

**DEPARTMENT OF HEALTH AND HUMAN SERVICES  
NATIONAL INSTITUTES OF HEALTH  
NATIONAL LIBRARY OF MEDICINE**

**MINUTES OF THE BOARD OF REGENTS  
February 7-8, 2012**

The 159<sup>th</sup> meeting of the Board of Regents was convened on February 7, 2012, at 9:00 a.m. in the Board Room, Building 38, National Library of Medicine (NLM), National Institutes of Health (NIH), in Bethesda, Maryland. The meeting was open to the public from 9:00 a.m. to 4:10 p.m., followed by a closed session for consideration of grant applications until 4:30 p.m. On February 8, the meeting was reopened to the public from 9:00 a.m. until adjournment at 12:00 p.m.

**MEMBERS PRESENT [Appendix A]:**

Ms. Virginia Tanji [Chair], University of Hawaii at Manoa  
Dr. Ronald Evens, Washington University School of Medicine  
Dr. Trudy MacKay, North Carolina State University  
Dr. Joyce Mitchell, University of Utah  
Dr. Ralph Roskies, University of Pittsburgh  
Ms. Mary Ryan, University of Arkansas for Medical Sciences Library

**EX OFFICIO AND ALTERNATE MEMBERS PRESENT:**

Dr. Regina Benjamin, Office of the Surgeon General, PHS  
Mr. Christopher Cole, National Agricultural Library  
Ms. Kathryn Mendenhall, Library of Congress  
Col. John Powers, United States Army  
MGEN Kim Siniscalchi, United States Air Force  
Dr. Dale Smith, Uniformed Services University of the Health Sciences

**CONSULTANTS TO THE BOR PRESENT:**

Dr. Tenley Albright, Massachusetts Institute of Technology  
Dr. Marion Ball, Johns Hopkins School of Nursing  
Dr. Holly Buchanan, University of New Mexico  
Dr. Ted Mala, Southcentral Foundation  
Dr. H. Kenneth Walker, Emory University School of Medicine

**SPEAKERS AND INVITED GUESTS PRESENT:**

Dr. Stephen Boyer, IBM Almaden Research Center  
Dr. John Brownstein, Children's Hospital, Boston  
Dr. Richard Hodes, National Institute of Aging, NIH  
Dr. Arthur Levine, University of Pittsburgh  
Dr. Anouk Stein, iAnatomy  
Mr. Thomas West, The Krasnow Institute for Advanced Study

**MEMBERS OF THE PUBLIC PRESENT:**

Mr. Kevin Beverly, Social & Scientific Systems, Inc.  
Ms. Julie Hunter, International Business Machines Corporation  
Mrs. Mary Lindberg

## **February 7-8, 2012 - Board of Regents**

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### **FEDERAL EMPLOYEES PRESENT:**

Dr. Donald A.B. Lindberg, Director, NLM  
Ms. Betsy Humphreys, Deputy Director, NLM  
Dr. Milton Corn, Deputy Director for Research and Education, NLM  
Dr. Michael Ackerman, Lister Hill Center, NLM  
Ms. Anne Altemus, Lister Hill Center, NLM  
Ms. Stacey Arnesen, Division of Specialized Information Services, NLM  
Ms. Dianne Babski, Lister Hill Center, NLM  
Ms. Joyce Backus, Division of Library Operations, NLM  
Dr. Olivier Bodenreider, Lister Hill Center, NLM  
Dr. Steve Bryant, Lister Hill Center, NLM  
Ms. Florance Chang, Division of Specialized Information Services, NLM  
Ms. Kathy Cravedi, Office of Communications and Public Liaison, NLM  
Ms. Francesca Crawford, Division of Extramural Programs, NLM  
Mr. Walter Cybulski, Division of Library Operations, NLM  
Mr. Todd Danielson, Office of the Director, NLM  
Mr. Ivor D'Souza, Office of Computing and Communications Systems, NLM  
Ms. Josseline de Saint Just, Division of Extramural Programs, NLM  
Dr. Kathel Dunn, Division of Library Operations, NLM  
Ms. Gale Dutcher, Division of Specialized Information Services, NLM  
Dr. William Elwood, Office of the Director, NIH  
Ms. Allison Fisher, Office of Communications and Public Liaison, NLM  
Dr. Valerie Florance, Division of Extramural Programs, NLM  
Mr. David Gillikin, Lister Hill Center, NLM  
Mr. Alan Graeff, National Center for Biotechnology Information, NLM  
Dr. Zoe Huang, Division of Extramural Programs, NLM  
Dr. Michael Huerta, Office of Health Information Programs Development, NLM  
Ms. Christine Ireland, Division of Extramural Programs, NLM  
Ms. Janice Kelly, Division of Specialized Information Services, NLM  
Mr. Sheldon Kotzin, Division of Library Operations, NLM  
Ms. Lisa Lang, Lister Hill Center, NLM  
Dr. Robert Logan, Office of Communications & Public Liaison, NLM  
Ms. Wei Ma, Lister Hill Center, NLM  
Dr. Clement McDonald, Lister Hill Center, NLM  
Mr. Dwight Mowery, Division of Extramural Programs, NLM  
Dr. Steven Phillips, Division of Specialized Information Services, NLM  
Dr. Barbara Rapp, Office of Health Information Programs Development, NLM  
Dr. Jeffrey Reznick, Division of Library Operations, NLM  
Dr. Angela Ruffin, Division of Library Operations, NLM  
Mr. Jerry Sheehan, Office of the Director, NLM  
Dr. Elliot Siegel, Consultant, NLM  
Dr. Hua-Chuan Sim, Division of Extramural Programs, NLM  
Mr. Kent Smith, Contractor, National Center for Biotechnology Information, NLM  
Dr. George Thoma, Lister Hill Center, NLM  
Dr. Alan Vanbiervliet, Division of Extramural Programs, NLM  
Dr. Fred Wood, Office of Health Information Programs Development, NLM

Dr. Jane Ye, Division of Extramural Programs, NLM

### **I. OPENING REMARKS**

Ms. Virginia Tanji, NLM Board of Regents Chair, welcomed the Regents, alternates and guests to the 159<sup>th</sup> meeting of the Board. Ms. Tanji also introduced new alternate ex-officio members. They included: Mr. Christopher Cole, Associate Director for Technical Resources at the National Agricultural Library; Dr. Joseph Francis, Veterans Health Administration; Ms. Kathryn Mendenhall, Director, Partnership and Outreach Programs, the Library of Congress; Col. Dom DeFrancis, representing the Air Force Medical Corps; and Dr. Ted Mala, a consultant from Southcentral Foundation. Ms. Tanji announced that Dr. Henry Lewis was unable to attend the board meeting due to his inauguration as President of Florida Memorial University. She also noted that Dr. Lindberg would be receiving the Research!America's Builders of Science Award on March 14, 2012. Consultant Dr. Tenley Albright explained that Research!America, run by president and CEO Mary Woolley, is the nation's largest not-for-profit public education and advocacy alliance, working to make research a national priority. They urge Congress to remember the words of the late Congressman Paul Rogers, "Without research, there is no hope!"

The Surgeon General was delayed, and the agenda was rearranged to accommodate this.

### **II. REPORT FROM THE DISASTER INFORMATION MANAGEMENT RESEARCH CENTER (DIMRC) WORKING GROUP**

Ms. Tanji noted that the DIMRC Working Group met in May 2011 to review the Center's activities and discuss the desirability of explicit authorization for its work. Attendees applauded the Center's activities and said that the DIMRC listserv keeps followers updated with a tremendous number of postings and is a great tool for librarians and others. A second meeting to be scheduled will address priorities for expanded efforts and a methodology for evaluation of current activities. The Regents approved without change the minutes from the May 2011 DIMRC Working Group meeting.

### **III. OCTOBER 2011 MINUTES AND FUTURE MEETINGS**

The Regents approved without change the minutes from the October 2011 meeting. The date for the February 2013 meeting was agreed upon. Following adoption of the October 2011 minutes and future BOR meetings, Ms. Tanji called upon the NLM Director for his report noting that Surgeon General Benjamin would make her report immediately upon her arrival.

### **IV. REPORT FROM THE NLM DIRECTOR**

NLM Director Dr. Lindberg began his report with a discussion of NLM's budget. He said the President signed the Consolidated Appropriations Act 2012 on December 23, 2011. The net appropriation for NLM (less transfers and across-the-board reductions) is \$337.5 million for FY 2012, an increase of approximately \$1 million over the FY 2011 level. This amount does not include reimbursable funds that NLM may receive during the fiscal year. The 2013 budget will be submitted to Congress in February.

Dr. Lindberg congratulated Betsy Humphreys, who was awarded the Smith College Medal for exemplifying in her life and her work the value of a liberal arts education.

## February 7-8, 2012 - Board of Regents

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Dr. Lindberg also announced the appointment of Dr. Jeffrey Reznick as Chief of the History of Medicine Division, replacing Dr. Elizabeth Fee. He noted that Dr. Wendy Rubinstein was appointed to a senior scientist position at NCBI and will now serve as Director of the NIH Genetic Testing Registry. He then introduced Lister Hill Director Dr. Clem McDonald provided information about his new staff: Swapna Abhyankar, MD appointed as staff scientist in the Computer Science Branch; and research fellows Tomasz Adamusiak, Ph.D., Guocai Chen, Ph.D. and Rainer Winnenbourg, Ph.D.

Dr. Lindberg updated the Board about legislative and regulatory issues noting that the 2012 Appropriations Act established the National Center for Advancing Translational Sciences at NIH and abolished the National Center for Research Resources. *[With the arrival of US Surgeon General Dr. Regina Benjamin, Dr. Lindberg yielded the podium to her.]*

### V. REPORT FROM THE OFFICE OF THE SURGEON GENERAL, PHS

Dr. Regina Benjamin began by noting that prevention is the foundation of her work as the US Surgeon General. She stated that health does not occur in the doctor's office or in hospitals alone. Health also occurs where we live, learn, work, play and pray. Prevention offers people the greatest opportunity for building stronger and a more sustainable healthcare system. Prevention is not new to the national dialogue. Preventing chronic illness has a profound measurable effect on communities and our economy, impacting people of all ages and ethnicities in economic strata. We know that with better health, children attend school more regularly and are better able to learn. We know that with better health, seniors can maintain their independence. The lack of prevention takes a devastating toll. Much of the illness and the early death related to chronic disease are caused by four modifiable risk behaviors: the lack of physical activity; poor nutrition; tobacco use; and excessive alcohol consumption. Almost 50 percent of adults have at least one chronic condition and seven out of 10 deaths each year are caused by chronic illnesses. In 2012, more than 800,000 Americans will die of heart disease, and the overall cost resulting from cardiovascular disease is estimated to be \$444 billion. Prevention, she said, has to be a part of our everyday lives. She chairs the National Prevention Council, consisting of 17 heads of federal agencies. The Council released the first ever Prevention Strategy to move our health care system from a focus on sickness and disease to a focus on wellness and prevention. The Council recommended a more holistically integrated approach to community health. The goal of the National Prevention Strategy is to increase the number of Americans who are healthy at every stage of life. She stated that if we follow the recommendations of the National Prevention Strategy we can prevent or at least significantly reduce the five leading causes of death. The Council is working with state and local government and others to bring this national prevention strategy to life. The biggest challenge is lifestyle change. This week, she noted, marked the second anniversary of the "Let's Move" campaign to reduce childhood obesity. She said that we need to make healthy behavior enjoyable and the OSG is working with radio stations to air "Dance Breaks," 30-60 seconds of music to encourage everyone to stop what they are doing and dance, take a mental break and experience the joy of being healthy.

The Office of the Surgeon General (OSG) has also been innovating outreach with technology. She has a Twitter feed, @SGRegina, and recently the OSG sponsored an apps challenge. The winning apps will be used next year on the "Journey to Joy," one of the Office's outreach initiatives. The apps are free.

The OSG released a breastfeeding report to help women interested in that topic. The report details the benefits of breastfeeding, not only for the baby but also for the mother. The OSG is working with the

March of Dimes to reduce pre-term birth rates. In addition, she will be releasing a tobacco report in March which will focus on youth smoking and the marketing of tobacco products to this age group. An OSG campaign, "Script Your Future," is underway, to get Americans to take their medications correctly. She noted that the OSG is also working on a number of other initiatives, including mental health and substance abuse, youth prescription drug misuse, suicide and violence.

#### **VI. REPORT FROM THE NLM DIRECTOR (resumed)**

Dr. Lindberg announced that Dr. Evens had been appointed to a special NIH Ad Hoc Committee on the Common Fund. Dr. Mitchell, the NLM Board representative to the NIH Council of Councils, reported that plans for use of the Common Fund had also been discussed at its recent meeting. She indicated that there was some ambiguity about the role of the advisory groups vis a vis the Common Fund.

Referring Board members to information in the briefing book on other topics, Dr. Lindberg then demonstrated an iPad loaded with the complete video content from the Native Voices exhibition, one of two methods NLM intends to make exhibition video content available via iPad for remote presentations, demonstrations, and future traveling versions of the exhibitions. Board members were enthusiastic about the quality of the video. Dr. Benjamin requested a copy for use in her presentations across the country.

#### **VII. DIGITIZING OUR MEDICAL HERITAGE**

Dr. Jeffrey Reznick, chief of NLM's History of Medicine Division, and Walter Cybulski of the Library's Preservation and Collection Management Section discussed NLM's work on the Medical Heritage Library project. Dr. Reznick noted that, for the past two years, NLM has received \$362,000 as part of a \$1.5 million dollar grant from the Alfred P. Sloan Foundation, to create a digital Medical Heritage Library.

NLM is one of five libraries with important medical historical collections participating in the Digital Medical Heritage Library project. Other partners include the Countway Library at Harvard Medical School, the Harvey Cushing/John Hay Whitney Medical Library at Yale University, the Augustus C. Long Health Sciences Library at Columbia University and the New York Public Library. The combined level of effort among all of these institutions is 30,000 volumes of public domain works. Together, these materials span a remarkable range of subjects. NLM is digitizing usable surrogates of rare and unique items from our Americana collection, a collection dating from the early 17<sup>th</sup> century through 1865. As of today, NLM has digitized nearly 6,000 volumes or approximately three quarters of its planned contribution to the project, encompassing over 1 million pages. The topics covered by NLM's contribution to the project include anatomy, military medicine, medical education, medical jurisprudence, public health, psychiatry and nursing. In conjunction with its engagement in the joint project, NLM has established its own digital scanning program, which has involved careful attention to cataloguing and conservation, and delivery of the highest quality content to the project. Four NLM units participate: the History of Medicine Division, the Preservation and Management section of the Public Services Division, the Technical Services Division and the Office of Computer and Communication Systems.

Walter Cybulski, preservation librarian in NLM's Preservation and Management Section, then explained NLM's production cycle and provided insights into some of the unique material that NLM digitized as part of this collaboration. He described what is involved in the scanning operation and provided

information on the technical requirements and tools used to digitize NLM's historical materials. NLM has scanned over 1.1 million pages and will end with about 1.5 million. This project will allow the public to look at our collection in ways they were unable to do before. NLM's part of the project will be approaching around 3 terabytes when the work here is completed. Two of the oldest texts scanned are one that was published in 1610 and another, an almanac, from 1701. To date, the project has realized its goal of creating a permanent, freely accessible digital library of published historical medical literature.

Board member Dr. Joyce Mitchell asked why NLM cared about the backup power supply for the project. Cybulski explained that, if the machine shuts down in the middle of scanning, a lot of material would be lost suddenly in the absence of backup power. Losing the data could mean losing up to half a day's work. The machine saves what is scanned, but data needs to be transferred to ensure that it is completely saved.

Consultant Dr. Holly Buchanan asked about NLM's criteria for selecting items to be scanned. Dr. Reznick noted that books have to have the physical integrity to go through the scanning process. More importantly, NLM chose certain themes like anatomy, military medicine, medical jurisprudence, medical psychology/health and nursing to avoid potential overlap with digitization done by the other institutions involved in the project.

Ex-officio alternate member Ms. Kathryn Mendenhall asked whether NLM has been able to identify funding for any follow-up projects. Dr. Reznick responded that NLM is looking for additional funding. Asked about other priorities for digitization, he mentioned the 15,000 other items in the Library's Americana collection and its historical audiovisuals collection. NLM is home to the finest and largest medical audiovisual collection in the world. NLM also has thousands of images in its Prints and Photographs Collection that have not yet been digitized.

## **VIII. NCBI BOARD OF SCIENTIFIC COUNSELORS REPORT**

Dr. Arthur S. Levine, chair of the NCBI Board of Scientific Counselors (BSC), discussed a report by an NIH Needs Assessment Committee, appointed by NIH Director Dr. Francis Collins. NCBI has seen a surge in the amount of information it manages, in the form of complex and diverse molecular biology, genomics and medical genetics data, especially resulting from high throughput DNA sequencing. The number of NIH genome-related grants is surging, too—6 percent of all NIH grants in 2000, 17 percent in 2010, and the number is still rising.

Unfortunately, NCBI's base budget has not kept pace with its expanding workload. Overall, it has seen an average cost increase of 7.6 percent annually—not nearly enough to cover expenses. As a result, NCBI has since 2006 received donations from other NIH Institutes, which in Fiscal Year 2011 comprised about 30 percent of NCBI's total operating budget. Dr. Collins and his advisors determined that this mechanism was unreliable, unpredictable and, finally, destabilizing. He therefore appointed a special panel, of which Dr. Levine was a member, to assess NCBI's needs and develop a better funding structure. In its October 2011 report to the Needs Assessment Committee, it recommended: (1) that the NCBI base budget increase annually at a rate related to the prior two years' growth in the NIH investment in genome-related grants; (2) that NCBI's needs over the next three to five years should be addressed in the appropriations-based budget, not by unpredictable and destabilizing taps from the Institutes; (3) that any new Institute-specific opportunities for data acquisition and management should be funded by Institute-specific agreements with NCBI; and (4) the creation of a permanent advisory group to assess Institute-

## February 7-8, 2012 - Board of Regents

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specific projects and new trans-NIH initiatives, and to recommend the deletion of existing NCBI databases, where appropriate.

Dr. Levine said that, assuming stability in the NIH appropriation, Dr. Collins has proposed a 5 percent increase in NCBI's base budget above FY 2012 levels for both FY 2013 and FY 2014. These amounts are likely to be included in the President's budget.. The panel had one other recommendation: that NCBI use a short cut to capture and archive some types of new data—for example, data- intensive studies of human phenotypes and function, and data emerging from metabolomics, glycomics and lipodomics. In contrast to the now well-established, heavily curated and standardized NCBI databases, this data would not be intensively examined and curated.

Board member Dr. Trudy Mackay asked about computational technology and whether there was the need for a revolution, along the lines of Next Generation sequencing, because current computer techniques are not up to the task. Also is there going to be a tipping point whereby the cost of regenerating the data anew is going to ignore the constant curating it and keeping it? Dr. Levine answered “Yes” to both queries. He noted that the era of cloud computing is probably going to heavily influence how the world deals with data and that it will likely make data management more cost effective. NCBI Director Dr. Lipman commented that, over the next one or two years, routine data processing will settle down and be less of an issue, replaced by a larger issue: What happens when we have a vast store of variation data for humans or model organisms and start to try to integrate across all of the protein binding of different sources and tissue types over time? How does one do that and pull as much discovery out of it as possible? That isn't a computer problem but a biological problem, and NCBI doesn't have the answers right now, he said.

Dr. Levine added that the world has embarked on an era of systems biology, especially because we recognize that in many cases that genotype doesn't predict phenotype. Dr. Lipman remarked that Dr. Mackay has one of the most interesting projects he knows, looking at this problem of mapping genotype to phenotype.

Dr. Lindberg said that he wanted the Board to know that NCBI grew from two people to 300 supported entirely by NLM's own appropriation. Then the combination of relatively flat budgets, new high throughput sequencing technology, and increasing NIH investments in data generation led to the strategy of obtaining contributions from other NIH institutes.

Board member Dr. Joyce Mitchell asked whether NIH's Common Fund could support some NCBI activities. Dr. Lipman replied that Common Fund monies, meant for short-term, high-impact projects, aren't predictable. In the FY 2012 budget, for example, NCBI's PubChem was cut by 85 percent.

In closing, Dr. Levine gave a recap of recent NCBI BSC meetings, which have included such topics as: the Thousand Genome Project, an attempt to catalogue singular nucleotide polymorphisms; the Sequence Read Archive, which houses data from Next Generation sequencing; comparative effectiveness research, which NCBI has also recently taken on; and the Genetic Testing Registry, which will prove an invaluable resource as the US enters the era of personalized medicine.

## **IX. IBM CONTRIBUTION OF CHEMICAL COMPOUND DATA TO PUBCHEM**

Dr. Stephen Bryant of NCBI gave an overview of PubChem, the public repository of small molecules and their biological activities. One of the site's components is substance records— records about physical samples, most often described by a chemical structure. PubChem currently has close to 100 million deposits of records. It has grown dramatically since its 2004 launch, which Dr. Bryant illustrated in a series of graphs.

He then turned the lectern over to Dr. Stephen Boyer from the IBM Almaden Research Center. Dr. Boyer has helped form a collaboration of pharmaceutical industry leaders and international government organizations, resulting in the recent donation of around 2 million molecular structures to the PubChem project. The group is pioneering new methods for computer curation, which he described as text and image analytics. This work is important to NIH, he said, and could potentially impact health care in this country.

What is the problem they're trying to solve? Researchers are overwhelmed with information. Patents are issued every day, journals are published and nobody can keep up with it. The answer would be if we could get computers to read documents, identify critical entities and perform meaningful associations that can help. It's like the movie, "Moneyball," but for medicine. You aggregate the data, connect the dots and then identify the form of treatment.

He then showed a slide of a typical drug patent, with molecular content, chemical names, bitmap images and complex chemical work units. To simplify searching of these complex forms, IBM has developed programs that can read the electronic data, read the text, identify where a chemical starts and ends, and automatically convert it into a structure. IBM gets daily electronic feeds from every patent office in the US and Europe. It can also process about a billion pages in three hours. The company typically gets the data within six hours of its issuance, and by that night, the new data has been analyzed and the structures uploaded in our database.

Unfortunately, drug synonyms pose a challenge. Valium, for example, has a trade name, a generic name, a chemical abstract registry number and, internationally, over 149 different synonyms. If a scientist seeks information on Valium, it's often buried under another name, or in some location where no text search engine can find it. The IBM group analyzes the text, images, XML files and complex work units, puts them all in a database and then takes the database and tries to integrate it with other content from other sources. IBM was doing this with chemical structures when a scientist from Johnson & Johnson asked whether they could do the same for biomarkers. We took his list of 485 biomarkers and tried to find the occurrence of every biomarker on every page of every patent for one year of data. IBM made some technical adjustments and its Blue Gene super computer started to search, but 20 seconds later it stopped. They thought it had died but it had actually finished the job. This shows the promise of this technology to be applied to other aspects of medicine.

IBM has the ability to analyze patents in MEDLINE, too. If a user has a compound in mind, he or she will then try to associate all the compounds with targets based on the literature curation. Dr. Boyer calls this "computer curation," and groups like the University of California, San Francisco, have made great progress. They have a program called SEA Change, short for "Similarity Ensemble Approach." Given any molecule, they perform three types of analysis on it and then they compute. They have taken the top



drugs on the market today and analyzed them, to find the targets associated. Often, they find not only the targets that have been reported in the literature but, in many cases, new ones. In laboratory tests, up to 80% of the new targets are found to be effective. IBM now has all of the computed compound relationships, and they know from the literature and the patents and the curation work they are doing that they have a reliable set of data. They have been collaborating in this effort with NCBI's PubChem staff. One of the things that the collaboration hopes to do is pull in all of the experimental data on the compound target associations and bring that into the database as well.

Board member Dr. Ralph Roskies asked whether there was machine learning going on in this computer curation, or a fixed algorithm. Dr. Boyer said they used combined set of technologies. Dr. Evens asked what IBM was hoping to gain from the PubChem project. The company's in research, Dr. Boyer said, and it organized this research collaboration, to work on a challenge that each of those companies face. Just this year, they transitioned it out of research into IBM Global Services and they are going to make the technology available commercially. Dr. Mitchell asked whether the system had a feature to help users actually locate a supply of the compounds they discover on it. Dr. Boyer said that they've heard this suggestion repeatedly and they hope to work with Chem Navigator or some other supply company, so researchers can buy the products they've identified online directly from the site. Dr. Bryant pointed out that PubChem links to sources of many of the substances that it describes.

## **X. EXTRAMURAL PROGRAMS REPORT**

The next scheduled presenter, Dr. Brownstein, was delayed, so Dr. Valerie Florance, Director of Extramural Programs (EP), spoke. She said that, as she does every February, she was seeking the Board's approval of their operating procedures for grant adjustments. According to the proposed guidelines, EP staff will report all administrative increases or decreases in excess of \$40,000 direct costs to the Board at the next available meeting, to permit review. Board confirmation of each administrative action will not be required, however. A motion was made and seconded to approve that new annual operating procedure. It received unanimous approval.

Dr. Florance next discussed the Small Business Innovation Research (SBIR) program. By legislative requirement, each agency that awards grants sets aside a portion of its budget for grants to small businesses—criteria are that it is 51% or more US-owned, is located in the US, has less than 500 employees, is for-profit and that the principal investigator's primary employment is with the company. Through FY2010, NLM's set-aside amount was 2.5 percent of its research grant budget for SBIR and .3 percent for collaborations between small businesses and research organizations which are called STTR (Small Tech Transfer Research). These set-aside rates are about to rise incrementally, so that by 2017, NLM will be putting 3.2 percent of its research budget into small business grants.

NLM's success rate for small business awards is 10-12 percent. The Library funds only four or five a year because the total set-aside is small.

Dr. Roskies asked whether NLM ever went back to learn what percentage of small businesses parlayed their NIH funding into financial success. Yes, NIH does this regularly, she replied, and it's on NLM's agenda to create a systematic method of review, to measure the output of its SBIR/STTR grants.

She next gave a report on American Recovery and Reinvestment Act (ARRA) grantee accomplishments. The purpose was to stimulate discoveries for economic activity and create and save jobs. In addition to its own ARRA allotment, NLM received funds from the Office of the Director of NIH, for grants that they considered high priority; NLM administered those. This expanded the \$70 million or so NLM had to spend on research to \$82 million.

NLM made 251 awards, which includes both new grants and the continuation of grants and supplements, to 59 organizations in 32 states. NLM gave 128 new awards, 59 of which were solicited as the “grand opportunities,” like the Challenge Grants. The other 69 awards went to either meritorious grant proposals that went unfunded for lack of money, or some administrative supplements to existing research grants. From the 128 new grants (2009-2011), 147 articles have been published in 82 journals, and cited 214 times. NLM has been comparing ARRA research grants with those funded by regular appropriations. These findings are preliminary, however, because most of NLM’s ARRA grants don’t end until September 2013. She’ll present a final analysis of ARRA grants at a future Board session.

#### **XI. A PLATFORM FOR MODELING THE GLOBAL IMPACT OF CLIMATE CHANGE ON INFECTIOUS DISEASE**

Dr. John Brownstein is an Associate Professor in the Department of Pediatrics, Harvard Medical School, and the winner of a Presidential Early Career Award for Scientists and Engineers for the NLM-supported work he is presenting today. He showed a stock price graph for a Chinese pharmaceutical company. In 2003, that stock shot up dramatically, reflecting a spike in sales of an herbal medication known to have antiviral properties. This was prompted by the spread of a mysterious illness, which turned out to be SARS, among school children in the province. Here, an unexpected source provided important insight into the health of a population. Dr. Brownstein’s group has been working to understand the process from the time an outbreak is discovered in some remote part of the world, to the time that details of it are understood and that information communicated to the public at large. While that progression is speedier now (about three weeks) than in the 1990s (up to four months), it is still unacceptable for dealing with a disease event.

Dr. Brownstein next showed typical pathways for reporting disease outbreak—slow, one-way and hierarchical. He and his colleagues have been working for five years to restructure public health for today’s interactive era, creating a multidirectional communication system in which everybody is a stakeholder.

The result is HealthMap.org, an open, freely available and transparent disease surveillance system. Essentially, it organizes world content on public health events, drawing constantly on volumes of data from about 50,000 Web sites in 10 languages. Articles are scanned for disease, species and location and, within an hour, that information is mapped and loaded onto HealthMap’s global interface. There is also a local component, “Outbreaks Near Me,” which is similar to weather.com but, instead of severe weather events, shows disease alerts near the user’s location in the past month. HealthMap gets over a million users a year, and a number of national and international organizations use it on a daily basis for real-time epidemic intelligence. There’s data from the Centers for Disease Control and Prevention (CDC), for example, saying that they regularly consult HealthMap to find out about an infectious disease risk.

Dr. Brownstein shared the example of HealthMap's work with some of the early cases of what turned out to be the H1N1 virus in Mexico in 2009. H1N1 was not as impactful as expected, but it provided a good dry run for HealthMap. There are a fixed number of public health, academics and clinicians out there who report on public health threats. HealthMap's ultimate goal is to tap into the general population. This new concept could be called "participatory epidemiology," where individuals are part of the public health fabric, sharing data on events in their community or their own lives via cell phone, the Web, Facebook or Twitter.

The group often gets questions about how they will deal with false alarms. They are building algorithms to filter out erroneous information, and, overall, their Outbreaks Near Me data correlates well with the CDC data on disease outbreaks. People around the globe use their app and they can "geo-target" them, asking for their insights into disease events happening nearby. The group has worked closely with Google on the idea of search. They built a tool called "Google Dengue Trends," tracking past and present cases of that disease. The topics that people search on the Web are often the earliest indicator of what's happening in the population.

Another area of interest to HealthMap is disasters and emergencies. The team studied the emergence of cholera in Haiti and then built a map to integrate disease information with information on clean water sources and healthcare facilities. When they observed a sudden surge on Twitter, with people talking about disease events in their population, HealthMap mined that information, looking at the rise in tweets about cholera in relation to hospitalization data. The two initial peaks of cholera were highly correlated with the Twitter traffic. HealthMap could glean the epidemiological importance of this strain in a few days from at Twitter data, compared to official sources which would provide the same news weeks later.

HealthMap has partnered with the American Public Health Association on a project called Flu Near You. This takes the self-reporting concept to the next level, asking participants to report their symptoms, or lack thereof, on a weekly basis. There have been close to 10,000 people who have joined the system in the few months since it was launched. They hope to expand it beyond flu. They are also taking over Google's project, Vaccine Finder, and will integrate that data with Flu Near You, so users may find a flu shot provider near them.

The first aim of the HealthMap project, a year and a half into it, was to validate the HealthMap data and figure out how to use them, from an epidemiological perspective. One hot button topic is climate change, and they're beginning to take the data that they've been collecting and look at relationships and the swings in temperature that are biologically meaningful. The second aim, then, and where they are now, is to develop climate models, exploring the relationship between climate and disease. The third aim, for next year, is to take these models and project them forward in time, forecasting what a global rise in temperature of a couple degrees may mean for the distribution of dengue, malaria or cholera. HealthMap would make the data freely available, and develop platform enabling other researchers to work off of this information and develop their own platforms.

HealthMap continues to see where the value of the fusion of these different data sources will take them. They're not saying that public health isn't working but that there's great opportunity to bring these streams of public information into public health, utilizing this data into research. He thanked NLM again for its funding, the HealthMap team, and the other project funders, including the CDC and Google.

Board member Dr. Katherine Gottlieb (by phone) said that her home state of Alaska is concerned about the effect of global climate change on the environment and living beings. She asked how Dr. Brownstein was going to validate information received, before they share it with others, when his group received reports on the effects of climate change on disease. Dr. Brownstein said it was a tricky matter. From a practical standpoint, they elect to share information immediately as opposed to holding it, except in the case of reports from individuals, which are reviewed before posting. HealthMap plays a different role than the CDC— it's not an official, but an informal channel. Specificity remains one of the biggest challenges to their system overall.

Dr. Boyer from IBM asked about false reporting to the system. Would they consider charging participants to share data, so they know that they're committed to the cause? Dr. Brownstein said that they do curate the data coming from individuals; if they get an unusual disease report in a place that they haven't seen it before, they may send an e-mail to local public health and get their views. The false alarm challenge is always there but the app is free and they're trying to make this into a tool with as low a barrier as possible to use. If they charge for things, the adoption would be a fraction of what it is.

Dr. Ted Mala described a major outbreak of AIDS in Alaska 20 years ago. The governor chose to identify the community and, to this day, the city was devastated about this as the new capital of AIDS, people don't want to go there, etc. He said he was nervous about targeting a community, members of which can feel stigmatized. Dr. Brownstein agreed that this could be a challenge, but HealthMap data is about more acute events—food-borne outbreaks, respiratory disease, etc. The system never identifies individuals and it masks the identity of any particular location. There's an ongoing debate about the level of aggregation that is needed to protect privacy; it's a trade off because, if you aggregate too far, the map isn't useful anymore.

Board consultant Dr. Walker asked what Dr. Brownstein predicted for this system over the next five to ten years. The bulk of their current sources are the news media, Dr. Brownstein said, and individuals supply about ten percent, including blogs and chat rooms, Facebook and Twitter. They're trying to do more scraping of "gray media," official sites and social media sites. They're partnering with Unilever, which might put HealthMap on every bar of soap they make, and possibly CVS and others who could license HealthMap data and feature it on their public sites. All of this would build up usage and add financial support.

SIS Director Dr. Steven Phillips asked about the use of a taxonomy, so that users worldwide can search for and describe disease events for the system. The group continues to work on that challenge. Also, new disease terms are always being added. Dr. Mitchell asked whether there are any areas of the world that weren't regularly reporting. Yes, Dr. Brownstein said; they have reporting networks in East Africa, West Africa, Southeast Asia, places that generally show a lack of reporting, but they're working to build up those communities, conducting training and other outreach, to increase the information flow from those places. But, of course, there will always be some bias in location and diseases. The HealthMap group has to be very clear that their map doesn't represent a comprehensive global incidence map but still, it is effective in what it does.

## XII. SHOW OFF YOUR APPS CHALLENGE

The Board received an overview of NLM's first software development challenge, "Show Off Your Apps: Innovative Uses of NLM Information," and heard from one of the winners, Dr. Anouk Stein, a radiologist and computer programmer from Phoenix, Arizona.

Ms. Dianne Babski, head of the MEDLARS Management Section within Library Operations, chaired the apps challenge committee and kicked off the presentation to the Board. The challenge was held during NLM's 175<sup>th</sup> anniversary year and celebrated the creation of innovative applications using the Library's vast array of biomedical data. The challenge committee started work in November 2010, and developed a plan that was reviewed and revised several times before getting legal approval. The contest was launched on the Challenge.gov web site on April 12, 2011. Entries were accepted through August 31, 2011. Submissions were reviewed and then given to three non-NLM judges, who are NLM federal advisory committee members. The judges chose five winners and five honorable mentions. Ms. Babski said the committee was pleasantly surprised to get 42 submissions, which made use of more than 50 separate NLM data sets (MEDLINE/PubMed was the most used). She briefly addressed the judging criteria. Did the applicant use NLM data and use it accurately? Did the product have an innovative design? Was it platform neutral and usable on the most common popular web browsers, operating systems and mobile devices? Did it meet Section 508 accessibility guidelines? The winners were GLAD4U, iAnatomy, KNALIJ, NLMPlus, and Quertle. Honorable mentions were the BioDigital Human Platform, DailyMedPlus, Drug Diary, Molecules, and ORKOV. Their reward was the opportunity to be recognized and demonstrate their winning apps at an awards ceremony that included NIH Deputy Director Lawrence Tabak, HHS Chief Technology Officer Todd Park, White House Chief Technology Officer Aneesh Chopra, and a video presentation by HHS Secretary Kathleen Sebelius. Ms. Babski then played video highlights from the awards ceremony to give the Board a feel for the event, and to introduce the presentation by Dr. Anouk Stein.

Dr. Stein demonstrated her winning app, iAnatomy. She said she designed it for the busy medical student, nurse, or physical therapist with maybe 2-3 minutes segments of time throughout that day that can be used to achieve real learning with iAnatomy. She said her app is a portable, cross-sectional, interactive anatomy atlas--touch a structure and the app will tell you the name. Stein said she programmed and designed this app by herself and used data from NLM's Visible Human Project for the face, neck, and female pelvic images. The app is designed to be free-standing. After the initial download, no internet connection is needed, which makes it useful in hospitals where connectivity can be a problem, and also for learning on planes or public transportation when your other apps may become useless. She then showed Board members how her product works and put Board members to the test with the quiz portion of the app. She noted that after her appearance at the awards ceremony, she was inspired to continue her project and developed an iPad app.

In discussion following the demonstration, Board member Mary Ryan asked Dr. Stein how she's marketing her product. Dr. Stein said it's largely word of mouth. Dr. Lindberg asked Dr. Stein for a peek at some of her other products. She demonstrated Mammogram Atlas, which is an atlas of different ways cancer can present that was created for radiologists reading mammographic images. She also demonstrated Cardiac Images, which includes a beating heart that users touch to see the anatomy.

**XIII. APPOINTMENT OF NOMINATING COMMITTEE FOR NEXT BOR CHAIR**

Board Chair Virginia Tanji announced the nominating committee for the next Board Chair. Ms. Kathryn Mendenhall will chair the committee and will be joined by Dr. Charles Rice and Dr. Simon Liu.

**XIV. REPORT FROM THE SUBCOMMITTEE ON OUTREACH AND PUBLIC INFORMATION**

Ms. Tanji, who also heads the Subcommittee on Outreach and Public Information, briefed the Board on yesterday's meeting. Dr. Mike Huerta, NLM Associate Director for Health Information Programs Development, is exploring promoting careers in health informatics at community colleges. He's been talking with the Universities at Shady Grove, which is a partnership of nine universities in the University System of Maryland. He's been looking at health informatics as a career track because it's a field in need and careers could be held with a variety of degrees ranging from certificate to graduate degrees.

Dr. Fred Wood, with the Office of Health Information Programs Development provided an update on the Native Voices exhibition. He said it was truly a trans-NLM effort and noted that the team is transitioning from exhibition development to outreach and promotion. The goal is to bring visitors to the physical exhibit. There's also a virtual component and the development of a travelling version. Several special events are in the works including an upcoming program with Tribal colleges and a lecture by Dr. Kalani Brady, who cares for the patients in Kalaupapa (the Hansen's disease colony).

Jenny Heiland-Luedtke and Martha Fishel addressed the NIH Senior Health redesign. Ms. Heiland-Luedtke said usage is down. She noted that when the site was first designed, many seniors were not adept at computers. But that's changed so the site needs to be updated.

**XV. OPPNET**

Dr. Richard Hodes, Director of the National Institute on Aging (NIA) at NIH, told the Board about OppNet, a trans-NIH initiative to expand the agency's funding of basic behavioral and social sciences research. OPPNet was formed in 2009 to provide a coordinated home for discourse and support for initiatives that span the missions of NIH institutes and centers, based on the understanding that behavioral and social research contributes to illuminating complex factors important for many aspects of health. Twenty-four institutes and centers that have extramural programs contribute to OppNet in proportion to their funded appropriation levels. Dr. Milton Corn, NLM Deputy Director for Research and Education is on the steering committee and Dr. Alan Vanbiervliet of NLM Extramural Programs is on the coordinating committee. The current level of funding per year is \$20 million across NIH. Dr. Hodes called it a modest amount that's been well-leveraged. He explained that basic research, not applied research, is the purview of OppNet. Basic research deals with human or animal model functions ranging from interactions between individuals to populations; influence of environmental factors on functioning; and interactions between or among biological, behavioral and social factors.

Three categories of basic and social sciences research (BSSR) are the study of behavioral and social processes (which include learning, cognition, social cognition, group processes, migration patterns at a sociocultural level); bio-psychosocial research (also known as biobehavioral and bio-social behavior); and methodology and measurement (for data collection, modeling). Dr. Hodes gave examples of concepts in

## **February 7-8, 2012 - Board of Regents**

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development for potential funding in FY 2013 and FY 2014. NLM is leading an OppNet R24 program, with about \$1 million allocated so far. The program will help integrate conceptual and analytic strengths spanning multiple scientific disciplines; and addressing gaps in terminology, approach, and methodology related to culture, health, and well-being.

To date, about \$21.5 million has been awarded for 106 extramural projects. There have been 17 different funding opportunities announced through the current year, 2012 and a number of on-campus symposia and meetings. Stakeholders include academic and advocacy groups, and there's also congressional interest.

Dr. Hodes briefly gave examples of what's been funded so far including: studies that link brains and behavior, such as processing two languages; differences in cognitive control; changes in sensory-motor processing; conceptualizing; and methodologies to better analyze oral patient-provider communication.

In discussion following the presentation, Dr. Ted Mala asked how they conduct outreach. Dr. Hodes said information is freely available and communicated through collaborations with multiple organizations, such as AARP. NLM has an enormous following of individuals who understand its role in outreach. He noted the collaboration between NLM and NIA on NIHSeniorHealth.gov. Dr. Lindberg said it's a great collaboration and noted that unfortunately use of it is declining. Ms. Betsy Humphreys noted they are working together on a redesign to try to address some of the issues.

### **XVI. NLM "APP OF APPS" AND OTHER MOBILE UPDATES**

During the February 2011 Board meeting, the idea was raised to create an "app of apps"—a mobile application that would contain information about all of NLM's mobile resources. The board got an update on the project from Ms. Wei Ma, chief of the Applications Branch for the Office of Computer and Communications Systems (OCCS), and Florance Chang, chief of the Biomedical Files Applications Branch in the Division of Specialized Information Services. Ms. Ma co-chairs the NLM Mobile Working Group, along with David Hale of SIS who was not available for the presentation.

The NLM Mobile Working Group was formed in June 2011 and consists of eight people throughout NLM. The group meets biweekly to investigate the feasibility of implementing an application; to develop a prototype for these types of technology and approach; and to share the information.

After an investigation, the group decided to use the NLM gallery of mobile apps and the site's page as a base. They designed and implemented an optimized beta version, called the "NLM App of Apps." Ms. Ma gave a demonstration of the app, which she described as user-friendly and easy-to navigate. There's no need to install a specific program. Users can save the NLM App of Apps to his or her mobile device. If a user is in a place without an Internet connection, he or she can still see the list of NLM mobile resources.

Ms. Chang then addressed the working group's next major task--developing mobile guidelines and recommending strategies for mobile development. The working group used the NLM Wiki to organize and share information contributed by the working group members. The information was gathered from a survey of mobile policies from the public and private sectors. Six hot button topics are covered: design, implementation, tests, security, privacy, accessibility, and outreach.

## **February 7-8, 2012 - Board of Regents**

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The group provides a comparison between mobile apps and mobile-optimized web sites, with recommendation and development guidelines. Implementation guidelines cover general as well as platform-specific information for mobile web, Android, and Apple's iOS. Testing guidelines recommend to first test the mobile apps and sites on emulators or simulators prior to the implementation phase. As far as real world testing, there are a few options, such as outsourcing.

As for security and privacy guidelines, currently there is limited information from government and industry on security and protection of personal information on mobile devices. However, there is security guidance published by Android and Apple iOS for their respective platforms.

As for accessibility, we basically recommend the Section 508 compliance, just as we do for all of our websites. For promotion and outreach, guidelines are developed for topics such as keyword policy, branding requirement, and other promotional guidance such as publicizing our mobile resources, and the use of QR codes.

In January 2012, the working group asked NLM staffers to use their smart phones to test the app and provide feedback. NLM workers have actively tested our app with iPhones, Blackberry, and even Windows 7 phones. Based on the feedback, the working group will finalize the design and implementation. Additionally, the working group will research important information related to best practices of implementing mobile apps and websites. This will help to further develop our guideline documents.

Ms. Chang then discussed current and upcoming NLM mobile resources. Currently, NLM has 20 mobile resources, including seven mobile-optimized sites, eight iPhone/iPad apps, three Android apps, and two Blackberry apps covering areas in biomedical information, disaster and emergency response, and education. Ms. Chang introduced some of the coming mobile resources. There will be an iPhone app for Wireless Information Resources for Emergency Responders (WISER) which was first released in 2004 as a Palm Pilot. Reunite is an iPhone app for uploading missing and found person information for family reunification during mass casualty incidents. By providing structured information to NLM's People Locator program, the newer version will have features such as searching, new user interface, and better integration with the People Locator Web Site. My Medication List is an iPhone/iPad app that helps patients manage medications and make the records readily available when needed. My Rx Pad is an iPhone/iPad app that is built to work in conjunction with the My Medication List app. It is an e-prescribing application which helps prescribers make well-informed and safe prescribing decisions. Both of these apps are brand new apps that will be available soon in the Apple app store. Turning the Pages is an iPad app that allows users to touch and virtually turn the pages of the rare medical books in NLM's collection. Turning the Pages was recently selected as one of the top 10 US Government apps by InformationWeek Government. Three mobile-optimized websites are in the offing. They are: ToxNet, a cluster of databases in the area of toxicology and environmental health; Drug Information Portal, a gateway to current and authoritative drug information from NLM and other key government agencies; and HazMap, an occupational health database linking chemical exposure with jobs and diseases. SIS also has a disaster apps and mobile-optimized web page that recently was tweeted about by the FEMA administrator.

In discussion following the presentation, Ms. Ryan asked if iPhone apps work on an iPad and was told yes, but it doesn't necessarily take advantage of all of the things an iPad can do. Ms. Humphreys said that, in her view, over time, as NLM upgrades these things or changes them, we should migrate them all to



## February 7-8, 2012 - Board of Regents

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HTML5, so we don't have to do the specific development. [NOTE: Ms. Humphreys later sent the Board a clarifying message about HTML5: "HTML5 does indeed simplify mobile website development. On the App side, to avoid the need to develop the entire application separately for each mobile platform, we are looking at the feasibility of developing the application code in HTML5 and then applying a thin, device-specific application wrapper that will give the application access to device specific controls, which are otherwise not directly accessible through HTML5. The HTML5 standard is still evolving, so it may be awhile before we finalize our strategy."]

Dr. Tenley Albright, who made the original app of apps suggestion, congratulated the group. She said it's like a dream come true and will be a tremendous help in getting the word out to let people know all that the Library does.

### XVII. ADJOURNMENT

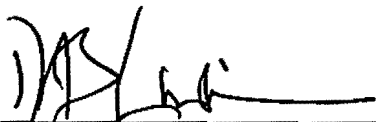
The Board of Regents meeting was adjourned at 12:00 p.m. on February 8, 2012.

#### ACTIONS TAKEN BY THE BOARD OF REGENTS:

- Approval of the October 4-5, 2011 Board Minutes
- Approval of the February 5-6, 2013 Future Meeting Dates
- Appointment of Nominating Committee for Next BOR Chair
- Approval of Grant Operating Procedures

#### Appendix A - Roster - Board of Regents

I certify that, to the best of my knowledge, the foregoing minutes and attachment are accurate and complete.



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Donald A.B. Lindberg, M.D.  
Director, National Library of Medicine



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Virginia Tanji, M.S.L.S., MED  
Chair, NLM Board of Regents