

PACIFIC SYMPOSIUM ON BIOCOMPUTING 2017

2017 marks the 22nd Pacific Symposium on Biocomputing (PSB)! Biocomputing, biomedical informatics and data science have become high profile activities in recent years. The associated emphasis on the need for policies and technologies for effective data sharing has also received quite a bit of attention. In a series of editorials, the New England Journal of Medicine (Longo & Drazen, N Engl J Med 2016; 374:276-277. 1/21/2016. DOI: 10.1056/NEJMe1516564 and Drazen, N Engl J Med 2016; 374:e24. 5/12/2016. DOI: 10.1056/NEJMe1601087) discussed the particular challenges for data sharing in the context of clinical data, generating much discussion about the proper approaches for these activities. Most notable, however, was the introduction of the phrase “research parasite” to describe “people who had nothing to do with the design and execution of the study but use another group’s data for their own ends, possibly stealing from the research productivity planned by the data gatherers, or even use the data to try to disprove what the original investigators had posited.” Of course, this perfectly describes (although in somewhat more negative terms than are typically used by data scientists) the motivation behind data sharing in genomics and molecular biology—and the potential value of secondary analysis of public data sets, including the occasional disproof of an incorrect scientific finding or conclusion—thus saving time, resources and potentially lives. The depiction of secondary analyses and the potential refutation of primary analyses as a negative surprised many, but points to the special challenges of sharing sensitive clinical data. Nonetheless, “I am a research parasite” became a refrain among biomedical data analysts who felt strongly that these analyses are indeed quite positive and exactly what is needed. In that vein, the PSB organizers were approached with an idea to host an award to recognize those who have made substantial scientific contributions by analyzing data collected by others. These “Research Parasite Awards” quickly attracted financial support and will be presented for the first time at this meeting. To his credit, Dr. Jeffrey Drazen, the Editor-in-Chief of the New England Journal of Medicine, has also agreed to give a talk about the challenges in clinical data sharing, particularly from his vantage point as an editor of an influential clinical journal. Dr. Drazen has no connection with the Research Parasite Awards, but is fully aware that they have been created and will be awarded at the meeting this year.

The mission of PSB is to provide a forum for the best *emerging* science in Biocomputing, providing both formal and informal mechanisms for scientific communication. PSB depends on the community to define emerging areas in biomedical computation. Its sessions are usually conceived at the previous PSB meeting as people discuss trends and opportunities for new science. The typical program includes sessions that evolve over two to three years as well as entirely new sessions. This year we revisit new dimensions of precision medicine, ranging from single cell measurements to populations.

In addition to being published by World Scientific and indexed in PubMed, the proceedings from all PSB meetings are available online at <http://psb.stanford.edu/psb-online/>. PSB has published more than 800 papers. These papers are often cited in journal articles and represent early contributions in emerging subfields—many times before there is an established literature in more traditional journals; for this reason, many papers have garnered hundreds of citations. The Twitter handle PSB 2017 is @PacSymBiocomp and the hashtag this year will be #psb17.

The efforts of a dedicated group of session organizers have produced an outstanding program. The sessions of PSB 2017 and their hard-working organizers are as follows:

Computational approaches to understanding the evolution of molecular function

Yana Bromberg, Matthew Hahn, and Predrag Radivojac

Imaging Genomics

Li Shen and Lee Cooper

Methods to Ensure the Reproducibility of Biomedical Research

Konrad J. Karczewski, Nicholas P. Tatonetti, Chirag J. Patel, Arjun K. Manrai, C. Titus Brown, and John P.A. Ioannidis

Patterns in Biomedical Data - How do we find them?

Anurag Verma, Anna Okula Basile, Marta Byrska-Bishop, Christian Darabos, H. Lester Kirchner, and Sarah Pendergrass

Precision medicine: from genotypes and molecular phenotypes towards improved health and therapies

Bruce Aronow, Steven E. Brenner, Dana C. Crawford, Joshua C. Denny, Sean D. Mooney, and Alexander A. Morgan

Single-cell analysis and modelling of cell population heterogeneity

Nikolay Samusik, Sean Bendall, and Nima Aghaepour

We are also pleased to present four workshops in which investigators with a common interest come together to exchange results and new ideas in a format that is more informal than the peer-reviewed sessions. For this year, the workshops and their organizers are:

Harnessing Big Data for Precision Medicine: Infrastructures and Applications

Kun-Hsing Yu, Steven Hart, Rachel Goldfeder, Qiangfeng Cliff Zhang, Stephen Parker, and Michael Snyder

The Making of Next Generation Data Scientists in Biomedicine

Lana Garmire, Shamim Nemati, John D. Van Horn, Jason Moore, Carole Shreffler and Michelle Dunn

No-Boundary Thinking in Bioinformatics

Xiuzhen Huang and Jason H. Moore

Open Data for Discovery Science

Philip R.O. Payne, Kun Huang, Nigam H. Shah, and Jessica Tenenbaum

We thank our keynote speakers Neil Risch (Science keynote) and David Magnus (Ethical, Legal and Social Implications keynote). We also thank Jeffrey Drazen for his talk.

Tiffany Murray has managed the peer review process and assembly of the proceedings since 2003, and also plays a key role in many other aspects of the meeting. We are grateful for the support of the The Penn Institute for Biomedical Informatics; Rxight Pharmacogenetics Program; and the Institute for Computational Biology, a collaborative effort of Case Western Reserve University, the Cleveland Clinic Foundation, and University Hospitals for their support of PSB 2017. We also thank the National Institutes of Health¹ and the International Society for Computational Biology (ISCB) for travel grant support. The research parasite awards benefit by support from: Jeff Stibel, GigaScience (Biomed Central), Nature Genetics, Scientific Data (Nature), the Gordon & Betty Moore Foundation, the Arnold Foundation, Tim Triche Jr., and Casey Greene.

We are particularly grateful to the onsite PSB staff Al Conde, Ryan Whaley, Georgia Hansen, BJ Morrison-McKay, Cynthia Paulazzo, Jackson Miller, Kasey Miller, and Paul Murray for their assistance. We also acknowledge the many busy researchers who reviewed the submitted manuscripts on a very tight schedule. The partial list following this preface does not include many who wished to remain anonymous, and of course we apologize to any who may have been left out by mistake.

¹ Funding for this conference was made possible (in part) by Grant # 5 R13 LM006766 – 20 from the National Library of Medicine. The views expressed in written conference materials or publications, and by speakers and moderators, does not necessarily reflect the official policies of the Department of Health and Human Services; nor does mention by trade names, commercial practices, or organizations imply endorsement by the U.S. Government.

We look forward to a great meeting once again. Aloha!

Pacific Symposium on Biocomputing Co-Chairs,
October 15, 2016

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Lawrence Hunter

Department of Pharmacology, University of Colorado Health Sciences Center

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Department of Biomedical and Translational Informatics, Geisinger Health System

Teri E. Klein

Department of Genetics, Stanford University

Thanks to the reviewers...

Finally, we wish to thank the scores of reviewers. PSB aims for every paper in this volume to be reviewed by three independent referees. Since there is a large volume of submitted papers, paper reviews require a great deal of work from many people. We are grateful to all of you listed below and to anyone whose name we may have accidentally omitted or who wished to remain anonymous.

Nima Aghaeepour	Shuiwang Ji	Joe Romano
Harindra Arachchi	Kipp Johnson	Mert Sabuncu
Mohammad Arbabshirani	Konrad Karczewski	Satya Sahoo
Bruce Aronow	Jonathan Karr	Erin Simonds
Chloe-Agathe Azencott	Dokyoong Kim	Marina Sirota
Anna Basile	Sungeun Kim	Johannes Soding
Kayhan Batmanghelich	H. Lester Kirchner	Sudeep Srivastava
Chris Bauer	Jun Kong	Jason Stein
Asa Ben-Hur	Linglong Kong	Timothy Sweeney
Sean Bendall	Mickey Kosloff	Suzanne Tamang
Tyler Burns	Irina Kufareva	Haixu Tang
William Bush	Willaim Lai	Nicholas Tatonetti
Mariusz Butkiewicz	Chirag Lakhani	Shaolei Teng
Fabien Campagne	Nicholas Larson	Gregg Thomas
Kevin Chen	Roman Laskowski	William Thompson
Shuo Chen	Li Li	Stefano Toppo
Yin Hoon Chew	Ruowang Li	Ryan Urbanowicz
Moo Chung	Nita Limdi	Giorgio Valentini
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James Costello	Kefei Liu	Sofie Van Gassen
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Lei Du	Tal Lorberbaum	Anurag Verma
Todd Edwards	Jose Lugo-Martinez	Yogasudha Veturi
Arne Elofsson	Gang Luo	Bjarni Vihjalmsson
Niclas Eriksson	Emily Mallory	Susann Vorberg
Tilman Flock	Elisabetta Manduchi	Pei Wang
Yi Gao	Arjun Manrai	Qianghu Wang
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Tian Ge	Brett McKinney	Chunlei Wu
Jeff Gentry	Andrew Michaels	Rong Xu
Olivier Gevaert	Marghoob Mohiyuddin	Ya Yang
Jesse Gillis	Jason Moore	Dmeliha Yetisgen
Anthony Gitter	Yves Moreau	Pooya Zakeri
Rachel Goldfeder	Spencer Muse	Daoqiang Zhang
Casey Greene	Kelly Nudelman	Xiaobo Zhou
Jake Hall	Randy Olson	Chengsheng Zhu
Xiaoke Hao	Casey Overby	
Yun Hao	Bernhard Palsson	
Imran Haque	Gaurav Pandey	
Jaroslav Harezlak	Chirag Patel	
Blanca Himes	Vikas Pejaver	
Isaac Hodes	Sarah Pendergrass	
Emily Holzinger	Hanchuan Peng	
Ting Hu	Minoli Perera	
Junzhou Huang	Abhishek Pratap	
Jake Hughey	Wei-Qi Qei	
Shaun Jackman	Marylyn Ritchie	
Ola Jacunski	Igor Rogozin	