

Final Report of the Committee to Review Proposals to the 2008 Ohio Research Scholars Program of the State of Ohio

Committee to Review Proposals to the Ohio Third Frontier ORSP Program

Board on Life Sciences
Division on Earth and Life Studies

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May 5, 2008

Lt. Gov. Lee Fisher
Chair, Third Frontier Commission
Ohio Department of Development
77 S. High Street
Columbus, OH 43215-6130

Dear Lt. Gov. Fisher:

This letter details the work of and transmits the final report of the Committee to Review Proposals to the 2008 Ohio Research Scholars Program of the State of Ohio. This activity was supported by a contract of the Ohio Department of Development (ODOD) with the National Academy of Sciences and was performed under the auspices of the National Research Council's Board on Life Sciences and Aeronautics and Space Engineering Board.

The Ohio Research Scholars Program has as its stated goal to “strengthen and increase the number of clusters* of research excellence led by Ohio’s academic institutions that support regional economic priorities.” The program objectives go well beyond the recruitment of individual star academic performers to Ohio and incorporate the additional aims of achieving critical mass in particular areas of research—thereby giving Ohio unique competitive advantage in those areas—and of choosing those areas of research that would also contribute to the regional economic priorities of the state and build on previous state investment in research.

Applicants were asked to characterize their proposed research clusters on a number of criteria, including: their current reputation, how their cluster ranks against national and international competitors in the specific research area, their history of and plans for collaboration, their current staff and graduate students, the adequacy of their institutional support and infrastructure, their integration with Ohio’s regional economies, and their development and commercialization relationships. Applicants were further asked to describe their research and academic goals, their growth plan, how the proposed positions would contribute to the success of the cluster, how candidates would be recruited and how the cluster would be led. Applicants were also asked to describe how their cluster contributed to one or more regional economies, how the positions requested would improve the cluster’s commercialization potential, and to detail past commercialization experience and define a process for ongoing engagement with

* A cluster is defined in the program’s Request for Proposals as: “a critical mass of distinguished and highly productive faculty and researchers, quality graduate students, infrastructure, and robust academic, business and government collaborations that have led to the attainment of international prominence in research and commercialization.”

industry and the investment community. Finally, applicants with previous funding from the Third Frontier Program (TFP) were asked to describe their performance on those grants and all applicants were asked to discuss how their proposal related to prior TFP investments.

The state invited proposals in 5 focus areas: advanced materials, biosciences, instruments-controls-electronics, information technology and power and propulsion (including Advanced Energy) and all five areas were represented in the 23 proposals submitted in response to the state's Request for Proposals (RFP). Applicants could request a minimum of \$2.5 million for a single endowed position and a maximum of \$50 million; the submitted proposals indeed covered that entire range, with the smallest proposals requesting a single endowed position and the largest requesting 12.

At the request of the state of Ohio, the National Research Council convened a committee of experts to consider the applications submitted in response to the state's Request for Proposals. The committee of 25 included 7 members of the National Academies (1 from the National Academy of Sciences, 5 from the National Academy of Engineering and 1 from the Institute of Medicine). Committee members were chosen not only for their expertise in the subject areas represented by the 23 applications but also for their experience in establishing or leading research clusters and in the commercialization of research results. Many of the committee members have first-hand experience with recruitment of world-class research scholars. Seven have spent a substantial portion of their careers in the private sector. Proposals were grouped into two general categories of biosciences and engineering/physical sciences, and a co-chair was appointed for each category: Bradley W. Fenwick for the biosciences and T.W. Fraser Russell for engineering. The biographies of the co-chairs and all of the committee members can be found in Appendix C.

The process used by the committee to review the proposals was as follows: each proposal was read by a primary and secondary reviewer and scored against each requirement in the RFP. At its first meeting, in Washington, D.C. on March 19-20, the engineering and biosciences subcommittees met separately and discussed their group of proposals in detail. Primary reviewers and secondary reviewers briefed the rest of the subcommittee on each proposal and presented their evaluations. The subcommittee asked questions and discussed each proposal's strengths and weaknesses. Stephen Berger, who served as a volunteer consultant to the committee, provided the committee with information on the performance of the various applicants on previous TFP funded projects. On March 20, the two subcommittees met and shared their decisions about which of their subgroup proposals should be the subject of follow-up interviews. Nine proposals were chosen, 5 from the biosciences and 4 from engineering/physical sciences. The committee then agreed on what follow-up questions should be forwarded to each applicant.

On April 9-10, 14 members of the committee traveled to Columbus to meet with groups representing 9 proposals for follow-up interviews. Each group was given 30 minutes to address the committee's questions, followed by 15 minutes of questions from the committee. On April 10 the committee met to finalize its recommendations.

The task of determining which of these extremely diverse proposals best met the wide-ranging objectives of the RFP was a challenging one. It was perhaps inevitable that no proposals would stand clearly above all others in every single criterion. Some proposals had strong scientific teams, but little potential for commercialization or for enhancing Ohio's regional economies. Others had substantial ties to important Ohio industries, but presented plans for enhancing their research teams that were deemed unrealistic or poorly focused. Still others presented interesting collaborations with considerable scientific and commercial potential, but

very little track record of success. The RFP itself provided no guidance to the committee as to which of its many criteria should be given greatest weight by the committee. It should be noted that one of the review criteria posed a particular problem for the committee. The panel took seriously the need to evaluate applicant's productivity resulting from prior Third Frontier Program funding and fully recognized the importance of a demonstrated track record of leveraging these investments to produce sustainable new resources. Mr. Berger was extremely helpful in answering the committee's questions. However, the panel had doubts about the validity of data that were provided because of the methodology that was used to generate project-specific return on investment information. There was substantial skepticism as to whether the "return on investment" metrics being reported by the applicants genuinely reflect the marginal return that can be attributed specifically to Third Frontier funding. As a result, the committee's ability to evaluate proposals on past performance was diminished. If this criterion is included in future RFPs, the panel recommends that Ohio reevaluate the methodology it has been using such that the value and economic return of previous and any future investments are more credibly measured.

Five proposals impressed the committee as having presented especially strong cases for how the new positions requested in their applications would strengthen their research cluster. These proposals also convinced the committee that their recruitment plans were credible and that they had adequate structures in place for coordination and leadership of the resulting larger group. Each of the proposals has significant commercial potential or substantial ties to important regional industries or both. Those that have received Third Frontier funding in the past have been successful and each has the potential to build on or complement previously funded TFP projects. A brief description of the strengths of these proposals follows, more detailed reviews will be found following this letter. The committee considered these 5 proposals as being essentially equivalent in the degree to which they met the standards set forth in the RFP and are presented here not in rank order but in order by their proposal number.

ORSP 08-007 Research Cluster on Surfaces in Advanced Materials

This proposal is for funds to support a research cluster on the science of soft matter interfaces (RC-SAM). The effort will be organized jointly by the Liquid Crystal Institute (LCI) at Kent State University and the materials research community (Physics and Macromolecular Departments) at Case Western Reserve University. The record of commercialization through spinoff companies of the applicants is particularly noteworthy. The committee was also very impressed by the commitment of the cluster's industrial partners. The researchers involved in the effort are the top in their fields, with a clear history of collaboration. The science being pursued is of critical importance to Ohio's economy, and the proposed goals are reasonable and achievable.

ORSP 08-012 Intelligent Propulsion and Advanced Life Management Systems

This proposal aims to accelerate the growth of an existing cluster of research competence at University of Cincinnati in power and propulsion in three focus areas: intelligent control and thermal management of adaptive power and propulsion systems, advanced energy sources for low emissions, and system and components prognosis and life management, by recruitment of three ORSP Scholars. The committee was particularly impressed by the level of enthusiasm and commitment expressed by the cluster's industrial end-users. The research team operates extensive experimental research facilities, including modern diagnostic equipment. The group

collaborates exceptionally well with Ohio industry and government research laboratories as well as with other universities.

ORSP 08-016 Center for Innovative Immunosuppressive Therapeutics

This application proposes the establishment of the “Ohio Center for Innovative Immunosuppressive Therapeutics” (OCIIT). The center presently counts as members twenty investigators drawn from the faculties of the University of Toledo (UT) and Case Western Reserve University (CWRU) and from two collaborating companies. Particularly impressive was the superb organization proposed for the center and the approach proposed for filling the requested positions. In addition to exceptional organization, this proposal is viewed as having excellent leadership and the potential to have a profound impact on the academic strength of the lead institution and of the region. Funding would create the opportunity for early entry in an area of emerging importance, with potential to reach international prominence. These strengths are matched with what appear to be reasonable goals and objectives, particularly the development of novel therapeutics for suppression of immunity.

ORSP 08-019 Research Cluster for the Development and Evaluation of Spinal Implants

This proposal is for funds to support the development of a Spinal Cluster based on collaboration between the University of Toledo and Cleveland Clinic’s Center for Spine Health and Clinical Center for Tissue Engineering. The proposal seeks to accomplish these goals by recruiting a new faculty member to be housed at the University of Toledo in Biomedical Engineering, with specific expertise in nanotechnology. The scientific team is of high quality at both partnering institutions and the research areas they encompass are synergistic. The Spinal Cluster will build on a long history of commercialization activities by the faculty at both institutions. The committee does not doubt that this Cluster will be successful in rapidly transferring appropriate technologies to Ohio companies. Overall, this is an outstanding program, which should be successful in achieving its goals. The two institutions are equal partners in the program and the choice of endowed chair will help cement the partnership. The orthopaedic device industry is growing and the aging population makes spine a target for the development of new therapeutic strategies. This team has the potential to be the leader in this area of biomedical research. Ohio companies can only benefit.

ORSP 08-023 Northwest Ohio Innovators in Thin Film Photovoltaics

This proposal describes a plan to strengthen a photovoltaics cluster in the state of Ohio by leveraging existing research activities at the University of Toledo in partnership with the Bowling Green State University. The goals identified by the proposal are consistent with the National Road Map for the Photovoltaic Technology as outlined by the Department of Energy. The team has reasonable credentials in photovoltaic technology and with the addition of five faculty members it could develop into an internationally renowned team. It is in the strategic interest of the state to be involved in this emerging photovoltaic technology as alternative energy sources will play major role in the future economy. The University of Toledo is particularly well situated in the field of photovoltaics to have a meaningful and lasting impact on the state of research and development in Ohio.

The committee found two additional proposals to have responded to the RFP sufficiently well to justify listing them as potentially worthy of consideration for funding. These proposals

had weaknesses that prevented them from being included in the above group, but were sufficiently responsive to the RFP to bear special mention.

ORSP 08-002 Innovation Institute for Product Reliability and Optimization

This proposed effort will establish a research cluster on reliability-based design optimization (RBDO). The effort will build on an existing research center at Wright State University and will be led by faculty who are already collaborating on research in the area. State funding will be used to endow two research scholar positions. One will be an expert on applying RBDO to the design of products, and the other will be an expert on applying RBDO to the design of manufacturing processes. Funding will also be used to construct facilities for the cluster and to hire staff and graduate students at the participating universities. RBDO is an important research area, and there are no existing centers that focus on this topic. The core faculty have an excellent record of working with industry in Ohio and providing value to them in terms of better products and manufacturing processes over a long period of time. The chief weakness of this proposal is the plan to stagger the hiring of the two scholars. The merits and reasoning behind this decision were not made sufficiently clear to the committee. Despite this weakness, the proposal is very strong and if funded would benefit the state of Ohio.

ORSP 08-038 Orthopaedic Research Cluster of Northeast Ohio

This application proposes the formation of the Orthopaedic Research Cluster of Northeast Ohio (ORCNEO) in the interface area of musculoskeletal biology, polymer/material science and clinical orthopaedics. The Orthopaedic Research Cluster could be a valuable asset to Ohio. The caliber of current cluster members is high and the individual institutions excel in their own domains. The plans for establishing and coordinating cluster activities had potential, but the panel felt that the group was not fully integrated. In addition, creating synergy with the addition of five additional members at four different institutions was seen as a major challenge and it was felt that so many additional members might dilute the plan's focus. Currently Ohio is strong in biopolymers and the biosciences and the new Orthopaedic Cluster of Northeast Ohio could support the development of a new industry of ortho-polymers. The committee felt strongly that this cluster deserves encouragement and could possibly attain some of their goals with fewer, but strategically justified, additional positions.

The remaining 16 proposals each contained significant deficiencies in meeting the requirements of the RFP. In general, these deficiencies fell into three categories. First, for some proposals the committee did not believe that the addition of the requested scholars would be sufficient to propel the proposed research cluster to a position of national or international prominence. Second, some of the proposals failed to make a case that there was a significant commercial opportunity or synergy with Ohio industry. Finally, several of the proposals failed to present a credible plan for how the requested scholars could be recruited and, more importantly, integrated into a functioning "whole" that would be greater than its parts. The latter deficiency was especially noticeable in the largest proposals which asked for up to a dozen endowed positions. Most of these proposals were in areas of research in which Ohio is already very strong and nationally known. The stated purpose of the ORSP being to boost these programs to the next level—that is, competitive with the best programs in the world—these proposals faced a challenge in making a case for the difference that the new positions would make in the strength of these research areas in Ohio. The committee, generally speaking, was not concerned about the size of

the recruitment packages, which were considered to be competitive. There was considerable skepticism that so many researchers could be recruited as quickly as proposed. But the more important concern was that simply adding several new researchers, however individually successful, would not tangibly strengthen these research areas unless the program had in place a compelling vision for how the new and current researchers would be motivated to work cooperatively. For the committee to be convinced that a program could successfully integrate such a large number of world-renowned researchers (each of whom would bring with him or her an extensive, existing research program), it expected to see a management plan with clear evidence that the current program members were willing to work together, in fact even give up a certain amount of autonomy or share resources in a significant way, in order to reach bigger goals collectively. Instead, these proposals generally presented an argument along the lines of “more of the same will produce more good results”, which the committee found to be unresponsive to the transformative goals of the RFP. It is possible that a smaller number of research scholars could have a catalytic effect on, or fill key gaps in, these already strong research clusters, but insufficient information is given in the proposals for the committee to recommend that any of them be considered for funding of a smaller number of positions.

The committee wishes to thank the state of Ohio for the opportunity to review these proposals and to provide its recommendations as to which of the proposals best met the requirements set forth in the RFP.

Sincerely,

Bradley W. Fenwick
Co-chair

T.W. Fraser Russell
Co-chair

cc: Warren Muir
Frances Sharples
Marcia Smith

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ORSP 08-001
Cluster of Excellence in Nano-Scale Multifunctional Materials
Wright State University

Proposal Summary:

This track two proposal aims to form a center in Ohio with a focus on research, development and commercialization of Nanoscale Materials for Energy and Environmental Applications. The proposal is led by the Wright State University (WSU) in partnership with Ohio University (OU) and Central State University. The proposal requests support for three faculty positions in the areas of:

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$8,620,000	\$3,029,885
Operating Non-ERP	\$2,809,547	\$12,918,696
Capital Non-ERP	\$11,014,280	\$7,547,200
Subtotal	\$22,443,827	\$23,495,781
TOTAL	\$45,939,608	

nanomaterials for energy advantage at WSU, nanomaterials for environmental improvement at WSU and nanosensors/nanodevices for energy and environment at OU. The proposed center would leverage efforts of the Center for Multifunctional Polymer Nanomaterials and Devices, the National Composite Center, the Third Frontier program in Fuel Cells, and the University Clean Energy Alliance of Ohio.

Detailed Review:

- **Quality of Research Cluster**

The principal investigator and the team members have done an excellent job of bringing together large number of diverse organizations and faculty members to address problem areas in energy and environment. The proposed cluster includes thirty eight faculty members from three universities, participation of four non-profit research commercialization and economic development centers, several industries and two federal laboratories. The proposal aims to develop synergy with federal laboratories like NASA-Glenn and the Air Force Research Laboratory (AFRL). New capabilities are planned to be built to address an important area of research in energy and the environment with significant commercialization potential. However, the proposal focus needs to be better defined and specific research areas that will be pursued should be addressed. The proposal requires fine tuning in terms of the specific research thrusts that would be pursued to provide world class leadership. Additionally, there is a significant overlap with the research activities carried out at the Center for Multifunctional Polymer Nanomaterials and Devices.

- **Growth Plan and Requested Positions**

The proposal calls for faculty positions in the areas of nanomaterials for energy advantage, nanomaterials for environmental improvement and nanosensors/nanodevices for energy and

environment. For faculty position under nanomaterials for energy advantage, the listed faculty expertise is too broad, indicating no strategic direction. No new faculty expertise details are provided for new hire for nanomaterials for environmental improvement. No comparison is made with external groups. Also, the current faculty participants have limited experience in the energy and environment technology area. The requested equipment needs to be better tied with specific research thrusts. The proposal needs more details on how the collaborative efforts would be carried out and its management structure. No details are given as to how the multifunctional nanomaterials help energy and environmental research areas.

- **Regional Economies and Commercialization**

Both Wright State University and Ohio University would use their technology transfer offices to assist in commercialization of the technology. The proposal uses generic terms to describe the potential for economic impact, failing to provide specific details. Letters of support from three Ohio industries are included; however, stronger industrial support would be helpful in commercialization. Sufficient details have not been provided on economic impact of the proposed center and commercialization plan.

- **Relationship to the Third Frontier Program**

The proposal provides some detail on the Wright Center of Innovation called the “Center for Multifunctional Polymer Nanomaterials and Devices,” which is led by Ohio State University with Wright State University as a participant. The proposal also provides details on the links between various other TFP investments, but fails to give enough detail on the successes in commercialization and job creation based on these investments, and, critically, the degree to which Wright State University has in the past been a major component in the success of this program, or, with ORSP funding, could significantly improve its ability to take advantage of the resources of the Wright Center.

- **Cost Share and Letters of Commitment**

The cost share amounts proposed by Wright State University, Ohio University and Central State University are reasonable. The letters of commitment are convincing and supportive, especially the letters from AFRL and NASA-Glenn.

Review Summary:

A good effort has been made to put together a diverse team of researchers from the university, national laboratories and industries. The committee fully appreciates the efforts made to put together such a large proposal. However, the proposed cluster of excellence in Nanoscale multifunctional materials needs to have a better focus and a more defined plan for its growth. Also, stronger industry ties would help the commercialization process. Initiation of the M.S. degree program in Renewable and clean energy and a multidisciplinary Ph.D. program in environmental science is noteworthy and provides education in the important fields of energy and environmental sciences. Building a partnership with the Nanoscale and Quantum Phenomenon

Institute at Ohio is a good idea to leverage the ongoing efforts at the partnering institute. However, more details are needed on specific collaborations that would be developed and how they will be managed.

ORSP 08-002
Innovation Institute for Product Reliability and Optimization
Wright State University

Proposal Summary:

The proposed effort will establish a research cluster on reliability-based design optimization (RBDO). The effort will build on an existing research center at Wright State University and will be led by faculty (at Wright State, University of Toledo, and Air Force Institute of Technology) who are already collaborating on research in this area.

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$5,324,000	\$3,888,119
Operating Non-ERP	\$1,627,909	\$8,324,459
Capital Non-ERP	\$6,155,243	\$1,645,000
Subtotal	\$13,107,152	\$13,857,578
TOTAL	\$26,964,730	

State funding will be used to endow two research scholar positions. One will be an expert on applying RBDO to the design of products, and the other will be an expert on applying RBDO to the design of manufacturing processes. Funding will also be used to construct facilities for the cluster and to hire staff and graduate students at the participating universities. Matching funds will be used to hire four other faculty to expand the research cluster.

Detailed Review:

- **Quality of Research Cluster**

RBDO is an important research area, and there are no existing centers that focus on this topic. The three core faculty are established researchers who have published scholarly books and articles on the topic. Their graduate students have been productive, won awards, and taken positions in both academics and industry. They also have a clear record of collaboration with government agencies (such as the Department of Defense, NASA, and the National Institute of Standards and Technology) and manufacturing firms (such as Caterpillar, GE, and GM).

The core faculty have an excellent record of working with industry in Ohio and providing value to them in terms of better products and manufacturing processes over a long period of time.

- **Growth Plan and Requested Positions**

The two research scholar positions are very appropriate for the scope and scale of the proposed research cluster. There is great potential for collaborations among them, the core faculty, and industrial partners. The plans for startup funds and GRA support for the two research scholar positions are appropriate and should make the positions attractive to potential applicants. In addition, Wright State has successfully hired world-class senior faculty in computer science and

engineering in the last five years. The research cluster's expected research milestones are realistic and appropriate.

The plans state that some GRAs, research staff, and equipment will be hired before the scholars, which limits the scholars' input but reduces some of their workload after their arrival. The process for selecting specific equipment will include input from the researchers and the industrial collaborators and will concentrate on equipment that supports the development and application of the RBDO approach in a variety of industries.

- **Regional Economies and Commercialization**

The activities of the proposed research cluster will be relevant beyond the Miami Valley to more than one Ohio regional economy. These activities are not intended to support any particular industry or to invent technology for commercialization. Instead, the requested funding will support research activities that are relevant to the entire range of Ohio firms engaged in product development and manufacturing, including advanced materials, aerospace, tool & die, machining, automotive, metals, medical, and energy. The proposers did not discuss applications to medical devices, however. The proposed research cluster will expand the capacity of the participating institutions to conduct RBDO research and applications to benefit Ohio firms.

- **Relationship to Third Frontier Program**

The group has no prior TFP funding. The proposal did clearly describe how the proposed research cluster is related to other TFP investments.

- **Cost Share and Letters of Commitment**

The cost share commitments are realistic and appropriate. The letters of support clearly describe how the collaborator will participate.

Review Summary:

This proposal meets the program requirements for a Track 2 research cluster. Unlike some other proposals, this research cluster is not tied to a specific industry in Ohio. The economic impact comes from improving the productivity and competitiveness of different industrial sectors of Ohio. The addition of two scholars (and other faculty and students) in this area can greatly increase the impact of this important research activity. However, a weakness of the proposal is the plan to stagger the hiring of the two scholars. The merits and reasoning behind this decision were not made sufficiently clear to the committee. Despite this weakness, the proposal is considered to be nearly as responsive to the RFP as the strongest five proposals and, if funded, would benefit the state of Ohio.

ORSP 08-003
Center for Research Excellence in Molecular Cardiovascular Innovation (CEMCI)
Cleveland State University

Proposal Summary:

This Track 2 proposal aims to create a Center for Research Excellence in Molecular Cardiovascular Innovation at Cleveland State University (CSU), which will coordinate with two previously funded initiatives: the Global Cardiovascular Innovation Center (GCIC, which includes Case Medical Center, Ohio State University, the University of Cincinnati, and the University of Toledo)

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$12,288,349	\$12,822,170
Operating Non-ERP	\$3,056,904	\$7,263,430
Capital Non-ERP	\$5,117,000	\$2,701,212
Subtotal	\$20,462,252	\$22,786,812
TOTAL	\$43,249,064	

and the Clinical Tissue Engineering Center (CTEC, a multi-institutional center based at the Cleveland Clinic that focuses on musculoskeletal tissue engineering) funded by the State of Ohio in 2006 and 2005 respectively. The proposal states that the new center would complement these initiatives by building on unique strengths of Cleveland State University: 1) research in cardiovascular repair and cardiovascular tissue engineering, which are not well represented in either the GCIC or CTEC; and 2) workforce development in bioscience research through careful coordination of this proposal with CSU's Choose Ohio First proposals.

To achieve these goals, the applicants propose to: 1) add four new endowed senior faculty positions (Endowed Research Scholars in Molecular Cardiovascular Innovation) at three institutions: one position at CSU in cellular and molecular biochemistry with a focus on cardiovascular repair, one position at CSU in cardiovascular biomedical engineering with a focus on tissue engineering, one position at Case Western Reserve University in cardiovascular stem cell medicine, and one position at Northeastern Ohio Universities College of Medicine (NEOUCOM) in cellular and molecular biochemistry with a focus on cardiovascular repair; 2) expand and update research space and instrumentation to support new research endeavors; and 3) coordinate activities with business and industry through close collaboration with regional commercialization experts to help identify commercial potential and obtain advice about commercial development.

Detailed Review:

- **Quality of Research Cluster**

The proposed center will build on the Cellular and Molecular Medicine (CMMS) program at CSU, which is spread across five departments in two colleges. There are currently 21 active research labs in CMMS, including 7 core faculty members who have been added since 2002. Research focuses mainly on the study of cellular and molecular bases of disease. The research

efforts are meritorious but fairly isolated and have not reached national recognition, a good reason to seek strengthening through the Track 2 Ohio Research Scholars Program.

The specific research areas to be developed are adult stem cells, inflammation, and apoptosis in relation to cardiovascular repair. Some internal efforts in these areas are cited, but they cannot currently be considered strengths at CSU. Most achievements discussed in the proposal reflect work outside Cleveland State University (e.g. at the Case Cardiovascular Center or the Cleveland Clinic). The proposal includes references to the affiliation of various researchers, but the text does not make a clear distinction between achievements at CSU versus external achievements. While this might be appropriate if a close partnership were already in place, this does not appear to be the case. In summary, there is no convincing case to support the unique strengths of the CSU in cardiovascular repair or tissue engineering, on which the proposal claims to build.

Three doctoral programs would be related to the center: Regulatory Biology, Clinical/Bioanalytical Chemistry, and Applied Biomedical Engineering, all collaborations with the Cleveland Clinic Lerner Research Institute. The application indicated that CSU's Ph.D. program in Clinical Chemistry is unique (the only U.S. accredited Ph.D. program in this area), but the proposal notably failed to leverage this unique strength of CSU in the proposed Center.

- **Growth Plan and Requested Positions**

The applicants appropriately identified benchmark institutions with high national ranking (Brigham & Women's Hospital, Mass General Hospital, and Johns Hopkins) and included proposed benchmarking criteria that were deemed to be appropriate. However, the proposal does not indicate as a baseline how CSU currently performs in relation to these criteria and is unclear about what actions and steps should be taken to reach these benchmarks. The efforts of collaborators, such as GCIC, are already above the benchmarks. The discussion assumes that association between CSU and highly ranked institutions will simply raise CSU to their level. This problem pervades the application, as most existing assets belong to other institutions (e.g. Cleveland Clinic), and it is not clear how value added to CSU will raise it to the level of the other components of the center.

Also unclear is what mechanisms will support collaboration between CSU and the other component institutions. The management plan for the collaborations is not well developed, simply mentioning periodic common meetings with a limited number of participants (a handful of senior members, including the newly endowed chairs). While some current inter-institutional collaborations are cited, such as ample evidence of productive collaboration between Case Western and Cleveland Clinic, the mechanisms that would extend such collaborations to CSU are not adequately discussed.

In addition, the recruitment packages for the requested positions are not sufficiently competitive and are not likely to attract preeminent scholars.

- **Regional Economies and Commercialization**

Besides forward-looking statements about the potential size of the market, the proposal does not contain specific plans to address commercialization, thus this is a weakness.

- **Relationship to Third Frontier Program**

As the proposal points out, the State of Ohio has substantial prior investments in tissue engineering through the Clinical Tissue Engineering Center at the Cleveland Clinic and in cardiovascular research through the Global Cardiovascular Innovation Center at Case. Thus, this proposal could potentially complement and bridge these two areas of research, and leverage these prior investments. However, the proposal fails to provide clear evidence that there is any current collaboration among the applicants and CTEC and GCIC, nor of firm commitments on the part of researchers at the CTEC or GCIC for cooperation or coordination of research in the future.

- **Cost Share and Letters of Commitment**

Product development and commercialization will rely on Cleveland Clinic Foundation Innovations Group (CCFI) and the University of Akron Research, both external to the center. The letters of intent do not contain firm commitments (e.g. amounts of effort/funds/resources they will make available) and have no description of the mechanisms of interaction between the center and these outside entities.

Review Summary:

The strengths of this proposal are mainly based on existing strengths of the Cleveland Clinic and CWRU, but how these strengths would be utilized to benefit CSU is not made clear. The benchmarking discussion does not indicate the current status of CSU and does not clarify how CSU will meet the benchmarks. The committee also did not find compelling evidence that the proposed use of funds would generate a vital new interaction between institutions, in large part due to inadequate evidence of specific commitments and of how collaboration would be managed.

OSRP 08-004
A Cyber Cluster for Innovation in Imaging and Knowledge Sciences
Wright State University

Project Summary:

This Track 2 project’s goal is to leverage core competencies at four centers – Wright State University, University of Cincinnati Children’s Hospital Medical Center, the Air Force Institute of Technology, and Miami University – in a cyber cluster to exploit informatics in knowledge modeling, knowledge management, visualization, and simulation against a set of tasks linked to five separate centers. These centers and related tasks are:

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$15,632,000	\$8,031,043
Operating Non-ERP	\$1,352,675	\$9,934,829
Capital Non-ERP	\$3,842,086	\$3,351,650
Subtotal	\$20,826,761	\$21,317,522
TOTAL	\$42,144,283	

- Computational Medicine Center – S1 Biological and Disease Related Knowledge, S2 Modeling Disease and Health Dynamics
- WSU Kno.e.sis Center – S3 Semantic Web and Services Computing
- WSU Interactive Systems Modeling and Simulation Laboratory – S4 Human Effectiveness and Visualization
- WSU Unmanned Vehicle Research and Information Exploitation Laboratory – S5 Defense Imaging
- WSU Assistive Technology Research Center – S6 Information Assurance and Security

The proposal calls for six endowed chairs, four at WSU and two at U.C. Children’s Hospital Medical Center. In addition to the above, Barco Inc., daytaOhio, LexisNexis, Miami University, Nanotek, Inc., and NCR Corp. are all collaborators on this proposal.

Detailed Review:

- **Quality of the Research Cluster**

This proposal is functionally responsive to the RFP. It documents areas of research that are quite well known in the U.S. research community, and the proposal is benchmarked reasonably well against U.S. competitors. The participants in this proposal have established reputations for collaboration in their field. However, there is less evidence that the participants have collaborated extensively among themselves in the areas of common interest. Several of the lead

investigators have national reputations in their field; for example, Prof. Amit Sheth has pioneered in Semantic Web Research. The leadership identified for each of the task domains rate highly in competencies in their respective fields.

An area of concern for the committee is the lack of clarity on infrastructure capabilities and needs. There is little capital investment in this proposal; what is there is intended for modest space expansion (additionally, the cost of \$500 per square foot appears excessive). The committee anticipates that the huge data sets envisaged with the computational demands of research and development of multiple and complex ontologies to support robust Semantic Webs will require major IT infrastructure investments. There are similar concerns on other tasks; e.g., infrastructure support for UAV Imaging in the knowledge context.

Endorsements from LexisNexis and NCR Corp. struck the reviewers as modest. For example, LexisNexis would be extremely well served by breakthroughs in Semantic Web technology. Other commercialization linkages went to very small firms and little regional potential was evident beyond the immediate collaborators.

The common elements across the six major tasks are fairly described in the proposal – knowledge management, knowledge modeling and simulation, and visualization. The individual centers appear competent within their focused areas. However, the task areas have little else in common and it takes a huge leap of faith to accept the proposal's assertion that there is cohesion among the tasks. Admittedly, commonality will be uncovered during the life of the cluster. There is little doubt that good work would be accomplished in most of these areas but it is doubtful that deep and meaningful collaboration across the full cluster will occur. Current status of Semantic Web technology does not appear to support its early use in the hard mission areas contained in this proposal – medicine and health, military imaging, information assurance, etc. The collaboration underway between Semantic Web experts and the Children's Hospital Medical Center is very encouraging and should be a major thrust of this cluster; albeit with full attention to major (structured) vectors in medical informatics.

- **Growth Plan and Requested Positions**

With the foregoing limitations in mind, and where goals are adequately focused, this review broadly accepts the goals as separately expressed. A few are entirely too broad; information assurance and security goals are far too broad and should be more sharply focused on major gaps within the cluster's domains (medical, biometrics for example). There is little doubt that the endowed chairs should be highly attractive to researchers outside the present community and those goals should be achieved. The targeted communities are appropriate. Funding requested should certainly be adequate to support the endowments as described.

- **Regional Economies and Commercialization**

There is evidence of prior success in start-ups and niche activities; however, this is more of a consulting than a product experience. The proposed advisory board would be helpful, particularly if regional commercial interests were represented. The patent success outlined in the proposal is impressive but lacks linkage to actual results in the marketplace.

- **Relationship to the Third Frontier Program**

The connections of elements of this proposal to earlier Third Frontier Program activities are well described. At least one of the collaborators is a result of the TFP. Although the Third Frontier Program base for this proposal is rather thin, the importance of the work to the state's economic well being appears to be appreciated. A process for engagement with economic interests is not evident although the committee understands that the research areas are very diverse.

- **Cost Share and letters of Commitment**

Costs are borne almost entirely by WSU and UCCMC. Cost sharing by commercial companies is very small, possibly suggesting low expectations. The funding plans are adequate with the exception, noted above, of the capital investments.

Review Summary:

This proposal represents a serious effort by WSU, its partners and collaborators to be responsive to the RFP. It is well written and quite detailed. The focus efforts are separately appealing and worthy of serious research efforts. The endowment strategy is very robust and aggressive and obviously reflects a deep sense of need by the current leadership in these fields. Industry support and linkages are weak, of little surprise given the absence of symmetry across the domains. Regrettably, the proposal lacks sufficient credibility as an integrated and cohesive cluster; and this accounts for most of the shortcomings elsewhere in the proposal.

ORSP 08-005
Calamityville Fusion Center
Wright State University

Proposal Summary:

This Track 2 proposal, led by Wright State University (WSU) in partnership with Miami University (MU), aims to develop a world-class research cluster, the Calamityville Fusion Center (CFC) that will work to define, design, and build disaster-resilient communities. Focused on disaster preparedness, the proposal aims create an ideal environment for integration of training, product testing and research. The applicants are seeking ORSP funding to augment disaster preparedness research, in conjunction with first responder training activities being carried out at the Owens Community College Center for Emergency Preparedness.

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$15,780,002	\$11,270,909
Operating Non-ERP	\$4,494,998	\$17,592,146
Capital Non-ERP	\$9,225,000	\$2,136,945
Subtotal	\$29,500,000	\$31,000,000
TOTAL	\$60,500,000	

The applicants propose that the new research cluster will team with a variety of business partners and with the Air Force Research Laboratory (AFRL) at Wright Patterson Air Force Base, which has expertise in sensor technology and simulation. Gap analysis conducted by the group identified a number of important shortfalls in current disaster preparedness and response efforts. To address these gaps, the proposal includes construction of a \$15M Calamityville Tactical Laboratory (C-TL) and recruitment of five new academic scholars, four at WSU and one at MU. These scholars will focus in: 1) emergency and disaster medicine; 2) human effectiveness; 3) sensors technology; 4) information technology and systems engineering; and 5) logistics and supply chain management.

Detailed Review:

- **Quality of Research Cluster**

The applicants have demonstrated considerable prior experience in training, along with some experience in product testing, but do not have an established track record in the proposed areas of research. This is consistent with the Track 2 classification of the proposal. The committee was impressed by the applicants' analysis of knowledge gaps, which was comprehensive and accurate. The applicants offered a relatively unique approach to addressing these gaps, as evidenced by the specialization areas that they chose for the new scholars.

However, one of the major weaknesses of this proposal is the lack of coordination between the various elements of the research cluster. The proposed partnerships between WSU, MU, AFRL, and industry were not fleshed out, and there was no demonstration of past collaboration or

compelling evidence for future collaboration among these players. The link between WSU and the planned single research scholar at Miami University, the sensors experts based in the AFRL/RYSensors Directorate and the shared industry partners was very tenuous. In addition, insufficient detail was provided with regard to how the varied elements of the research cluster would use the C-TL to full advantage.

The choice of institutions/centers for benchmarking of research and training activity was comprehensive but the discussions of these benchmarks contained important factual errors. For example, the proposal neglected to mention important industry partners of some of the benchmarked centers, which would have affected the analysis of those centers.

The applicants point out that the proposed center would be unique compared to similar initiatives across the country because it would be led by emergency medicine physicians, rather than leaders with technical (non-medical) expertise. The committee agreed that the leadership is unique, but was not convinced that this unique expertise would be leveraged effectively in the proposed center. Overall, the committee felt that the quality of the proposed research cluster suffered because of its diffuse and unintegrated nature. The application could have been significantly strengthened if the proposed research cluster was more focused; for example, on the science of disaster medicine in the context of emergency response, which would have built more effectively on the unique leadership of the center.

- **Growth Plan and Requested Positions**

A well-conceived growth plan supported by clear goals and objectives was a notable strength of this proposal. The leadership reputation of the principal investigator, coupled with leveraging of financial resources and institutional support, suggests a strong long-term commitment to these goals. The recruitment process is well-defined, with packages that are reasonable for attracting the caliber of talent described.

The committee was not convinced, however, that the requested positions would help form an integrated research cluster. While the various new scholar positions would be individually well-placed within their host schools and departments, significant concerns were raised regarding the true extent of multidisciplinary collaboration among such disparate elements. The scholars would be spread out among different departments with no specific plans for inter-scholar collaboration. The specialization areas of the scholars do not overlap, which might have helped foster collaboration in the absence of a specific management plan, and it is not evident how their research would feed off one another. Although these positions would independently add value to their institutions (primarily to WSU), the committee did not see evidence of or potential for significant synergy.

- **Regional Economies and Commercialization**

The proposal projects a five-year economic impact in excess of \$500M and 600 new jobs. While the applicants have included a number of regionally-based companies, the integration of these companies and prospect of commercialization is relatively weak. A few examples of potential products with commercialization potential are cited, including ventilators and cots, but generally

remain in exploratory stages. Commercial partners were not integrally involved in the discussions leading up to the proposal, raising important questions about the true extent of future collaboration with industry. The committee does not feel that the proposal gives sufficient evidence of robust relationships with industry.

- **Relationship to Third Frontier Program**

The proposal gives a sufficiently detailed review of past performance on prior TFP awards to WSU and daytaOhio. The proposal also highlights the potential contribution of IDCAST to the CFC in the area of layered sensing, research that has received prior TFP investment. While IDCAST has enjoyed a relatively high level of recent success with WSU as a collaborative partner, the extent of the applicant's participation is not detailed. WSU does not appear to have been integrally involved in the IDCAST successes.

- **Cost Share and Letters of Commitment**

Cost share commitments are realistic and letters of support meet the requirements established by the RFP.

Review Summary:

The applicants identify and describe important areas of research that are required to develop disaster resilient communities by establishment of a unique disaster preparedness and response research center in Ohio. While the applicants have demonstrated considerable experience related to training and should be praised for their efforts to date, a major concern with this proposal is the lack of convincing plans for integrating the varied elements within the proposed research cluster and building a synergistic center in areas where the applicants do not have an established track record. The committee felt that the research focus was too diffuse and that the proposed scholars were not well integrated with each other or with the Calamityville Tactical Laboratory. Thus there was not sufficient evidence that the state's investment would lead to any real collaboration or value added outside of WSU. A research cluster focusing on any of the primary areas identified would have a greater likelihood of achieving the successful and synergistic collaboration that is the goal of the Ohio Research Scholars Program and would have been considered more competitive. The designated name of the project, "Calamityville," also lacked general appeal. While our comments on this proposal should not be read as detracting from the importance of any of the individual areas of proposed research, the proposal as a whole was not deemed sufficiently competitive to be recommended for consideration for funding.

ORSP 08-006

**Industrial Applications of Mathematical Analysis in Medical and Information Technology
Kent State University**

Proposal Summary:

This Track 2 proposal aims to create a collaborative network unifying Mathematics departments at Ohio universities (Kent State University, Case Western Reserve University, Ohio University, Bowling Green State University) in a joint enterprise with Philips Healthcare. A key component of the proposal is to add an outstanding Research Scholar in Applied Analysis to the faculty at Kent State University to increase the international prominence of that university's Banach

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$2,500,000	\$625,000
Operating Non-ERP	\$328,777	\$2,203,777
Capital Non-ERP	\$0	\$0
Subtotal	\$2,828,777	\$2,828,777
TOTAL	\$5,657,554	

Center and to expand its activities to innovative industrial interactions. In addition, funds are requested to hire a postdoctoral researcher to support the work of the Research Scholar and to collaborate with Philips Healthcare. Matching funds will provide faculty time to devote to the project and provide for doctoral students to support the research of the lead researchers. The collaborative effort is based on research in Applied Analysis with special emphasis on problems related to Medical and Computed Tomography. The main goal of the research cluster is to establish collaborative work between the above mentioned universities and Philips Healthcare, which they envision will be catalyzed by the new scholar.

Detailed Review:

- **Quality of Research Cluster**

The analysts identified in this proposal are strong mathematical researchers with solid records in securing external funding and advising capable Ph.D. students who have gone on to successful careers in academia and/or business. The interactions of the groups at the various universities, either through the Banach Center or otherwise, are well established and well recognized.

What is lacking in this proposal is a description of significant interaction with the industrial partner, Philips Healthcare that could lead to commercialization. The main ingredient of the proposed interaction involves two student internships per year at Philips Healthcare. While this will be very beneficial for the students and it could enhance the discussions between the researchers at the universities and those at Philips, any specificity of commercialization is missing. Since this is missing, the integration of the academic research efforts with the state's regional economies is not appropriately worked out in the proposal.

In addition, benchmarking has not been adequately addressed. While the proposal points out the strengths of the analysts at the various universities and separately the strengths of Philips Healthcare, there is no benchmarking with any cluster or similar entity that combines the strengths of both.

- **Growth Plan and Requested Positions**

Catalyzing the envisioned collaboration between these institutions and Philips Healthcare is a challenging task for the new scholar, and the committee was skeptical that the appropriate caliber of talent could be recruited for this position. The growth plan was not well justified, especially given the lack of appropriate benchmarking to identify the expected outcome of the investments of the state of Ohio.

- **Regional Economies and Commercialization**

As discussed above, the proposal fails to satisfactorily connect the research groups at the universities with Philips Healthcare. Although new tomographic methods are mentioned as the potential product, there is no credible commercialization plan presented. The committee was also concerned that the chosen area of research, CT reconstruction, is not likely to have a major impact on any commercial application, because vendors of CT instrumentation such as Philips have aggressive research and development efforts that fully encompass high priority aspects of their products, such as image reconstruction, and these developments remain proprietary within the company. The applicants would need to provide much more substantial evidence of collaboration and commitment from Philips Healthcare to support the idea that the vendor is likely to take advice on CT reconstruction from its academic partners.

- **Relationship to Third Frontier Program**

The group has no prior TFP funding.

- **Cost Share and Letters of Commitment**

The cost share commitments are realistic, but the financial commitment from Philips Healthcare is rather minimal, consisting only of matching funds to support student interns from the academic institutions. In general the letter from Philips does not give confidence in their commitment to this effort.

Review Summary:

The applicants have a strong record of achievement, which is an important strength of the application. However, the proposed effort does not have great potential as a response to the ORSP program, because the proposal fails to address some of the key issues in the request for proposals, such as benchmarking and the potential for economic impact and commercialization. Economic impact would be particularly challenging for a cluster with this research focus because

of the nature of CT reconstruction, which is proprietary with instrumentation vendors. Therefore, the committee did not find this proposal to be competitive.

ORSP 08-007
Research Cluster on Surfaces in Advanced Materials (RC-SAM)
Kent State University

Proposal Summary:

The proposed effort will invest \$15.6M in State funds to establish a research cluster on the science of soft matter interfaces (RC-SAM), matched by an equal contribution from University sources. The effort will be organized jointly by the Liquid Crystal Institute (LCI) at Kent State University and the materials research community (Physics and Macromolecular Departments) at Case Western Reserve University. There are a variety of current

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$10,589,000	\$7,238,099
Operating Non-ERP	\$1,237,489	\$6,839,140
Capital Non-ERP	\$3,852,000	\$1,601,250
Subtotal	\$15,678,489	\$15,678,489
TOTAL	\$31,356,978	

soft materials research collaborations between KSU and CWRU. State funding will be used to endow two research scholar (faculty) positions at each institution. KSU proposes to add an experimental physicist and a computer simulationist studying soft matter interfaces. CWRU proposes two hires (one senior) in advanced materials science with a focus on soft surfaces.

Detailed Review:

- **Quality of Research Cluster**

The science of soft matter interfaces is a rapidly evolving research area that, on the one hand, generates some of the most exciting interface science, and, on the other hand, addresses key issues in technologies ranging from tires to organic electronics to biomaterials development.

The LCI is widely regarded as the world's leading comprehensive liquid crystal research and development center, especially with respect to its efforts to promote technology transfer and industrial interaction. CWRU has outstanding expertise in soft matter science, ranging from the theoretical and experimental study of liquid crystals to colloid and polymer science. The LCI/CWRU collaboration is currently informal but has been funded in the past as an NSF Science and Technology Center. The two groups currently have broad federal and industrial research support in soft matter science and technology and the collaboration has an exceptional record of industrial interaction.

- **Growth Plan and Requested Positions**

The requested funding level is consistent with the scope and scale of the proposed research cluster. KSU proposes to add an experimental physicist and a computer simulationist studying soft matter interfaces. CWRU proposes two hires (one senior) in advanced materials physics with a focus on surfaces. The capital request (~\$3.8M + ~1.6M matching) is for start-up and relevant

equipment. The applicants presented adequate information about the organization of collaboration between WRU and the LCI, and about ongoing work in soft interface science.

- **Regional Economies and Commercialization**

The collaboration has a strong track record of commercialization, which is a positive indicator of potential impact of the proposed cluster. Thus, the proposal outlines interaction with a variety of local companies and institutions, nearly all LCI/CWRU spin-offs. The proposed cluster is to establish an expertise in soft interfaces that would act as a resource in Ohio for companies across a broad front of developing technologies.

- **Relationship to Third Frontier Program**

The proposal details LCI's role in the **Wright Center of Innovation Center for Multifunctional Polymer Nanomaterials and Devices (CMPND)**; LCI's share of this grant was \$367,000, which was used to purchase elements for the new microscopy system that allows researchers to image soft matter materials such as liquid crystals and polymers in three dimensions. The proposal will clearly build on this investment.

- **Cost Share and Letters of Commitment**

The cost share amounts in the proposal are reasonable. The letters of commitment are very convincing.

Review Summary:

This proposal fully complies with the program's RFP. The researchers involved are the top in their fields, with a clear history of collaboration. The science being pursued is of critical importance to Ohio's economy and the goals are very reasonable. The record of commercialization through spinoff companies is particularly noteworthy. The strength of the industrial support for this proposal greatly impressed the committee and helps indicate that this cluster, if funded, will be effective.

ORSP 08-012
Intelligent Propulsion and Advanced Life Management Systems
University of Cincinnati

Proposal Summary:

The proposal aims to accelerate the growth of an existing cluster of research competence at University of Cincinnati in power and propulsion in three focus areas: intelligent control and thermal management of adaptive power and propulsion systems; advanced energy sources for low emissions; and system and components prognosis and life management, by recruitment of three ORSP Scholars. The proposed work extends support of the extensive Ohio industry and collaboration with other research groups in the field. The existing team is comprised of twenty faculty and 100 post-docs and graduate students as well as extensive and modern experimental facilities.

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$9,750,000	\$9,343,821
Operating Non-ERP	\$2,250,000	\$5,656,179
Capital Non-ERP	\$3,000,000	\$0
Subtotal	\$15,000,000	\$15,000,000
TOTAL	\$30,000,000	

Detailed Review:

- **Quality of Research Cluster**

The proposal provides evidence of considerable eminence among the existing senior faculty (including Eminent Scholars) and of high-quality junior faculty. It also documents notable performance by graduate students. They operate impressive research facilities, including modern measurement and diagnostic equipment. The team has good experimental expertise. Though the school also has a number of faculty with relevant computational and theoretical expertise, the case of their involvement in the cluster was not strongly made. For a systems engineering oriented proposal, this collaboration will be essential. This is a minor weakness for the proposal, however, as the plan to manage the collaboration of the team is quite strong. Overall, the group has good research productivity and high national and international standing.

The extension of their competence by the recruitment of three ORSP scholars is well conceived and will complement existing strengths. The group is well connected with the Ohio industry, government laboratories, and university groups in the field. The operational and financial time-line plan is reasonable and well distributed over the five years. The management plan is to have a three-person executive committee with monthly meetings and an oversight committee with representatives from industry, the Air Force Research Laboratory, and NASA Glenn. The proposal does a good job in benchmarking the work of the group against national and international research groups in experimental, and particularly in diagnostic work, but not in theoretical or computational activities.

- **Growth Plan and Requested Positions**

The planned development of the growth over the funding period is good. However, while it makes sense, the committee feels that recruitment of presumably senior faculty should not be focused too narrowly, as a quality candidate will have plans of his or her own that need to be fitted into the program in a reasonable way.

- **Regional Economies and Commercialization**

The research results of the group have been commercialized very successfully. Their close collaboration with the Ohio propulsion industry suggests that mechanisms of technology transfer will continue to be obvious and direct. Isolated examples are given in the proposal, and convincing presentations from industrial partners were given at the review meeting.

- **Relationship to Third Frontier Program**

The research group proposing this cluster has been associated with two major TFP centers in collaboration with other Ohio universities: The Ohio Center for Advanced Propulsion and Power, and the Ohio Center for Nondestructive Characterization of Micro and Nano Devices. Under these programs three laboratories have been considerably enhanced and their productivity is still growing as a result of this funding.

- **Cost Share and Letters of Commitment**

The cost share plan appears to be reasonable. The letters of commitment are very supportive. The committee was particularly impressed by the physical presence of the industrial partners at the team's review in Columbus. A weakness of the proposal is that it does not call for collaboration with other Ohio institutions. However, based on the strength of the partnerships with industry, the committee feels that this lack of other institutions will not be a problem.

Review Summary:

This is a good proposal, put together by a well-respected research team. They operate extensive experimental research facilities, including modern diagnostic equipment. The group collaborates exceptionally well with Ohio industry and government research laboratories as well as with other universities. The financial and management plans are reasonable. In the committee's view, the proposal fully complies with the requirements set forth by the RFP.

ORSP 08-016
Ohio Center for Innovative Immunosuppressive Therapeutics
University of Toledo

Proposal Summary:

This Track 2 proposal aims to establish the “Ohio Center for Innovative Immunosuppressive Therapeutics” (OCIIT). The center presently counts as members twenty investigators drawn from the faculties of the University of Toledo (UT) and Case Western Reserve University (CWRU) and from two collaborating companies.

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$11,510,000	\$9,525,000
Operating Non-ERP	\$690,000	\$6,570,000
Capital Non-ERP	\$1,000,000	\$0
Subtotal	\$13,200,000	\$16,095,000
TOTAL	\$29,295,000	

The center adopts overarching goals of producing and testing immunosuppressive agents that would fill therapeutic gaps and avert the most vexing side effects of drugs now used. Toward this end, the center will recruit to fill three endowed chairs. Two chairs at UT will be established experts in (i) leukocyte migration and (ii) immunological tolerance. One chair at CWRU will be filled by an expert in cutaneous immunobiology.

Detailed Review:

- **Quality of Research Cluster**

The committee noted and commended certain strengths of this program. Particularly impressive was the superb organization proposed for the center and the approaches taken to filling the proposed chairs. For example, the applicants have already established a conference that brings leading immunologists from outside Ohio to meet with immunologists from UT and CWRU. The applicants have also selected appropriate entities for benchmarking, evaluated their present standing and prospects realistically against these benchmarks and included benchmarking in the operating plans for the center. Thirdly, and perhaps most importantly, the applicants have identified resources that would appeal to candidates of sufficient promise to have a substantial impact on the center and the region, identified potential candidates and have devised an organizational approach to recruitment that would strengthen the center concept. Finally, the committee viewed the application and accomplishments to date as evidence that the cluster will have the strong leadership that would be needed to support a center with geographically disparate components.

- **Growth Plan and Requested Positions**

The committee noted certain weaknesses but differed on the extent to which these weaknesses are eclipsed by the organizational strengths. One main concern is the center's proposed focus on immunosuppression. The applicants correctly note that most drugs of this type emerge from pharmaceutical companies and not from academic centers. The recruitments proposed in the application will add significant academic value and commercial potential, even if not specifically for the purpose of developing immunosuppressive therapeutics. The committee is confident that the Center will generate agents with commercial potential, if it is willing to recruit the best possible candidates for the requested chairs and flexible about the specific areas of and approaches to immunomodulation pursued by the Center, rather than focusing directly and exclusively on immunosuppression. The field of leukocyte migration is already well populated and the committee fears that the center will not likely achieve preeminence by recruiting one senior and one junior figure, however well intended. The field of tolerance, although well populated, offers more opportunity, (since tolerance is not as yet approaching clinical application). The leadership of the center clearly does envision evolution of thinking and goals. At the follow-up interview, the PI provided a convincing argument of the flexibility of the recruitment plan. The committee also noted that the proposed benchmarks - doubling research funding, identifying 20 prototype newer generation immunosuppressive compounds, submission of 30 invention disclosures, submission of 15 patent applications, 5 technology licenses to regional biotechnology companies, \$3 M in licensing revenues, and 5-10 new start-up biotechnology companies to commercialize programmatic discoveries – are ambitious but the clarification provided by the PI at the follow-up interview gave the committee more confidence that these metrics are not unreasonable.

- **Regional Economies and Commercialization**

While the proposal argues that the state of Ohio has over 200 companies in the pharmaceutical or biologics industries in Ohio, this sector would probably not be considered a major regional economic player. The jobs created by this initiative would likely be modest in number and largely research-focused. However, this group could contribute to the creation of additional small biotech firms in the northeast region and thus to the potential for a critical mass of expertise and resources for a healthy biotechnology sector in the region. The proposal makes a convincing argument that this investment will create an immunosuppression “corridor” that will be world-class and the center for these types of studies, providing benefit to the regional economy. Although the group so far has a moderate track record for commercialization, the area of immunosuppression is perceived by the committee as an emerging trend that could become very important for other local initiatives such as tissue engineering, implants and orthopedics.

- **Relationship to Third Frontier Program**

The group in question has not received prior Third Frontier funding. However, the proposal appropriately points out that it will be leveraging investments already made by the Third Frontier Program in the Clinical Tissue Engineering Center and the Ohio Center for Stem Cell and Regenerative Medicine. The applicants intend to take advantage of the strength in intellectual property generation and translation of research findings developed in those centers. Access to

and knowledge of those resources is provided by already developed professional ties: Kevin Cooper is on the internal advisory board of the Clinical Tissue Engineering Center and is a center investigator within the Center for Stem Cell and Regenerative Medicine. The committee noted that developing in-state expertise in immunosuppression could be of considerable interest to Ohio's medical device industry and that interesting collaborative opportunities might be developed between the proposed Center and current Third Frontier funded programs in cancer, cardiovascular disease and neuromodulation.

- **Cost Share and Letters of Commitment**

Cost share and letters of commitment were adequate.

Review Summary:

In sum, this proposal is viewed as outstanding, having exceptional organization and leadership and possessing the potential to have a profound impact on the academic strength of the lead institution and of the region. Funding would create the opportunity for early entry in an area of emerging importance, with potential to reach international prominence. These strengths are matched with what appear to be reasonable goals and objectives, particularly the development of novel therapeutics for suppression of immunity. A flexible recruitment strategy focused on attracting the best talent available is important to the success of the cluster.

ORSP 08-017
Ohio Computational Scholars Program
Ohio University

Proposal Summary:

This Track 1 proposal would assemble a broad interdisciplinary team of twelve endowed scholars distributed across five collaborating institutions, with expertise in High Performance Computing (HPC) and Networking as the common thread. The proposed distribution of scholars is: one scholar in Bioinformatics and one in Computer

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$34,470,000	\$14,561,160
Operating Non-ERP	\$750,740	\$20,013,011
Capital Non-ERP	\$8,100,000	\$8,850,000
Subtotal	\$43,320,740	\$43,424,171
TOTAL	\$86,744,911	

Science (Biostatistics and Information Systems) at Ohio University; two scholars in High Performance Computing (Scaling Computational Science Codes and Tools Development for HPC) and one in Bioinformatics and Comparative Genomics at Ohio State University; one scholar in Mechanical Engineering (CFD and Bio-Fluids) and two in the multi-scale Physics of bio/materials at University of Cincinnati; one scholar in Bioinformatics at University of Toledo; one scholar in Biomedical Computation (Statistical Pattern Recognition) and one in Data Analytics and Natural Language Processing at Wright State University; and one scholar in Materials Science and Engineering at Youngstown State. In addition, the Ohio Supercomputer Center (OSC) would play a central role, providing computational resources for the scholars and creating an interlinked virtual work environment.

By forming a collaborative, interactive statewide consortium focused on multidisciplinary HPC and Networking, the project aims to: (1) enable new discoveries through significantly improved access to and analysis of large-scale databases, as well as development of new methods in multi-scale, multi-time systems in biosciences and materials sciences; (2) enable improved products and production methods in existing Ohio firms; and (3) accelerate the discovery of new products, predictors of and treatments for disease, new materials, and advances in information technology. Together with existing faculty, the scholars would form a virtual research community and would devote at least 25% of their time to state-wide projects. In addition, they would solicit proposals for computational projects from Ohio businesses, and select at least eight projects per year as pilot projects. HPC resources for the pilot projects would be provided at no cost by the OSC, and a full time person at the OSC would function as a liaison to the scholars. A major capital investment would include new supercomputing resources in the first and fourth years.

Detailed Review:

- **Quality of Research Cluster**

The investigators do an excellent job of delineating the large-scale and very difficult challenges at the forefront of computational science, and it is likely that an integrated multidisciplinary approach ultimately will be necessary to solve such problems. The academic quality of the collaborating institutions is excellent in terms of the expertise and success of existing faculty, graduate recruiting, etc., as well as the existing computational capacity of the OSC.

However, the quality of the proposed cluster itself was difficult to judge given that there were very few details provided about specific research projects to be carried out by the cluster. The future research aims and academic goals are extremely ambitious and very broadly defined. Thus the proposal suffers from a relative lack of focus for a Track 1 project. In addition, there is not much record of past collaboration or integrated focus among the institutions and the OSC, nor do the participating institutions have a history of successful commercialization in this area.

- **Growth Plan and Requested Positions**

A number of broad trans-institutional and multidisciplinary goals are outlined for the new scholars (see above), and are envisioned to engage the Ohio business community. However, the proposal suffers from lack of a clear leadership/management plan to guide the interactive functioning of the scholars within and across their respective departments and institutions. The committee found this omission, in combination with the lack of a commercialization plan (see below), to be a fatal flaw of the proposal. Similarly, the recruitment process is only minimally described, and although the recruitment packages are competitive, the committee was not convinced that outstanding talent could be effectively attracted and retained.

The major strength of the proposed capital project is the two-stage (year 1 and 4) acquisition of supercomputing resources, which would allow greater impact relative to the cost of the outyear machine to be purchased in the 4th year. On the other hand, the nature of cutting edge supercomputing research requires constantly increasing resources and facilities. This project's envisioned goal—to seriously target the largest scale cutting edge codes and projects—may require even larger resources from national centers, and the plan for Ohio state supercomputing may not remain state-of-the-art and competitive at the national and/or international scale even with an investment by the state in this area.

- **Regional Economies and Commercialization**

Given the broad cross-cutting nature of the proposed program, there is tremendous potential for commercialization in many different areas. In principle, the requested scholar positions and plan could yield substantial business interactions and commercialization, but because the proposal did not delineate much more specific projects (e.g., beyond portal development, and with a clear management plan, see above) the committee could not assess the likelihood of substantial success. This was compounded by the fact that the proposal did not include a detailed plan for commercialization or engagement with industry.

The committee was somewhat surprised that the OSC is not directly collaborating in many other, more focused, engineering proposals that have substantial computational needs in modeling and simulation. In a related vein, it seems surprising that a much deeper connection between OSC and the Ohio business community does not already exist.

- **Relationship to Third Frontier Program**

The proposal cites a number of linkages to prior Third Frontier Program investments, but they are either unrelated to this effort or related to fairly general computational and training infrastructure. Thus there is not a history of leveraging prior investments in this area.

- **Cost Share and Letters of Commitment**

The cost share commitments appear realistic and support the positions requested for this large proposed program. However, there are no substantial commitments from industrial partners.

Review Summary:

This proposal seeks to create a critical mass of multidisciplinary computational expertise to target large-scale cutting-edge problems in biomedicine, engineering, and physics, to work in concert with existing faculty in all of these areas to achieve dramatic advances. In this respect the vision is extremely appealing. On the other hand, the proposed cluster is extremely broad, is motivated by extremely difficult computational problems, and does not specifically leverage an existing, well-established and externally recognized targeted research cluster. It is a forward-looking project with tremendous potential, but currently with multiple fatal flaws. The committee felt that this proposal would need a much more concrete management plan, more focused projects, and more clearly defined commercialization plans in order to be competitive and responsive to the objectives and goals of the ORSP program.

ORSP 08-019
Research Cluster for the Design and Evaluation of Spinal Implants
University of Toledo/Cleveland Clinic Foundation

Proposal Summary:

This Track 2 proposal is for funds to support the development of a Spinal Cluster representing a collaboration between the University of Toledo and Cleveland Clinic’s Center for Spine Health and Clinical Center for Tissue Engineering. The goals of the Spinal Cluster are to (1) catalyze externally funded, cutting edge basic and applied research in spinal diseases and devices; (2) generate new Ohio-based intellectual property and spin-off companies; (3) supplement ORSP funds through research dollars generated by scientists in the cluster; and (4) train engineers, medical students, residents, and fellows in the new technologies and in moving new technologies from bench to bedside. They propose to accomplish these goals by recruiting a new faculty member to be housed at the University of Toledo in Biomedical Engineering, with specific expertise in nanotechnology. Funds will be used to support the endowed chair, post-docs, and graduate students working on cluster research projects.

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$2,500,000	\$1,331,196
Operating Non-ERP	\$720,000	\$3,396,847
Capital Non-ERP	\$1,625,000	\$125,000
Subtotal	\$4,845,000	\$4,853,043
TOTAL	\$9,698,043	

Detailed Review

- **Quality of Research Cluster**

This proposal is focused on the development of technologies that address the spinal implants market. The research team is particularly well suited to accomplishing this goal. The group at UT is headed by Dr. Vijay Goel, who is an internationally recognized expert in spinal implants. He already has collaborations with the emerging spine industry. He is part of the Engineering Center for Orthopaedic Research Excellence at UT, which he co-directs with Dr. Nabil Ebraheim. This Center includes basic scientists, engineers, and clinicians, enhancing the likelihood that technologies developed in the Center will actually be transferable. The group at Cleveland Clinic Foundation is equally accomplished. Dr. George Muschler is director of the Clinical Tissue Engineering Center, which consists of over 60 investigators involved in various aspects of cell and tissue engineering. Several of his inventions have been commercialized and are now standards of patient care. The Center for Spine Health is directed by Dr. Ed Benzel, who is founder of OrthoMEMS, LLC, which is developing MEMS-based sensors for in vivo disc pressure measurement. In addition, Cleveland Clinic has recruited Dr. Lars Gilbertson to direct its Spine Research laboratory; Dr. Gilbertson is focused on developing stem cell and gene therapy for treating spinal defects. Thus, the scientific team is of high quality at both partnering institutions and the research areas they encompass are synergistic.

- **Growth Plan and Requested Positions**

The Spinal Cluster is requesting a single new position. This person will be housed at UT in the Department of Biomedical Engineering. The goal is to recruit an individual who has experience in nanotechnology, particularly with respect to MEMS. The new hire is expected to provide a bridge between the two institutions and to be a focus for the development of new research at UT. Dr. Goel is a more traditional orthopaedic investigator, so the addition of a MEMS specialist at UT makes sense and ensures that the CCF group will have direct scientific ties to the UT group. While a MEMS specialist is the most desired recruit, the Cluster will consider other outstanding individuals for this position, for example with biomaterials or tissue engineering/drug delivery expertise. The applicants emphasized that the new recruit should also have a significant commercialization record. Although they have a fallback plan if the position is not filled by next year, they have already received inquiries about this position and are therefore confident of their ability to recruit an individual of the appropriate caliber. In addition to recruitment plans, the Spinal Cluster funds will be used to supplement their Choose Ohio First program and their Brady endowment fund to recruit students who would participate in the research, development and commercialization activities of the program.

If funded, the applicants' long-term growth plan for the Spinal Cluster is to establish the Center for Spinal Implant Development and Evaluation (CSIDE), involving additional recruitments and an expanded research portfolio. The center will be benchmarked against Rush University, University of California, San Francisco, Duke University, Emory University and the University of Pennsylvania. The committee felt that the Cluster's long term goal of becoming a leader in spinal implant development and evaluation industries was appropriate and reachable.

- **Regional Economies and Commercialization**

The Spinal Cluster will build on a long history of commercialization activities by the faculty at both institutions. Dr. Goel has been very active in collaborating with industry both in Ohio and nationally. Letters from companies with which he works speak highly of his contributions to their success. In addition, through the Third Frontier Product Development Pilot Program, Drs. Biyani and Goel have assisted in the development of products by Ohio companies from bench to clinic. Dr. Goel is presently negotiating with UT to establish a start-up company in Toledo to develop a novel posterior disc. Similarly, investigators at the Cleveland Clinic Foundation have been active in building industry in Ohio. OrthoMEMS is a spin-off company developing micro-sensors for in vivo use in the spinal disc, and Dr. Muschler has several patents in the cellular area, some of which are directly related to spine therapies. Based on this past record, the committee was confident that this Cluster would be successful in rapidly transferring appropriate technologies to Ohio companies.

- **Relationship to Third Frontier Program**

The participating investigators at both institutions have successfully built on Third Frontier Program investments. Dr. Goel has collaborated with Theken Spine in Ohio with the development of their technology. Dr. Muschler has led the Tissue Engineering Center to

prominence within the state and also has a national reputation for his work with connective tissue progenitor cells, not only in orthopaedics but in tissue regeneration in general. The investigators in the Spinal Cluster have competed successfully for funding from the National Institutes of Health and the National Science Foundation, as well as from industry.

- **Cost Share and Letters of Commitment**

Appropriate letters of commitment were included with the proposal. Cost shares were responsive to the RFP, and the resources allocated for the new scholar's startup package (including both ORSP funds and substantial supplemental funds) were explained in detail during the applicants' interview with the committee. The committee also approved of the proposal to use some of the requested funds to support release time for collaborating faculty, which will help ensure that the team has the opportunity to work together to meet common goals.

Review Summary:

Overall, this is an outstanding program that should be successful in achieving its goals. The two institutions are equal partners in the program and the new research scholar will help cement the partnership. Participating investigators have a very strong track record of both academic success and engagement with industry, and the research area of the proposed scholar has been carefully considered to complement the Cluster's existing expertise. The orthopaedic device industry is growing and the aging population makes spine an important target for the development of new therapeutic strategies. The committee believes that this team could become the leader in this area of biomedical research, and Ohio companies would only benefit from its success.

ORSP 08-021
Northeast Ohio Advanced Vehicle Power Systems
Youngstown State University

Proposal Summary:

This Track 2 proposal, led by Youngstown State University (YSU), seeks to create a research cluster dedicated to improving fuel economy in cars and trucks through the development and optimization of vehicle components, control systems and technology. Specifically, it requests four endowed scholar positions, two each at YSU and University of Akron (UA), in Efficient Component Design, Energy Efficiency/Computation, Vehicle Power Management and Systems Integration. The industrial collaborator is Parker-Hannifin Corporation (PH).

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$13,040,000	\$7,748,360
Operating Non-ERP	\$1,123,180	\$5,711,838
Capital Non-ERP	\$1,000,000	\$2,900,000
Subtotal	\$15,163,180	\$16,360,198
TOTAL	\$31,523,378	

The underlying premise behind the proposal is the undeniable national imperative of improving the fuel economy of essentially conventional cars and trucks, including the class of hybrid vehicles which are just entering the marketplace in significant numbers, even as interest grows in alternative fuels and powertrains. The importance of reducing parasitic losses of energy in engines and the electrical consumption of long-haul trucks is huge, and is well-stated in the proposal. The proposed focus areas are relevant to these challenges, and the goal of graduating students with understanding and expertise in these areas is also nationally important.

Detailed Review:

- **Quality of Research Cluster**

The proposal does a good job of justifying the importance and uniqueness of its research goals, pointing out that vehicle efficiency research today is largely concentrated on alternative fuels and advanced propulsion systems such as fuel cells, and that more conventional systems are underserved. The lineup of participating faculty is strong, and the Project Director brings an impressive resume and track record to the proposal. The involvement of Parker-Hannifin as the key industrial collaborator brings considerable resources and capabilities to the proposed cluster, as the company is a globally-recognized manufacturer of vehicle componentry and systems. However, PH has a very strong focus on hydraulics, and this focus is reflected throughout the proposal. In many places, “hybrid” is regarded as synonymous with “hydraulic”, and vehicle auxiliaries are assumed to be hydraulic: while hydraulic hybrids and accessories enjoy some interest in the heavy truck industry, elsewhere increasing electrification of vehicles together with advanced batteries or supercapacitors are increasingly favored.

- **Growth Plan and Requested Positions**

The growth plan speaks of both the car and truck fuel economy aspects of the Energy Independence and Security Act (EISA) of 2007, but the core of the proposed cluster is an Advanced Vehicle Power Systems Institute (AVPSI). This is in fact largely a hydraulics development facility in concert with various PH divisions, which substantially narrows the focus and potential of the cluster. Much of the vehicular response to EISA will be in enhanced electrification. While it could be argued that, to the extent that heavy trucks adopt enhanced hydraulic methods to improve efficiency, this facility could potentially support a leadership position (albeit essentially dedicated to PH products in a very competitive marketplace), the committee felt that this narrow niche is more suited to industrial development than to a major research initiative. Although the proposal includes a few references to other fuel efficiency opportunities, these are too vague to evaluate thoroughly and are typically in areas that are comprehensively represented in other research institutions and in industry.

The recruitment plan seems robust and the requested positions are all relevant to the proposed portfolio, although the systems analysis and computational fields are already heavily subscribed elsewhere, including within the Department of Energy's National Labs, and the scope of work anticipated is currently readily available in the commercial domain.

- **Regional Economies and Commercialization**

The proposal properly stresses both the national importance and the relevance to the Ohio economy of vehicle fuel efficiency, and the close relationship with PH provides a logical path to commercialization. However, it is noteworthy that in their letters of support, PH stress that their support is conditional upon retaining control of any IP generated. This somewhat limits the opportunities for commercialization of any technologies which originate in the AVPSI in a highly competitive marketplace.

- **Relationship to Third Frontier Program**

As a Track 2 proposal, this is by definition a new cluster. Though unrelated to this area, prior TFP projects involving the current participants are detailed and show impressive results.

- **Cost Share and Letters of Commitment**

The letters of support are relatively detailed and satisfy the RFP requirements.

Review Summary:

The proposal makes a strong case for the importance of improved fuel efficiency in largely conventional vehicles, and the academic leadership team is strong. However, the major focus is upon hydraulic systems and components, reflecting the influence of the primary industrial partner, PH. This is a narrow niche, and more suited to industrial development than to a major

research initiative. For this and the other reasons outlined above, the committee felt that it could not recommend this proposal because it was not adequately responsive to the ORSP RFP.

ORSP 08-023
Northwest Ohio Innovators in Thin Film Photovoltaics
University of Toledo

Proposal Summary:

The proposal describes a plan to strengthen a photovoltaics cluster in the state of Ohio by leveraging existing research activities at the University of Toledo in partnership with the Bowling Green State University. The proposal requests support for five faculty positions in the areas of: Thin Silicon Photovoltaic Science, Photovoltaic Nanoscale Surface Science, Solid State Photonics,

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$6,960,000	\$5,974,400
Operating Non-ERP	\$727,421	\$3,360,623
Capital Non-ERP	\$1,730,000	\$200,000
Subtotal	\$9,417,421	\$9,535,023
TOTAL	\$18,952,444	

Deposition Modeling and Molecular Photonics. New faculty positions are requested to address the future growth in photovoltaic science and engineering. Four positions will be added at the University of Toledo, and one at Bowling Green State University in the area of Molecular Photonics. The vision of the proposed Ohio Research Scholar program is (1) to establish faculty positions to address the future growth opportunities in photovoltaic technology (2) leverage the under utilized glass forming, metal working and polymer extrusion industries that have been primarily supporting the automotive industrial sector.

Detailed Review:

- **Quality of Research Cluster**

The team has identified growth opportunities in photovoltaic technology based on multicrystalline semiconductors (first generation), thin films on low cost substrates (second generation) and use of nanomaterials and nanostructures (third generation). These goals are consistent with the National Road Map for the Photovoltaic Technology as outlined by the Department of Energy. The team has reasonable credentials in photovoltaic technology and with the addition of five faculty members it could develop into a very strong team.

- **Growth Plan and Requested Positions**

Adding faculty members to address second and third generation photovoltaic research areas seems very appropriate. However, a specific plan for commercialization of photovoltaic technology is not sufficiently described. A critical issue in photovoltaic technology is the development of commercial scale manufacturing at relatively lower cost. Greater involvement of engineering faculty would help meet the proposal's commercialization goals. The additional involvement of NASA-Glenn, the Air Force Research Laboratory, First Solar, and others could help make this a world class photovoltaic research and technology center.

- **Regional Economies and Commercialization**

Both the University of Toledo and Bowling Green State University technology transfer offices are planning to assist in commercialization of the technology. The university provides preferred position to companies in Northwest Ohio. The University of Toledo has received funding from the NSF partnership for innovation program to develop university-government-industry partnerships to advance the alternative and renewable energy cluster.

- **Relationship to Third Frontier Program**

The proposal provides details on the Wright Center for “Photovoltaic Innovation and Commercialization” on page 70, where some of the companies are serving as direct collaborators in second generation photovoltaic technology and others serving as end users of third generation. Figure 4.1 describes the Wright center activities and the linkage to the proposed Ohio Scholar program. Some of the goals include: (1) education and public outreach activities on photovoltaics (2) market entry of integrated systems in 0-3 years (3) demonstration of new higher performance photovoltaic technology in 3-6 years (4) development of 2nd generation devices in 6-9 years and (5) development of 3rd generation photovoltaic technology in beyond nine years. The discussion describes required technology needs and past performance.

- **Cost Share and Letters of Commitment**

The cost share amounts proposed by University of Toledo and Bowling Green State University are reasonable. The letters of commitment are adequate and convincing. The Bowling Green State University has not requested funds as part of the endowed recruitment package. Inclusion of letters of commitment from NASA-Glenn, AFRL and First solar would have been desirable, although not necessary to comply with the RFP.

Review Summary:

Photovoltaic research and subsequent development of commercial scale manufacturing is a promising technology for Ohio. It is in the strategic interest of the state to be involved in this emerging technology as alternative energy sources will play major role in the economic development. The University of Toledo is well positioned in photovoltaic technology with an adequate track record of laboratory scale research. The development of stronger collaborations with AFRL, NASA-Glenn, and First Solar etc would strengthen the consortium’s position for photovoltaic commercialization. The overall plan is reasonable and fully responsive to the RFP. The State might wish to encourage the team to devote further effort and resources to the involvement of qualified engineering faculty members to support commercialization efforts.

ORSP 08-025
The Ohio Neural Technology Network
Case Western Reserve University

Proposal Summary:

This Track 1 proposal is for a network of eight institutions bound by the common goal of developing new technologies to restore neural function, with an emphasis on a devices approach to neural repair. In addition to the research goals, the Network will act as a portal for interested parties to pursue commercialization, and will deliver a significant training capacity. The proposal aims to take advantage of and develop local expertise and interest in basic molecular and cellular brain research, neuro-genomics, neuro-imaging and biomedical engineering.

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$28,731,640	\$26,681,679
Operating Non-ERP	\$5,133,144	\$9,476,361
Capital Non-ERP	\$13,900,000	\$15,552,977
Subtotal	\$47,764,784	\$51,711,017
TOTAL	\$99,475,801	

Four institutions dominate the application, with four others playing lesser roles. The application proposes the recruitment of nine scholars (two each at Case Western Reserve University, University of Cincinnati and Cincinnati Children’s Hospital Medical Center, and one each at Wright State University, Bowling Green State University and Northeastern Ohio Universities Colleges of Medicine and Pharmacy) and the development of new research teams around these key hires. The proposed capital investment is dominated by a \$6.5M request from Wright State University, primarily for a new building that will house one of the nine new scholars.

Detailed Review:

- **Quality of Research Cluster**

New therapeutic approaches to address diseases of and damage to the nervous system are needed, and whereas many groups are exploring disease mechanisms, traditional pharmaceutical approaches, biomarkers, clinical trials and other translational programs, the Ohio Neural Technology Network takes a unique approach with its focus on further developing expertise in the area of therapeutic devices. The individual, pre-existing research clusters (e.g. neurogenomics, neuroimaging, brain injury) are strong, but although there are a couple of stars, not all of them are in the top tier internationally. Recruitment of leading investigators into each of these clusters would strengthen the individual clusters, but it was not clear to the committee that the Network would develop synergistically. The unifying theme and vision of the Network (beyond simply developing a variety of neuro-relevant technologies) could also have been better presented.

The proposal is very ambitious, aiming to be “best in class” for neural technology, a “world leader in developmental and behavioral neuroscience by 2015”, a “world leader in psychiatric neuroimaging” and “one of best equipped and talented neuroimaging groups nationwide.” These aims are unrealistic for the individual parts of the cluster, and can only be achieved if the cluster proves capable of pulling the various parts of the network together to form a single team of outstanding collective ability. The committee felt that while a major opportunity exists to develop a truly integrated, collaborative, unified program that will take full advantage of the skills, technology and resources across the proposed Network, the proposed plan for drawing the various clusters together into a cohesive and collaborative unit was not adequate and allowed too much institutional autonomy and flexibility. Managing such an ambitious program and such a diverse and geographically distributed group is a significant challenge. Without programmatic details on how the Network will collectively meet that challenge—how they will prioritize aims, share emerging data, develop common programs and focus resources on them, share expertise, etc—it is difficult to have confidence that the Network will be more than the sum of its parts.

- **Growth Plan and Requested Positions**

Funding for nine endowed scholars is requested. While most positions are well defined, collectively it is difficult to see how these various positions (including cellular and molecular neuroscience, tissue engineering, genetics, MEG imaging, auditory neuroscience, etc) come together into a cohesive program of such internal strength and cohesion that it would elevate the group into the international arena. A major challenge will be attracting the caliber of individuals that this proposal depends on, and the goal of completing the recruiting within two years appears overly ambitious assuming that they are looking for “best in field” candidates. The proposal would have been strengthened by a discussion of which of these candidates would receive priority in recruiting because of their potential for having the greatest impact across the network (e.g. the committee thought there might be such potential in the CNS Neural Injury Scholar, Functional Neural Interfaces Scholar, Quantitative Geneticist, Scholar in Acute Brain Injury).

The proposal also includes a request from Wright State University for \$6.5M for a new building. Although the new building will house one of the proposed new scholars and associated junior hires, collectively this group will only represent in the order of one third of the building’s activity.

- **Regional Economies and Commercialization**

Strong evidence is presented in support of the claim that there is a good match between the declared interests and ambitions of the Network and the regional capacity to commercialize relevant discoveries. Past performance on industry collaboration, IP generation and commercialization is good. The proposed integration of the Network with a bioscience industry that represents 15% of the state economy is well thought through and unlikely to be a sticking point.

- **Relationship to Third Frontier Program**

Considerable previous engagement with the Third Frontier Program is documented. Collectively the Network's institutional partners boast 13 previous TFP projects. In many cases progress appears to be responsive to the original aims of the TFP. Overall this represents impressive performance and bodes well.

- **Cost Share and Letters of Commitment**

Strong and detailed letters of commitment were included in the application. Most of the individual institutional matches follow the requests for state funds, though the level of match from Case Western Reserve University was not clear, and the University of Cincinnati appears to be requesting \$11M against a match of just \$5.3M.

Review Summary:

The committee was enthusiastic about the vision described in the proposal. The Ohio Neural Technology Network has an opportunity to develop a unique research capability in the area of therapeutic devices. The proposed Network includes some strong smaller clusters that would be strengthened by recruitment of leading investigators. The committee's major concern is the lack of a convincing unifying theme and vision of the Network, beyond simply developing a variety of neuro-relevant technologies, and the lack of a strong plan for achieving such a vision. The applicants have not adequately described how the various clusters will be drawn together into a cohesive and collaborative unit. Without programmatic details on how the Network will collectively meet that challenge—how they will prioritize aims, share emerging data, develop common programs and focus resources on them, share expertise etc—it is difficult to have confidence that the Network will be more than the sum of its parts. These concerns about the management structure and how a culture of collaboration and synergy would be built were not persuasively addressed during the committee's interview with the investigators.

ORSP 08-028
Technology Enabling and Emergent Materials
The Ohio State University

Proposal Summary:

This track 1 proposal aims to expand a research cluster to pioneer revolutionary approaches to materials development, leveraging the materials science strengths of The Ohio State University, the University of Akron, and the University of Dayton.

Significant economic impacts are anticipated by the applicant, if funded.

The cluster's goal is to accelerate materials innovation and commercialization by evaluating emergent materials at an early stage through predictive modeling and characterization. The proposal calls for eight new eminent scholars and 10-15 other positions to complement the current faculty at the participating universities. The proposed scholars would be recruited in the following research areas: two in Bio-Based and Nanoengineered Carbon, two in Functional Synthesis, three in Processing, and one in Nanoscale Characterization.

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$31,950,304	\$8,552,132
Operating Non-ERP	\$2,249,696	\$24,539,510
Capital Non-ERP	\$800,000	\$1,972,880
Subtotal	\$35,000,000	\$35,064,521
TOTAL	\$70,064,521	

Detailed Review:

- **Quality of Research Cluster**

Ohio is a major leader in research in Advanced Materials. The existing cluster has a clear and well established research history. The proposal team constitutes more than 25% of the materials related faculty at the proposing institutions, indicating a substantial level of commitment from the universities. There are many existing collaborations (inter- and intra- institution) among the members of this group, as might be expected from its size and the history of support for collaborative research in Ohio. The proposal's research goals are lofty and reflect the kinds of achievements that the field of materials research as a whole would hope for. However, details of the specific science and technology to be pursued by the cluster are conspicuously absent from the proposal. This problem is also apparent elsewhere in the proposal; thus, a principal shortcoming of the proposal is its lack of focus.

There is also a near-absence of operational plans for how collective goals are to be achieved. While plans to hire the scholars are detailed, plans for how to make the whole more than the sum of its parts are vague. For example, the proposals states in several places that the cluster will achieve vertical and horizontal integration of its research activities, i.e., on the one hand, take projects from ideas to science to prototypes to products and, on the other hand, foster collaboration between people with overlapping interests and capabilities. To accomplish this, the

applicants propose to establish an oversight committee (Materials Innovation Council, MIC) to manage funds and oversee hiring decisions, to commit resources for recruiting talent that is broadly applicable in materials science (such as materials characterization), and to have the proposed new scholars participate in interactions among researchers in the cluster. However, the committee was not satisfied with the level of detail given about these plans. Given that cluster members will be distributed over three campuses and more than 20 departments, the committee felt that establishing an effective operational framework to promote and reward activities that foster the collaboration and integration put forth as important goals in the proposal is a principal challenge and essential task for the cluster, and the lack of sufficient details addressing this issue was considered a fatal flaw.

- **Growth Plan and Requested Positions**

The plans for selection and hiring of the scholars are detailed and appropriate. The funding level is consistent with the scope and scale of the proposed research cluster. The proposed positions are in areas that are forefront and interdisciplinary, which in principle should foster integration. As discussed above, however, the proposal's lack of details about the overall operational framework draws into question how effective this integration will be. In addition, the lack of details about the specific projects to be pursued by the cluster made it difficult for the committee to evaluate the potential for growth.

- **Regional Economies and Commercialization**

A major goal of the RFP is integration with regional economies, and this cluster is coupled to essentially every regional economy in Ohio, as one might expect given its size. The specific impacts outlined by the proposal are substantial. The proposal claims that its targets for job creation and other impacts are fully achievable based simply on the reputations of the universities, their history of funding, and the number of companies in Ohio in the materials field. The committee felt that this justification was insufficient and questioned the likelihood of the impacts given the lack of a detailed operational plan.

Over 40 industrial collaborators are identified, indicating the relevance of the cluster for Ohio's economy. This set of intended industrial collaborators is remarkable in two respects. It includes many companies whose collective annual production in Ohio must total many tens of billions of dollars. These companies have made an impressive promise of in-kind support (>\$8M) in their letters of commitment. However, in-kind support is somewhat nebulous, and, given the magnitude of the state and university investment in a program specifically promoting economic development and industrial interaction, it is equally remarkable (and disappointing) that there is no industrial cash support.

- **Relationship to Third Frontier Program**

The proposal details the participant institutions' past industrial interactions and development under prior TFP investments. The past history is very impressive and noteworthy, ranging from creation of major investments to products in production, joint grants, etc.

- **Cost Share and Letters of Commitment**

The cost share amounts in the proposal are reasonable. The letters of commitment are convincing, although greater funding collaboration from the industrial supporters would strengthen the proposal.

Review Summary:

This proposal has clear relevance to Ohio's economy and past investments. The enthusiasm of the potential industrial partners is particularly noteworthy. However, the proposal has significant deficiencies. The chief weaknesses of the proposal are simply the lack of focus and lack of critical details about both science and management. The plan to integrate the effort into a synergistic whole is questionable at best and greatly underdeveloped, and this deficiency combined with the lack of specifics in other areas makes this proposal fundamentally flawed.

ORSP 08-030
Advanced Energy Systems via Green Industrialization
The Ohio State University Research Foundation

Proposal Summary:

The objective of this Track 1 proposal is to establish a collaborative cluster of ten research faculty (including nine new endowed chairs, relative to about 15 presently existing in the four universities) focused on Advanced Energy Systems in four areas: (1) Photovoltaics, (2) Energy Conversion and Storage, (3) Clean Coal and (4) Biofuels/Biomass. The team includes

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$30,360,000	\$21,672,263
Operating Non-ERP	\$1,820,000	\$14,112,689
Capital Non-ERP	\$5,340,000	\$2,164,050
Subtotal	\$37,520,000	\$37,949,002
TOTAL	\$75,469,002	

four leading Ohio universities which represent 90 percent of the state’s research capability in advanced and renewable energy, and collaboration with Ohio companies is included in the plan.

- University of Toledo would lead in Photovoltaics, and add an endowed chair in Electric Power Conversion and Management Solutions and a senior faculty position in Photovoltaics/Hydrogen.
- Case Western Reserve University would lead in Energy Conversion and Storage, and would add endowed chairs in (1) Energy Conversion and Storage and (2) Functional Nanomaterials for Energy Devices.
- University of Ohio would lead in Clean Coal, and would add an endowed chair in Syngas Generation and Utilization (from coal feedstock).
- Ohio State University would lead the cluster in Biofuels and Bioenergy, and would add endowed chairs, in (1) Biofuels Processing, (2) Energy Conversion and Storage, (3) Photovoltaics and (4) Subsurface Extraction and Sequestration

Detailed Review:

- **Quality of the Research Cluster**

The proposed cluster would broaden and strengthen existing collaborations among capable and well-established faculty and improve external recognition of an Ohio Cluster in Advanced Energy. The proposal’s benchmarking effort is uneven in quality, relative to the high international standard requested. It ignores, as one example, the Helios Project (led by a Nobelist, and involving Lawrence Berkeley Lab, University of California Berkeley, University of Illinois, and British Petroleum – which has pledged \$500 million support over 10 years and a co-located group of BP scientific and engineering staff.). Helios focuses at the interface on (1) advances in nanoscience and technology applied to new approaches to photovoltaics, and (2) rapid advances in Industrial Synthetic Biology applied to production from non-food biofeedstocks of precursors to liquid transportation fuel, notably JP-8.

The current collective staff of the proposed ORSP Cluster includes several faculty of international prominence and numerous faculties with strong records of publications and a mid-tier record of attracting external funding. The cluster attracts good graduate students, and the proposal notes the need to attract many more graduates from top-ten undergraduate schools, an objective likely to be enhanced over time if the proposed ten Ohio Research Scholars were to be added to this cluster. Infrastructure and Regional Integration are adequately addressed.

- **The Growth Plans and Requested Positions**

Growth Plans and Requested Positions are described rather well, but in some instances seem somewhat general or incremental in now broadly-recognized areas of advanced energy. In another area, the advocacy lacked balance regarding high risk. The financial resources of the cluster are probably not adequate for the high level of commercial leverage sought in the RFP. The collegial management plan also appears weak. The CV for the proposed Project Director was not included. The hiring plan seems overly optimistic and highly front-end loaded financially especially in pursuing the immediate attraction of nine faculty of international rank from outside Ohio for endowed chairs while other top tier research universities are also adding significant resources, industry collaboration, and offering attractive packages in green energy.

- **Regional Economies and Commercialization**

In most cases the committee generally viewed favorably the likelihood of positive long-term impact on regional economies of Ohio, but instances of past commercial performance lacked metrics on commercial viability of spin-offs and jobs created, and thus did not adequately provide a basis for projections at the level requested in the RFP. The proposal recognized the need for improved plans to attract venture capital, resolve business issues including those related to intellectual property, and to engage regionally. The committee did not share the proposal's commercial optimism for large-scale In-Situ Generation of Syngas (underground coal gasification), and felt the proposal more or less assumed the need, but did not adequately make the case for high commercial expectation in this area. That is, the proposal did not demonstrate how past research could be leveraged to overcome such objection.

- **Relationship to Third Frontier Program**

Good examples of earlier Third Frontier Program funding are mentioned, but not uniformly in the specificity requested in the RFP on jobs created and economic impact. That aside, the committee noted favorably the importance of (1) strengthening already good capability in photovoltaics, (2) in strengthening good capability in energy conversion and storage, (3) strengthening new approaches to sequestration of vast quantities of carbon dioxide, and (4) improved focus on biofuels and biomass.

However, the committee expressed considerable reservation on the need to add nine endowed chairs, and the distribution among the four universities. In addition, advocacy by coal states and the Air Force Research Labs aside, the committee expressed great reservation (as has a recent Defense Science Board report and a recent JASON's report for the Department of Defense) on

the adverse environmental impacts of Fischer-Tropsch synthesis of transportation fuels from coal, notably extremely high emissions of carbon dioxide, or the likelihood of paradigm-shifting breakthroughs in production of liquid transportation fuels at large scale via coal-to-liquids processes. The committee noted the advocacy, but also that there are opposing views and controversy on this issue, and the proposal did not provide balance in addressing these issues.

- **Cost Share and Letters of Commitment**

The proposed cost share plan and Letters of Commitment meet the requirements in the RFP. Numerous letters of support express enthusiasm and indicate modest levels of financial support. (One is conditioned on retaining title to Intellectual Property, a general issue yet to be addressed by the cluster.)

Review Summary:

This proposal has many strengths as noted above, but the committee believes it is too expansive in the requested number and distribution of new endowed chairs and thus in cost. Understanding the critical importance of enhancing green energy research and industrialization, the committee concluded that the proposed management plan was too weak, and levels of capital required for expectation of major commercial success in four areas were underestimated. The committee also appreciates the importance of coal to Ohio, and the need for breakthroughs, but concluded the case for in-situ gasification of coal was not adequately made in this proposal especially since it hinged on a high expectation for large-scale commercial success.

ORSP 08-031
Ohio Consortium for Cancer Diagnostics and Targeted Therapies
Ohio State University Research Foundation

Proposal Summary:

The Ohio Consortium for Cancer Diagnostics and Targeted Therapies is a Track 2 proposal of 5 academic institutions, including The Ohio State University, The University of Cincinnati, Cincinnati Children’s Hospital, Ohio University, and The University of Toledo, and two early stage biotechnology companies, Diagnostics Hybrids and Gene Express, to form a research cluster in cancer diagnostics and drug development with strong ties to the Ohio biotechnology and medical care industries. This Consortium proposes to create translational research strength in: (1) cancer molecular mechanisms and molecular marker research; (2) drug and diagnostics discovery and medicinal chemistry; (3) drug development and delivery; and (4) clinical translation and commercialization. The overall vision is to create an integrated organization that will be able to carry basic discoveries in cancer through the entire development cycle to commercialization.

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$39,196,000	\$15,175,246
Operating Non-ERP	\$4,786,008	\$23,404,226
Capital Non-ERP	\$6,018,000	\$11,908,332
Subtotal	\$50,000,008	\$50,487,804
TOTAL	\$100,487,812	

The Consortium will comprise 20 established investigators and their research teams already in place at participating institutions, and 12 new Research Scholars and 14 supporting junior faculty. The new recruitments are selected to strategically nucleate key research strengths across the discovery-translation-development-commercialization continuum, leveraging the considerable intellectual and technological infrastructure at participating institutions. In addition, the program seeks to establish unique collaborations of scientists, engineers, physicians and entrepreneurs and create new interdisciplinary education programs to train the next generation of translational scientists in cancer. In essence, the proposal seeks to coalesce Ohio’s intellectual and technical capital in cancer research, capitalizing on individual elements of the discovery-development paradigm, into a Consortium for translating discoveries in molecular oncogenesis into new drugs and their companion diagnostics. This is an ambitious and exceptionally challenging goal that, to a large degree, is critically dependent upon systems-level management of projects from conception to fruition.

Detailed Review:

- **Quality of Research Cluster**

The current intellectual and technological elements contributing to the Consortium are outstanding. Existing clusters of excellence include: the Ohio State University (OSU) Comprehensive Cancer Center; the OSU Nanoscale Science and Engineering Center, an NSF Center of Excellence; the Center for Drug Design and Development at the University of Toledo;

and the Genome Research Institute at the University of Cincinnati. Established investigators have been productive, with outstanding success in attracting extramural research funding and publishing research results. The area of focus for this Consortium—cancer diagnostics and therapeutics—while not particularly novel, is an area of critical need at both the state and federal levels. There is evidence of existing collaborations between Consortium members within institutions, though there are fewer interactions across institutions. The participating institutions provide outstanding facilities and support services, including technology transfer, to realize the vision.

The participants are also integrated into the regional biotechnology sector, with concrete ties to Diagnostics Hybrid and Gene Express, companies that have been developed by Consortium members, as well as other companies. It is noteworthy that while there are commercial spin-offs from members of the existing Consortium, there are very few examples of successful commercialization and revenue generation. However, Consortium members have been successful at attracting venture capital and other development funds to leverage scientific discovery into commercialization.

The applicants have benchmarked the proposed Consortium against the M.D. Anderson Cancer Center at the University of Texas and the Broad Institute at Harvard/MIT. While these organizations do have a focus on bench-to-bedside translation in cancer, the committee felt that the comparison was not justified in that both benchmarks are stand-alone and self-contained organizations, while the Consortium would span multiple institutions across Ohio, which is associated with particular management challenges, discussed below.

- **Growth Plan and Requested Positions**

The Consortium members recognize that to form a truly world-class vertically integrated research organization that can bring discoveries through the entire development cycle to commercialization, strategic recruitments will be required. 12 endowed chairs for research scholars are requested. A scholar with expertise in stem cell biology and signaling will be recruited in each of the four disease focus areas (leukemia, neuro-oncology, breast and hormone-sensitive cancers, and lung cancer) and will be situated at the University of Cincinnati and Cincinnati Children's Hospital. Two scholars will be recruited in the area of medicinal chemistry at the University of Cincinnati to take advantage of the Genomics Research Institute and the Department of Chemistry, and to capitalize on the capacity for high throughput screening and the newly acquired small molecule library. A scholar will be recruited to work with the Center for Drug Design and Development at the University of Toledo to pursue diagnostic biomarker technologies, in close collaboration with Gene Express, Inc. A recruited scholar at Ohio University will work in close collaboration with Diagnostics Hybrid, Inc. pursuing molecular and cell-based diagnostics. Two scholars will be recruited to OSU in the area of T cell function and cytokine biology. Another scholar will be recruited to OSU to work with the Nanoscale Science and Engineering Center to provide opportunities to integrate nanotechnology into novel diagnostics and therapeutics in cancer. Finally, a novel recruitment will be a scholar at OSU who works at the interface between the Veterinary and Medical Schools, to focus on animal models of disease and novel diagnostics and therapeutics for companion animals.

Recruitment packages, including packages for supporting junior faculty, are reasonably generous and appropriately detailed in the application.

It is important to note that these recruitments are aligned with the Consortium's vision of establishing requisite expertise at each stage of the discovery-development paradigm for drugs and diagnostics from bench to bedside. The committee was impressed by this vision and found it attractive and novel, noting that such a vision has not yet been successfully realized in the academic environment. However, there was a conspicuous absence of leadership, organization, governance, management or oversight of this over-arching enterprise in the proposal. These elements are essential to realize the goal of moving discovery to commercialization across the geographically, technically, and conceptually disparate components of the Consortium. These elements require strategic direction to transition discoveries through the stages of the healthcare product development life cycle, make decisions about progressing key programs, and allocate finite resources to competing and often mutually exclusive initiatives. In the absence of strategic direction, investigators become individual centers of excellence, without the synergy that is required to realize the structure and vision of the Consortium. While the applicants were responsive to these concerns in their presentation to the committee, they proposed a management structure that is well-suited to a matrix cancer center, but not completely aligned with the vision of the Consortium, which has the added challenges of close project management during key transitions in the conception-through-commercialization pathway. In fact, the committee was concerned that the academic model proposed may be antithetical to the success of this vision, which requires that investigators work in large project teams spanning discovery, development, and commercialization and focusing limited resources on the most promising leads. The committee also felt that faculty of the caliber targeted for the new research scholar positions could have been integrated into the management structure at a higher level.

- **Regional Economies and Commercialization**

Consortium members are already integrated into the regional economies. Several members have started spin-off biotechnology companies, most notably Gene Express and Diagnostics Hybrid, Inc, which have successfully created new jobs in the state. Several biotechnology and pharmaceutical companies are end-users of the innovations provided by Consortium members, and these are discussed in the proposal. Moreover, the Consortium has ample resources including technology transfer and intellectual property management, start-up management and development support, and access to capital in the form of angel investors, venture capital funds, and pharmaceutical company development funds to ensure that promising technology will be advanced into commercialization.

- **Relationship to Third Frontier Program**

This program directly benefits from and capitalizes on prior TFP investment in a lung cancer program at OSU. Moreover, the Consortium leverages resources, facilities and technologies created by TFP investments to advance the vision of drug and diagnostic discovery and development. These resources are appropriately detailed in the proposal.

- **Cost Share and Letters of Commitment**

Cost sharing for the Consortium is adequately detailed. Letters of commitment from all participating academic institutions and biotechnology companies are provided. They are appropriately detailed and convincingly elaborate commitments by these organizations to the Consortium.

Review Summary:

The Ohio Consortium for Cancer Diagnostics and Targeted Therapies aims to leverage existing strengths to create a coordinated organization for drug and diagnostic innovation in cancer, bridging bench to bedside. While the area is not novel, it is important. The Consortium embodies a bold and exciting vision of coalescing the elements of various academic and commercial organizations to carry basic drug and diagnostic discovery through development and commercialization. While the core Consortium members are outstanding and the recruitment plan is scientifically well designed, the recruitment plan was not strategic in terms of integrating the proposed scholars into the senior management of the Consortium. Indeed, critical elements of leadership, organization, process, management, and oversight—which are absolutely required to realize the full potential of the proposed structure—were not convincingly developed and considered a critical flaw of the application. Given the challenges involved, the committee found that the Consortium lacked the strategic oversight to be able to manage *multiple concurrent* projects all the way through target identification, assay development, HTS, secondary assays, medicinal chemistry, toxicology, preclinical efficacy, IND and clinical trials. In addition, the applicants have committed few resources for administering this new consortium, which the committee feels is also critical given the significant new administrative workload that the Consortium would entail. For the Consortium to succeed as envisioned, the committee would have expected a well-articulated plan to attract a management team with drug development expertise, policies providing leverage for directing individual team members to pull in the same strategic direction, and structures to strategically transition projects through the drug and diagnostic development pathway across geographically and culturally disparate organizations. In the absence of these elements, the committee felt that although these organizations will continue to produce excellent science, they will not be able to realize the over-arching vision of the proposal.

OSRP 08-035
Research Center for Efficient and Clean Propulsion and Power
The Ohio State University Research Foundation

Proposal Summary:

This proposal would create eight Research Scholars, distributed among The Ohio State University (OSU), University of Dayton (UD), University of Toledo (UT), and University of Akron (UA), as follows: (1) Aircraft/ Engine Systems (OSU), (2) Prognostics and Health Management (OSU), (3) Aeroacoustics (OSU), (4) Turbine Aerodynamics and Heat Transfer (OSU), (5) Coal to Fuel Conversion (OSU), (6) Advanced Tribology (UA), (7) Small Turbine Technology (UT), and (8) Alternative Fuels and Low Emissions Combustion (UD). These scholars will augment an existing research cluster, created under Third Frontier funding, called the Ohio Center for Advanced Propulsion and Power (OCAPP), which has been quite successful in obtaining follow-on funding. It is also proposed that new technologies developed for improving energy efficiency and reducing pollution/acoustic emissions of propulsion will be leveraged to improve similar energy conversion devices.

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$35,710,514	\$25,679,497
Operating Non-ERP	\$2,289,486	\$19,254,636
Capital Non-ERP	\$12,000,000	\$8,412,250
Subtotal	\$50,000,000	\$53,346,383
TOTAL	\$38,762,714	

Detailed Review:

- **Quality of Research Cluster**

The proposal identifies important research areas that are critical for the development of modern commercial and military aircraft. Furthermore, the research leverages a significant strength of the State of Ohio, and success in this research and the resulting commercialization would undoubtedly have first-order impacts on the economic health of the State. In these aspects, the proposal is strong.

The research from the existing research cluster is internationally recognized, as is evident from the contributions of individual team members. However, it was particularly frustrating that no benchmarking was performed against other national or international research groups in comparable areas. Such benchmarking is crucial to clarify the cluster’s preeminence and furthermore, to identify the areas in which it ought to improve.

- **Growth Plan and Requested Positions**

For the most part, the proposal does an adequate job of identifying key technologies in next-generation propulsion systems and in laying out the plans for the research scholars. However, the

proposal's descriptions of some of the new research scholar positions read too much like shopping lists for incremental improvements in the existing cluster. This is particularly evident in the description of the Coal to Fuel Conversion scholar, in which it is envisioned that the scholar will first "attain a comprehensive understanding of the OSU chemical looping technologies," and then make small tweaks to such technologies. There are similar weaknesses in some of the other scholar descriptions. The reader is left with little understanding of how such a growth plan will affect the cluster's standing in the propulsion community. Will these scholars and their associated targeted research establish and maintain world leadership? It is not clear.

Beyond their individual descriptions, the proposal includes very little discussion of how the various targeted areas will interact. One gets the sense from reading the proposal that these eight scholars will be completely isolated from one another, and that their research will not cross-pollinate. For example, interaction between areas 8 (Alternative Fuels and Low Emissions Combustion) and 5 (Coal to Fuel Conversion) would seem to have merit, but such interactions are not identified in the proposal. The same is true of interactions between areas 1 (Aircraft/Engine Systems) and 3 (Aeroacoustics). Even if the existing researchers in these distinct groups have no history of working closely together, the proposed scholars provide an excellent opportunity for establishing new relationships between these groups. The proposal would have been stronger if the new scholars had been in fewer areas, perhaps interdisciplinary in nature, with a more detailed description of their impact.

Also, though applications to energy conversion technology such as stationary gas turbines and wind turbines is mentioned in the abstract, there appears to be no discussion about how such applications will be pursued. The proposed research scholars could be advocates of technology transfer to such applications, so a valuable opportunity was missed in this proposal.

- **Regional Economies and Commercialization**

The proposal discusses the importance of commercializing propulsion technology for the regional economy. Furthermore, a plan is laid out for commercialization that utilizes existing ties to Ohio aerospace companies, along with the already-existing frameworks of these companies for bringing technology to the marketplace. The probability of success is high, given the previous precedent established by the cluster, and the fact that the center lead (Prof. M. Benzakein) had a long and distinguished career with GE Aviation. However, there is little novelty in this plan, and it fails to demonstrate that innovative thinking was devoted to it. The lack of a well-developed strategy for transferring technology to other applications, particularly energy conversion, was also disappointing.

- **Relationship to Third Frontier Program**

The existing TFP in propulsion, the OCAPP, has quickly established a successful standing in the international community. In this respect, the planned growth can immediately leverage much of the existing infrastructure established under this center. The proposal does a good job of describing this.

- **Cost Share and Letters of Commitment**

The cost sharing is extensive and adequate. The letters of commitment provided by industrial partners are mostly boilerplate and provide few details about how the partnership will proceed. In particular, the RFP requirements were not followed in terms of providing cost sharing numbers that match the budget.

Review Summary:

In summary, though the proposal identifies important technology areas to target with new Research Scholars, it falls short in a number of important elements. In particular, the proposal suffers from a lack of a cohesive growth plan that incorporates all elements into an interdisciplinary whole, a failure to benchmark existing strengths, a missed opportunity for transfer technology to land-based energy conversion, and the relatively weak letters of commitment of industrial partners.

ORSP 08-036
Ohio Imaging Research and Innovation Network
The Ohio State University Research Foundation

Proposal Summary:

This Track 1 proposal brings together a collection of 4 academic institutions—Ohio State University (OSU), Case Western Reserve University (CWRU), Kent State University and Wright State University—and 9 industrial or healthcare partners to develop a network of biomedical imaging excellence in Ohio through the endowment of 11 chairs in various areas of healthcare-related imaging. The proposal is the result of concatenating 5 original Letters of Intent to the ORSP and seeks to build upon the TFP-funded Wright Center of Innovation in Biomedical Imaging at OSU. It is led by Dr. Michael Knopp as PI and comprises 15 other collaborators, each having expertise in relevant areas of imaging, with an aim to further develop molecular, oncologic, neuroscience and cardiovascular imaging.

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$42,247,369	\$34,550,843
Operating Non-ERP	\$2,311,198	\$13,551,424
Capital Non-ERP	\$5,441,000	\$6,083,528
Subtotal	\$49,999,566	\$54,185,796
TOTAL	\$104,185,362	

Detailed Review:

- **Quality of Research Cluster**

This proposal is an ambitious effort to enhance the Ohio biomedical imaging research enterprise with 11 key scholar recruitments. It was developed as an amalgam of 4 participating institutions who initially submitted 5 separate letters of intent to the ORSP. Each institution has an existing strong base of expertise in their respective fields. The strengths of the proposal are many, and include the strong track records of the PI, Dr. Knopp, as well as the many senior collaborators in the proposed network. Each has an admirable history of academic productivity and excellence in terms of published research, international reputation, grant support and graduate education. The participating institutions have the necessary infrastructure and commitment to support the proposed programs, and many excellent or outstanding collaborations have resulted with the industrial and healthcare-related organizations affiliated with the universities. Indeed, previous state support of the Wright Center of Innovation in Biomedical Imaging at OSU has reportedly developed a substantial leverage of funding opportunities through its partnerships with Phillips Medical, especially in MRI product sales, and others.

The Network aims to benchmark itself against other leading imaging research centers in the US, although it claims that there is no true peer for this consortium. Unfortunately, there is no discussion of how success will be measured. A plan is proposed for consortium oversight that includes a board of directors from the major stakeholders that will meet monthly by teleconference and at an annual site meeting, and an external advisory board that meets by email

with the board. While this management plan is strong on paper, it is not clear from the proposal that there is assurance of success in managing the diverse and unconnected efforts proposed across the participating groups.

- **Growth Plan and Requested Positions**

The proposed recruitments are exceedingly well supported with \$6-\$11M allocated for each, including the endowment, additional faculty, funds for ~4 graduate students, faculty research release time and various capital improvement programs. Given these strong enticements, it is likely that eminent scholars could be attracted to fill the chairs.

The first recruitment at OSU is for a radiochemist to develop a new cyclotron facility in the Wright Center for Imaging together with the radiopharmaceutical PET services partnership at Cardinal Health. This capability would support both production of academic research radioisotopes for the scholar by day and clinical production of imaging agents at night. However, the justification for this position at the level proposed was not clear; i.e., why a less senior investigator could not develop the cyclotron facility and its associated infrastructure, especially given other existing investigators at the Wright Center and the second proposed recruitment, a molecular imaging scientist whose effort would be synergistic with the cyclotron facility. The third position at OSU is for a neurofunctional imaging scientist to develop advanced capabilities at 3T and 7T, and to link (in an unspecified way) with the previous two nuclear medicine/molecular imaging scientists. A fourth chair is proposed in veterinary medicine, specializing in neuroscience studies such as neuroprotective agents. The OSU has a strong academic and teaching program in this field, and the envisioned scholar would have good relationships with the other 3 scholars. The fifth and final chair proposed for OSU is for Technology entrepreneurship and commercialization in imaging, whose occupant would sit in the Fisher College of Business. She/he would have a trans-institutional role in leveraging commercialization of imaging technology. While there may well be good reasons for having such a function in the network, the motivation for recruiting such a senior scholar was not clearly articulated, as it seems a much less senior administrative support person rather than an academic scholar would suffice.

The CWRU component of the proposal includes 4 requested scholars. The first is for an MR imaging physicist, for which the applicants make the case that the Physics department has a rich history in electromagnetics, and this expertise is important in high field MRI development. A number of examples of needed developments are proposed that are not particularly compelling (e.g. magnetic shielding, RF heterogeneity, parallel receive/transmit), because a large amount of academic and industrial research is already being performed that has solved many of these problems and/or will quickly overtake an academic enterprise at this level. The second position is for a molecular imaging scientist with a role very similar to that proposed for OSU's first two scholars, with no apparent synergy (other than a single phrase on p. 29 suggesting a "further collaboration aspect with the WCI team at OSU"). The third scholar will develop cellular and molecular imaging in optical imaging, similar to a proposed scholar at Kent State (see below). While it is stated that there will be no overlap between these two scholars and their roles will be complementary, there is no mention of specific collaborations with the Kent State scholar. The

final CWRU position is for an imaging reconstruction scholar, which is appropriate in principle but again not integrated into network collaborations outside of CWRU.

Finally, Kent State and Wright State universities each propose a scholar position in the network. At Kent State, an endowed position in biophotonics is envisioned as a means to nurture existing efforts and seed the development of an NIBIB funded National Center for Bioimaging and biophotonic applications. This appears to be an appropriate mechanism to leverage Kent State's resources and build a strong program. The final requested position is a scholar at WSU to form a program in imaging informatics that builds upon and complements efforts in the Biomedical Imaging Laboratory.

Despite the strength of the individual programs proposed, the fundamental weakness of this proposal is that the package is not an integrated network as stated, but 4 separate silos of excellence in respective fields melded together with no real plan for inter-institutional collaboration. Although there are instances of collaboration with industrial partners, there are few if any existing or proposed collaborations between the 4 academic groups, and there is overlap between at least 2 sets of 2-3 proposed scholar positions that would not be the case were a more thoughtful consortium proposal developed. Several of the proposed positions are poorly justified, such as the chair in entrepreneurship at OSU and the first imaging physicist at CWRU. While the proposal indicates that there will be oversight of the recruitment efforts at a network level, it appears from the proposed oversight plan that in reality each institution will be responsible for its own recruitment and will make the final decision. No integrated growth plan was proposed that gives confidence in the network's evolution as an integrated partnership. Thus, although each of the participating entities has an excellent record and would be strengthened by additional investment, it is difficult to see how this proposed program will evolve into a whole that is greater than the sum of its parts.

- **Regional Economies and Commercialization**

The strong record of achievement in commercialization of the previously-funded Wright Center at the lead institution (OSU) is cited, but only a limited discussion was provided for the economic impact of the network as a whole. Given the lack of cohesiveness of the network it was not clear how the network would bring added benefit to the Ohio economy.

- **Relationship to Third Frontier Program**

This proposal aims to build upon the highly successful Wright Center of Innovation in Biomedical Imaging funded in 2003 through TFP support. The strong track record of that Center is one of the strengths of this proposal.

- **Cost Share and Letters of Commitment**

The 4 academic centers and the other partners have each provided substantial institutional commitment in cost-sharing, and the letters of commitment show exceptionally strong support from all parties at levels appropriate to the proposed efforts.

Review Summary:

The strengths of this project include the outstanding record of achievement in research, education and commercialization at each of the component institutions, the strong institutional commitment in both funds and infrastructure support, and the exceptional letters of commitment from the industrial partners. The recruitment packages are exceptionally strong and should easily be capable of attracting the desired level of senior investigators. The primary weakness is that the proposed network lacks a cohesive framework that truly seeks to bring the 4 academic centers together to build a stronger integrated program. There was no compelling justification for why the network would be stronger than the individual components. There is little or no past record of inter-institutional collaboration and there is no substantial collaboration proposed. In addition, there is overlap between several proposed chairs and poor justification for the need of several others. Thus, while the individual programs that originally sought to propose separate ORSP efforts might have ranked very favorably with others nationally, the committee's overall enthusiasm for this network as a whole can be considered moderate.

ORSP 08-037
Ohio Academic Research Cluster for Layered Sensing
University of Dayton

Proposal Summary:

As described in the proposal for the Ohio Academic Research Cluster for layered Sensing (OARCLS), layered sensing is defined as taking a multitude of diverse and distinct sensor platforms and fusing their data into one synergistic view of the environment being sensed.

Applications of interest, according to the proposal, include military, security, safety, medical, triage, law enforcement, geographic information services, environmental, and agricultural markets.

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$35,710,514	\$25,679,497
Operating Non-ERP	\$2,289,486	\$19,254,636
Capital Non-ERP	\$12,000,000	\$8,412,250
Subtotal	\$50,000,000	\$53,346,383
TOTAL	\$103,346,383	

The purpose of this Track 2 proposal is to enable the compilation of world-renowned layered sensing intellectual capital in Ohio and thereby establish Ohio as the undisputed academic leader in layered sensing. Ten new research scholars would work with five existing endowed chairs and 99 other scientists, professors, and researchers who are part of the Wright Center of Innovation, Institute for the Development and Commercialization of Advanced Sensor Technology (IDCAST) universities. Through IDCAST, OARCLS would leverage the technological and intellectual capital of the Air Force Research Laboratory and other federal labs to identify and share global layered sensing needs, technologies, and solutions. Working through IDCAST, OARCLS would also exploit the technological and intellectual capital of industry and federal labs to create the state-encompassing Ohio Alliance for Layered Sensing (OALS), where those who develop technology would directly interface and collaborate with those who define the needs, provide the funding, and provide the commercial solutions for Layered Sensing. The net result is intended to have a sustainable and substantial economic impact on Ohio.

Detailed Review:

- **Quality of the research cluster**

The proposal presents an ambitious goal to develop world leadership in layered sensing. The quality of the proposed group is excellent. They have a strong history of excellent research. The backing of IDCAST is a significant plus. The research groups have a history of attracting quality graduate students. However, the proposal is weak with regard to benchmarking.

- **Growth plan**

The growth plan and the request for 10 research scholar positions are highly ambitious. This plan misses the user group and focuses mostly on technology, which may not be practical. Also, the link between sensors and solutions is not well described. Without a clearly identified user group, this program may not be successful. Technology alone will not necessarily bring solutions to these problems.

- **Regional economies and commercialization**

The sensors program within Ohio has played a significant role in regional economics, jobs and commercialization. There is an excellent track record of developing new technologies, commercialization of technologies, industrial collaboration and product development. The link with IDCAST that brings millions of dollars to support commercialization is considered outstanding.

- **Relationship to Third Frontier Program**

The relationship of this proposal to the third frontier program is very good.

- **Cost share and letters of commitment**

Cost share and letters of commitment are considered adequate for the process. The partnership with Air Force Research Laboratory is considered an important asset to the program.

Review Summary:

It was not clear whether this proposal should have been a Track 1 or a Track 2 proposal. The proposal request is for the full amount allowed in the program. The technology part of the proposal is very strong, but the technology may not be practical. The request of 10 positions to develop this program is ambitious. The integration of this effort into IDCAST seems like a natural plan. It is not clear how all of the proposed technologies would solve problems of interest to clearly identified users. There is no clear articulation of the link to “disruptive challenges, irregular challenges and the catastrophic challenges” that the layered sensing program is expected to tackle. A management plan linking this to the end user group would have been very helpful.

ORSP 08-038
Orthopaedic Research Cluster of Northeast Ohio
The University of Akron

Proposal Summary:

This Track 2 proposal aims to establish the Orthopaedic Research Cluster of Northeast Ohio (ORCNEO) at the interface of musculoskeletal biology, polymer/material science and clinical orthopaedics. The cluster will consist of a core group of key basic and clinical scientists from participating institutions. In addition, five new eminent scholars—a polymer/biomaterial chemist at the University of Akron, a biomedical engineer at the University of Akron, a musculoskeletal biologist in tissue engineering at NEOUCOM (Northeastern Ohio Universities College of Medicine), an orthopaedic oncologist / skeletal tumor biologist at NEOUCOM, and a musculoskeletal biologist at Case Western Reserve University—and associated staff members will be recruited. The cluster’s major initiatives will have both educational and research goals and the research will focus on areas with commercialization potential. Three areas of research are identified as the primary focus: soft functional materials for structured biosurfaces; drug delivery devices for orthopaedic applications; and diagnostic markers for bone and cartilage tumors.

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$17,563,791	\$14,073,745
Operating Non-ERP	\$2,501,243	\$6,655,288
Capital Non-ERP	\$2,898,000	\$2,455,000
Subtotal	\$22,963,035	\$23,184,033
TOTAL	\$46,147,068	

Five future growth areas for the cluster are defined. They include regional inclusion, governance structure, member programs, research topical thrusts and commercialization plans. These growth areas are expected to solidify existing relationships among the participating institutions, which will eventually expand and include additional partners, and create critical mass to maximize recruitment, funding and research. A governing structure to facilitate collective interactions is described in detail. The expectations are that the five new endowed faculty members will significantly improve the group’s commercialization prospects, including partnerships with companies, licensing agreements, product developments, spin-off companies and joint ventures.

Detailed Review:

- **Quality of Research Cluster**

The faculty members from the cluster institutions have expertise in polymer science, biology, and orthopedics. They are internationally known in polymer science, biomedical engineering and orthopaedics, and several have successful collaborations with Ohio-based industries, including both established and start-up companies. Interdisciplinary, inter-departmental and collaborative research among the participating institutions appears to be growing. The University of Akron has a track record of training a large number of PhD students, and CWRU and NEOUCOM

participate in an Integrated BioScience Program with UA. The core facility is well developed and is adequately described in the proposal. Benchmark institutions in related fields are the Hospital for Special Surgery in New York, the Mayo Clinic, the University of Iowa, the University of Pittsburgh and the University of Rochester. The goals of the ORCNEO, to match or exceed the performance of these institutions, are realistic.

- **Growth Plan and Requested Positions**

The growth plan of the ORCNEO Research Cluster is very well outlined. It covers regional inclusion, governance structure, member programs, research topical thrusts and commercialization plans. The proposed governance structure includes high level administrators from the participating institutions with Dr. Walter E. Horton, Jr., of NEOUCOM, as the director. Plans for a commercial advising committee and a scientific advisory committee are in place. Additional plans for seminars, workshops, data review series, a pre-submission review program, research retreats, a resource database and commercialization workshops are specified. For the basic research foci of the ORCNEO in polymer science/biomedical engineering, orthopedics, musculoskeletal biology, key personnel and collaborators are identified. Three research areas that have immediate commercialization potential have been identified. They are soft functional materials for structured biosurfaces, drug delivery devices for orthopaedic applications and diagnostic markers for bone and cartilage tumors.

Resources allocated for the new scholars' startup packages (including both ORSP funds and substantial supplemental funds) were explained in detail during the applicants' interview with the committee and were considered appropriate. The committee felt that the plans for establishing and coordinating cluster activities had significant potential, but that the addition of five new faculty members at four different institutions would make it difficult to achieve synergy. The committee agreed that a more focused cluster with fewer new positions might be more successful. For example, the cluster might be able to succeed with either a musculoskeletal biologist with expertise in tissue engineering or an oncologist / skeletal tumor biologist at NEOUCOM, but not both. In either case, it is important that the applicants justify the strategic importance of each of their proposed faculty members.

- **Regional Economies and Commercialization**

Ohio is currently strong in biopolymers and the biosciences, and the new Orthopaedic Research Cluster of Northeast Ohio would support the development of a new industry of ortho-polymers. The four new commercialization endpoints described—novel bone cement, localized drug delivery to treat osteoarthritis, bone support polymer and engineered skeletal elements—are very relevant and realistic. Cluster faculty members already have a record of success in commercialization and a flowchart describing company partnerships, licensing agreements, product developments, spin-off companies and joint venture agreements is provided. How joint ventures will be governed and intellectual property shared with industrial partners could be better defined.

- **Relationship to Third Frontier Program**

There are active applied TFP supported research activities discussed in the proposal, but their direct relationships to the current cluster researchers were not well defined. No Third Frontier investments in orthopaedics are described.

- **Cost Share and Letters of Commitment**

There was some concern that not all members of the Cluster were equally invested in the proposal, based on their institutional contribution to the recruitment process. Although a letter of support was provided by the tissue engineering group at Cleveland Clinic and the Lerner Research Institute, it was not clear how the Cluster would interface with this group. Such an interaction was felt to be very important for achieving the stated goals of the Cluster.

Review Summary:

This proposal is responsive to the RFP. The Orthopaedic Research Cluster would be a valuable asset to Ohio, and this is a particularly important area of research given the aging of the baby boomer population. The caliber of current cluster members is high and the individual institutions excel in their own domains. The committee felt that although the group was very strong, its goals might be achievable with fewer strategic hires. Specifically, the committee felt that four endowed scholar positions instead of five, might be more appropriate. Moreover, the selection of these individuals is critical as they will cement the Cluster across geographical and programmatic barriers. The panel felt strongly that this cluster deserves encouragement but that they might be able to achieve most of their goals with a lesser investment than that requested.

ORSP 08-040
Adaptive MetroScale Instrumentation and Information Networks
for Urban Health and Sustainability Monitoring
University of Cincinnati

Proposal Summary:

This proposal describes plans for collaboration between the University of Cincinnati (UC) and Wright State University (WSU) to develop a research cluster in the area of sustainable cities. Funding is requested for five faculty scholars, one each in the following programs: Computer Science (UC), the Center for Chemical Sensors and

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$18,260,000	\$5,439,595
Operating Non-ERP	0	\$11,933,119
Capital Non-ERP	0	\$3,351,650
Subtotal	\$18,260,000	\$20,502,714
TOTAL	\$38,762,714	

Biosensors in the Department of Chemistry (UC), the Environmental Engineering and Science Group in the Department of Civil and Environmental Engineering (UC), the Department of Environmental Health (UC), and the Department of Computer Science (WSU). The main objective of this consortium is to establish intelligent networks of sensors for air quality, water quality, structural integrity, energy consumption, and other parameters within an urban area to enable the data to be available to a variety of users. Such a network would provide information about air and water contaminants, deterioration of structures before they fail, attacks on people or property, and other emergency situations. Real-time continuous data resulting from this network could be valuable for safeguarding city residents and for allowing vital city functions to continue during emergencies. The data could also be used by city decision makers to better understand how urban development can proceed without compromising the long-term health, safety, or quality of life of city residents.

Detailed Review:

- **Quality of the Research Cluster**

The investigators have identified a very important topic area. Networks of sensors of the type proposed here are greatly needed, and they would help avoid short-term, local emergencies as well as long-term, unsustainable urban growth with high energy consumption rates, excessive use of material resources, and continued acquisition of land for urban development. Some of the investigators have excellent track records, with success in obtaining research grants and in producing outstanding graduate students. However, the quality of the investigators throughout the five collaborating programs is a bit uneven. The attention to recruiting underrepresented groups is noteworthy. Although the investigators propose to bring their expertise together in collaboration, these groups have only limited past experience in working together. The proposal

contains little discussion of the science behind the proposed research such as the types of sensors to be developed, nor is there discussion of the networks to be established.

- **Growth Plan and Requested Positions**

The plans for recruiting the faculty scholars are well described in the proposal for the four UC slots. The proposal does a good job of integrating plans with the UC21 Academic Master Plan “Defining the New Urban Research University.” This integration suggests that the UC administration will be solidly behind the proposed work. It is also gratifying that the university is committed to funding an instrumented sustainable residence hall to serve as a living laboratory where individual resource use will be monitored. The proposal does a commendable job of identifying four of the five faculty scholar positions and the work of the scholars in relation to the proposed research cluster. However, asking for five faculty slots is ambitious for a Track 2 proposal. Furthermore, there is little information given about the fifth faculty scholar to be hired at WSU. Although the proposal lists programs at other schools as benchmarks, the characteristics of these benchmarked programs are absent, and thus it is difficult to know how the investigators will make use of the work underway at these other institutions.

- **Regional Economies and Commercialization**

Both universities involved in this proposal have considerable experience at the administrative level in technology transfer. The UC Intellectual Property Office and the WSU Director of Technology Transfer appear to be well equipped to promote commercialization efforts. Using Pegasus Technical Services, Inc. as an example may be overly optimistic, however; the amazing growth experienced by Pegasus, growing from a company of one employee to a company of 50 employees in three years, will be hard to match.

- **Relationship to the Third Frontier Program**

The proposal discusses a Wright Center for Innovation in Data Management and Analysis (ADMA) on page 13, and states that the UC Department of Computer Science “contributed significantly” to this Center. However, information from the State of Ohio indicates that WSU is lead institution for ADMA, and UC is merely a partner and therefore not responsible for this Center. Furthermore, the proposal discusses the Institute for the Development and Commercialization of Advanced Sensor Technology (IDCAST) at WSU, another TFP-sponsored program, stating on page 9 that “Both UC and WSU are founding academic partners of IDCAST.” Information from the State of Ohio shows that the University of Dayton is the lead institution for IDCAST, and hence the leadership at UD is responsible for the administration of this Center. Thus the leadership at UC may not be a major contributor to IDCAST’s success.

- **Cost Share and Letters of Commitment**

The cost share amounts proposed by UC and WSU are reasonable for the project. The letters of commitment are adequate.

Review Summary:

This proposal identifies an important area with good possibilities for development of technologies that have the potential of commercialization. The proposal is generally well prepared and makes reasonable arguments for the planned research cluster. However, the proposal may be too ambitious in asking for five faculty scholars, since the group has had limited experience in collaborating and has not been engaged directly in the TFP process before. The proposal could be strengthened by briefly discussing some of the sensor technologies and networking methods proposed for development, identifying characteristics of the benchmarked programs to be adopted here, and discussing research areas of PhD students at the WSU Department of Computer Science and Engineering as well as what the faculty scholar hired at WSU would be expected to do.

ORSP 08-042
Ohio's PROMISE – The Program in Microbial Sensing
University of Cincinnati

Proposal Summary:

This Track 1 proposal aims to establish a multi-institutional Program in Microbial Sensing (PROMISE) to develop and commercialize non-invasive, portable, accurate, rapid and reliable handheld Point of Care (POC) diagnostic devices for infectious diseases using unique biomarkers. The initial focus will be on detection of agents causing respiratory infections, and participating investigators already have lead compounds to aid diagnosis of Pneumocystis pneumonia, herpes simplex virus, and MRSA.

Proposed Budget		
	State Funds	Cost Share
Endowed Recruitment Package (ERP)	\$36,866,714	\$19,178,504
Operating Non-ERP	\$2,508,401	\$20,876,835
Capital Non-ERP	\$6,750,000	\$6,228,000
Subtotal	\$46,145,115	\$46,283,339
TOTAL	\$92,428,454	

The program brings together current faculty from six institutions: the University of Cincinnati (UC), Cincinnati Children's Hospital Medical Center (CCHMC), the University of Dayton (UD), Miami University (MU), Wright Patterson Air Force Base (WPAFB), and Wright State University (WSU). It also integrates seven existing biotech/POC device companies. As part of the new Program, the applicants propose to establish a Biomarker Discovery Group and Diagnostic Nanodevice Group, which will coordinate with an Ohio Company Group of the interested companies. Funds are requested to support 9 new research scholars in the areas of microbial pathogenesis (2 scholars at CCHMC), systems biology and biomarker discovery for infectious diseases (1 scholar at UC), microbial proteomics (1 scholar at MU), microbial signature evaluation (2 scholars at UC), biomaterials and molecular recognition (1 scholar at UC), biosensor fabrication (1 scholar at UC), and bioelectronics (1 scholar at UC). The Program Director would be selected from among the new hires.

Detailed Review:

- **Quality of Research Cluster**

This program builds on existing expertise in respiratory pathogens and nanoscale science technology, and the total number of currently available principal investigators at the participating institutions is quite large. However, the committee expressed concern at what it felt was evidence of the applicants' lack of experience with the full process of development and commercialization of biomarker-based diagnostic devices. The proposal did not acknowledge the very substantial technical challenges of predicting disease characteristics based on microbial detection, which is particularly difficult because of current limited understanding of host-pathogen interactions. The committee was concerned that the proposal did not adequately take

into account the fundamental nature of diagnostic microbiology: that as sensitivity increases there is a proportional loss of specificity and predictive power. (For example, in many cases it is still controversial whether or not to treat or take action based on a PCR-positive test result in an otherwise healthy presenting patient.) The proposed development pipeline—discovering biomarkers using established methods such as genomics, proteomics, and data mining and then developing these biomarkers as POC biosensors—is a conventional and unimaginative approach. The absence of current collaborations between the participating institutions also raised concerns, because of the risks inherent in having the success of the program depend on yet-to-be-recruited leaders.

Given the apparent lack of prior collaborations and experience in the focus area of the proposed Program, the committee noted that this proposal might have been better classified as Track 2. In summary, while the proposal made a strong case for the importance of rapid and reliable diagnosis of infectious diseases, the committee was not confident that this Program would provide a dynamic and nationally competitive research and development foundation in this area, able to adjust as funding opportunities and product market conditions change.

- **Growth Plan and Requested Positions**

The proposal does a thorough job of laying out the academic and research goals for PROMISE, in six month intervals. The goals are challenging and ambitious, and the applicants acknowledge that the Program's success is critically linked to their ability to recruit nine highly qualified individuals with relevant expertise, including four "significant leadership recruitments" at the level of director. The expected qualifications for each of the requested research scholar positions are well defined in the proposal. The committee agrees that failure to hire a critical mass or the right individuals would almost certainly result in failure to reach the stated goals. The applicants address this issue by offering competitive recruitment packages and by identifying a reputable recruitment firm to help fill these critical positions. Even so, the committee was skeptical that the applicants would be able to recruit individuals of sufficient caliber to carry off the proposed program, and questioned whether the recruitment timeline was realistic given the focused nature of these positions and the competitiveness in the marketplace for these disciplines. The proposal did not include a fall-back plan in the event that the recruiting efforts do not progress as proposed, which would have provided more confidence that the program would be successful and meet its stated goals.

The proposal is also lacking in its discussion of how the new faculty's research and future funding applications will be managed in order to maintain a cohesive team. Given the nature of the individuals and organizations involved, a detailed plan for management of conflicts of interest (COI) and responsible conduct of research at both the individual as well as at the institutional level is essential. To be credible, it is important that such plans be enforceable and auditable, which may present a significant administrative challenge to some of the participating individuals and organizations (particularly privately held companies).

- **Regional Economies and Commercialization**

The business model and reporting structure are well developed and provide confidence that the program will benefit from several layers of advice and oversight. A well defined path for Project Management has been provided. Here again, however, the Program Director (to be recruited) is a very critical element. Given the stated desire to “hit the ground running,” the committee was concerned that there is no discussion of who will serve in this capacity until the permanent director is recruited, which could take up to two years.

- **Relationship to Third Frontier Program**

The lead applicant, UC, has not been a lead applicant on any past Third Frontier Program awards. The proposal discusses the past successes of the Wright Center of Innovation IDCAST (Institute for the Development and Commercialization of Advanced Sensor Technology), many of whose members are participants in the current proposal.

- **Cost Share and Letters of Commitment**

Appropriate documents have been provided for letters of commitment from the various sources.

Review Summary:

The committee felt that this proposal was too ambitious relative to the current expertise of the participating institutions and too heavily dependent on the new recruits for success. The proposal did not reflect sufficient experience with the focus area of the proposed Program in Microbial Sensing: the development and commercialization of POC diagnostic devices utilizing unique biomarkers of infectious diseases. It did not acknowledge the unique challenges in identifying biomarkers for infectious diseases and in commercializing diagnostic tests such as those proposed. It also took a conventional approach to biomarker discovery and integrated device development without looking forward to advances in these areas that may transform the marketplace five years from now. Although the required personnel to establish this Program were well defined, the committee was skeptical that individuals of sufficient caliber could be recruited. Overall, the participating institutions’ current lack of expertise and history of past collaborations in this area, coupled with extreme dependence on leadership from the new recruits, left the committee unconvinced that this proposal could succeed.

APPENDIX B

Evaluation Criteria		ORSP 08-	ORSP 08-
A. Quality of Research Cluster		Score 0-5*	Score 0-5*
	Track 1	Track 2	
Current reputation	Research cluster is well-established and externally recognized	Promising areas of research that have not received external recognition	
Benchmarks	Research activity has been benchmarked against international leaders and applicant understands investment needed to be competitive on an ongoing basis	Research activity has been benchmarked against leaders in the chosen field and applicant understands investment needed to become competitive against benchmarked leaders	
Collaboration	There is significant collaboration including industrial research centers; other research institutions; or interdisciplinary relationships within an institution	Group has pursued successful collaboration including industrial research centers; other research institutions; or interdisciplinary relationships within an institution	
Current staff	Research cluster is highly productive with distinguished faculty members with a substantial history of external funding and a record of attracting scholar-leaders of international eminence	Research group has a core of researchers that have demonstrated some evidence of having advanced scientific knowledge in the research focus area and have been successful at attracting external funding	
Current graduate students	Research cluster has a history of attracting academically outstanding graduate students	Research cluster has a history of attracting quality graduate students	
Environment/infrastructure	Adequate support services and infrastructure to conduct the highest quality research, development and commercialization	Adequate support services and infrastructure to conduct quality research, development and commercialization	
Regional integration	Proposed research area is integrated with the strengths of one or more of the state's regional economies (same for track 1 and 2)		
R&D and Commercialization	Track 2 only	Research group has productive research	

relationships		development and commercialization relationship with Ohio-based companies in proposed focus area		
B. Growth Plan and Requested Positions				
Future research and academic goals are clearly defined and realistic				
Growth plans are detailed and clearly support the attainment of the research and academic goals				
Growth plans represent potential for substantial improvement in the quality and competitiveness of the research cluster relative to benchmarked leaders				
Growth plans are appropriate fit to overall structure of participating institutions and will benefit from synergies with other research, academic, and service units				
Financial and other resources are adequate				
Appropriate leadership is identified with authority to commit resources and provide long-term oversight				
New positions are clearly defined, critical to improving the quality of the cluster and well-integrated in the growth plan (see attachment)				
Likelihood that participating institution will be able to attract the caliber of talent defined by the new positions				
Recruitment process is clearly defined and adequate for attraction of caliber of talent defined				
Packages proposed are competitive for attraction of caliber of talent defined				
Capital project proposed (if any) are consistent with the growth plans and strengthen the competitiveness of the endowed recruitment packages				
C. Regional Economies and Commercialization				
Growth plans and positions requested improve the relevance of the research cluster to one of more Ohio regional economies				
Growth plans and positions requested improve the commercialization potential of the research cluster and details are provided about the nature of future commercial opportunities				
Past commercialization performance support assumptions about future commercialization potential				
Appropriate resources to support technology commercialization are identified and a plan for their integration into the research cluster is defined				
A process is defined for maintaining an ongoing engagement with regional economic development interests, private business, and the investment community				
D. Relationship to Third Frontier Program				
The applicant provides a description of research cluster's performance on prior TFP grants that is sufficiently detailed to allow assessment of whether the performance on each prior grant has been satisfactory.				

This discussion is required only if group has prior TFP funding		
The applicant clearly describes how the proposal relates to prior TFP investments, If the proposed research cluster focus area does not relate to prior TFP investments, a description is provided of why this proposed research cluster is of critical importance to Ohio’s economic future. This discussion is <u>required</u> whether or not the applicant has received such funding.		
F. Cost Share and Letters of Commitment		
Cost share commitments are realistic and relate directly to the support of new positions and growth plan		
Letters of support meet the requirements established by the RFP and are sufficiently detailed to inspire confidence in that the collaboration is substantive.		

* A score of 0 should be used to indicate that the applicant either did not address the requirement or that the applicant completely failed to meet the requirement. A score of 5 should be used to indicate that the applicant meets the requirement exceptionally well.

APPENDIX C

BIOGRAPHICAL SKETCHES OF COMMITTEE MEMBERS

CO-CHAIRS

Bradley W. Fenwick, Ph.D., currently serves as Vice Chancellor for Research and Engagement at the University of Tennessee. Prior to his recent move to the University of Tennessee, Dr. Fenwick was Vice President for Research at Virginia Tech for three years. Before he arrived at Virginia Tech in 2004, Fenwick served as the Chief Science Adviser for the U.S. Department of Agriculture's competitive research program for two years. He oversaw a research program spanning a wide variety of subject areas in the biological, environmental, physical, and social sciences. At Virginia Tech, Fenwick saw the expansion of the university's research program to more than \$300 million in research expenditures over the course of his tenure. A veterinarian, he also has an active research program in infectious diseases and animal-human comparative medicine. Dr. Fenwick earned his D.V.M. at Kansas State University in 1981, and later earned his Ph.D. in Comparative Biology at the University of California, Davis, in 1985. He has various certificates, licenses, and awards. He also owns 4 patents. Dr. Fenwick has authored multiple scientific publications.

T.W. Fraser Russell, Ph.D. (NAE), is the Allan P. Colburn Professor of Chemical Engineering at the University of Delaware. He has also served as chairman and professor in the Department of Chemical Engineering, acting dean and associate dean in the College of Engineering, director of the Institute of Energy Conversion, and Vice Provost for Research, all at the University of Delaware. Previously, Dr. Russell was a design engineer for Union Carbide Canada; a research engineer for the Research Council of Alberta; a chemist at the British American Oil Company; and a consultant to a number of industries, including E.I. Du Pont de Nemours. He has been extensively involved in the engineering development of semiconductor materials for photovoltaic modules, including manufacture and commercial-scale designs. Dr. Russell has received a number of awards, including the Francis Alison Award, the American Institute of Chemical Engineers (AIChE) Award in Chemical Engineering Practice, the AIChE Wilmington Section Thomas H. Chilton Award, and the American Chemical Society Leo Friend Award. He has a B.S. and M.S. from the University of Alberta and a Ph.D. from the University of Delaware in chemical engineering.

MEMBERS

Angela M. Belcher, Ph.D., is the Germehausen Professor of Materials Science and Engineering and Biological Engineering at Massachusetts Institute of Technology. The focus of Dr. Belcher's research is understanding and using the process by which Nature makes materials in order to design novel hybrid organic-inorganic electronic and magnetic materials on new length scales. Her expertise is biomaterials, biomolecular materials, organic-inorganic interfaces, and solid state chemistry. Dr. Belcher has been awarded the Presidential Early Career Award in Science and Engineering (2000) and the Du Pont Young Investigators Award (1999). She received her BA in Creative Studies in 1991 and her Ph.D. in Chemistry (1997) at the University of California, Santa Barbara.

Barbara D. Boyan, Ph.D., is a professor in the Wallace H. Coulter Department of Biomedical Engineering at Georgia Tech and Emory University in Atlanta, Georgia where she holds the Price Gilbert, Jr. Chair in Tissue Engineering. She is also an adjunct professor in the Departments of Orthopaedics and Cell Biology at Emory University Medical School as well as the Schools of Biology and Materials

Science and Engineering at the Georgia Institute of Technology, and she has an adjunct professorship in Periodontics at the University of Texas Health Science Center at San Antonio. She is a Georgia Research Alliance Eminent Scholar and Deputy Director of Research at the Georgia Tech-Emory Center for the Engineering of Living Tissue as well as Director of Children's Healthcare of Atlanta's Laboratory for Craniofacial Plastic Surgery Research. Dr. Boyan's research program is focused on bone and cartilage cell biology in the fields of orthopaedics, plastic and reconstructive surgery, and oral health. In 1993, she co-founded OsteoBiologics, Inc. (San Antonio, Texas) to develop tissue engineered medical products for treatment of bone and cartilage defects. The first generation of these products is now approved for use clinically both in the US and Europe. Dr. Boyan is also co-founder of Biomedical Development Corporation in San Antonio, Texas and Orthonics, Inc., SpherIngenics, Inc., and DentiCure, Inc., in Atlanta. Dr. Boyan co-chairs the Preclinical Assessments subcommittee of the Tissue Engineered Medical Products F04 Division of ASTM. She has served as chair of the Orthopaedic Device Panel of the United States Food and Drug Administration and presently serves on the CMS (Center for Medicare and Medicaid Services) medical device panel, as well as on the National Materials Advisory Board for the National Academies in the United States. The author of more than 340 peer-reviewed papers, reviews, and book chapters, Dr. Boyan holds eight U.S. and international patents, with additional patents pending.

V. Chandra Chandrasekar, Ph.D., is currently a professor at Colorado State University (CSU) and serves as Associate Dean for International Research. Dr. Chandrasekar has been involved with research and development of weather radar systems for about 25 years. He has played a key role in developing the CSU-CHILL National Radar facility as one of the most advanced meteorological radar systems available for research. He also serves as the deputy director of the recently established National Science Foundation (NSF) Engineering Research Center, Center for Collaborative Adaptive Sensing of the Atmosphere. He served as a member of the NRC committee on Weather Radar Technology beyond NEXRAD (Next Generation Weather Radar), and is the general chair for the 2006 International Geoscience and Remote Sensing Symposium. He was elected a fellow of the Institute of Electrical & Electronics Engineers (Geo-Science and Remote Sensing) in recognition of his contributions to quantitative remote sensing. He was elected Fellow of the American Meteorological Society in recognition of his contribution to Radar Meteorology.

Noel A. Clark, Ph.D. (NAS), is a professor of the Physics Department at the University of Colorado. Before moving to the University of Colorado, he was a Research Fellow and Assistant Professor at Harvard University. His current research interest is directed toward understanding and using the properties of condensed phases, ranging from experiments on the fundamental physics of phase transitions, such as melting, to the development of liquid crystal electro-optic light valves. Dr. Clark has served on several committees, including the NRC Panel on Biomolecular Materials and the Committee on Army Basic Scientific Research. He received his Ph.D. in Physics from Massachusetts Institute of Technology in 1970.

George R. Cotter, M.S. (NAE), currently holds the position of Senior Executive at the National Security Agency. Until recently, Mr. Cotter was Director for Information Technologies and Chief Information Officer for the National Security Agency. Mr. Cotter has extensive experience in the field of Cryptology, with a career spanning 50 years, mostly in Computer Science, Mathematics and Cyber Security. Mr. Cotter was founding member of the Federal IT Research and Development Committee, and he remains active in this sector. He has extensive knowledge in High End Computing including development of the latest scalar, vector and multi-threaded architectures in industry and internally. Mr. Cotter also has considerable involvement in the creation and operations of very large-scale IT infrastructures, including: systems, data centers, wide area and global networking. Collaborations in these fields over the past 20 years include most national laboratories, university centers of excellence and other federal agencies. Mr. Cotter has supported NAS studies in the past, primarily in the IT and Security fields, both with funding and briefings, and he was elected to the NAE in 2007.

Cliff I. Davidson, Ph.D., is a professor of Civil and Environmental Engineering as well as Engineering and Public Policy at the Carnegie Mellon University. Dr. Davidson is also the Director of the Center for Sustainable Engineering. Some of his current research focuses on the dynamics and characterization of airborne particles, especially atmosphere-surface exchange, development of emission inventories for ammonia from agricultural sources, and mathematical modeling and measurement of indoor air pollutant concentrations. Dr. Davidson has been awarded the Charles Beyer Distinguished Lecturer, Phillip Dowd Fellowship and Outstanding Educator Award. He received his M.S. and Ph.D. in Environmental Engineering Science at the California Institute of Technology.

Jeff D. Eldredge, Ph.D., is an Assistant Professor in the Mechanical and Aerospace Engineering Department at the University of California, Los Angeles. He directs the Simulations of Flow Physics and Acoustics (SOFIA) Laboratory. Dr. Eldredge's research inclinations fall into the categories of fluid dynamics and acoustics. He specializes in: fluid mechanics and acoustics, interaction of fluid flow and sound, control of acoustically-driven instabilities, and fluid particle-based computational techniques. Dr. Eldredge recently received the National Science Foundation Faculty Early Career Development (CAREER) Award for 2007-2012. He is also a recipient of the "Susan and Henry Samueli MAE Teaching Award" award (June 2006). He completed his Ph.D. in 2001.

Samuel M. Fleming, Sc.D., an independent consultant, is Principal and Founder of Claremont Canyon Consultants. Earlier at Bechtel Corporation he was executive assistant to the executive vice president for strategic planning and technology commercialization of Bechtel BWXT Idaho, LLC. In Bechtel research organizations he served as a senior program manager in operations and in commercial development; as program and commercial development manager for Bechtel's CargoScan™ x-ray imaging system for verification of the US – USSR Intermediate Nuclear Forces (INF) Treaty; as department manager for advanced processes; and as operations manager for renewable energy and fuels. Earlier, he was Director of Advanced Technology Planning at Fluor Engineers and Constructors, was Director of Technology at the Badger Company, Inc., and was a member of the faculty of chemical engineering at M.I.T., and Director of the M.I.T. School of Chemical Practice. Dr. Fleming's expertise spans a wide range of advanced technologies and engineering developments, technical and economic due-diligence analyses, including in advanced fuel and gas conversion, nuclear, solar, wind, geothermal, drilling, biotechnology, x-ray imaging and superconducting magnetic energy storage. He has served on several NRC Panels and on the recently-completed Defense Science Board Task Force on Energy Strategy for the Department of Defense. He has B.S. (Pennsylvania State University), S.M. (MIT), and Sc.D. (MIT) degrees in chemical engineering.

Zorina Galis, Ph.D., is Professor of Vascular Surgery at Indiana University. She was previously Associate Professor of Medicine/Cardiology at Emory University Medical School and Associate Professor in the joint Biomedical Engineering department of Emory University and Georgia Institute of Technology. Her basic research and drug development work has targeted the control of natural and tissue engineered vascular tissue remodeling, including management of clinical cardiovascular events. This work has been supported by numerous research awards from the National Institutes of Health, the American Heart Association, and the National Science Foundation, and has been consistently featured on the "Most read" and "Most cited" articles in top vascular journals. She has been a regularly invited speaker, advisor, and organizer of major international meetings and serves as consultant for several national and international granting agencies, as well as a reviewer and editorial board member for vascular journals. Dr. Galis received undergraduate training in Physics and graduate training in Biophysics and Cell Biology from the University of Bucharest, a Ph.D. in human pathology from the McGill University School of Medicine, and postdoctoral training in Vascular Medicine from Harvard University. Dr. Galis has also acquired drug development expertise while holding key positions in the Cardiovascular Division of Lilly Research Laboratories.

Gary H. Glover, Ph.D. (NAE), is Professor of Radiology and Professor in Neurosciences & Biophysics at Stanford University School of Medicine. His academic research interests encompass the physics, biophysics and mathematics of biomedical/diagnostic imaging, primarily with Magnetic Resonance. Presently his research is directed towards exploration of rapid MRI scanning methods using spiral and other non-Cartesian k-space trajectories for dynamic imaging of brain function. Using these techniques, his students develop MRI pulse sequences and processing methods for mapping cortical brain function, with applications in both basic and clinical neurosciences. These methods provide functional image contrast from hemodynamically driven increases in oxygen content in the vascular bed of neuronally activated cortex, using pulse sequences sensitive to the paramagnetic behavior of deoxyhemoglobin or to changes in the blood perfusion. As Director of the Lucas Center, where virtually all campus fMRI scanning is performed, he collaborates with a large number of students and faculty in performing studies in cognition of memory, language, emotion, mood, audition, pain, depression and many other basic and clinical research fields. Most recently, Dr. Glover has been developing real-time fMRI feedback techniques for regulating brain function with potential therapeutic applications such as the reduction of chronic pain, control of addiction and depression and enhanced learning in cognitive dysfunction. Dr. Glover is an elected member of the National Academy of Engineering and was trained in electrical engineering at the University of Minnesota.

Mool C. Gupta, Ph.D., is currently Langley Distinguished Professor and Director of NSF I/UCRC Center for Lasers and Plasmas at the University of Virginia. Previously, he was Director of the Applied Research Center, Program Director for Materials Science and Engineering at Old Dominion University. He has worked at the Research Laboratories of Eastman Kodak Company for 17 years as a Senior Scientist and Group Leader. Before joining Kodak he was Senior Scientist at Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California. His research interest includes Photon Processing of Materials, Thin Films, nanomaterials and devices and Sensors. Dr. Gupta is the Editor-in-Chief for *CRC Handbook of Photonics* (first edition). He has over 85 research publications and 25 patents and was inducted in Kodak's Inventors Gallery. He has taught courses at Cornell University, University of Rochester, MRS and SPIE meetings. Dr. Gupta has a Ph.D. in Physics from Washington State University (1973).

Jeffrey W. Herrmann, Ph.D., is an associate professor in the Department of Mechanical Engineering and the Institute for Systems Research at the University of Maryland. He is also the director of the university's Computer Integrated Manufacturing Lab. Dr. Herrmann is a member of several societies including the American Society of Engineering Education (ASEE), the Institute of Industrial Engineers (IIE), and the Society of Manufacturing Engineers (SME). His current research interests include emergency preparedness planning and response, health care operations, production scheduling, and engineering design decision-making. Dr. Herrmann received his B.S. in Applied Mathematics from Georgia Institute of Technology and his Ph.D. in Industrial and Systems Engineering at the University of Florida.

Hans G. Hornung, Ph.D. (NAE), is the Clarence L. Johnson Professor of Aeronautics at the California Institute of Technology. His research focuses on turbulence and flow in hypersonic environments. Formerly, he was the director of the DFVLR Institute for Experimental Fluid Mechanics in Göttingen, Germany, and a professor of physics at the Australian National University, Canberra. He also held a position as a research scientist at the Aeronautical Research Laboratories in Melbourne. Dr. Hornung holds a bachelor's degree in mechanical engineering, a master's degree in engineering science from the University of Melbourne, and a Ph.D. in aeronautics from Imperial College at the University of London. He is experienced in aerospace engineering, physics, thermodynamics, and aerodynamics. He was elected as a foreign member to the Royal Swedish Academy of Engineering Science in 1991 and as a foreign associate to the National Academy of Engineering in 1997.

Edbert Hsu, M.D., M.P.H., is the Director of Training at the Johns Hopkins Office of Critical Event Preparedness and Response (CEPAR). Combining his international health background with a special interest in disaster medicine as a faculty member at Johns Hopkins, Dr. Hsu has worked on emergency medicine program development and disaster preparedness around the world. Currently, he serves on the leadership group of the Office of Critical Event Preparedness and Response (CEPAR) and is a co-investigator with the DHS Center for the Study of Preparedness and Catastrophic Event Response (PACER) at Johns Hopkins. Dr. Hsu has completed military training in the management of chemical and biological casualties and has extensive experience in the planning and evaluation of disaster drills. In recent years, he has led statewide efforts to enhance hospital pharmaceutical preparedness for public health emergencies. As a fellow of the American College of Emergency Physicians (FACEP) and principle investigator on several federally funded projects, he has lectured widely on various emergency and disaster-related topics and has been a grant reviewer for ASPR. Dr. Hsu is currently an Associate Editor for the recently launched *AMA Journal of Disaster Medicine and Public Health Preparedness* and has been the recipient of the Society for Academic Emergency Medicine Young Investigator Award and the AMA Foundation Leadership Award.

Adrian J. Ivinson, Ph.D., is the founding Director of the Harvard NeuroDiscovery Center (formerly Harvard Center for Neurodegeneration and Repair), a broad-reaching program to enhance translational neuroscience research at Harvard Medical School and its teaching hospitals. By combining programs in neuro imaging, drug discovery, biomarkers, clinical trials and genetics, the Center aims to advance our understanding and treatment of Alzheimer's disease, Parkinson's disease, Multiple Sclerosis, ALS and other neurodegenerative diseases. Previously Dr. Ivinson was a Special Assistant to the Provost at Harvard University and Deputy Director of a new project on technology and ethics. In 1993, Dr. Ivinson began his eight-year tenure with the Nature Publishing Group where he served as Senior Editor, Editor in Chief, and finally Publisher of the monthly journals group including: *Nature Genetics*, *Nature Biotechnology*, *Nature Neuroscience* and *Nature Medicine*. After completing undergraduate studies at the University of Aberdeen, and a Masters degree in Medical Genetics at Glasgow University in 1986, he joined the Department of Medical Genetics at the University of Manchester, England and was awarded a Ph.D. in 1991. Concurrent with his Ph.D. studies, he worked in a medical genetics laboratory developing prenatal and diagnostic tests for genetic disorders and organ transplantation services. Dr. Ivinson's interest in biomedical research extends to the area of neuroethics. He serves as an advisor on a variety of boards including: the Program in Applied Ethics and Biotechnology at the University of Toronto and the Boston Museum of Science Health Science Education Partnership. He regularly visits K-12 classrooms to talk about biomedical research and inspire the next generation of scientists. He lives in Massachusetts with his wife, an artist, and their three daughters.

Noshir A. Langrana, Ph.D., is the chair and Professor of Biomedical Engineering at Rutgers, The State University of New Jersey. He is a Fellow of two professional societies, American Society of Mechanical Engineers (ASME) and American Institute for Medical and Biological Engineering (AIMBE). His areas of expertise are Spine Biomechanics, Rehabilitation and recently Tissue Engineering. Two major highlights of his career include investiture as the first holder of the Mary W. Raisler Distinguished Teaching Chair in Mechanical Engineering at Rutgers University in 2001, and the 2008 H.R. Lissner Medal for outstanding achievement in bioengineering, and significant contribution to the growth of bioengineering and to the mission of the ASME Bioengineering Division. In the national and international bioengineering community, he is both a team builder and a leader. At present he is serving as Associate Editor on three journals: including *Spine Journal*, a publication of the International Society of the Study for the Lumbar Spine; *The Spine Journal*, a peer-review journal sponsored by the North American Spine Society; and the *Journal of Biomechanical Engineering*. While at Rutgers, Professor Langrana has trained many graduate and medical students.

Jeffrey L. Platt, M.D. (IOM), is Director of the Transplantation Biology Program and Professor of Surgery, and Microbiology and Immunology at the University of Michigan. Dr. Platt's research includes fundamental investigation of how T cells and B cells and their products interact with tissues. This research includes projects directed at the development of novel approaches to measuring and restoring immunological fitness and to replacing organ function and protecting tissues against immune and toxic injury. Dr. Platt has authored more than 500 papers and authored or edited 4 books. Dr. Platt is a member of numerous honorary societies and professional organizations, including The American Society of Nephrology, the American Heart Association, and the Association of American Physicians. Dr. Platt earned his M.D. at the University of Southern California in 1977. Dr. Platt was elected to the IOM in 1997.

Bernard I. Robertson, M.B.A., M.S., M.Eng. (NAE), is president of BIR1, LLC, an engineering consultancy specializing in transportation and energy matters that he founded in January 2004, upon his retirement from DaimlerChrysler Corporation. During the latter part of his 38-year career in the automotive industry, Mr. Robertson was elected an officer of Chrysler Corporation in February 1992. He was appointed senior vice president coincident with the merger of Chrysler Corporation and Daimler-Benz AG in November 1998, and was named senior vice president of Engineering Technologies and Regulatory Affairs in January 2001. In his last position, he led the Liberty and Technical Affairs Research group; Advanced Technology Management and FreedomCAR activities; and hybrid electric, battery electric, fuel cell, and military vehicle development. In addition, he was responsible for regulatory analysis and compliance for safety and emissions. He is a member of the National Academy of Engineering, a fellow of the Institute of Mechanical Engineers (U.K.), a chartered engineer (U.K.), and a fellow of the Society of Automotive Engineers. Mr. Robertson holds an M.B.A. from Michigan State University, a master's degree in automotive engineering from the Chrysler Institute, and a master's degree in mechanical sciences from Cambridge University, England.

Venkatakrishna Shyamala, Ph.D. has a PhD from the Indian Institute of Science, Bangalore, India. Dr. Shyamala gained expertise in PCR as a Visiting Scientist in the lab of Dr. Giovanna Ames, Department of Biochemistry at the University of Berkeley. During her 16-year stay at Chiron she worked on Hepatitis C virus, signaling by growth factors and seven transmembrane receptors. Dr. Shyamala acquired considerable nucleic acid diagnostics experience supporting the Chiron Procleix assays used for screening the donated blood for HCV, HIV, HBV, WNV and Parvo B19 virus. More recently as Director at Digene Corporation, she participated in developing assays for the detection of Sexually Transmitted Diseases. Dr. Shyamala currently holds the position of Senior VP of Research and Development at Innovative Biosensors, Inc. in Rockville, MD.

Joel R. Stiles, M.D., Ph.D., is Director of the National Resource for Biomedical Supercomputing (NRBSC) at the Pittsburgh Supercomputing Center, and Associate Professor in the Mellon College of Science and Lane Center for Computational Biology at Carnegie Mellon University. The NRBSC is a Biotechnology Research Resource center funded by the National Center for Research Resources at the National Institutes of Health. Dr. Stiles also holds adjunct Associate Professorships in the Department of Biology at Carnegie Mellon University and the Departments of Neuroscience and Computational Biology at the University of Pittsburgh. Dr. Stiles is perhaps best described as a computational physiologist, with general research interests in cell and tissue modeling applied to personalized medicine, and current specific interests in synaptic and cellular microphysiology. His work includes creation and distribution of research and teaching software for spatially realistic simulations of cellular function, and has illustrated counterintuitive structure-function relationships at the nerve-muscle synapse and in specific instances of neuromuscular disease. He is a principal co-author of MCell, a Monte Carlo simulator of cellular microphysiology, and is also the principal architect of DReAMM (Design, Render, and Animate MCell Models). Dr. Stiles also directs educational outreach activities from K-12 through graduate levels at the

NRBSC and PSC, including the highly acclaimed CMIST program (Computational Modules In Science Teaching).

Scott A. Waldman, M.D., Ph.D., F.C.P., is the Samuel M.V. Hamilton Professor of Medicine and Professor of Biochemistry and Molecular Pharmacology, and the Director of the Division of Clinical Pharmacology at Thomas Jefferson University. Also, he is the Director of the Developmental Therapeutics Program in the Kimmel Cancer Center at TJU. He is a past President of the American Society for Clinical Pharmacology and Therapeutics, and Regent of the American College of Clinical Pharmacology, and the Secretary-Treasurer of the American Board of Clinical Pharmacology. Dr. Waldman graduated with a B.S. in Anatomy from the State University of New York at Albany in 1975. He received his Ph.D. in Human Anatomy and Biochemistry from TJU in 1980 and his M.D. from Stanford University School of Medicine in 1987. Dr. Waldman is a founder of TDT and is the Senior Science Advisor and the Principal Investigator under the TJU Research Funding Agreement and the Principal Investigator under the two NCI-NIH grants for TDT's lymph node and blood tests.

Dr. Steven Warach, M.D., Ph.D., is a Senior Investigator at the National Institute of Neurological Disorders and Stroke (NINDS). He received his B.S., M.A. and Ph.D. degrees from Michigan State University and his M.D. degree from Harvard Medical School. After receiving his Ph.D. in neuroscience and psychology for studies of cerebrovascular effects of cognitive tasks and gender, he did his postdoctoral work at the University of Pennsylvania. Upon completion of his M.D., he did his neurology residency in the Harvard-Longwood Neurology Training Program. In conjunction with his residency, Dr. Warach completed an MRI Fellowship at Beth Israel Hospital in Boston, MA. During this fellowship, he began his work developing and using diffusion-perfusion MRI methods for the clinical diagnosis, management and investigation of acute stroke. In 1993, he joined the neurology and radiology faculties of Harvard Medical School, and in 1994 he was appointed as the founding Chief of the Division of Cerebrovascular Diseases at Beth Israel Hospital. Dr. Warach was recruited to the National Institute of Neurological Disorders and Stroke in 1999, as Chief of the newly formed Section on Stroke Diagnostics and Therapeutics. He directs a translational research program in acute stroke on the following themes: (1) Use of imaging to improve the diagnosis of acute stroke. (2) The identification of early pathologic events and their ability to predict stroke outcome and response to therapeutic intervention. (3) The development of new imaging tools for improvement in clinical stroke trial design. (4) Phase II trials of novel, innovative stroke therapies.

Hugo J. Woerdeman, Ph.D., is Professor and Department Head in the Department of Mathematics at Drexel University. His current research interests are in modern analysis, including operator theory, matrix analysis, optimization, signal and image processing, control theory, and quantum information. He received his Ph.D. from the Vrije Universiteit in Amsterdam, The Netherlands in 1989. In that same year he was appointed assistant professor at the College of William and Mary. During his tenure there he received a 1995 Alumni Fellowship Award for "Excellence in Teaching", and he was awarded the title of Margaret L. Hamilton Professor of Mathematics. Over the years, he has had long-term stays at the University of California, San Diego; the George Washington University; Ecole Nationale Supérieure des Techniques Avancées; Katholieke Universiteit Leuven and Université Catholique de Louvain. Dr. Woerdeman is currently serving as Associate Editor of two journals: the SIAM Journal of Matrix Analysis and its Applications and the International Journal for Information and Systems Sciences.