MINUTES

Biological and Environmental Research Advisory Committee (BERAC Meeting
Office of Biological and Environmental Research
Office of Science
U.S. Department of Energy

DATE: November 3-4, 2004

LOCATION: American Geophysical Union, 2000 Florida Avenue, NW, Washington, DC. The meeting was announced in the Federal Register on October 20, 2004.

PARTICIPANTS: Approximately 75 people were in attendance for part or all of the meeting. Twenty BERAC members were present:

Keith Hodgson	Steven Larson
James Adelstein	Margaret Leinen
Eugene Bierly	Louis Pitelka
Michelle Broido	Melvin Simon
Joanne Fowler	Janet Smith
Robert Fri	Lisa Stubbs
Ray Gesteland	James Tiedje
Jonathan Greer	Warren Washington
Richard Hallgren	Barbara Wold
Will Harrison	John Wooley

Three BERAC members were not present:

David Burgess
Richard Gibbs
Patricia Maurice

Information on the BERAC membership can be found at:
http://www.sc.doe.gov/ober/berac/members.html

Wednesday, November 3, 2004

Ray Orbach, Director, Office of Science

I know the importance of advisory committees and the work you do. Your time and efforts make a big difference to us. I am anxious to hear Ray Gesteland's report on GTL 1. I know how hard many of you have worked on this. This subcommittee report will be something that I can use directly to support the development of GTL 1. We need attention from the House Energy and Water subcommittee on GTL 1. I am working with members of this committee to support the science that BERAC recommends. We are eager and

anxious to share and support information on this facility and your other science with Congress and the Administration.

Thank you for your support of the Committee of Visitors (two to date). These are new to us, but very important. We have received very positive recognition for our COV activities so far.

More information on request to widen the competition? In response to a specific member? This is the voice/mark of the subcommittee. We try not to second guess the members. The ranking members of the subcommittee are interested in competition in the broadest sense. These are good people with legitimate concerns. The important thing for SC is the integrity of the project and the science. That is what the subcommittee wants too. We learn from them and appreciate their interests and concerns.

Ray Gesteland, University of Utah, BERAC Member

Final Report to be posted on BERAC web site.
(http://www.sc.doe.gov/ober/berac/Reports.html)

Twenty-one members met October 11 at SLAC. Seven members were also BERAC members. This is a draft report. Summary conclusions were reached by full consensus. Some details still need to be discussed. Some very specific questions were asked:

1. Why is GTL 1 essential to GTL science program?
2. Is the proposed facility right in output, capabilities, dimensions?
3. Does it have to be centralized or distributed?
4. Does it require a special building or can it use existing space?
5. What probes such as light sources or mass specs are required?
6. Does is need to be next to a light source?
7. Relation to activities/interests at other agencies

- Important for GTL program without question. Only through the use of such high throughput approaches can we fully realize the potential of microbes and genomics to address DOE mission needs.
- Should initially focus on well characterized and studied organisms such as yeast, E coli, and B subtilis.
- Effort on organism focus should shift as quickly as possible to DOE relevant organisms.
- GTL 1 proposed scope is appropriate. Need to distribute R&D development activities.
- Needs to be in specifically designed building with flexible space.
- Needs for certain specialized equipment though close proximity to synchrotron light source is not essential.
- GTL 1 is complementary to interests and needs of other agencies.

Key is having high throughput, global proteomics capability. There is great value in being able to look at individual microbes or communities in depth. Looking at the right organisms initially will provide a strong initial foundation. We will benefit from large user community and depth of knowledge from using well studied organisms initially. Rapid shift to a variety of DOE-relevant microbes (examples listed in report).

There is value of looking at classes of similar organisms across organisms. Examples include: cytochromes, stress proteins, rhodopsins. Absolute complete coverage of all proteins from a microbe is unrealistic. However, the goal is to get as comprehensive as possible. Not dissimilar from DNA sequencing efforts and cDNA analyses. Certainly didn't give us the entire picture of the genome but let us make rapid progress. Need to be careful about analogies to genome project. Proteins a lot more complicated than DNA. Can't promise completeness but can strive for comprehensiveness.

Products to come from GTL 1

- Clones of genes. Valuable in themselves for DOE mission and other. These should be made broadly available.
- The proteins themselves. Expression of all clones. This part needs to have much flexibility due to great differences between proteins. Also need for evolution of technology development. Clones. Preproduction screening. Expression in microbes or using cell free protein synthesis or using solid phase synthetic synthesis. Work needed to make these, especially the latter two, much more robust. Post translation protein modification also an issue to be dealt with especially for the latter two methods.
- Biophysical characterization of the proteins being produced is essential to make proteins most useful to users. Goal here is not crystallization and atomic structure determination. That is a goal of other national efforts. Desire to study function of some proteins in more detail.
- Specially tagged proteins will be needed for specific purposes in some cases. Value for purification or for making protein microarrays with tens of thousands of proteins to identify and study small molecules that interact with specific proteins.
- Lots of specific design features. High throughput essential. Robotics. Mass spectrometry instrumentation. Clean rooms for PCR. Fermentors. Freezers. Computational capabilities. Power needs.
- Centralized versus decentralized facility discussion. Value of centralization clearly shown for DNA sequencing in Human Genome Project. Subcommittee saw value of unification of process, management, and staff. Multiplicity of challenges and problems best and most efficiently dealt with by having everything in one place. Dedicated new facility most likely the way to go to plan for science needs over 10-20 years.
- Underpinning research essential. Some will go on in the facility but much can and should go on at universities, the national labs, and industry. Distributed research efforts (whether GTL funded or not) are essential.
- Light source proximity issue. Some limitation for the minority of proteins that will be unstable but these few should not drive the overall facility siting.

- Relation to other efforts especially the Protein Structure Initiative at NIGMS. Goal of this effort is very different from GTL goal but also very complimentary. PSI focuses on a variety of organisms. GTL 1 will focus just on microbes especially DOE relevant microbes. Enormous advantage of PSI and GTL 1 running in parallel.

Questions / Comments

Scale of production? mg? g? kg? This will depend a lot on the particular protein. Demand will vary. Generally 100 mg level. Review of previously prepared documents by subcommittee. ~10,000 proteins per year at mg scale. Key thing is to be responsive to the research user community. Management is a crucial thing.

Fully subscribe to all reasons for GTL. Heartened by language in this draft report. As we go forward with GTL, am concerned that we don't exclude the biomedical community due to opportunities for translation. Focus on microbes is appropriate but don't want to exclude the broader community of interest. Technology developed can and certainly be shared more broadly than for DOE microbes. Don't want report to give impression of being exclusionary.

For DOE long term objectives want to make sure that we master the convergence of physical and the life sciences. This is certainly where DOE shines, e.g., in nuclear medicine. Trying to understand the bridge between microbial proteins and its mammalian counterparts in terms of process for example. This should be within DOE's mission. Molecular probes are certainly becoming routine tools for nuclear medicine and medical imaging so resources and technologies developed here will be important. Research effort that feeds into this needs to have appropriate focus.

How in fact will coupling to biomedical community occur? Talked more about similarities of technology needs. Didn't really have a specific discussion beyond this. Will talk a lot more about specific and broad interactions with other agencies during Ari's remarks later. Hopeful that some underpinning R&D will be undertaken jointly with NIH.

Very few proteins in the universe that belong only to one type of organism.

Don't know how to deliver a protein without knowing or defining its function. This is one level of complexity that this facility will need to address directly. Also know that many proteins don't function independently so should be considering higher order complexity. When a protein is produced need to be considering the end user. There are very different needs depending on whether the end user is an enzymologist an NMR person or a crystallographer. Many reagents could be provided. Very often want antibodies for the proteins we study. Would this facility provide reagents of that sort? Disagree with first point since a value of the facility is being able to produce all proteins not just those whose function we know. Is it the job of the facility or researcher to make complexes? Will need to have capability to make some proteins together. It is not the goal of this facility to make crystals.

One product will be clones that have been tested and that are known to produce a protein when following a recipe that will also be provided. This will enable many more researchers to produce proteins of interest in their own laboratories.

For what fraction of 10,000 proteins will folding and assembly be a real problem? Will this be a research issue at the facility? Will the fraction only be small? Goal is to get as many out as possible. There certainly will be some where folding is a significant problem and this is part of the broader research issue. Chemical synthesis can be used to solve some of these problems.

Central facility needs to "have no walls." This will enable technology transfer to any and all. Some development research should be done regardless of the specific focus or application to get technology that is critical for the facility. We may want to have capability to send a person to the facility or to produce in one's own lab. Can't actually imagine wanting protein sent. Antibodies yes. It's the idosyncracies that get you. This is somewhat inconsistent with a high throughput facility. This will be ok for some microbial proteins but not for the vast majority of proteins. Needs to be some back and forth with the facility. Individual users will have the greatest insights and motivations. End user interactions are critical. Is this consistent with a production facility? How much customization is possible? Getting the clone and learning how is was expressed may in fact be the most useful product of this facility. The report should include discussion of interaction with the end user. This may impact on where the facility should even be located. Agenda does need to be driven by the mission of the GTL science program – it can't be viewed as "just" a protein production facility. Shouldn't forget this underpinning motivation. Recall that second proposed GTL facility is in part focused on the protein complex issue. Clearly a perfect overlap between these two facilities.

Is there any other expertise that this facility should be near? Subcommittee felt that most of the analytical instrumentation was transportable enough that they could go where the facility was sited. Clearly very sophisticated analytical and computational capabilities will be needed however.

The challenge of dealing with the proteome will not go away even in 20 years. One facility can't do everything for everyone. Will need to have a clear view of what this first facility should look like in its first 5 years. This could then serve as a model for other GTL 1's if there is a need, interest, and resources. Just need to get in there and demonstrate what is possible but do need to maintain flexibility.

The need to expand the scope of the facility and the program is appreciated. It is not our intent to have a straight jacket on the program. However, do have to remain focused on the goals of the GTL program in the end. Would urge some caution expanding the scope too much beyond the needs of the GTL science. Don't want to make this a Christmas tree. Principle driver has been high throughput and low cost – the one lesson learned from the genome project that has opened so many new doors.

Still have to go back to the Hill. Suggest that an iron clad case needs to be made in plain language for why this facility is needed and how other places will benefit and contribute. Subcommittee did discuss this point. Must be intellectually honest on the issue of distributed versus centralized. It's Impossible to say this cannot be done in a decentralized mode. It is being done by NIH for a comparable cost. NIH structure determination goal is very different however. GTL focus on more comprehensive analysis of small number of organisms justifies centralized facility. High throughput and low cost are certainly art forms. Economies of scale would be lost through distribution and is not scientifically indefensible. If 5 times the money is being offered for 5 facilities of the proposed scale then distribution would make sense, but not 5 facilities at one-fifth the cost each. Output will be available to all constituents at little or no cost to them.

No excess capacity in the NIH PSI program. They couldn't respond as currently designed. Centralized approach is more easily scalable.

This is not just about being satisfied with the low hanging fruit. GTL 1 is the place where technology goes when it is ready for prime time. A closely integrated R&D program needs to be run in parallel both inside of and outside of GTL 1. The management of this broader R&D is essential so that the basic research is being focused so that it can be successfully transferred into GTL 1.

Analogy with Human Genome Project breaks down because the project goals were very clear and specific. End goal here is not clear but will change as a function of time. New technology will always be relevant so GTL 1 is not likely to ever fix technology and grind through as with the genome project.

Many people have been involved with the development of roadmaps for these facilities. The documents produced do consider a diversity of approaches, many of which could be done outside of the facility itself. R&D is a component of facility development and long term facility operation, much of which can and should be done many different places where the expertise resides.

How will choices about organisms and proteins be made? GTL science is and will be the driver since it is the primary customer for the facility using RFP or Advisory Committee mechanisms.

Strongly endorse current proposal with three organisms proposed for first use. Biology that DOE wants to get at is very different from traditional NIH strategy so approaches are complementary. Even comparisons of pathogen survival versus survival of a "DOE organisms" in the environment present significantly different challenges. Membrane proteins are likely to be key and should be a focus.

Why is the time now since the technology appears to be incomplete as discussed. The technology will never be complete since it is an ever moving target. There is more than enough technology to go forward aggressively now. Getting these types of reagents could very well be the rate limiting step to achieving success in GTL science.

We haven't discussed the tags part of the facility yet. Didn't discuss too much during the subcommittee either. This aspect is a next step. What is the user need? Need to state clearly what is ready now and will be up and running when the facility opens and what will have a greater R&D component now. There has been quite a bit written already about tags.

What is the time line? Elaborate and rigorous process followed at DOE for facility development. Facility won't open its doors for 5 years under the most optimistic scenarios.

Process to move forward to come to closure on the report by the subcommittee and by BERAC. Important to have a final report as soon as possible. Will clearly do this by mail. No real contention but many good points to be made. Send comments to Ray Gesteland and Keith. Goal to have this done by Thanksgiving.

Is there interest in having a preliminary show of support pending the discussed modifications? Moved and seconded. Major modifications have been proposed - though none change the sense of the report. Not talking about substantive changes in the conclusions of the report. Are the summary conclusions (7 bullets on pages 2-3) the right ones? Need to remember that these were generated in response to a very specific set of questions. Conclusions will not change but the articulation of the conclusions will change. Motioned passed without opposition 18-0.

Committee introductions.

George Church, Harvard Medical School – Science Talk - Analysis and Synthesis of Omes, (vugraphs on BERAC website http://www.science.doe.gov/ober/berac/church11_04.ppt)

Synthetic genomes and proteins. Why?

- Cheaper/faster standard biology more cost effectively
- Synthetic testing of DNA motif combinations
- Access to any protein or complex including post transcriptional modification
- affinity reagents for the above
- Protein design, interactions, soluble versions

Have designed a 150 gene synthetic genome that has all the components needed to make proteins. Can, for example, remove RNA-synthetases that normally would remove non traditional amino acids.

Synthesis of 150 genes from E coli and 760 from a mycoplasma. Nimblegen technology to make 380,000 (soon 760,000) oligomers on a single chip. Typically used for RNA quantitation. Useful way of making synthetic oligos at 5000X below current cost (for about 1,000,000 fewer molecules). Amplication of 50mers from chip. Use mismatch to purify ones they want away from 50mers with single base mismatches. Assembly to

gene-sized pieces. Error rates go from one per 160 to one per 1,400 to one per 10,000 to one per 30,000 using a series of "purification" steps, which is 10-times better than error rate for PCR.

Why DNA sequencing? Cancer, pathogens in the environment. Sequencing single molecules needed for ecosystem studies. Need single cell amplification. Amplification has a background even if no DNA added to start so amplification of very small pieces more difficult that of larger molecules.

Ari Patrinos, Associate Director of Science for Biology and the Environment
The State of BER, (vugraph on BERAC website
http://www.science.doe.gov/ober/berac/patrinos11_04.ppt)

People

Welcome to BERAC members Margaret Leinen from NSF, and Mel Simon from Cal Tech and the original chair of our genome subcommittee.

BER comings and goings:

A sad and fond farewell to Marv Frazier who retired from Federal service to join the J. Craig Venter Foundation. Teresa Fryberger has left BER for a detail to OSTP. Anna Palmisano is now at USDA as Deputy Administrator for Competitive Programs in the Cooperative State Research, Education and Extension Service (CSREES).

Welcome to new BER staff members Todd Anderson in Environmental Remediation, Anguli Bamzai in Climate Change Research, Mike Kuperberg, an IPA, as Acting Director of Environmental Remediation, Tim Boyle a detailee in Life Sciences, Drew Tait a detailee in Environmental Remediation. Ray Wildung will be joining us as an IPA in Environmental Remediation. Peter Kirchner will be spending more time with us as he continues at the National Institute of Biomedical Imaging and Bioengineering.

We continue to look for an ARM Science Program Manager. Any help or suggestions would be welcome. A geneticist position for Life Sciences is being posted. A microbiologist for Life Sciences is being reviewed. A biologist for Medical Sciences is to be posted. Hope to be able to announce Medical Sciences Division Director soon.

We are currently under a continuing resolution with an uncertain path forward. A budget handout has been provided. Request mostly flat request with an internal increase requested for GTL.

Safety at the laboratories. A very high priority issue for Ray Orbach. Several within our office are paying particular attention to safety – Mike Riches, Paul Bayer, Mike Teresinski. Science suffers in the end if we don't pay attention to safety.

Apologies for the extraordinary attention we have been paying to Genomics:GTL. All our programs are important, but GTL is our flagship program and will help drive BER success overall. Obviously many issues are on the table in the GTL program from the research to the planned facilities. Special thanks to the many who have been working on the GTL roadmap especially John Houghton, Tim Boyle, Betty Mansfield, and Mike Knotek. Reminder that GTL is not just a BER program but and ASCR/BER program.

We are currently facing some interesting biocomputing challenges. High end computing is a priority for Ray Orbach and the Office of Science. How can GTL make use of these resources? A Leadership Class computer was recently funded at ORNL following broad competition. The GTL program has taken the lead to identify high end computing challenges and opportunities in biology. Commission a JASON study this past summer on this topic, but the result was somewhat disappointing. Preliminary conclusion was that biology for the most part was not yet ready to use high end computing. Should have petaflop computing by the end of the decade. We just need to get the biology community more organized. Computing discussions with colleagues at NIH – genome and general medicine – about applications that they had been doing quite well with existing computing capabilities that have recently been overwhelmed by the amount of data that is now being analyzed. Examples – comparison of SNPs or mapping the spread of infectious diseases.

DNA sequencing. Visit the new JGI web site. (http://www.jgi.doe.gov) Do have yet another paper in Nature on the finished, finished, finished version of the genome. Individual chromosome papers have been or are being published. Sequencing production keeps going up as costs continue to go down. Have launched a new effort at the PGF – Community Sequencing Program using about 60% of PGF capacity for project driven, peer reviewed DNA sequencing for the scientific community. The balance of the 40% effort is program driven to serve the BER research program. Currently having discussions with colleagues at the Office of Naval Research to sequence the dolphin genome – hopefully soon.

Climate Change Science Program strategic plan progress. A 13-agency effort under the leadership of Jim Mahoney at NOAA is in the process of plan implementation. Synthesis and assessment – the end result of taking completed research and translating in products for policy makers or managers at all levels – products are our responsibility. There are a few differences of opinion on ground rules for developing these. Maybe this will be easier with the election now over. First products are due in about 10 months – a deadline that seems impossible today. Will need to negotiate new deadlines.

Big aerosol restructuring has gone full circle with a new solicitation and awards that have just been made. Hope to report on this new program at the next BERAC meeting. Peter Lunn, Program Manager. Jerry Elwood Division Director.

Environmental Remediation Sciences Division. Efforts continue to integrate elements of this division – some previously existing and some imported to BER.

Artificial retina program has been a jewel in the BER and Office of Science program. There was a recent high profile signing of multi institute agreement signing involving the Secretary.

Existing Charges:

Superparameterization in Climate Prediction – Warren Washington is heading subcommittee meeting in 2 weeks. Also considering issue of whether we should engage in abrupt climate change research.

Neural Prosthesis – reminder to Mike Viola and Steve Larson that we need to move forward on this charge.

Value of interagency partnerships. We end up being junior partners in many or most of our relationships with other agencies – a role we relish. NIH interactions with Medical and Life Science programs. Protein Structure Initiative interactions after our initial launching. Many of our national labs continue to play a central role in this initiative – a reflection on their capabilities and the BER role. Partnership with Human Genome Research Institute continues since both have sequencing centers focused on other life forms to minimize and avoid overlap and to optimize progress. Continuing relationship with NIBIB through Mike Viola and Peter Kirchner. Bullish about exchanges with NCI and possibilities to cement partnership and the possibility of joint funding for GTL facilities. Growing importance of interface between the life and physical sciences – we are leading by example. Want to talk about this at the next BERAC meeting. Continued relationship with USDA and Anna Palmisano who also chairs the interagency Microbe Project group that is commenting on GTL facilities relative to their own individual agency interests and needs. EPA interactions on both biology and climate. NASA on low dose radiation research. We aggressively seek interagency interactions and partnerships.

There is a list of BER solicitations in your packet for FY 2004.

New BERAC Charges. Had hoped to have them signed and delivered to Keith today--

Next COV review – Life Sciences Division. John Wooley has graciously agreed to lead this effort.

There is a second charge to review the science at the Environmental Molecular Sciences Laboratory. There are many issues (not problems). Undertaking several grand challenges. The facility is close to 7 years old. There are challenges of flat operating budget and instruments that need to be refurbished. There are many paths that need to be considered for the long term viability and health of EMSL. We may need to make some tough decisions. Asking for BERAC advice. Focus on EMSL science and its operation. Pursuing a companion review – a Lehman type review – of EMSL management.

Questions/Comments

Reference to November 9 meeting sponsored by NIH and NSF on the interface between the life and physical science. Any discussion with Howard Hughes and educational opportunities at this same interface? May be some opportunities for interaction.

Meeting 2 weeks ago on radiologic defense at NIAID. Does BER have a role in this? BER is part of an interagency working group that is being led by NIAID. Remember that BER did lose biodefense related dollars in the aftermath of 9/11 and the creation of the Department of Homeland Security.

Only currently open solicitation is GTL solicitation. Why is there not a longer lead time like other agencies especially for these more complex solicitations? No reason we can't have longer lead times in the future. These RFAs are the critical outputs of BERAC (and other) deliberations. Conveyed GTL-only interest in microbes, especially those that are GTL relevant. Are we taking too narrow an approach? Our "narrow" focus has been the result of a very traumatic set of interactions with congressional staffers who were very hostile towards GTL and its motivations, drivers, and goals. Our prescription has been an effort to not cross some "imaginary line" between DOE and NIH (and other) science. In spite of this there is/was general understanding about the nature of research and the value of limited amounts of overlap or research at different agencies. Also too prescriptive in the computational component by stating that significant lab based experimental research would not be funded.

How can BERAC help in fighting the good fight with Congress, for example, as more of the types of interactions that have occurred in the past come up again? Challenging times in the face of NIH budget doubling and even decreases for physical science research. When push comes to shove people will rise to defend the agency that provides the bulk of the biomedical funding.

Next generation of scientists (and diversity) is an emphasis at NSF, i.e., workforce development. Has BERAC taken on any topics related to that? BERAC has not addressed this specifically. Ray Orbach and the Secretary both have initiatives in this area. Should have Peter Faletra at the next meeting. NSF only gets about 25% voluntary response to diversity questions.

Mary Anne Scott, Office of Advanced Scientific Computing Research – Energy Science Network (ES Net) (vugraphs on BERAC website http://www.science.doe.gov/ober/berac/scott11_04.ppt)

Support computational science, mathematics, and network research. This leads to tools that support the overall mission of science. ES Net has been around since the mid-1980s. Many drivers – data sharing, collaboration, distributed data processing, distributed simulation, data management.

ESNet provides communications infrastructure and leading edge network services that support DOE and SC missions. Essentially all national data traffic supporting US science is carried by 2 networks – ESNet and Internet-2/Abilene (which plays a similar role for the university community).

Estimate of 10,000 to 100,000 users. Mainly SC programs, all national labs, hundreds of universities and foreign institutions. 100% increase in demand since its inception in the mid 1990s.

Where is ESNet going in the future? BER representatives on ESNet Steering Committee (ESSC) at PNNL (T.P. Straatsma) and ORNL (Raymond McCord).

[see viewgraphs for additional information]

Mike Viola - BER Distinguished Scientist Fellowship Program (vugraphs on BERAC website http://www.science.doe.gov/ober/berac/viola11_04.ppt)

- 5 year renewable fellowship for a total of $1.25M ($250,000 per year)
- Full time employees of national labs or other DOE facilities with 10 years or more at lab
- Nominations by lab leadership following application by individuals, colleagues, labs
- External peer review
- BER selection
- 20 awards at any one time.
- Six awards maximum to any one lab

Importance of advertising broadly. Should bring lots of positive feedback.

Dean Cole – Artificial Retina (vugraph on BERAC website http://www.science.doe.gov/ober/berac/cole11_04.ppt)

This began as a photochemistry pilot with Eli Greenbaum at ORNL. Quickly realized value of DOE capabilities in this area. DOE is clearly international leader in international sight today.

Excellent example of coupling of diverse areas of science. NIH taking lead role in clinical studies.

Five national labs, three universities, one private company. Two years to work out an IP agreement that was recently signed at Secretarial event in Chicago – What's Next Expo (Future Science for Future Scientists). Mark Humayan from USC gave keynote talk to hundreds of Middle School students. Signing ceremony. First patient participated in the event and spoke on his experience.

Currently in first phase. Six patients implanted with 4x4 electrode array device similar to FDA phase I/II trial. Patients can sense motion, identify shapes, and see large letters by scanning. FDA approved first patient to use device turned on at home. Goal is to get to 1000 electrode device.

Working on Model 2, 60 electrode device. Animal tests going well. Plan to implant first patient in summer 2005. Designing Model 3 device with 256 electrodes.

Goal to restore unaided mobility and to restore reading and face recognition.

Ganglion cells and optic nerve still intact in many patients who have been blind for decades. Need research to actually determine what cells are being stimulated. Do they see color? The electrodes are very large. This is artificial sight. They see sparks of light. Now stimulating groups of cells. With large arrays may get to level of stimulating individual cells.

FDA criteria is that patients must have had sight at one time and to be blind in both eyes.

Public Comment – none
Meeting adjourned.

November 4, 2004

Gene Bierly, American Geophysical Union, BERAC member, Climate Change Research Division COV Final Report

Charge to consider and evaluate DOE lab and university projects –

- efficacy, fairness, ad quality of the processes used to solicit, review, recommend, and document proposal funding actions and to monitor active projects and
- programs for progress and outcomes and to assess the efficacy and quality of processes used to manage ongoing programs raised by the following. Does the process:
    - consider the depth and balance of research portfolio
    - solicit and encourage some exploratory high risk research
    - link research to DOE mission needs
    - enable support of coherent suites of projects that are integrated and collectively of added scientific value to programs
    - ensure a reasonable and appropriate turnover of funded investigators to enable and foster the support of new projects and scientists by programs
    - result in a portfolio of elements and programs that have national and international scientific standing

Nine different programs evaluated. Most COV members had little involvement with DOE and many were not even familiar with DOE. Only 2 women, no minorities, more older than younger members.

Used common set of 30 questions from NSF COV process for each area reviewed.

Process in place are adequate for universities, but not for DOE labs. Inadequate documentation of decision process for DOE labs. Looked at 45% of all awards made in FY 2002 and only about 9% of declinations. Some common issues across all program areas reviewed. Specific items to be included in project jackets should be common across programs and files and should provide adequate description of processes from solicitation through decisions. Should continue integration of programs into interagency climate program. Should do better job of getting the word out about what DOE programs do and contribute. Better articulation of peer review process and expectations. Need for expanded reviewer pool getting away from "the old boys club." Need to get more younger reviewers involved. Program announcements and solicitations. Eye opening to some COV members that national labs are not treated preferentially, but need to document the lab process more clearly to show the high quality of expectations that are used. COV commented on inadequacy of BER staffing levels.

Report makes recommendations for the next COV.

BER has been very responsive to recommendations and has implemented many changes already.

Comments:

This has been a good thing for DOE management. This should help Ari and all the program managers do their jobs better. Some very valuable lessons and recommendations and improvement from reviewer selection and use of reviews. Recognize importance of supporting the labs, but can do a better job of that process.

Striking variation among programs. Processes adequate on average. Some appear unsatisfactory. Comment on how programs are/aren't known in the community. Some are very well know, e.g., terrestrial ecology, AmeriFlux, FACE.

This is an excellent report. Thanks to all COV members. Executive Summary does factually summarize the outcomes of the report. Might be useful to add a paragraph on the unique contributions of the program in the Summary since that is often all that people read.

Approved report will go on the web site http://www.sc.doe.gov/ober/berac/CCRD_COV.pdf and BER is required to prepare a detailed response within 30 days.

Report constantly comments on high quality of science conducted, yet there are so many criticisms of process that a casual review could give the impression that program is in shambles. Should emphasize the staffing issue in several places.

This is the highest quality report of many seen. Question/answer format very informative.

This is a daunting task for a program of this size especially for the first time. A stretch for COV and DOE staff. Compliments on high level tone taken by the report. A lot has been suggested for busy and overworked program managers. Might help if there was a sense of prioritization of the very long list of suggestions and comments – short versus long term actions? Some have already been implemented and at least one will probably never be done. Compliments to Ari Patrinos and Jerry Elwood and staff. NSF often does these in the summer when summer interns are hired to provide extra help. Any general, informal comments from BER for BERAC.

This was imposed on us initially, but we are now glad to be part of this process since it is extremely useful. Have done two already and are setting up the third. The fourth will be the following year. This also helped us push for changes/reforms that we maybe should have been doing but was now validated by this process. Some of the changes we will put in place will be forward looking and long lasting. Staffing issue is not unique to BER or even DOE. COV will judge us next time around on the actions we have taken so prioritization would certainly be helpful to us now and in future reviews. We were flattered by the quality of the people and the level of effort especially to focus on process as opposed to the meat of the science for the most part. (Note – the COV did comment on both process and some science.)

COV report is also useful to investigators. Informative for preparation of future proposals and staying on mission.

Motion to accept the report and second. Approved.

Michelle Broido, University of Pittsburgh, BERAC member – Environmental Remediation Sciences Division (ERSD) COV

COV has approved this report so it is final from COV and SC-75 perspective. ERSD has only been a separate division for 3 years. Only 1 of the 4 elements in this division are "traditional" science programs. NABIR originated in BER. EMSP originated in EM. EMSL is a user facility not a grant awarding program. SREL is neither a program nor a laboratory but not a grant awarding program.

Fourteen members. No question that program managers are dedicated, competent, and intellectually invested in the program yet extremely stretched in terms of expectations. Staff does not have adequate time to interact appropriately with funded investigators and applicants. Only a single support person for the division. Program manager gets much more involved in the research program (especially in NABIR) than for many programs at other agencies. Program managers have a responsibility and role in ensuring program mission balance. Do applicants know this? Is there a way to publicize this as part of BER program information dissemination?

Reviewer pool closed for some of the programs. Greater breadth for EMSP than NABIR because of program breadth. COV suggested addition of mail reviews in addition to

current panel reviews. Is it possible to get demographics of applicants and awardees? This is an issue for DOE to answer.

Suggestion made that for future reviews the reviewers should be notified the COV-like groups may review their reviews in the future.

Recommendations for program file materials similar to previous discussion (above). Progress reports really need to have content beyond publications. This would also be useful to program manager's ability to articulate program progress overall. A progress report format might be helpful.

Program staff was very helpful and responsive during the review.

NABIR. The only traditional program that was looked at. Has been in place for 7 years. NABIR goals reaffirmed by COV. Some important results of value to DOE have come out. Breadth of science initially envisioned for NABIR cannot be met with current program funds. NABIR has been narrowed considerably which also narrows the investigator pool. Can breadth be increased (at the acknowledged cost of less depth) since this would bring more scientists into the program? Important to make sure that complementary national and international program are well aware of NABIR and its results. Should organize national/international symposia to get the word out. There are grants awarded to investigators outside the U.S., e.g., Canada and Europe. Is this appropriate – yes if that is where the science is. However, in these specific cases there are high or higher quality scientists in the U.S. doing comparable research.

EMSP. Is addressing fundamental and applied research of value to DOE. Good lab/university balance. Substantive partnership between labs in EMSP and NABIR. EMSP does publicize its results in special session at national meetings though it could do more. Size of EMSP awards has not changed since the first EMSP awards were made. Nature of the projects requires larger awards in some cases. May have to make fewer bigger awards.

EMSL. Looking at process of interaction between BER and EMSL but not at what EMSL does with the money once they receive it. That is the topic of a new BERAC charge. EMSL on its way to becoming a premier user facility. Need for clear articulation of vision of EMSL from BER and PNNL perspectives. Have heard about EMSL grand challenges at previous BERAC meetings but these will only help define vision in 5 years. Need for clearer near term vision. Issue of EMSL instrumentation. Cost was $100M when EMSL first opened. Money has been not been available for much upgrade or replacement of 5-7 year old instrumentation. What do you do within flat budgets? What is being or can be provided to users under this scenario? Path forward?

SREL. Something very different. Currently managed by the University of Georgia on the Savannah River Site under a cooperative agreement. Funds used to support many University of Georgia faculty and staff. When SREL was transferred to BER the cooperative agreement was transferred also. Agreement is up for renewal soon so it can

be upgraded to better address BER needs. SC-75 and SREL management have engaged in productive process over the past year to identify areas of alignment and process to phase out elements that are not in alignment with BER. Bulk of movement should come from SREL but some movement from BER would be appropriate to take advantage of unique SREL capabilities that could benefit BER programs. Is it University of Georgia staff or the lab itself who are under the management of BER? Do SREL scientists have an unfair advantage when applying to other agencies for funding if they are fully supported by DOE? These are issues for University of GA, DOE, and BER to work out.

All 4 of these programs have something to contribute to the others. Integration, where possible, is important.

One table of confidential information is in draft report. Should this be deleted from the report since it can't be part of the public report?

Comments:

Need to address the general issue of equipment/instrumentation for facilities. Plans for upgrades need to part of annual operating costs since we can't depend on additional money being available every 3-5 years (which simply isn't going to happen).

Follow up BER comments on SREL? This needs to be resolved very carefully. One of the objectives we have for all SC-75 activities is to integrate all elements into something that is greater than the sum of the parts. This set of programs presents a unique opportunity that will underpin the Department's and the Nation's massive cleanup challenges. Right direction has been set. Delighted with team we have in SC-75. SREL issue needs to be viewed in context of overall push for the entire Division. Reluctant to start that process for SREL before we have a clearer picture of the vision and goals for the entire Division.

We need to start planning these facilities with a business model in mind. JGI has done a pretty good job of this by budgeting for equipment replacements/upgrades by doing fewer experiments or not hiring people as appropriate. ARM has also done a pretty job of this as well.

What has been so far with SREL? SREL request to clarify alignment or lack of alignment on all 61 SREL projects. Agreement that SREL would provide group of smaller number of larger projects that address BER needs for merit review and implementation later in FY 2005.

NSF has started experimenting in several areas where groups use performance curves (more like leases) from vendors.

SREL is essentially a university department that has been funded by DOE for a long time. This has not been adversarial. Discussion has been very collegial so far. It is awkward none-the-less.

Same process for this COV report – posting on the web http://www.sc.doe.gov/ober/berac/ERSD_COV.pdf and BER response in 30 days.

Nothing specific was heard that needs to be changed in the report. Are any changes needed? Confidential appendix and references to it should be deleted from the report. Motion to accept the report and second. Approved.

Discussion of BERAC role in validating BER progress on interim performance goals:

Is OMB happy with the interim goals? They are reflected in the SC strategic plan so OMB is indirectly ok with them.

What kind of deliverables are needed/wanted? Metrics listed are all things versus knowledge. BER has done a good job of translating fundamental science into measurable things?

Environmental goals very dependent on EM so not independent measures. BERAC would need to hear from the partners not just BER.

Climate change research – reasonable. For 2010 will have models that have both biological and ecological systems built in. Why not list CCSP instead of NOAA?

Some goals are pretty ambitious. Photosynthetic microbe for continuous hydrogen production. Joel Parriott said that failure on ambitious goals was ok and better than goals that are too easy. The real issue is whether the right science is being done in the right way. Key thing is how the question is posed. Is there an organized approach of investment that would logically lead to the achievement of these goals? These are grand challenges.

Road map is a relevant and exciting group of projects. Concerned by the reality of budgets presented by Joel Parriott.

Concerned about the way some of the climate change research goals are stated. 2006 goal – why not talk about all observations versus just missing ones. Take realistic out of 2007. 2010 – take out "new". Why "Provide" in 2010. What are safe levels of greenhouse gases? This is actually the holy grail of the framework agreement. This is a powerful word for this administration. Please send specific words/suggestions.

In climate area there is a subcommittee. Good forum to discuss. Same for genomics and the environmental areas.

GTL web site. Nice information on what started this year. Only have a picture of what is new this year not what goes farther back. Everyone does not go to workshops. Need this more broadly for all projects.

Integration of response to COV queries and specific metrics. Could include program manager presentation, project information summaries, partners presentations, etc.

Why couldn't more of this be done electronically with televideo. One way to get more feedback.

Medical bullet doesn't include anything about the devices. The interim bullets don't quite match up. Engineering and science goals. Goal could be diffusion of technology rather than just the artificial retina itself.

Abstracts from all funded projects would be very useful.

Other comments:

BES put out a chemical sciences book every year essentially by the PIs not program staff. BER used to do this when Murray Schulman was in BER.

Instrumentation discussion so important. One element left out. For EMSL and ARM there is a first of a kind class of instrumentation that actually needs to be developed not just refreshed. In new aerosol program there is a lot of instrumentation but it is actually not good enough to do the new research. Put this general topic on the agenda for a future meeting.

Meeting adjourned.