

Item A

Proposal for the Creation of the Center for Structural Biology

1. Goals and Significance

Structural biology is a newly emerging discipline that has created a revolution in the biological sciences leading to major advances in both basic and applied research. Structural biology aims to understand the function of complex biomolecules (DNA, RNA, proteins, and carbohydrates) by the study of their structure. The ultimate objective is the understanding of function through the determination of the three-dimensional structure of the molecule of interest. This proposal is for the creation of a Center for Structural Biology at the University of Kentucky administered under the office Vice-President for Research. The over-all objective of the Center is to promote and facilitate the use of structural biology in research, teaching, and commercial development at the University and within the Commonwealth of Kentucky. The Center will bring together expertise in x-ray crystallography, NMR spectroscopy, computation sciences, structural bioinformatics, and proteomics to work together as a research resource. A National Science Foundation EPSCoR grant provided the proposed Center with the necessary infrastructure, including facilities for X-ray crystallographic analysis, molecular modeling, and nuclear magnetic resonance spectroscopy.

Participation in the Center is open to anyone with an interest in structural biology. The Center will work with other units to coordinate the use of current and new facilities that support research in structural biology. In addition the Center will help to oversee a core laboratory for the preparation of biological materials and their crystallization. This laboratory is currently located on the sixth floor of the Medical Sciences Building as part of the space allocated to the Department of Biochemistry.

A director appointed by the Vice-President for Research will oversee the Center. An advisory board consisting of qualified and interested faculty in related fields, appointed by the Vice-President for Research, will advise the director and will help to set both the long term and short term goals and objectives of the Center.

One of the objectives of the Center will be to make faculty and students aware of the capabilities of structural biology in research. To this end the Center plans to sponsor seminar speakers, support a journal club, and hold a bi-annual symposium in structural biology. In addition the Center will maintain a Web site and

will help to recruit to the University students and postdoctoral scholars with an interest in structural biology.

A major goal of the Center is to attract research funding to the University in the form of individual research grants and contracts, as well as programmatic grants, including training grants. The advisory committee will work with the Center director to coordinate these efforts and to make faculty aware of research opportunities and to assist in grant applications whenever feasible.

2. Justification for creating a center.

Currently, there exists a Structural Biology Working Group including faculty from the College of Medicine, the College of Agriculture, the College of Arts and Sciences, and the College of Engineering. In addition faculty from U of I and ECU interact with this group. The Center will further facilitate the interactions among these faculty, provide a framework for the development of new interdisciplinary courses in structural biology, assist with the recruitment of graduate students with special interests in structural biology, provide and maintain appropriate facilities, provide support and expertise for new research initiatives including program project grants, and provide opportunities for undergraduate, graduate and postdoctoral training in this emerging field.

3. Faculty leadership

At the present time, Professor Louis Hersh of the Department of Biochemistry serves as interim director of the proposed center.

4. Reporting relationships

The Center will report to the Vice President for Research.

5. Staff and facilities requirements.

The Center for Structural Biology will house a core lab for protein production, purification, and crystallization. Specialized equipment will be available for large-scale fermentation and rapid protein purification. A state-of-the-art macromolecular X-ray data collection facility consisting of an X-ray generator and image plate detector under the control of a computer workstation will be available for use through the Center. In addition, a cryostat allows data collection at cryogenic temperatures. The equipment is housed in a humidity-controlled room equipped with a small shop for maintenance and repair. There are computer

facilities with a total of seven Silicon Graphics workstations optimized for high-speed graphics, which will be used by Center members. A fast, local network that allows for rapid transfer of data connects these machines.

The University's participation in a macromolecular X-ray beamline at the Advanced Photon Source (Argonne National Laboratory) will be administered through the Center. The Center is also affiliated with the Biomolecular NMR Facility, which houses a 500MHz nuclear magnetic resonance spectrometer.

6. Funding.

Following a three-year period of partial funding by the University (\$60,000 per year) the Center will be supported through extramural funds. The University funding, which has been approved and budgeted by the Vice-President for research, will be used to support a technician and supplies for the core laboratory.

7. Potential for generating extramural funds

This Center is expected to generate new extramural funding. The current informal incarnation of the Center has already attracted major funding in the form of a grant of over \$1 million dollars from the National Science Foundation-EPSCoR program. A major mechanism for attracting further funding will be through collaborations involving faculty from various sectors within the University. In the short time since inception of the current working group, numerous productive collaborations have already been established among research groups from different sectors. These collaborations are expected to result in both new and renewal grant applications to the National Institutes of Health and the National Science Foundation, as well as to private foundations such as the American Chemical Society, the American Cancer Society, the American Heart Association and the Burroughs Wellcome Fund.

Physical resources provided by the Center will help faculty enhance their potential for generating extramural funding. Examples of such resources have already been mentioned. The core laboratory provides the facilities and expertise required for faculty to prepare and crystallize biological macromolecules and complexes. These crystals can then be used for structure determination in the X-ray diffraction laboratory located in the Department of Biochemistry.

The establishment of the Center will provide a more formal organizational structure through which Center faculty can apply for both Training and Program Project Grants from the National Institutes of Health, as well as similar programs

through other organizations (*e.g.* the Burroughs Wellcome Fund). Coordinating faculty experienced in structural biology within the Center will make the Center an ideal recipient for an National Institutes of Health Training Grant. Such a grant will allow the Center to train and support a number of graduate students and postdoctoral researchers, thereby increasing and enhancing the structural biology and related research being carried out at the University.

The Center will provide the leadership and organization required to apply for program project funding from the National Institutes of Health and National Science Foundation. Such funding would take the form of a series of related grants, within the field of structural biology, submitted as a joint application by a number of faculty associated with the Center. When future equipment needs arise, the faculty associated with the Center will also be well poised to apply for equipment grants from the National Science Foundation and National Institutes of Health.

As Center faculty accrue grants and contracts, the awards will be listed in the UKRF summary under their respective departments holding their primary appointments. Indirect costs will be distributed according to the percentages listed on the Internal Approval Forms.

8. Other proposed benefits

This Center will provide an invaluable resource for the Commonwealth of Kentucky: it will be the only significant structural biology resource within the Commonwealth. As such, the Center will aid in the development of biotechnology industries within the Commonwealth and will prove to be an invaluable aid to such companies once established.

One way in which the Center has already benefited the University is attracting and training students. The Center advertises for graduate students and has already attracted a number of students to the Biochemistry Department graduate program, including a MD/Ph.D. student. The Center has also supported a number of undergraduates in a summer research program as well as a number of University graduate students. Undergraduates have the opportunity to do research with Center faculty for credit during the fall and spring semester.

The Center has available physical resources, such as the core laboratory that could aid researchers within the University and at other Commonwealth institutions thereby helping to stimulate research throughout the region. Faculty from Eastern Kentucky University have already taken advantage of the core

laboratory facilities. A development that will further stimulate research activity in the Commonwealth is the involvement of the Center in a consortium of southern universities formed to construct a beam line facility at the Argonne National Laboratory Advanced Photon Source. This facility will be administered through the Center and should prove to be an invaluable resource to crystallographers associated with the Center, allowing for more accurate and timely determination of macromolecular structures.

The proposal has been reviewed and approved by the Acting Vice President for Research, Senate's Committee on Academic Organization and Structure and the University Senate Council.

Note: If approved, the proposal will be forwarded to the Provost to be scheduled for Board consideration