohesion is vital and the IRC views this broad issue as being probably the key issue.

The IRC is concerned about the future of solid earth geophysics within CIRES. UCB cannot afford to let a nationally respected area of expertise deteriorate. This is related to the question of the long-term focus of CIRES. CIRES is positioned to play an important role locally and nationally in the Global Change initiative, but it cannot do everything. CIRES should establish better defined goals and limits.

The agreement between NOAA and the University should include, if possible, the option that would facilitate other NOAA/University links.

The IRC concludes with a number of questions that should be addressed, and four recommendations. These questions, and the recommendations, are summarized here:

The questions raised by the Internal Review Committee are:

1. How can CIRES improve communications between all levels of its organization?

2. How can appropriate career tracks for RAs and Professional Research Associates be defined?

3. Is CIRES now so large and complex that it needs to delegate management power to its four divisions?

4. What is the role of the Director of CIRES, and how can CIRES encourage the development of individuals who are both interested in and capable of undertaking the position of director, so that CIRES can plan ahead for long-term stability?

5. How can CIRES develop a flexible, long-term strategic plan that addresses both the issues of an exciting research agenda, and the practicalities of moving with the shifting agendas of granting agencies?

6. How can the impetus for critical Self-Study be maintained?

7. Is it appropriate for UCB units to compete against each other when different overhead/space agreements are struck by the administration?

8. How can CIRES upper and middle management involve RAs in the decision making process so that there is a clearer sense of identity between that large and important element, and the Institute?

The IRC then makes the following four specific recommendations:

1. CIRES should develop a career track for RAs based on existing models within UCB but adapted to CIRES needs.

2. The Dean of the Graduate School, and the Dean of Arts and Sciences should in the near future convene a meeting with the CIRES Director, the Director of the Solid Earth Sciences Division of CIRES, and the chairs of relevant Departments to evaluate the role of this group within CIRES and at UCB.

3. CIRES should accelerate its efforts to identify research links between its four divisions with a focus on issues of Global Change and Natural Disasters (this latter dependent on the outcome of recommendation #2, above). It should also seek to establish new links and fortify old connections with other units on campus that can contribute to the campus research thrust into these issues.

4. CIRES should convene a series of internal meetings to discuss fully and frankly how the major members--Fellows and Senior RAs--feel that CIRES can best be organized and managed to react to the challenges of the next seven years.

FINDINGS OF THE EXTERNAL REVIEW COMMITTEE

The ERC first addresses the scientific quality of the research programs. Solid Earth Sciences is described as the epitome of success of interdepartmental research and graduate education. The stature of this group has remained high nationally, although its role within CIRES has diminished significantly in recent years. Much of the CIRES involvement in research in Atmospheric Dynamics and Climate Modeling is focused in NOAA/ERL. When the new Director for the Atmospheric Sciences Program arrives at UCB, it will be important for the University and for CIRES to build upon his strength, and the strengths of the appropriate NOAA research laboratories, to build a well-integrated CU/NOAA program in this area. The Cryospheric and Polar Processes group is small but is among the most coherent and is one of the half-dozen or so leading groups of its kind in the nation. There are healthy trends toward increased emphasis on process studies in the polar regions, using numerical techniques, and exploiting satellite remote sensing. In Environmental Chemistry and Biology, the NOAA component has gained an international reputation; the UCB component has made significant, but lesser, contributions. Due to two recent faculty additions, the UCB contribution to this area should increase substantially. The relocation of the USGS Hydrologic Sciences laboratories to Boulder provides opportunities for cooperative research in the area of water quality.

In its summary evaluation of CIRES, the ERC praises the able leadership of the Director, and points out the many benefits to both NOAA and the University, of the Cooperative Institute. CIRES has made significant advances in our understanding of global and regional scale environmental processes, and merits full support by the University Administration.

The ERC then make nine specific recommendations. Although most of these recommendations address issues already mentioned in the above summaries, the ERC recommendations take a different view in the following cases:

A. Solid Earth Sciences. The program in solid earth sciences-geophysics should not be allowed to deteriorate. If CIRES cannot provide a home for a healthy program, the University should consider establishing a new Institute for Geophysics.

B. Base funding from NOAA. The level of base funding from NOAA has not kept pace with inflation. The University should support the CIRES Director in his efforts to negotiate increases in the base funding level. Also, the University should reduce the level of rents that it charges CIRES for space.

C. Communications within CIRES. There is a need for better and more open communication within CIRES. The Director should share with the CIRES Fellows, to a greater extent than in the past, the problems that CIRES is faced with, and should consult with them more broadly in making policy and funding decisions. He should delegate more to individuals and committees. This should foster the Fellow's sense of involvement in CIRES. An oversight committee consisting of Deans/Chairs of appropriate units should be constituted to assure that the best interests of the University as a whole are served by the actions taken by CIRES, and to promote harmonious relations between CIRES and the involved units.

D. Future Directions. A strategic plan is needed, otherwise there is a danger that the CIRES effort in global change research could degenerate into a collection of unrelated, subcritical, or overspecialized efforts. A fresh look should be taken at the available program options that could build upon existing strengths. Possible placing of a limit on the size of CIRES should distinguish between the sizes of the University component, and the size of the NOAA component. Long-term block funding for support of graduate students and Post-doctoral fellows should be sought from a wide array of federal agencies.

E. Academic Programs in the Earth Sciences. The time may have come to consider changes in the UCB departmental structure that would facilitate interactions between faculty in the environmental sciences, and would more fully utilize the expertise at NOAA. Possibilities include: setting up a number of new graduate degree programs such as the Atmospheric Sciences program; or consolidating into a single Ph.D.-Degree granting Department of Environmental Sciences, those appropriate faculty from relevant departments and institutes across the campus.

F. This recommendation was essentially the same as recommendation (1) of the IRC, concerning development of a career track for RAs and PRAs.

G. Rental Charges. The University should pay for the renovation of Ekeley space for use by CIRES and should not charge them rent for the space.

H. Conflict of Interest. The ERC perceived a potential conflict of interest in the position of the Director, who is also an elected Regent, and pointed out the possibility for publicity damaging to the University, whether the conflict of interest is real or not. The ERC report suggests one solution would be to appoint an interim director for CIRES for as long as the present Director is on the Board of Regents.

I. Self-Study. Finally, the ERC report noted the degree of deletion of material critical of CIRES in the Self-Study and recommended that in the future, there should be more openness toward minority or dissenting opinions.

PROGRAM REVIEW PANEL DETERMINATIONS

CIRES is a very successful, diverse research organization which has undergone phenomenal growth in recent years. It is managed by an able and strong Director who has been very successful in obtaining outside funds and in overseeing CIRES during the period of rapid growth. There are significant strains within CIRES due to inadequacy of communications, the diversity of interests, and the multiplicity of locations of research activities. Solid Earth Sciences-Geophysics has been a very strong program which is on the decline within CIRES. There is no strategic plan, or long-term vision, available to guide the further development of CIRES. PRP welcomes the fact that, following the development of the Self-Study, CIRES has undertaken a comprehensive strategic planning process.

Because of the varied history of agreements between the University Administration and Institutes, and the commitments regarding amortization of bonded indebtedness which are unknown to this Panel, it is not within the purview of the PRP to make a recommendation on this issue. The Panel notes that both the IRC and the ERC raised questions and made recommendations about space rental charges that CIRES pays. It is unrealistic for CIRES to expect that space in a single building on the main campus could be found to accommodate the entire Institute.

Although primarily a research and graduate training institute, CIRES is to be commended for its efforts in mentoring undergraduate research interns through a CCHE Center of Excellence Award which supported 26 students in the fall of 1990.

PRP RECOMMENDATIONS - 1992

COOPERATIVE INSTITUTE FOR RESEARCH IN THE ENVIRONMENTAL SCIENCES (CIRES)

1. CIRES should develop a long-term strategic plan, which identifies the important research themes to be addressed, and which builds upon strengths at UCB and at NOAA. The plan should also include, but not be limited to, consideration of such long-term issues as internal organization of CIRES, the role of Solid Earth Sciences, degree options, space, facilities, faculty positions, and limitations on the size of CIRES. The Director must lead this effort and must be prepared to devote substantial time and energy to developing and implementing a focused research agenda for CIRES. This plan should be submitted to the Dean of the Graduate School by the end of the Academic Year 1992-1993.

2. The Director of CIRES should continue efforts to improve administration and communications within CIRES by involving the CIRES Fellows more in decision- and policy-making, by delegating more responsibility, and by such other means as are appropriate as suggested in the Internal and External Review reports. The Director should evaluate the degree to which responsibility can be delegated, in order for the governance of CIRES to continue developing in such a way that the Executive Committee has more responsibility and policy-making authority.

3. Further growth of CIRES in research areas in which there is little collaboration with faculty researchers should be extremely limited.

4. The University should not allow the Solid Earth Sciences-Geophysics program to languish. A strong Solid Earth Geosciences component within CIRES benefits the University, NOAA, CIRES, and the individual researchers. PRP recommends that Solid Earth Geosciences remain in CIRES. However in the event that CIRES' Strategic Planning Committee should decide to reduce the role of Solid Earth Geosciences within CIRES, then an appropriate group, including the Director of CIRES, Deans, and Chairs of relevant Departments, should immediately convene to assure the future of this program.

5. The University and CIRES should develop a more clearly structured career track for Research Associates and for Professional Research Assistants, that would distinguish between limited-term and indefinite-term appointments, and make clear who is eligible to serve as Principal Investigator on research grants. There should be a systematic evaluation process, and a meaningful career ladder/reward system, for Research Associates and for Professional Research Assistants.

6. The University should evaluate the adequacy of the Research Professor positions for non-tenured Research Associates and consider alternate mechanisms for the support of Research Associates during temporary lapses in funding.

7. The Director of CIRES should continue careful efforts to prevent the appearance or potentiality of a conflict of interest.

8. University Administrators at the highest level should support the CIRES Director in his efforts to negotiate increases in the base funding level obtained from NOAA, by meeting with counterparts in NOAA on a regular basis.

9. Future self-studies of CIRES should be more open to dissent and self-critical information.

10. CIRES should continue vigorous efforts to recruit women and minorities at all levels among their scientific staff.

The Institute must report annually to the Dean of the Graduate School, and to the Vice Chancellor for Academic Affairs on the implementation of these recommendations.