Summary of the Biological Science & Bioengineering Proposal

STRENGTHS:

The Biological and Bioengineering Sciences spire has a core of 50 faculty members across 21 departments and 4 colleges with national reputations and consistent grant success, representing 39% of the university’s grant funding. Meaningful connections with VT economic development have already been established with more than 200 inventions, over 50 patents and more than 20 licensing agreements. Strong doctoral programs are in place with high quality students. Recruitment potential is significant for particular areas of research foci that already exist at UVM. Facilities are in place and can be leveraged to access additional competitive funding with opportunities to enhance current collaborations. There are clear connections to the proposed spires in Neuroscience and Complex Systems.

WEAKNESSES:

The proposal lacks definition and focus that makes it difficult to identify the value added. The spire is comprised of high quality, nationally recognized and consistently productive faculty who to their credit recognize the challenge of true transdisciplinary work but struggle to describe how the strong research foundation they have already established can be moved forward. Six core areas of research involving motion or movement from atoms to populations are identified with reported collaboration in 2-3 of these areas, although these were not specified. It was difficult to determine from the current description what is the proposed new, transdisciplinary knowledge that will be established that is not already in place—which aspects of the 6 core areas will be further developed? Nuances in the curriculum and proposed research experiences, particularly for the graduate students, that make them transdisciplinary and innovative are missing.

SUGGESTIONS FOR REVISION:

1. It would be important to clearly define the value added.
2. The proposal would be enhanced by making specific connections among the 6 identified research areas that are currently in place and what additional connections can be made among the core areas with investment in the spire.
3. The proposal needs to answer the question, what can be done to move current work in this area to the next level and create an innovative curriculum and research experience that can then be used to recruit the best undergraduate and
graduate students as well as faculty who are interested in addressing critical research questions in a transdisciplinary manner?
Complex Systems

This is a strong and well-written proposal that builds on the work of the Complex Systems Center over the last several years. The concept of “complex systems” is clearly articulated, inherently transdisciplinary, and could lead to major steps forward across a variety of disciplines. There is excellent potential for funding, and promising connections to local/regional economic development.

This proposal has a number of strengths. UVM seems to be well positioned to lead the nation in program development in this area. There is a critical mass of faculty already at UVM, and the imminent arrival of Stuart Kaufman will garner national attention and interest. The proposal did an excellent job identifying partnerships across the university, and making the case for the large variety of collaborations that are possible.

The Certificate in CSYS is already providing a strong draw for graduate students who want skills in this area, but not necessarily a math or computer science degree. The development of a PhD program in complex systems will highlight the program and has the potential to draw excellent graduate students. Because complex systems approaches can and should be woven into many research domains across the campus, the notion of an “umbrella program” where students are co-advised is even more attractive, although more difficult to achieve.

The weaknesses in the proposal are links to the undergraduate curriculum, the potential for collaboration with businesses and thus contributing to economic development in Vermont, and the request for resources.

There are several opportunities to improve the proposal. First, the rationale for the faculty lines needed should be further developed. The high, medium and low options are confusing – what is your best (and realistic) guess about what is needed to grow to national prominence in a reasonable period of time? If we must hire a minimum of 5 new faculty members just to establish a Ph.D. program, we have little chance of becoming nationally prominent in 5 years. Is there a way to better leverage the faculty that we currently have?

Additional attention to the balance between methods faculty in computer science and math versus faculty in other areas that use complex systems approaches in their work would strengthen the proposal. There will be a need for faculty members across the disciplines that can be the collaborators and links to experimental scientists who are collecting the data sets necessary to run the models. Limited data sets can be a major constraint for real-world applications of complex systems approaches.

Finally, as this proposal moves forward, the question of whether complex systems should be developed as an independent focal area, or instead should be integrated as a signature approach across many research themes should receive additional attention.
Culture and Society Spire Proposal/Evaluative Response

The purpose of this proposal is to establish a center with the intent of bringing together a group of faculty who have an interest in some aspect of culture and/or society. The organizers propose to bring together 10-12 organizing faculty and post-doctoral fellows each year to work on topics related to the chosen theme for that particular year. It is expected that a core body of knowledge will emerge and stronger scholarly ties will be forged between and among colleagues. A strength of the proposal is the attempt to recognize and include as many faculty as possible. This is also the weakness. By attempting to be so inclusive they “spiral” down into the mundane. Although they acknowledge the affinity centers already on campus they do not adequately show how those centers might help inform the work to be done at the proposed center.

The proposal as presented does not rise to the level of a spire. However, the University could benefit from some entity that brings together those who do research and programming in the areas of culture and society. Although Vermont is rich in culture, there is no unifying entity in the State that truly capitalizes on this richness. UVM could serve this purpose.

Rightly, the team does not propose a PhD program in this area. They also do not acknowledge the dynamics occurring across the country with what is viewed as cultural or ethnic-oriented curriculum. The number of students enrolled in courses in that have to do with culture, society, race, gender, etc. is relatively high across the nation, but the number of students majoring in such areas is declining. So, the question becomes how might a focus in this area allow the University to become a leader?

It is suggested that the team identify some emerging themes from the 600 or so research interests they collected from faculty. What are the four or five key themes that could be used to bring faculty interested in some aspects of culture and society together? Are those themes cutting edge or emerging ideas in the area? There are several affinity-oriented centers on campus. How might those centers be connected to the proposed center? What might be the benefits to UVM, Chittenden County, and the State to have a focus on culture and society? Some attempt to answer or address these questions might strengthen the proposal.

The group who worked on this proposed spire should be commended because culture and society is such a broad area and finding one or several points of foci can be very difficult. However, how the University might distinguish itself in the areas of culture and society can and should be a question that is addressed on the campus.
PROPOSED SPIRE IN ENVIRONMENTAL CHANGE AND ADAPTATION
Council of Deans Summary

The proposal documents the impressive strength of the current faculty at UVM and the vast potential for an integrated program focused on the environment. The PIs propose research initiatives in five categories:
(1) modeling and forecasting environmental change with innovative computational tools, analyzing long-term data sets, and developing and marketing novel environmental sensors;
(2) developing socio-economic indicators of environmental change;
(3) modeling economic and ecological change;
(4) developing novel adaptive management strategies;
(5) integrating of spire activities with education outreach and enhancement of UVM undergraduate curriculum.

Proposed activities include:
(1) Submission of new grant proposal through faculty release funds;
(2) Four new faculty appointments across campus in areas of environmental change and adaptation;
(3) University-wide graduate research fellowships to enhance scholarship;
(4) A competitive postdoctoral fellowship program to attract young scholars to UVM;
(5) Transdisciplinary working groups that bring in visiting scholars;
(6) A summer institute offering graduate courses in ECA Spire research topics.

Strengths. The panel discussed the fact that UVM has significant strength across campus and that there is great potential for the development of an exceptional spire centered around the environment. Faculty working in the environment and related fields garner significant amounts of extramural funding and many have national/international reputations. Some of the research is novel (i.e. economic modeling and ecosystem services research in the Gund Institute), giving distinction to UVM and there is potential to interact with the complex systems group. The university is perceived as one that has strong environmental focus in its programs and all the components currently exist to create a campus-wide initiative that integrates interdisciplinary research with graduate and undergraduate education. The concept of a summer institute was well received.

Weaknesses. There is ambiguity in the description of the modeling efforts and it is not clear how environmental modeling differs from modeling of ecological change. Modeling can provide insights to systems that are well understood but it is blind to nonlinear events, which can have profound and overriding effects. Moreover, a research initiative focused on modeling is unlikely to bring distinction to UVM because it is being done extensively at other universities and the national labs. The most significant weakness is that the proposal does not make a convincing case for a mechanism that will bring individual faculty together to work collaboratively. Nor does it describe how an integrative program in graduate education could be created, or how investments could facilitate better coherence across the institution. The resources requested for the proposed activities are reasonable, but it is not clear how these
investments will stimulate a change from the status quo where small groups of faculty interact but usually within very localized spheres. There are missed opportunities to cross-bridge academic units with allied interests and there are missed opportunities for innovations at the undergraduate level.

Recommendation regarding external review and suggestions for revision
The panel recognizes some of the strengths described in this proposal but the overriding view is that a major rewrite will be necessary to build a spire of excellence in environment that takes advantage of the collective talent currently resident at UVM. The deficiencies need to be addressed before the proposal goes forward for external review.
Food Systems TRI  
Summary

Definition of a food system: “an interconnected web of activities, resources and people that extends across all domains involved in providing human nourishment and sustaining health, including production, processing, packaging, distribution, marketing, consumption and disposal of food. The organization of a food system reflects and responds to social, cultural, political, economic, health and environmental conditions and can be identified at multiple scales, from a household kitchen to a city, country, state, or nation.”

Problem: Paradox of unparalleled productivity accompanied by unacceptable levels of diet-related health problems, food-borne illness and disease, hunger, and agricultural pollution.

Goals: revitalizing agriculture, improving diets, protecting environmental quality and creating economic opportunity

Proposed Areas of Research: locally and regionally-scaled research on food, culture and health; energy and food; policy, ecology and land use; and regional value chains

Resource Request: 1) four faculty position “to address critical transdisciplinary food systems questions”; 2) an endowed chair in regional food systems research; 3) 4 $25K food systems research planning grants over the first 3 years; 4) host national symposia of food systems research/outreach; 5) regional food systems advisory council; 6) campus engagement in pursuit of healthy regional food systems; 7) integrate into student recruitment plan; 8) commit to UVM leadership role on the national and international scene; 9) UVM Food Systems Research Center.

Arguments in Support: 1) Vermont is already known as a food systems laboratory (already an important component of the economy; VT leads the nation in per-capita direct-market sales from farmers to consumer and % of land under organic management); 2) UVM is already well-positioned (land-grant within close proximity to massive urban areas; grassroots nature of food production in the state; integrates well with UVM focus on health and environment; undergrads already deeply committed to this issue; UVM already engaged in nationally acclaimed entrepreneurship in food, farming and renewable energy); 3) UVM already has significant existing resources (farms and forests; funded research; a dairy; depth of course offerings; health care institutions; extension demonstration projects); 4) Spire will be unique because it will extend across all schools and colleges; 5) robust community of external partners, including the state); 6) USDA-funded Master’s degree in food systems in progress and NSF IGERT proposal pending for a food systems doctorate; 7) opportunities for external funding (National Institute of Food and Agriculture, USDA, NIH, Kellogg).

Institutional Metrics: 1st yr: 3 transdisciplinary proposals submitted = $1m; master’s is launched with the recruitment of five students; 2 new Ph.D. students; development secures $500k in pledges to support the endowed chair; 2nd yr: $5m in grant proposals submitted by 25 faculty members; 15 faculty associate their publications with the spire; chair endowment reaches $2m; 5 more master’s students and 2 more doctoral students recruited; 3rd yr: $2.5m in external funding; three publications based in transdisciplinary grants obtained; endowed chair hired; more than 20 graduate students involved in food
systems research; 5th year: annual external funding of $40m for food systems research; faculty in spire generate 30 refereed publications; cohort of graduate students reaches 25.

**Examples of Societal Metrics:** healthier menus, nutritional awareness, consumption of local food; new product development, regional markets established, farm partnerships designed, fruit and vegetable intake, sugar consumption, local farm profit, transportation costs, obesity and diabetes rates, academic performance, farm viability, energy, carbon flows, land-use patterns.

**COD Critique:** The food systems spire is inherently transdisciplinary because of the way the proposal’s authors have defined its focus and themes and because of the very complexity of nourishing a local, regional and national population. This is an area where UVM could be unique and where the state already has a certain cache. The proposal itself needs editing and needs a much more extended and detailed discussion of the scholarship that informs and would be informed by this spire. The next draft should emphasize more the link to economic development in the state, the ways that faculty from CAS could participate (particularly in the area of culture and food, e.g., anthropology and/or history), and make more connections to UVM’s existing commitments in the area of public health, especially as operationalized in the medical school and through programs at Fletcher Allen. The deans also felt that the tone of this proposal was too modest, that it needed to trumpet its importance more resoundingly and locate itself more centrally within the nexus of other TRI initiatives and within the core commitments of the university. This criticism also emerged from the sense that what had already been accomplished via the USDA-funded master’s program and IGERT proposal for a doctorate was not adequately highlighted. Finally, the COD felt that the discussion of regional value chains should either be dropped or elaborated.
Neuroscience, Behavior, and Health spire:

Overall this is an excellent proposal. The investigators involved have a substantial track record of success as individuals and as collaborators. The research proposed as a cohesive theme. It also has a particular niche and potential for funding. The group believed it was the best written of the proposals. The criticisms are that despite the comment that this spire would require a relatively modest investment by the University of Vermont the requested investment is enormous and it did not incorporate all of the related strengths of the University.

This spire has a clinical focus on behavior as a major factor in disease and disability. It proposes three research groupings, fundamental neurobiology, fundamental neural behavior and cognitive processes, and diseases, disorders and disabilities. It seeks to investigate how neurobiology affects behavior and how behavior affects disease, making the well supported argument that behavior causes, modifies, or prevents most chronic diseases which cause most of our healthcare problems. This theme feeds directly into the public health spire.

These research groupings have current intellectual substance to them. They have substantial current evidence of collaboration across disciplines exemplified by the neuroscience CoBRE grant, the neurosciences graduate program, and the anticipated interdisciplinary undergraduate neuroscience major. They also have substantial current external funding. However, it should be noted that the grant funding asserted casts a very broad net, for example it includes the funding of the departments of Dr. Mark Nelson (pharmacology) and Dr. David Warshaw (physiology) who are authors of the biology and bioengineered spire.

This spire appears to have a niche relative to other neuroscience centers with its emphasis on health. It also has a rather unique link to healthcare across the state. It clearly has potential for increased peer-reviewed funding from a number of agencies. There is an anticipated NIH request for applications, or an Institute wide initiative, to address the science of behavior change.

The unanimous criticism was that the request for resources was enormous. The authors request their own new building, up to 12 new faculty hires, an increase in the number and the amount for graduate student assistantships, startup funding for current investigators, new MRI equipment, additional center staff, supplemental support for biostatistical consultation and animal husbandry, new IT systems, and new criteria for faculty promotion and tenure. There was also concern that not all of the strengths and emerging strengths of the University in areas such as disabilities, movement science and social anthropology were adequately incorporated.
Policy Studies Transdisciplinary Research Initiative (PSTRI)

Strengths:
Policy studies is an important area in which to build and show UVM leadership
Describes the strong potential of the Jeffords Center on Policy for being the focal point for research efforts at UVM in the future
Describes the need for a Ph.D. program to help fill a void in the social-science base at UVM
Identifies three domains that are of importance to Vermont and society (including our students)
Identifies the opportunities for transdisciplinary work across disciplines where UVM clearly has strengths
Many faculty could potentially participate in the area
Great concept of a collaboration with the Vermont Law School

Weaknesses:
The unifying theme presented, "utilization of diverse methodological and theoretical frameworks", as described in the proposal, was not a strong basis of differentiation and uniqueness for developing a new UVM program that would have to compete with institutions having established Policy focused Ph.D. programs or Policy Centers.
The proposal never focused on a clear path or area of expertise in which to achieve prominence
It was difficult to align the listed metrics with the time line needed to hire new faculty, establish a Ph.D. program and meet the need to secure funds to be largely fiscally self-sustaining within 5 years.

Was not recommended for External Review

Suggestions for revision:
Focus on an area that would cross cut the university to build a defined reputation in a Policy area.
Develop and publish policy briefs at the Jeffords Center to develop its reputation as a research center that can be used to create greater leverage in a subsequent proposal
Suggest that common methodologies is not a strong enough unifying theme for developing a preeminent academic and research program.
Public Health

This is a proposal to develop a Public Health TRI at UVM. The proposal centers around existing strengths in health, social, behavioral, and environmental research and education at UVM. One of the key ideas is to use Vermont as a public-health laboratory and draw on the fact that a large segment of the Vermont population uses UVM health-care facilities.

Resources to be leveraged include biomedical and ecological informatics, translational research, policy analysis, environmental science, exercise science, and nutrition as well as a number of other sources of expertise.

The proposed spire will draw on faculty from all units across campus and will develop "collaboratories," which consist of constellations of faculty in virtual laboratories. The idea is that these multi-disciplinary groups will tackle important problems such as obesity and diabetes in a unique, distinctive way. The spire includes the establishment of a "Transdisciplinary Institute of Public Health," which will be housed in the Center for Clinical and Translational Science.

The first two proposed collaboratories are (1) public health and the environment, and (2) health promotion and health-care delivery systems. These will build on the over $8 million in annual funding that UVM receives for public-health-related activities.

Proposed with the spire is a multidisciplinary master’s degree in public health, including a 4+1 baccalaureate program.

The proposal focuses on allocating protected time for faculty to develop collaboratories. Faculty hiring will consist of a director and a mid-level faculty member. Additional funds will be needed for research support, administrative staffing, general operations, and the development of a certificate program and an MPH program. The total funding needed appears to be about $4M.

The primary strength of the proposal is the importance of public-health research given today’s health-care challenges not only in the United States but globally. As a rural state, Vermont represents an excellent venue for studying health issues associated with a rural environment. In addition, as a small state with many residents accessing health-care essentially through one facility with an integrated medical record, there is a potential to tap informatics resources to address research questions. Public-health research is also quite fundable, and there are many potential sources of funding. Overall, the proposal is viewed as being highly trans-disciplinary. The proposed undergraduate track in public health is also viewed as a strength.

The proposal has a number of limitations. In particular, it lacks data on current faculty activity and interests in public health research. The plan for how the collaboratories will be developed and how they will function is not clear. There are also a number of questions about how successful will be attempts to utilize Vermont as a “living laboratory.” There are likely a great many gaps in the medical records at any one institution, making it questionable that research hypotheses can be adequately addressed in a scientifically rigorous way. In addition, there are other, established resources that may have significant advantages in this regard. Group Health Cooperative is an example. As an HMO with a half million subscribers, GHC is able to link medicine use and health outcomes.
A key limitation is that UVM lacks a school of public health, placing the institution at a potentially large disadvantage in competing for funding. UVM also lacks a health services research center as well as a program in epidemiology. 

In summary, the proposal is highly trans-disciplinary, has much merit, and a number of really good ideas. The idea of using Vermont as a “living laboratory” is definitely interesting and worthy of looking at for feasibility. There are several significant limitations that dampen enthusiasm for this spire; however, it is recognized that a public health spire at UVM has potential, and the proposal for this spire should be further developed.

The Council of Deans was split on whether this spire should be put forward for further review. A vote taken after initial discussion resulted in a tie. A second vote taken after further discussion also resulted in a tie.