DEPARTMENT OF HEALTH AND HUMAN SERVICES
NATIONAL INSTITUTES OF HEALTH
NATIONAL LIBRARY OF MEDICINE
MINUTES OF THE BOARD OF REGENTS
February 4-5, 2020

The 183rd meeting of the Board of Regents (BOR) was convened on February 4, 2020, at 9:00 a.m. in the Donald A.B. Lindberg 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 4:00 p.m., followed by a closed session until 4:30 p.m. On February 5, 2020, the meeting reopened from 9:00 a.m. to 12:00 p.m. The meeting adjourned at 12:00 p.m.

MEMBERS PRESENT [Appendix A]
Dr. Lourdes Baezconde-Garbanati, University of Southern California
Dr. Suzanne Bakken, Columbia University
Ms. Jane Blumenthal, University of Michigan (Retired) [Chair]
Dr. Eric Horvitz, Microsoft Research (Telephone)
Dr. Carlos Jaén, University of Texas Health Science Center at San Antonio
Dr. S. Claiborne Johnston, The University of Texas at Austin
Dr. Gary Puckrein, National Minority Quality Forum
Mr. Neil Rambo, NYU School of Medicine (Retired)
Dr. Heidi Rehm, Massachusetts General Hospital

MEMBERS NOT PRESENT
Dr. Martin Philbert, University of Michigan

EX OFFICIO AND ALTERNATE MEMBERS PRESENT
Col. Thomas Cantilina, United States Air Force
Dr. Carolyn Clancy, Veterans Health Administation
Col. Kent DeZee, United States Army
RADM Joan Hunter, Office of the Surgeon General, Public Health Service
Dr. Mary Mazanec, Library of Congress
Dr. Brent Miller, National Science Foundation
Dr. Cynthia Parr, National Agricultural Library
Dr. Dale Smith, Uniformed Services University of the Health Sciences
Cdr. James Tessier, United States Navy

SPEAKERS AND INVITED GUESTS PRESENT
Dr. Lana Garmire, University of Michigan at Ann Arbor

MEMBERS OF THE PUBLIC PRESENT
Mr. Glen Campbell, BMJ Publishing, FNLM
Mr. Fred Jorgensen, Booz Allen Hamilton Inc.
Dr. Barbara Redman, New York University/FNLM
Ms. Tovah Reis, Friends of the National Library of Medicine

Mr. Rajni Samavedam, Booz Allen Hamilton Inc.
Ms. Joyce Wanga, Technical Resources International, Inc.

FEDERAL EMPLOYEES/CONTRACTORS PRESENT
Dr. Patricia Flatley Brennan, Director, NLM
Mr. Jerry Sheehan, Deputy Director, NLM
Ms. Joyce Backus, Division of Library Operations, NLM
Dr. Olivier Bodenreider, Lister Hill Center, NLM
Dr. Anna Calcagno, Division of Extramural Programs, NLM
Mr. Ivor D'Souza, Office of Computer and Communications Systems, NLM
Dr. Lisa Federer, Office of Strategic Initiatives, NLM
Dr. Valerie Florance, Division of Extramural Programs, NLM
Ms. Rebecca Goodwin, Office of Strategic Initiatives, NLM
Dr. Zoe Huang, Division of Extramural Programs, NLM
Dr. Michael Huerta, Office of Strategic Initiatives, NLM
Ms. Christine Ireland, Division of Extramural Programs, NLM
Dr. Stefan Jaeger, Lister Hill Center, NLM
Ms. Michelle Krever, Division of Extramural Programs, NLM
Dr. David Landsman, National Center for Biotechnology Information, NLM
Ms. Margaret McGhee, Division of Library Operations, NLM
Mr. David Nash, Office of the Director, NLM
Ms. Jody Nurik, Office of Communications and Public Liaison, NLM
Dr. James Ostell, National Center for Biotechnology Information, NLM
Dr. Dina Paltoo, Office of the Director, NLM
Dr. Lauren Porter, National Center for Biotechnology Information, NLM
Dr. Kim Pruitt, National Center for Biotechnology Information, NLM
Mr. Eddie Rivera, Office of the Director, NLM
Ms. Leigh Samsel, Office of Strategic Initiatives, NLM
Dr. Stephen Sherry, National Center for Biotechnology Information, NLM
Dr. Hua-Chuan Sim, Division of Extramural Programs, NLM
Mr. James Taylor, Office of the Director, NLM
Ms. Samantha Tempchin, Division of Extramural Programs, NLM
Ms. Victoria Townsend, Division of Extramural Programs, NLM
Dr. Bart Trawick, National Center for Biotechnology Information, NLM
Dr. Alan Vanbiervliet, Division of Extramural Programs, NLM
Ms. Amanda J. Wilson, Office of the Director, NLM
Dr. Rebecca Williams, National Center for Biotechnology Information, NLM

I.   **CALL TO ORDER AND INTRODUCTORY REMARKS**
      Ms. Jane Blumenthal, Chair, BOR
      [See Feb. 4 00:00:04] NIH Videocast Day 1

Ms. Jane Blumenthal called the meeting to order and welcomed attendees to the meeting.

Ms. Blumenthal introduced two new alternate *ex officio* members:
  • Dr. Cynthia Parr, National Agriculture Library (attending for Paul Wester).

- Cdr. James Tessier, Navy Medicine Chief Health Informatics Officer, U.S. Navy (attending for Capt. Hassan Tetteh).

II.   REPORT FROM THE OFFICE OF THE SURGEON GENERAL
RADM Joan Hunter, Office of the Surgeon General U.S. Public Health Service
[See Feb. 4, 00:01:16] NIH Videocast Day 1

RADM Hunter provided an update regarding the Office of the Surgeon General's (OSG) efforts on the current coronavirus outbreak. As there has been a public health emergency declared for the outbreak, the Public Health Service (PHS) has been deployed, with officers stationed at 7 U.S. airports. The OSG is planning the repatriation of U.S. citizens from China and is working closely with the Health and Human Services (HHS) agencies, the Center for Disease Control (CDC) and the Department of Homeland Security.

The OSG just released a report on Smoking Cessation, the first report released in 30 years regarding the topic; OSG partnered with the CDC to make this report and executive summary available on both websites. RADM Hunter noted some of the facts stated in the evidence-based report. The report also notes five nicotine replacement therapies and two non-nicotine oral medications approved by the FDA, as well as recommended major systemic strategies to promote smoking cessation.

Upcoming publications from the OSG in 2020 will focus on Community Health & Economic Prosperity (CHEP) and Oral Health. In partnership with the CDC, the report on CHEP will focus on strategies to improve the health of communities with challenging socioeconomic factors. It was confirmed that there will be an evaluation of the CHEP initiative. The report on Oral Health, in collaboration with the National Institute of Dental and Craniofacial Research (NIDCR), will focus on one of the four outlined priorities of the Surgeon General, increasing awareness and noting its importance to the overall health of the public.

III.   SEPTEMBER 10-11, 2019 MINUTES AND FUTURE MEETINGS
Ms. Jane Blumenthal, Chair, BOR
[See Feb. 4, 00:17:02] NIH Videocast Day 1

Ms. Blumenthal noted the listed dates for future BOR meetings, including the addition of the Winter BOR Meeting date of February 8-9, 2022. There were no objections or conflicts noted.

Motion: The BOR approved the motion to accept the Winter BOR meeting date of February 8-9, 2022.
Motion: The BOR approved the motion to accept the minutes from the September 10-11, 2019 meeting.

IV.   REPORT FROM THE NLM DIRECTOR
Patricia Flatley Brennan, RN, PhD, Director, NLM
[See Feb. 4, 00:18:20] NIH Videocast Day 1

Dr. Brennan showed a video presenting the potential applications of artificial intelligence (AI)

in the future goals of the NLM. She noted that the NLM is particularly interested in using new methods in machine learning and natural language processing that will accelerate the ability to organize the library's current literature collection and disseminate it to the participating communities.

Dr. Brennan noted the upcoming mid-course review for the NLM Strategic Plan. She noted several of the intramural goals that have been completed thus far, including the complete merger of a single Board of Scientific Counselors and the development of a lecture series to showcase science work currently occurring in the institute. Other activities include updates to NLM offerings such as PubMed 2.0, which allows for relevance-based ranking of search results and the new text snippets feature. The Strategic Planning Working Group will launch a strategy to assess the current plan and examine a unified tracking of offerings.

Dr. Brennan highlighted recent NLM activities including the development of the IT Program Management Task Force to streamline IT acquisitions and related functions across the NLM and the development of the Biomedical Citation Selector to improve upon automated indexing. Additional updates noted were the expansion of the Clinical Variation (ClinVar) data repository which accepted its millionth submission in late December 2019, and the NLM's response to the novel coronavirus public health emergency. Dr. Brennan noted the quick turnaround to present the complete published viral genome sequence and additional information about the novel coronavirus on the NLM homepage. Personnel, budget, and legislation/policy updates were also provided.

Board members discussed the impact of ClinicalTrials.gov based on its varied uses in the biomedical community such as a data repository, the potential for quality indicators and how to measure them, and determining how to support the use of the website by third parties/organizations in its modernization. The members also discussed requirements that would ensure compliance and successful implementation of the NIH Data Management and Sharing policy and community interactions in relation to the upcoming NLM renovations.

V. WORKING GROUP BREAKOUTS

BOR members divided into four breakout groups. Group representatives summarized their discussions later in the meeting.

VI. CCC SUBSTANCE USE DISORDER WORKSHOP
Dr. Suzanne Bakken and Dr. Olivier Bodenreider
[See Feb. 4, 2020, 1:30] NIH Videocast Day 1

Dr. Bodenreider provided an overview of the magnitude of the opioid crisis and the NIH's role in addressing it, which includes research on drug use, addiction, and pain management. NLM has also aided the NIH's research efforts, adapting data standards to facilitate analyzing health data and helping create a system to automatically identify the mention of opioid drugs in death certificates.

Dr. Bakken noted that the Computing Community Consortium (CCC) of the ACM (acm.org) brought together stakeholders, mostly from academia but also from the government and

technology sectors, with the goals of creating an investigator-mentor cohort to advance research and identifying current knowledge gaps. Several activities led to innovative ideas and strategies, with a focus on the recovery process, such as geo-coding, geo-fencing, and increased situational awareness.

A white paper outlining the opportunities and risks associated with the ideas from the workshop will be published in six to nine months, and a Special Issue of the Journal of the American Medical Informatics Association (JAMIA) covering a broad range of subjects aligned with the goals of the workshop will be published in approximately one year.

In the following discussion, it was noted that the workshop participants decided to focus on recovery, likely due to the panel of individuals in various stages of recovery from substance abuse disorder that also occurred during the workshop. Many participants felt that recovery was an area where technology could be most useful. It was noted that in addition to being a medical issue, drug use can have many societal influences that technology applications can hopefully capture.

VII.   NCBI SERVICES
Dr. Kim Pruitt
[See Feb. 4, 2020, 1:57] NIH Videocast Day 1

Dr. Pruitt provided an overview of the National Center for Biotechnology Information (NCBI), noting that the Information Engineering Branch (IEB) houses many public production services related to biomedical data. The IEB has 15 key offerings supporting four main ecosystems: research, patient care, public health, and policy communities. Dr. Pruitt provided offering examples for each ecosystem and also noted that nearly all IEB offerings support medical and basic research communities.

For the public health ecosystem, Dr. Pruitt noted the examples of GenBank database and Pathogen Detection Pipeline, providing a timeline of key GenBank responses to the novel coronavirus outbreak. For the research ecosystem, Dr. Pruitt highlighted recent efforts, such as the modernization and move to cloud-based data storage for PubMed and the ongoing move of data to cloud-based storage for the Sequence Read Archive (SRA), that aid in data accessibility.

Dr. Pruitt also provided offering examples for the patient care ecosystem (Genetic Testing Registry, ClinVar, and RefSeq) and the policy ecosystem (ClinicalTrials.gov, which is undergoing a modernization initiative). All offerings have shown continuous growth in data volume and use. Future goals of the IEB include the continued transfer of data to the cloud and the modernization of infrastructure.

The BOR members discussed the importance and difficulty of effectively communicating about the NCBI offerings across the different communities associated with the different ecosystems. The group also discussed the IEB's strategic priorities for the modernization and maintenance of their offerings, such as the NIH-wide initiative toward cloud-based data storage. It was clarified that the IEB has a branch that monitors and blocks cybersecurity threats.

VIII.   AN INTEGRATIVE BIOINFORMATICS PLATFORM WITH APPLICATION IN SINGLE CANCER CELLS
Dr. Lana Garmire, University of Michigan at Ann Arbor
[See Feb. 4, 2020, 2:51] NIH Videocast Day 1

Dr. Garmire noted the benefit of single-cell technology in presenting heterogeneous transcriptome profiles through single-cell RNA sequencing (RNA-Seq) that can be overlooked with typical sequencing techniques/bulk RNA-Seq. There is a need to develop new computational methods and user-friendly tools to aid approaches in single-cell bioinformatics.

Dr. Garmire highlighted two examples of novel computational methods developed by her lab: SSrGE for single-cell RNA-Seq (scRNA-Seq) analysis, and DeepImpute. For the former, small nucleotide variations (SNVs) identified from scRNA-Seq data were used to develop a linear modeling framework to obtain effective and expressed SNVs (eeSNVs) associated with gene expression profiles. EeSNVs were shown to be more accurate in identifying genotype-phenotype links than gene expression alone. For the latter, the deep learning method was developed to resolve issues related to scRNA-Seq including dropout events, overdispersion, and outliers. By replacing missing data with substituted values, this scalable method has been shown to yield better empirical statistical metrics and cluster separation compared to other statistical methods.

She also noted the user-friendly tools developed in her lab, including Granatum, a graphical scRNA-Seq analysis pipeline available for public use. This tool does not require any programming. GranatumX was developed as a community-engaging and flexible single-cell analysis software environment to connect biologists and bioinformaticians.

Dr. Garmire noted that the field is evolving quickly and moving towards clinical-based strategies. Her lab's ongoing and future work includes examining spatial transcriptomics in single-cell resolution and developing tools to enable benchmarking and meta-analysis.

The subsequent discussion focused on the current state of the single-cell bioinformatics field, the limitations and challenges associated with single-cell technologies, and the different skillsets and backgrounds needed to further work in the field.

IX.   CONCEPT CLEARANCE FOR FUTURE FUNDING OPPORTUNITIES ANNOUNCEMENT
Dr. Valerie Florance
[See Feb. 4, 2020, 3:39] NIH Videocast Day 1

Dr. Florance gave a brief background of Concept Clearance at NIH, noting that this discussion must be performed for new or continuing extramural initiatives. She presented two concepts to the Board for their input and comments.

Concept one described the NLM's engagement in support for an extramural research repository of digital health data. When the NIH Scientific Data Council approved the concept of continuing grant funding at extramural organizations for core biomedical repositories, the NLM did not join the issuance as they deemed the initial funding opportunity announcement scope too broad.

Currently, the NLM is considering publishing a "Notice of Significant Interest" focusing on the institute's specific interests of clinical and health-related data needed for methods development in bioinformatics and data science. Discussion on this concept included a potential broader role for the NLM, if supporting this concept would fit in the institute's current priorities, how to determine what data should be stored, and using this funding to develop a standardized metadata model. It was noted that more discussion within the NIH institutes is needed.

Concept two described the re-issue of the funding announcement to support the National Network of Libraries of Medicine (NNLM). Dr. Florance noted the benefits of the NNLM and key accomplishments as a result of current funding. The scope and objectives noted in the last Request for Applications (RFA) were also presented. Board members agreed that the NNLM should continue to be funded.

X. CLOSED PORTION

The closed portion of the meeting took place from 4:00 p.m. to 4:30 p.m. on February 4, 2020.

XI. BOR WORKING GROUP REPORTS AND DISCUSSION
[See Feb. 5, 2020, 00:00:30] NIH Videocast Day 2

Strategic Planning

Ms. Jane Blumenthal reported for the Strategic Planning Working Group. This group discussed the upcoming NLM Strategic Plan mid-course review update that will be presented during the May 2020 BOR meeting. It was anticipated that a draft report will be ready by Spring 2021 and a public release by Fall 2021. Dr. Brennan will present this report to the NIH Advisory Committee to the Director (ACD) prior to updating the Strategic Plan with the newly provided NIH template. The group recommended the formation of a Strategic Planning Update Group to complete the information gathering process and asked the BOR for recommendations for potential group members. Several board members expressed interest in participating, and suggestions of potential external members were provided.

Research Frontiers

Dr. S. Claiborne Johnston reported for the Research Frontiers Working Group. This group discussed the AI Working Group update that was presented to the ACD in December 2019. The AI Working Group recommendations included data generation, the development of consent and data access standards, and the development of ethical principles and training curricula. The Research Frontiers Working Group discussed recommendations presented at the update and the NLM's potential role. It was noted that the NLM should contribute to the advancement of AI at the NIH in the development of an adequate AI platform; however, additional funding and support from other NIH institutes would be needed. The BOR further discussed the ADC report's recommendations regarding AI methods and cross-training on the future advancement goals of AI at the NLM and NIH.

Collections

Ms. Joyce E.B. Backus reported for the Collections Working Group. This group discussed the NLM Collection and Literature Budget Overview and the NIH Preprint Pilot. Noted community benefits of the NLM Collection include the support of MEDLINE indexing and PubMed Central (PMC) content; the community depends on the NLM selections in regard to quality. Ms. Backus noted NLM's current collection and its maintenance. Approximately 80% of the acquisitions budget is for MEDLINE titles but it was noted that there have been an increasing number of open-access titles being made available from publishers. The NLM is seeking additional ways to control costs and maintain the current literature budget. The group also discussed the NIH Preprint Pilot which will occur over the next 12 months. This voluntary pilot for NIH-funded research will focus on discovery, researcher education, tracking and reporting, and community engagement. Board members discussed the potential improvement of the NLM's Collection with AI to encourage the rapid information development and potential benefits that may be observed with the Preprint Pilot.

Public Service

Dr. Carlos Jaén reported for the Public Service Working Group. This group discussed the ClinicalTrials.gov modernization updates and planning for the upcoming public meeting in April 2020. An overview of the modernization plan and internal/external modernization activities was presented to the board. The Request for Information (RFI) topic areas and goals for the public meeting were also presented. The group discussed additional topics under the RFI topic areas that should be raised during the public meeting. BOR members discussed the overall general approach for the modernization and how to improve ClinicalTrials.gov based on future NLM goals.

XII. NETWORK BIOLOGY AND DATA INTEGRATION AS A TOOL TO STUDY PROCESSES SHAPING CANCER GENOME
Dr. Teresa Przytycka
[See Feb. 5, 2020, 01:53] NIH Videocast Day 2

Dr. Przytycka noted that specific mutagenic processes generate key mutagenic patterns, and understanding those patterns can help with cancer prevention and therapy. Network-based approaches can aid in the modeling and interpretation of complex disease data and provide higher statistical power in uncovering associations with a group of functionally related genes. She added that the lab's research into mutational signatures has many similar aspects to language processing, namely that both disciplines are looking for the characteristic frequencies of what they are studying.

Dr. Przytycka noted two computational approaches her team has used: 1) finding associations between gene expression molecules and mutational signatures and 2) finding associations between mutated subnetworks and continuous phenotypes. The latter approach led to the development of NETPHIX, a method that finds mutated subnetworks associated with a particular phenotype in cancer patients. NETPHIX can be used to anticipate complementary drug sensitivities, and Dr. Przytycka noted an example of a current clinical trial using a drug

combination identified by this method. With a collaborator from the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), the lab also developed a "recommendation system" (NetREX-CF), like ones used by Netflix or Amazon, using a collaborative filtering process to help make predictions based on incomplete data.

The discussion focused on future areas of interest for the lab, including further therapeutic applications, graph embedding, and using prediction methods for secondary structures such as zDNA. Dr. Przytycka clarified that the lab does not conduct experiments to produce data but looks at publicly available databases or collaborates with investigators that have matching research interests. Dr. Przytycka noted that as a result of the lab's research, a catalogue of associations with about 50 mutational signatures is available online.

XIII. APPOINTMENT OF NOMINATING COMMITTEE FOR BOR CHAIR

Drs. Carolyn Clancy, Mary Mazanec, and Dale Smith agreed to serve on the nominating committee for the next BOR chair. They will review eligible candidates and report to the BOR at the next meeting.

XIV. ADJOURNMENT

Ms. Blumenthal adjourned the Board of Regents meeting at 12:00 p.m. on February 5, 2020.

ACTIONS TAKEN BY THE BOARD OF REGENTS:
- Approval of the September 10-11, 2019 Board Minutes
- Approval of the February 8-9, 2022 Future Meeting Dates

Appendix A - Roster - Board of Regents

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

Digitally signed by Brennan, Patti (NIH/NLM) [E]
Date: 2020.04.04 16:54:52 -04'00'

Patricia Flatley Brennan, RN, PhD
Director, National Library of Medicine

Jane Blumenthal, MSLS
Chair, NLM Board of Regents