Please cite this article in press as: Nannenga and Gonen, The 2023 Structural Biology Summit at UCLA, Structure (2023), https://doi.org/10.1016/j.str.2023.06.011

Structure

CellPress

Meeting Report

The 2023 Structural Biology Summit at UCLA

Brent L. Nannenga[1,2,*] **and Tamir Gonen**[3,4,*]
[1]Chemical Engineering, School for Engineering of Matter, Transport, and Energy, Arizona State University, Tempe, AZ 85287, USA
[2]Center for Applied Structural Discovery, The Biodesign Institute, Arizona State University, Tempe, AZ 85287, USA
[3]Departments of Biological Chemistry and Physiology, David Geffen School of Medicine, University of California, Los Angeles, Los Angeles, CA 90095, USA
[4]Howard Hughes Medical Institute, University of California, Los Angeles, Los Angeles, CA 90095, USA
*Correspondence: brent.nannenga@asu.edu (B.L.N.), tgonen@g.ucla.edu (T.G.)
https://doi.org/10.1016/j.str.2023.06.011

In early 2023, the first Structural Biology Summit was held at the University of California, Los Angeles, which focused specifically on methods developments within the field of structural biology. This meeting report summarizes the 2023 Structural Biology summit and describes the main topics discussed during the meeting.

From January 17th to 20th, 2023, the Structural Biology Summit was held on the University of California, Los Angeles campus for the first time, breaking tradition with prior meetings that were typically held at the Janelia Research Campus of the Howard Hughes Medical Institute since 2013, except for a hiatus due to the COVID-19 pandemic. This summit brought together experts from various fields such as cryogenic electron microscopy (cryo-EM), electron cryotomography (cryo-ET), single-particle analysis (SPA), microcrystal electron diffraction (MicroED), and X-ray crystallography, as well as software and camera developers and computational modeling experts to discuss the current progress, challenges, and future opportunities in structural biology (Figure 1). Although the meeting covered a range of new and interesting structures and fundamental studies, the primary focus was on methodological advancements and their potential impact on the field of structural biology. Throughout the meeting, different topics were discussed, with a few common themes emerging.

The first recurring theme to emerge from the meeting was the pursuit of new techniques to increase throughput and optimize

Figure 1. 2023 Structural Biology Summit
Attendees were Pavel Afonine, Dominika Borek, Aaron Brewster, Axel Brunger, Stephen Burley, Guillermo Calero, José María Carazo, Po-Lin Chiu, Michael Cianfrocco, Max Clabbers, Jason de la Cruz, Emma Danelius, Frank DiMaio, Edward Eng, Gwyndaf Evans, Israel Fernandez, Adam Frost, Cornelius Gati, Tamir Gonen, Tim Grant, Basil Greber, Dorit Hanein, Johan Hattne, Mark Herzik, Richard Hite, Chi-Min Ho, James Holton, Huw Jenkins, Grant Jensen, Abhay Kotecha, Steven Ludtke, Michael Martynowycz, Toshio Moriya, Brent Nannenga, William Jules Nicolas, Alex Noble, Zbyszek Otwinowski, Eduardo Perozo, Stefan Raunser, Alexis Rohou, Nicholas Sauter, Anna Shiriaeva, Alistair Siebert, Piotr Sliz, Matt Swulius, Johan Unge, David Waterman, Graeme Winter, Mark Yeager, Iris Young, Peijun Zhang, Hong Zhou, and Xiaodong Zou.

Please cite this article in press as: Nannenga and Gonen, The 2023 Structural Biology Summit at UCLA, Structure (2023), https://doi.org/10.1016/j.str.2023.06.011

sample preparation. This was a shared goal across all of the techniques discussed, including cryo-EM (cryo-ET, SPA, and MicroED), and X-ray crystallography. Presenters highlighted various novel hardware and software-based methods to improve throughput and sample preparation, which could enhance both data quality and user access to high-end instrumentation. Another recurring topic was centered around improving the quality of data and models in structural biology, with a particular emphasis on validation of data, maps, and resulting structural models. This included talks on new data-processing algorithms and the use of advanced detectors, as well as discussions on the best practices for data processing, refinement, and error analysis. There were also conversations on data and model validation, raw and processed data archiving, and the role of existing structural databanks in supporting the community as techniques continue to advance. In addition, several presentations focused on the application of machine learning, deep learning, and cloud computing in structural biology, which has the potential to significantly advance the field by enabling new science across all methods within structural biology.

Many conferences and sessions in structural biology tend to concentrate on medical applications, often relegating method development to secondary roles. The Structural Biology Summit, however, had a different focus. The invited speakers were specifically requested to concentrate on the methods rather than biology. The summit was designed to explore the future of structural biology, including potential challenges and how they can be overcome in the next decade. The summit was intentionally kept small to provide ample time for discussions. Each attendee committed to attending the entire meeting and presenting a seminar, and everyone contributed to the dynamic discussions. Our objective is to establish the Structural Biology Summit as a regular biannual gathering that brings together researchers dedicated to methods development, enabling them to discuss current trends and future possibilities. This will create an atmosphere where cutting-edge ideas can be shared, and interdisciplinary teams can collaborate on implementing these ideas. Our aim is to facilitate the emergence of the next major breakthroughs in structural biology.

ACKNOWLEDGMENTS

Brent Nannenga and Tamir Gonen, from the MicroED Imaging Center (MEDIC)—which is supported by NIH (P41GM136508)—organized the 2023 Structural Biology Summit. Thermo Fisher Scientific provided generous support for the summit.

DECLARATION OF INTERESTS

The authors declare no competing interests.