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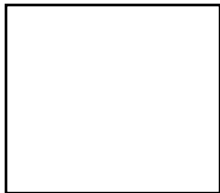
AAI NEWSLETTER

OCTOBER 2022



Meet the 2022–2023 AAI Leadership

Read President's Message on page 4



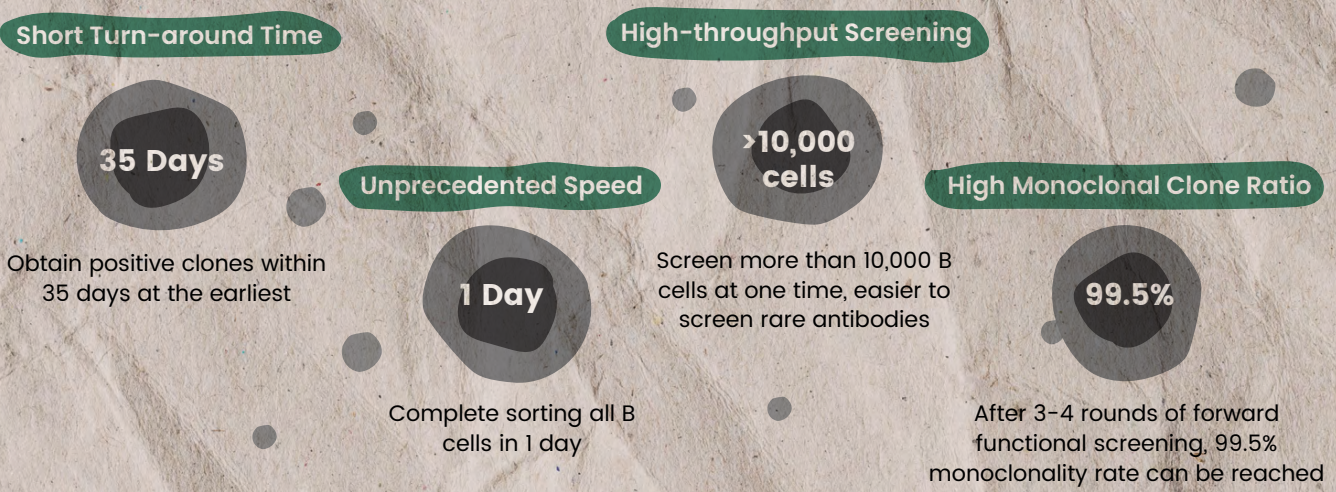
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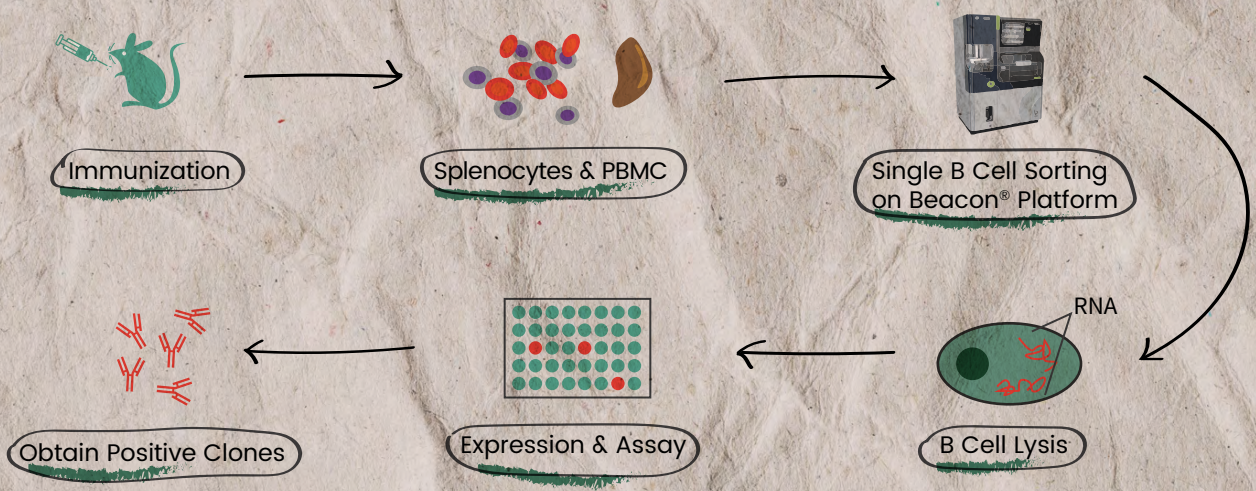
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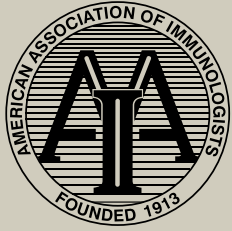
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To see a list of AAI staff, visit

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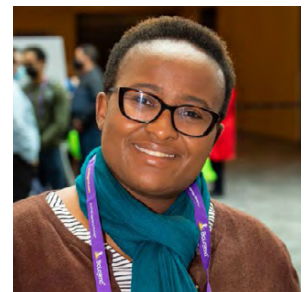
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Do you have a story or a story idea for a future issue of the *AAI Newsletter*? Send us an email! Interested in the latest news from AAI? Keep in touch through our social media channels. Follow us on social media and keep abreast of daily developments in the world of immunology.


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AAI President's Message



Mark M. Davis, Ph.D.
(AAI '88)

AAI President, 2022–2023

**Burt and Marion Avery Family
Professor, Department of
Microbiology and Immunology,
and Director, Institute for
Immunity, Transplantation and**

Infection—Stanford University School of Medicine

Investigator—Howard Hughes Medical Institute

It is an honor and a privilege to serve as President of AAI for 2022-2023. Since its founding in 1913, AAI has been a mainstay in the field, disseminating important research findings through *The Journal of Immunology* and more recently *ImmunoHorizons*, and through its annual meeting, which this year we were able to celebrate again in person for the first time since 2019. Zoom fatigue is a very real phenomenon, and in-person meetings are so much more rewarding!

I am reminded of how I wandered into immunology as a graduate student in 1977 and was almost immediately swept up into the fast pace of both antibody gene rearrangement work and the recombinant DNA revolution. Ever since, as various mysteries were dispelled, others remained, and each decade has brought tremendous progress, often unimaginable in the prior era. This unfortunately led some very prominent immunologists of the 60s, 70s, and 80s to say, essentially, “Sorry kids, it’s all over, we did all the important stuff,” as they settled into retirement or moved on to figure out how the brain works (foolishly). Luckily, their reports of the demise of the field were premature; the field hasn’t missed a beat, and immunologists continue to move ahead with remarkable creativity and energy to meet new challenges, ever more in the public eye.

For those relatively new to immunology, from someone who has been around as long as I have, the best advice I can give is to not get too used to the questions and approaches that have defined this past decade because they will change—often abruptly—as new approaches and questions arise. It will surprise no one that I think one of the main challenges of the current decade centers on human immunology, which is full of mysteries all its own, including (what I suspect are) unique mechanisms to understand, especially as they relate

to our perpetual evolutionary duels with our many infectious diseases. Our understanding in this area is still at quite a primitive state, as highlighted by this recent pandemic that never wants to leave us. And of course, this will not be the last pandemic. Bird flu, antibiotic resistant TB, and more (monkeypox!) are waiting in the wings. Of course, as drawn to the conundrums of human immunology as I am, I admit there are plenty of mysteries in the immune systems of other species as well. The variety of how different immune systems have evolved is both amazing and instructive. The field thrives on thousands of different visions—and while sometimes it seems like a Tower of Babel, it reflects mostly how vibrant and diverse the field is, and how we are all the beneficiaries of this.

Speaking of diversity, it has been my very vivid experience that scientists with different life experiences and training often approach problems in very different ways, and this increases the chances of a breakthrough and enriches our understanding of the field. Thus, AAI is very firmly committed to enhancing the diversity of the immunology community by creating a welcoming and inclusive society and appreciating and embracing the unique perspectives our members bring to the creative process. This is important for good science. It is the smart thing to do. It is the right thing to do.

We all know that a life in science is full of disappointments; failed experiments, blind alleys, rejected papers, and late nights. We also know that criticism plays an important role in stress testing data and its interpretation, ultimately creating solid foundations to build upon. Too often, however, criticism is more about scoring points. At its worst, it is a reviewer intent on trashing papers that disagree with their prejudices. Therefore, a very important mission of AAI is to encourage immunologists, especially students and postdocs, to endure the inevitable setbacks. AAI pursues this mission in great part by offering hundreds of travel awards every year to AAI and other meetings; arranging the best courses in immunology available, financing millions of dollars a year to support training opportunities, and, importantly, affording immunologists the opportunity to speak in symposia, make short podium presentations, and present posters of their work. All these opportunities allow scientists to get useful feedback and gain recognition. We also work diligently, especially with our industry sponsors, to bestow awards on our most accomplished investigators of all career stages at the annual meeting so that you can hear their stories and be inspired.

Ultimately, of course, the greatest of encouragements you can have in science, in this modern age of exploration, is to look at your experimental results and say “Toll!” (German for “Wow!”), as Christiane Nüsslein-Volhard said when she looked through the microscope and discovered how the toll gene changed the body plan of *Drosophila*—a breakthrough that helped her win a Nobel Prize. There is nothing more encouraging than that! And AAI wants to help you get there.

With respect to the organization itself, for 26 years we benefited from the incredible leadership of Dr. Michele Hogan, the CEO of AAI. When she first came, we were struggling financially, barely making it from one year to the next, and had a skeleton staff. Now, thanks to her tireless efforts, we are among the most financially secure of professional societies, hosting one of the largest annual meetings for immunologists, and able to fund the plethora of awards and programs briefly mentioned above. But as was announced at the annual meeting, Michele has stepped down, and we are now engaged in the process of searching for a new leader that we can only hope will be as talented and capable. Thank you, Michele—you will be an incredibly hard act to follow!

It is also appropriate to acknowledge how hard the AAI staff has worked this past year as we transition out of pandemic shut-down mode into not quite business as usual, and back to the in-person annual meeting and courses. It's been a time full of challenges and setbacks, but the staff have met these all with grace and dedication!

I also want to extend my profound thanks to Gary Koretzky, who in June finished his term as President of AAI. Gary has worked tirelessly to steer us through the turbulence of these plague years, with unfailing patience and calm, winning the respect and admiration of us all. Luckily for me, he is obliged to stay on as Past President, and so, hopefully, I will have even more time to actually learn how to do this job properly!

Lastly, I have been inspired by Gary to continue the effort he launched to make AAI more visible in the public eye and be seen as a trusted source of information about immunology as it relates to public health. This is a long-term project, but tremendously important given the misinformation that permeates the public sphere. This has reached epidemic proportions, so to speak, and we have been encouraged by top leaders at NIH and elsewhere to speak out against what is politely called “vaccine hesitancy,” but is more about how conspiracy theories and blatantly false information can spread rapidly through modern media and destroy the lives and health of millions of people. As immunologists, we need to do whatever we can to counteract this insanity. Working with you, I am determined to build on what Gary has started and look forward to our making a meaningful difference in safeguarding and promoting accurate information and dispelling false claims in our public discourse.

PRESIDENT'S PROFILE: MARK M. DAVIS, PH.D. (AAI '01)



Mark M. Davis, a member of the AAI Council since his election in 2017, commenced his leadership of AAI as the 106th president on July 1.

Dr. Davis is a Howard Hughes Medical Institute investigator, professor of microbiology and immunology, and the Burt and Marion Avery Family Professor of Immunology at the Stanford University School of

Medicine, where he also directs the Stanford Institute for Immunity, Transplantation, and Infection.

Davis's research interests include how T and B lymphocytes recognize specific antigens. This field of study includes the structural and biochemical underpinnings of T cell receptor binding and signal transduction and the dynamics of molecular movement

at the immunological synapse. He published the cloning of the murine T cell receptor gene in 1984. Davis and his research group have made many discoveries on the T cell receptor's biochemical properties and other characteristics, including demonstrating that T cells can detect and respond to even a single molecule of their cognate peptide in complex with major histocompatibility complex cell surface molecules.

He has also found solutions to the unique challenges of studying the human immune system, particularly in the context of infectious disease and vaccination strategies. His work has pioneered studies of the biochemistry, genetics, and cell biology of the T cell receptor and T lymphocytes generally, which play a key role in orchestrating immune responses. His current research focuses on obtaining a "systems level" understanding of the human immune system. This work has involved the steady state and vaccine responses of old and young subjects, as well as a recent study of twins, which concluded that the variation in most immune system parameters is driven by environmental factors rather than inherited.

Along with discoveries made by Tak W. Mak, Ph.D., Davis's work made cell-based immune therapy a medical reality and an effective new form of cancer treatment. His work has also been featured in 410 publications.

Davis was an AAI Distinguished Lecturer in 1989 and the 1997 recipient of the AAI Behring-Heidelberg Award. Prior to his election to Council in 2017, Davis served as a member and chair of the AAI Nominating Committee and was selected as an AAI President's Symposium speaker and AAI major symposium chair and speaker at AAI annual meetings. He has also served as an associate editor for *The Journal of Immunology (The JI)* and as a faculty member at the AAI Advanced Course in Immunology.

He serves as a member of the External Advisory Board of the Weatherall Institute of Molecular Medicine at Oxford in the United Kingdom. He also serves on the Stanford Bio-X Board, Ragon Institute of Harvard and MIT

Scientific Advisory Board, and the Tsinghua University Institute of Immunology Scientific Advisory Board.

Davis received a B.A. from Johns Hopkins University and a Ph.D. from the California Institute of Technology. He began his career as a postdoctoral fellow in 1980 at the Laboratory of Immunology, National Institutes of Health (NIH), and was made a staff fellow in 1982. Davis joined Stanford as an assistant professor in 1983 in the Department of Medical Microbiology, Stanford University School of Medicine, where he went on to hold associate and then full professor appointments.

He became a member of the Allergy and Immunology Study Section, Division of Research Grants, at NIH in 1988. He became a Howard Hughes Medical Institute Investigator in 1991. He served as director of the doctoral program in immunology at the Stanford University School of Medicine and associate chair of the department of microbiology and immunology before becoming chair in 2002. He became director of the Stanford Institute for Immunity, Transplantation, and Infection in 2004 and co-director of the Parker Institute of Cancer Immunotherapy at Stanford in 2015.

Davis has received many honors for his contributions, including membership in the National Academy of Sciences, the American Academy of Arts and Sciences, the Institute of Medicine of the National Academies of Science, the Royal Society of London, and the Henry Kunkel Society.

His additional career honors include the William B. Coley Award, Cancer Research Institute; Pius XI Award, the Pontifical Academy of Sciences; Rose Payne Award, American Society for Histocompatibility and Immunogenetics; Ernst W. Bertner Memorial Award, University of Texas MD Anderson Cancer Center; Paul Ehrlich and Ludwig Darmstaedter Prize, Paul Ehrlich Institute; and Szent-Györgyi Prize, National Foundation for Cancer Research.

AAI Leadership and Volunteers

AAI is pleased to recognize those individuals who are serving the organization as leaders and volunteers in 2022–2023.

2022–2023 AAI Council

AAI is led by a volunteer Council composed of eight scientists elected by voting AAI members. Forward-looking in their determination to answer the significant questions facing scientists, Council members are charged to speak on behalf of the AAI membership and act in the best interests of AAI. These leaders of AAI are recognized experts in their specific fields and experienced administrators.

The Council consists of four officers, a President, Vice-President, Secretary-Treasurer, and Past President, and four additional Councilors. In addition, the Council has four *ex officio* non-voting members, the Chairs of the Publications and Program Committees, the Editor-in-Chief of *The Journal of Immunology*, and the Chief Executive Officer of the association.

Officers



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Mark M. Davis, Ph.D. (2022–2023)
Burt and Marion Avery Family Professor, Department of Microbiology and Immunology, and Director, Institute for Immunity, Transplantation and Infection—*Stanford University School of Medicine*; Investigator—*Howard Hughes Medical Institute*



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2022–2023 AAI Committees and Chairs

The 12 standing committees of The AAI, along with ad hoc committees, help fulfill the AAI mission of advancing research in immunology and related disciplines, fostering the interchange of ideas and information among investigators, and promoting public understanding of immunology and its importance to human health.

AAI committees are served by appointed members and, in the case of five—Awards, Finance, Nominating*, Program, and Publications—by a combination of elected and appointed members. Duties of each committee are those specifically authorized under the bylaws, established by other rules of AAI, and assigned by action of the AAI Council. In advance of the Council’s spring and fall meetings, each committee chair is obligated to report on the committee’s ongoing, planned, and proposed future activities.

Collectively, AAI committee members work together to:

- promote immunology research and advance the efforts of those who carry it out
• contribute to the professional development of AAI member scientists and trainees
• safeguard and responsibly allocate the resources of AAI
• advocate for the immunological community on public policy issues that affect the conduct and funding of research, and
• educate the public and lawmakers about the importance of supporting immunological discovery and its groundbreaking contributions to confronting and countering disease.

*The Nominating Committee is composed entirely of elected members.

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Highlights of the 2022 AAI Business Meeting



The annual AAI Business Meeting and Awards Presentation convened this year during **IMMUNOLOGY2022™** on Saturday, May 7. AAI leaders and staff presented on the state of the association, *The Journal of Immunology (The JI)*, and *ImmunoHorizons (IH)*. The session also featured the presentation or acknowledgement of select 2022 awards.

AAI Chief Executive Officer (CEO) **M. Michele Hogan, Ph.D., DFAAI (AAI '88)**, called the meeting to order at 1:00 p.m. PT, welcoming all present and thanking the hundreds of member volunteers. She then asked all in attendance to observe a moment of silence in memory of members whose deaths had occurred or become known during the previous year. (See a listing of these names in this issue on page 21.)

AAI Membership

As of December 31, 2021, AAI had 7,639 total memberships (regular, trainee, emeritus, and associate member scientists). Regular members account for the majority (65 percent) of the membership, and trainee members equal about 30 percent of the total membership. Based on scientists' residency, AAI membership remains approximately 80 percent domestic (United States) and 20 percent international.

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AAI was pleased to return to a fully in-person annual meeting this year, the first since 2019 due to the global COVID-19 pandemic. A full program of scientific sessions and lectures, career development sessions, and social events was offered to attendees. One of the biggest highlights was a special session sponsored by the Committee on Public Affairs (CPA) and chaired by CPA Chair **Peter Jensen, M.D., DFAAI (AAI '87)**, entitled, "Vaccine Acceptance: Lessons from the Past and Tools for the Future." Featured speakers were Richard M. Carpiano, a professor of public policy at the University of California, Riverside, and AAI Vice President **Akiko Iwasaki, Ph.D. (AAI '00)**. The meeting welcomed 3,288 registrants from 35 countries, 1,644 abstract submissions, and 105 exhibitors. Additionally, 13 guest societies and two NIH institutes participated in this year's meeting.

Hogan acknowledged the contributions of the many sponsors of the 2022 meeting: **Platinum sponsor** BioLegend; **Gold sponsors** Miltenyi Biotec and Travel Portland; **Silver sponsors** STEMCELL Technologies, 10x Genomics, and Thermo Fisher Scientific; **Bronze sponsors** Bio X Cell and Nanosttring; **Sustaining sponsors** BD Biosciences, GSK, and Sony Biotechnology; **Supporting sponsor** KGL; **Contributing sponsors** Ampersand Biosciences, Destination DC, Emulate, Fluidigm, Genentech, Lanterne Dx, and Luminex; and **Collaborating sponsors** Adaptive Biotechnologies, Akadeum Life Sciences, Inc., Akoya Bio, Bio-Rad Laboratories, Boca Scientific Inc., Cell Signaling Technology, Chondrex, Inc., Curiox Biosystems, Cytex Biosciences Inc., FlowJo, LLC, Immudex USA, InvivoGen, IVIM Technology, Leinco Technologies, Lunaphore Technologies, ProImmune, Inc., Promega Corporation, Slingshot Biosciences, Inc., Studylog Animal Study Workflow Software, and Worthington Biochemical Corp.

IMMUNOLOGY2023™

Hogan announced that IMMUNOLOGY2023™ will take place in our nation's capital, Washington, DC, from May 11–15.

2022 AAI Education and Awards Programs

Hogan recognized the 2022 class of Distinguished Fellows, which included 21 new members. The Distinguished Fellows Program honors active, long-term members for excellence in research accomplishment; exceptional leadership to the immunology community; or notable distinction as an educator.

Hogan provided information about the 2022 AAI Summer Courses. The Introductory Course in Immunology will be held July 12–17 at the UCLA Luskin Conference Center in Los Angeles with course director **Helen Goodridge, Ph.D. (AAI '09)**, professor, Cedars-Sinai Medical Center. The Advanced Course in Immunology will be held July 24–29 at the Westin Copley Place in Boston with course director **Wayne Yokoyama, M.D., DFAAI (AAI '84)**, Sam J. Levin and Audrey Loew Levin Professor of Arthritis Research, Washington University School of Medicine.

For IMMUNOLOGY2022™, AAI conferred awards on 669 AAI members, including 321 **Trainee Abstract Awards**, 85 **Trainee Poster Awards**, 36 **Laboratory Grants**, 52 **Early Career Faculty Grants**, 13 **Undergraduate Faculty Grants**, 3 **Young Scholars Awards**, 43 **Minority Scientist Awards**, and 37 **Fellowship Travel Awards**.

AAI awarded 10 **Intersect Fellowships for Computational Scientists and Immunologists**. This program improves understanding and communication between immunology researchers and computational scientists by affording an opportunity to train in each other's disciplines. There were five **Career Reentry Fellowships** awarded in 2022. The Fellowship Program for Career Reentry provides support for postdoctoral trainees who have taken a leave of absence of one year or more for family-related issues, medical absences, or military obligations. The largest AAI awards program, the **Careers in Immunology Fellowship**, providing PIs with salary support for trainee lab members, supported 23 PIs and trainees in 2021 for \$1 million. Hogan said that 2022 recipients would be announced in the summer.

Hogan reported that the AAI Outreach Program continues to provide robust support for member-organized regional

immunology meetings. While the number of meetings being held decreased during the pandemic, AAI provided support for awards and career development sessions at nine domestic meetings in 2021. Since 2011, the Outreach Program has supported more than 1,150 young investigator awards. In total, AAI anticipates honoring over 900 scientists in 2022 with more than \$3 million for career awards, fellowships, and travel awards.

AAI Committee on Public Affairs (CPA)

CPA Chair Jensen provided an update on AAI public affairs activities. The CPA continues to advocate for major priorities, including increasing funding for the National Institutes of Health (NIH). In March 2022, a full-year funding bill for fiscal year (FY) 2022 was enacted that provided \$45 billion for the NIH base budget, representing an increase of \$2.25 billion (5.3%) over last year's budget. The funding bill also included \$1 billion to establish President Joe Biden's newly proposed Advanced Research Projects Agency for Health (ARPA-H).

In April 2022, President Biden released his budget request for FY 2023. His proposal for federal spending includes \$45.3 billion for the NIH base budget (a 0.6% increase from FY 2022 levels), \$5 billion for ARPA-H, and \$88.2 billion to create a pandemic preparedness program with mandatory funding. AAI issued a statement expressing both appreciation of the President's longtime support of biomedical research and concern for this year's insufficient budget request. AAI recommended that NIH receive an increase of \$4 billion for the base budget and "substantial" funding for ARPA-H. Meanwhile, the House and Senate have not yet begun work on any of the FY 2023 appropriations bills.

The CPA has also been active on issues related to COVID-19 and other public-facing activities:

- AAI wrote to key Congressional leaders in April urging them "to expeditiously approve legislation that provides at least \$15.6 billion in supplemental funding to address some of the most pressing challenges posed by the COVID-19 pandemic."
- AAI President Koretzky issued a statement urging eligible Americans to get fully vaccinated and boosted against COVID-19.
- President Koretzky issued a statement reaffirming the AAI commitment to "fostering an inclusive and diverse biomedical research community working in environments free of harassment, discrimination, and fear."
- President Koretzky issued a statement condemning the Russian invasion of Ukraine, including endorsing a statement issued by the National Academies of the G7 states, which calls the invasion "an assault on the fundamental principles of freedom, democracy and self-determination, which provide the basis for

academic freedom and opportunities for scientific exchange and cooperation."

- The CPA is sponsoring two sessions at IMMUNOLOGY2022™
 - » "ARPA-H: What You Need to Know and How it May Impact Federal Funding of Biomedical Research" featuring the following speakers: Tara Schwetz, Ph.D., Acting Principal Director, NIH; Amy Jenkins, Ph.D., Program Manager, DARPA; and **Amanda Jamieson, Ph.D. (AAI '15)**, Associate Professor, Brown University
 - » "Vaccine Acceptance: Lessons from the Past and Tools for the Future" featuring the following speakers: Richard Carpiano, Ph.D., M.P.H., Professor of Public Policy, University of California Riverside; and AAI Councilor Iwasaki, Sterling Professor of Immunobiology and of Molecular, Cellular and Developmental Biology, Yale University

In March 2022, AAI held its second virtual Capitol Hill Day with the participants of the 2021–2022 Public Policy Fellows Program (PPFP). Many of the Congressional staff with whom the Fellows met were eager to talk about biomedical research, especially as it relates to COVID-19. Prior to their Hill meetings, the Fellows were briefed by National Institute of Allergy and Infectious Diseases (NIAID) Principal Deputy Director **Hugh Auchincloss, M.D., DFAAI (AAI '83)**, on ongoing activities at NIH/NIAID and on scientific developments related to COVID-19. As part of the program, the Fellows helped AAI revise the "COVID-19: Your Questions Answered" handout, which they provided to the congressional offices they visited.

The 12th PPFP class began its fellowship year on May 1, 2022. This class, which was introduced at the meeting, includes Fellows from five previously unrepresented states, for a total of 43 states/territories with PPFP participants to date. The Fellows are scheduled to visit Capitol Hill in March 2023.

Anonymous survey results from the 109 PPFP participants who have completed the program indicate that 100 percent would recommend the program to other eligible scientists.

AAI Finances

AAI Secretary-Treasurer Joan Goverman, Ph.D., DFAAI (AAI '95), provided an overview of the finances of AAI. Operating revenue in 2021 was \$8.92 million. Goverman reviewed AAI 2021 revenues by category, noting that the largest sources of gross revenue were *The JI* (65 percent), followed by the Annual Meeting (16 percent) and membership dues and the AAI Summer Courses, each of which represented 8 percent of AAI operating revenue. Operating expenses for 2021 totaled \$9.38 million. The largest categories for 2021 expenses by activity were *The JI* (28 percent of all AAI operating expenses), followed by AAI awards programs (25 percent). Goverman

highlighted the 2021 AAI investment portfolio, ending 2021 at \$86.09 million, and outlined the historical difference between AAI revenue from operations and income from investments.

The JI

Eugene M. Oltz, Ph.D. (AAI '95), continued his service term as editor-in-chief of *The JI*, which began in 2018 and will end in 2023. Outgoing section editors completed their terms of service and new section editors began their service on July 1, 2022. The impact factor for *The JI* was released in June 2021 and was 5.426; the journal continues to rank first in total number of citations among 167 immunology journals. In the coming months, the journal is planning to publish two Topical Review issues. In October 2022, *The JI* will publish “Maternal-Fetal Immunology” with guest editor **Nardhy Gomez-Lopez, Ph.D. (AAI '14)**. In February 2023, *The JI* will publish a section on Systems Immunology with guest editor Golnaz Vahedi, Ph.D.

IH

Mark H. Kaplan, Ph.D. (AAI '98), continued his service term as editor-in-chief of *IH*, which began in January 2020. There are two paths to publication in *IH*: *de novo* submission or through author-initiated transfer of manuscripts not accepted into *The JI* that are scientifically sound and communicate important information. The average time from manuscript submission to initial decision for *de novo* submissions is 18 days; the average time from manuscript submission to initial decision for transfers is four days. *IH* now publishes the largest percentage of manuscripts not accepted by *The JI*. *IH* is indexed in MEDLINE and the *Directory of Open-Access Journals*, both of which are highly selective in which journals they choose to index.

The following awards were presented, with Hogan presiding:

Distinguished Service Awards to Ross Kedl, Ph.D. (AAI '02), University of Colorado School of Medicine, for

outstanding service as chair and member of the AAI Committee on Public Affairs, 2015–2021, and to **Edith M. Lord, Ph.D., DFAAI (AAI '78)**, University of Rochester School of Medicine and Dentistry, for exceptional service as AAI Secretary-Treasurer, 2015–2021.

Pfizer-Showell Travel Award to Henrique Borges da Silva, Ph.D. (AAI '19), Mayo Clinic, to recognize the professional promise of an early career investigator.

Chambers-Thermo Fisher Scientific Memorial Award to Hazem E. Ghoneim, Ph.D. (AAI '17), The Ohio State University, to advance the career of an early career scientist who attends the AAI annual meeting and presents an outstanding abstract specifically in the area of cancer biology.

Lefrançois-BioLegend Memorial Award to Emily M. Eshleman, Ph.D. (AAI '21), Cincinnati Children's Hospital Medical Center, to advance the career of a trainee who attends the AAI annual meeting and presents an outstanding abstract specifically in the area of mucosal immunology.

Lustgarten-Thermo Fisher Scientific Award to Haitao Wen, Ph.D. (AAI '13), The Ohio State University, to advance the career of a mid-career scientist who attends the AAI annual meeting and presents an outstanding abstract specifically in the area of immune regulation.

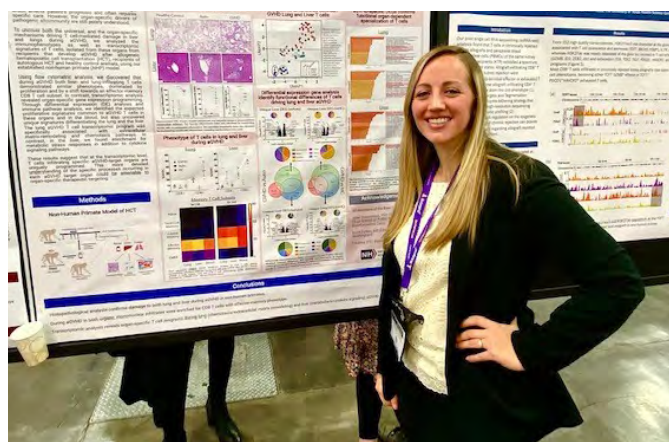
AAI-Thermo Fisher Scientific Trainee Achievement Awards

- **Heather L. Caslin, Ph.D. (AAI '21)**, Vanderbilt University
- **Jing Li, Ph.D. (AAI '21)**, Stanford University
- **Jorge F. Ortiz-Carpena (AAI '21)**, University of Pennsylvania
- **Nataliya Prokhnevska (AAI '21)**, Emory University
- **Daniel F. Zegarra Ruiz, Ph.D. (AAI '18)**, Sloan Kettering Cancer Center
- **Zinan Zhang (AAI '21)**, Harvard Medical School

The meeting was adjourned by CEO Hogan at 2:30 p.m. PT.



Minority Affairs Committee Chair Tonya Webb (left) and AAI staff liaison Michael Cuddy with the 2022 AAI Young Scholars Awardees Melanie Ayala Ceja, Nicole Pagan Torres, and Joel Gutierrez Estupinan



One of the 1,600 presenters who helped make the poster sessions so successful!

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Call for 2023 Award Nominations

Deadline: October 12, 2022

Nominations are invited for the following AAI Career Awards. These awards honor immunologists of extraordinary scientific achievement and promise.

AAI Members! Don't miss the opportunity to nominate a worthy colleague for awards that are among the leading professional honors presented annually to immunologists!

AAI-BioLegend Herzenberg Award

Established to honor the memory of AAI member Leonard A. Herzenberg, Ph.D., this award recognizes an individual who has made exemplary research contributions to the field of B cell biology. The award recipient will receive a \$5,000 cash award, meeting registration, and travel support to the AAI annual meeting. The recipient will present their research in an award lecture.

AAI Excellence in Mentoring Award

This award recognizes a senior scientist who has significantly influenced the professional development and careers of a new generation. AAI honors the award recipient's contributions to the profession through outstanding mentoring. The award includes a plaque, meeting registration, and travel support to the AAI annual meeting. This award is presented at an awards presentation program at the AAI annual meeting.

AAI-Steinman Award for Human Immunology Research

This award recognizes an individual who has made significant contributions to the understanding of immune processes underlying human disease pathogenesis, prevention, or therapy. The award recipient will receive a \$5,000 cash award, meeting registration, and travel support to the AAI annual meeting. The recipient will present their research in an award lecture.

AAI-Thermo Fisher Meritorious Career Award

This award recognizes a mid-career scientist for outstanding research contributions to the field of immunology. The award recipient will receive a \$10,000 cash award, meeting registration, and travel support to the AAI annual meeting for presentation of their research in an award lecture.

AAI-BD Biosciences Investigator Award

This award recognizes an early-career investigator who has made outstanding contributions to the field of immunology. The awardee will receive a \$5,000 cash prize, meeting registration, and travel support to the AAI annual meeting for presentation of their research in an award lecture.

For complete AAI Career Award nomination details, as well as information on applying for AAI Travel Awards and Grants, visit www.AAI.org/Awards.

The 2023 AAI Awards will be presented in conjunction with

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Questions? Contact AAI at 301-634-7178 or awards@aai.org



CHIPS and Science Bill Signed into Law

On August 9, President Joe Biden signed the bipartisan Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act of 2022 into law. This new law provides more than \$52 billion for American manufacturing of semiconductor microchips, which have been limited in availability due to COVID-19 disruptions and supply chain issues. It also authorizes \$81 billion for the National Science Foundation (NSF) over five years, \$20 billion of which would go to the new NSF Technology, Innovation, and Partnerships (TIP) Directorate. According to NSF, the TIP Directorate “creates breakthrough technologies; meets societal and economic needs; leads to new, high-wage jobs; and empowers all Americans to participate in the U.S. research and innovation enterprise.” Other provisions include increased funding authorizations for the Department of Energy Office of Science and the National Institute of Science and Technology (NIST), as well as initiatives to foster diversity, equity, and inclusion (DEI) and research security within the scientific community.

House Committee Approves Fiscal Year 2023 Funding for NIH; Senate Releases Draft Bill

In June 2022, the House Appropriations Committee approved its FY 2023 appropriations bill for the Departments of Labor, Health and Human Services, Education, and Related Agencies (Labor-HHS). The bill includes a total of \$47.5 billion, an increase of \$2.5 billion over FY 2022, for the base budget of the National Institutes of Health (NIH), and provides an increase of at least 3.2 percent for all NIH Institutes and Centers. It also includes \$2.75 billion, an increase of \$1.75 billion, for the Advanced Research Projects Agency for Health (ARPA-H).

The bill invests \$216 million in the National Cancer Institute’s (NCI) Cancer Moonshot, \$3.7 billion for research on Alzheimer’s disease and related dementias, and \$260 million for research to generate a universal flu vaccine. Additionally, the bill provides \$3.7 billion for the Public Health and Social Services Emergency Fund, an increase of \$500 million over the enacted FY 2022 level, to improve on public health preparedness initiatives, including \$382 million for pandemic influenza and \$845 million for the Biomedical Advanced Research and Development Authority.

On July 28, the Senate Appropriations Committee released its draft spending bill for FY 2023, including the Labor-

HHS appropriations bill. This bill would provide a base NIH budget of \$47 billion, a \$2 billion increase over FY 2022, and \$1 billion for ARPA-H.

The bill also includes \$16 billion in emergency supplemental funding to be used for COVID-19 related issues or any other emerging potential pandemic pathogen, \$275 million to develop a universal flu vaccine, and \$10 million to establish an Office of Autoimmune Disease Research to help coordinate efforts to combat autoimmune diseases across NIH Institutes and Centers.

In the wake of the Supreme Court’s decision in Dobbs v. Jackson Women’s Health Organization, which reversed Roe v. Wade and rescinded the federally protected right to abortion, the bill includes funding to support and increase access to abortion services and reproductive health care as well as to reduce the maternal mortality rate.

This fall, the House and Senate are expected to negotiate a final spending bill for the new fiscal year, which begins on October 1, 2022. However, a continuing resolution will almost certainly be needed to fund the federal government at roughly last year’s levels until a final appropriations bill is enacted.

Biden Administration Declares Monkeypox a Public Health Emergency

On August 4, the Biden Administration declared a public health emergency (PHE) due to the rapidly increasing number of monkeypox cases in the United States. Since the first case was reported in May, the U.S. has seen a dramatic increase in monkeypox cases, with more than 22,000 cases as of September 12. Worldwide, 103 locations have recorded more than 58,000 cases, the majority of which have been in countries without previous reports of the virus.

Monkeypox virus is spread via close, personal contact with an infected person. Signs and symptoms include a rash, fever, chills, muscle aches, headaches, exhaustion, and more. Infected persons may experience one or all of these symptoms, which appear generally within three weeks of exposure.

Thus far, the majority of monkeypox cases have been reported in men who have sex with men and the disease disproportionately affects communities of color. As the academic year begins, there is increased concern about spread among children at daycare, school, and sports settings, as well as at college campuses.

Vaccination against monkeypox greatly reduces risk of infection; the Centers for Disease Control and Prevention

(CDC) currently recommends that those who are at higher risk of or who have been exposed to monkeypox get vaccinated. Continually updated information about monkeypox vaccination and treatments is available at www.cdc.gov/poxvirus/monkeypox/index.html.

Under the PHE, the U.S. Food and Drug Administration (FDA) issued an emergency use authorization (EUA) allowing the FDA-approved Jynneos monkeypox vaccine to be administered via an alternative strategy. Doses would be given intradermally (between layers of skin), rather than subcutaneously (beneath the skin), in order to stretch the availability of the vaccine up to five-fold. This EUA was issued in response to the short supply of vaccines, which is stored in the U.S. Department of Health and Human Services (HHS) Strategic National Stockpile and currently available only through local and state health departments.

Update on COVID-19 Booster Shots

The Biden administration has extended the PHE declaration for COVID-19 to provide continued access to tests, vaccines, and treatments. As of September 13, there have been nearly 100 million reported COVID-19 cases and more than one million deaths in the United States. Globally, there have been nearly 610 million cases and 6.5 million deaths. CDC estimates that one in five people who have contracted SARS-CoV-2, the virus that causes COVID-19, suffers from long COVID, defined as symptoms lasting three or more months after initial infection.

Vaccines against SARS-CoV-2 remain effective, even against current variants, in significantly reducing the risk of severe disease, hospitalization, and death. Currently, CDC recommends that everyone ages five years and older receive one booster, and that adults 50 years and older and immunocompromised individuals receive two boosters, spaced at least four months apart. CDC COVID-19 information and recommendations are available at www.cdc.gov/coronavirus/2019-ncov/index.html.

However, as SARS-CoV-2 continues to mutate, variants have emerged that can infect even those who are fully vaccinated and boosted and/or who have had a previous infection. Currently in the United States, the omicron subvariant BA.5 represents the vast majority of COVID-19 cases. To combat this highly transmissible variant, the FDA recommends that vaccine manufacturers update their COVID-19 vaccine formulations to extend coverage to the omicron subvariants. Subsequently, HHS and the U.S. Department of Defense purchased 105 million doses of Pfizer-BioNTech's updated bivalent booster and 66 million doses of Moderna's bivalent COVID-19 booster, both of which provide specific protection against the omicron variants. Recently, the FDA authorized and the CDC recommended the use of these updated boosters to

be given at least two months after receiving a previous shot. Individuals 12 years and older can get the Pfizer-BioNTech booster shot, and adults 18 years and older can receive the Moderna booster shot. At a recent White House Press Briefing, Anthony Fauci, M.D., DFAAI (AAI '73), mentioned that we are heading towards a yearly booster scenario, much like the annual flu shot.

Nomination of Dr. Arati Prabhakar as Presidential Science Advisor, OSTP Director Moves Forward



In June, President Biden announced the nomination of Arati Prabhakar, Ph.D., to serve as the director of the White House Office of Science and Technology Policy (OSTP) and as the presidential Science Advisor. The Senate Commerce Committee approved her nomination in July by a vote of 15–13. If confirmed by the full Senate, Dr. Prabhakar will be the first woman and first person of color to lead OSTP.

Dr. Prabhakar is an applied physicist and engineer with extensive experience as a business leader and venture capitalist, as well as a federal agency leader. She is a former director of the Defense Advanced Research Projects Agency, where notably she oversaw teams that launched the rapid response mRNA vaccine platform that led to COVID-19 vaccines, and a former director of NIST.

If confirmed, Dr. Prabhakar would take over duties that are currently split between Dr. Alondra Nelson, who is the OSTP acting director, and former NIH Director Dr. Francis Collins, who is temporarily serving as presidential Science Advisor.

Monica Bertagnolli, M.D., to Be Next NCI Director

President Biden has announced his intent to appoint Dr. Monica Bertagnolli, professor of surgery at Harvard Medical School and surgical oncologist at Brigham and Women's Hospital and Dana-Farber Cancer Institute, as the 16th director of NCI. She will be the first woman to lead the \$7 billion agency, which is the largest of the 27 ICs that comprise NIH. Dr. Bertagnolli will spearhead the next phase of the Cancer Moonshot, which aims to reduce the death rate from cancer by at least 50% over the next 25 years.

Dr. Bertagnolli, who specializes in gastrointestinal cancers, is a member of the National Academy of Medicine and previously served as president of the American Society for Clinical Oncology. In addition to her research on understanding how colon cancers develop, she leads clinical trials focused on the prevention of colorectal adenoma formation.

Sharpe Receives FASEB's 2022 Excellence in Science Lifetime Achievement Award



Arlene Sharpe, M.D., Ph.D., DFAAI '97, received FASEB's 2022 Excellence in Science Lifetime Achievement Award for her contributions to paradigm-shifting discoveries in effective treatments for cancer, chronic viral infections, and autoimmune diseases, excellence in research, outstanding teaching, mentorship, and leadership in the field of pathology. This

award honors female scientists who are making an impact in the biological and biomedical research community.

Dr. Sharpe is the George Fabyan Professor of Comparative Pathology in the Department of Immunology in the Evergrande Center for Immunologic Diseases at Harvard Medical School. Sharpe is a past AAI president and has served on the AAI Publications and Program Committees. In 2022, Sharpe was named an AAI Distinguished Fellow and received the AAI Lifetime Achievement Award. More information about her research and lab can be found at <https://sharpelab.hms.harvard.edu/>.

To see the full announcement, visit <https://bit.ly/3DsDhXF>.

Krishnaswamy Receives FASEB Excellence in Science Early-Career Investigator Award



Smita Krishnaswamy, Ph.D. (AAI '21), is the recipient of the 2022 FASEB Excellence in Science Early-Career Investigator Award. This award recognizes women early in their research career whose research has contributed significantly to a particular discipline in biological science.

Dr. Krishnaswamy is an associate professor of genetics and computer science at the Yale School of Medicine. Her research focuses on unsupervised machine learning methods, specifically manifold learning and deep learning techniques for detecting structure and patterns in data. Learn more about Krishnaswamy's research at <https://bit.ly/3A56btG>.

To see the full announcement, visit <https://bit.ly/3DsDhXF>.

Recently Deceased Members

AAI extends condolences to the families, friends, and colleagues of the following members whose deaths were recorded since July 2021.

Christine A. Biron, Ph.D., DFAAI, AAI '84
Providence, RI
d. 10/16/21

Edward J. Moticka, Ph.D., AAI '75
Scottsdale, AZ
d. 3/4/22

Michael Sela, Ph.D., AAI '73
Rehovot, Israel
d. 5/27/22

Peter J. Lachmann, Sc.D., AAI '67
Cambridge, United Kingdom
d. 12/26/20

Deborah A. Nickerson, Ph.D., AAI '82
Seattle, WA
d. 12/24/21

Samuel Strober, M.D., AAI '72
Stanford, CA
d. 2/11/22

Yoh Matsumoto, M.D., Ph.D., AAI '91
Saitama, Japan
d. 5/1/21

Joost J. Oppenheim, M.D., DFAAI, AAI '68
Frederick, MD
d. 5/14/22

Thomas A. Waldmann, M.D., AAI '71
Bethesda, MD
d. 9/25/21

Matthew F. Mescher, Ph.D., AAI '79
Chester, MD
d. 12/21/21

NEW!

The AAI ASPIRE Award

Encouraging and
supporting early
career investigators



APPLICATION DEADLINE: OCTOBER 12

The American Association of Immunologists is pleased to announce the launch of a new awards program specifically for early career investigators: The AAI ASPIRE Award.

Purpose

The AAI ASPIRE Award encourages and fosters the development of talented early career AAI member scientists through support to advance their research activities and scientific contributions in immunology—including the opportunity and travel support to disseminate their research in a special symposium at the AAI annual meeting.

The ASPIRE Award annually recognizes up to five outstanding early career investigators for research accomplishments and professional promise in the field.



The American Association of Immunologists annually honors the research achievements and professional promise of over 1,000 scientists through fellowships, career awards, and travel grants. To learn about all AAI awards and grants, visit www.aai.org/Awards.

Eligibility

Principal investigators who are Regular AAI members within 10 years of their advanced degree (Ph.D., M.D., or equivalent) or the end of postgraduate clinical training (whichever date is later at the time of application) are eligible to apply.

Awardee Support

Recipients of the ASPIRE Award will receive:

- a \$2,000 cash award
- complimentary AAI annual meeting registration
- travel support to the AAI annual meeting for presentation of their research in a symposium preceded by the award presentation.

How to Apply

The application cycle is now open. Application materials can be found at www.aai.org/ASPIRE. **Please submit your application by October 12, 2022, at 11:59 p.m. Eastern Time.** AAI encourages applications from women and underrepresented scientists.

For More Information

- For more information, please visit www.aai.org/ASPIRE.
- Direct any inquiries to awards@aai.org.

AAI Announces Summer 2022 Travel for Techniques Awardees

AAI is pleased to announce the most recent **AAI Travel for Techniques Award** recipients, selected from among applicants during the program's Summer 2022 application cycle.

The AAI Travel for Techniques Program assists member principal investigators (regular or associate) in their efforts to expand their skill sets to benefit their research. Selected applicants may choose to use the award to travel themselves, assign the award to a trainee in their lab, or assign the award to another lab member. AAI reimburses award recipients as much as \$1,500 in travel expenses incurred on a trip to another laboratory to learn a technique.

AAI extends congratulations to:



Roslyn Kemp, Ph.D. (AAI '13)

Associate Professor, *University of Otago, New Zealand*

Designated Traveler: Gemma Laws (AAI '22), graduate student

Destination: The laboratory of Dr. Laura Cook, University of Melbourne and Doherty Institute, Australia

Technique: Sorting of T cell subsets

Application: To enrich for populations of human T cells for use in organoid models of inflammatory bowel disease and to test for antigen-specific CD4 T cell responses



Mary A. Markiewicz, Ph.D. (AAI '11)

Associate Professor, *University of Kansas Medical Center*

Destination: The laboratory of Dr. Kristi A. Kuhn (AAI '15), University of Colorado School of Medicine

Technique: Maintaining germ-free mouse colonies

Application: To investigate the impact of NKG2D signaling on type 1 diabetes development and progression

Travel for Techniques Award applications are reviewed in three cycles annually—winter, spring, and fall. Fall cycle applications are being accepted through October 15.

Details on applying for the AAI Travel for Techniques Award are available at www.aai.org/TravelforTechniques.

AAI Announces Recipients of 2022 Careers in Immunology Fellowships

AAI congratulates 21 members selected to receive AAI Careers in Immunology Fellowships in 2022. The program, launched in 2014, provides independent research scientists with fellowships supporting one year of salary for a trainee (predoctoral or postdoctoral) in their labs.

Details about this program may be found at www.aai.org/CIFP.

The investigators selected for the 2022 Careers in Immunology Fellowships are:



Estelle Bettelli, Ph.D. (AAI '04), Associate Member, Benaroya Research Institute

Trainee: Yevgeniy Yuzepolskiy, Ph.D. (AAI '22), Postdoctoral Fellow

Project: Understanding the role of resident memory T cells in CNS autoimmunity



Shannon A. Carty, M.D. (AAI '19), Assistant Professor, University of Michigan

Trainee: Luis O. Correa (AAI '22), Graduate Student

Project: Role of ER-associated degradation in effector CD8⁺ T cell survival



Antje Blumenthal, Ph.D. (AAI '17), Professor, University of Queensland, Australia

Trainee: Carmen D. Mathmann, Ph.D. (AAI '19), Postdoctoral Fellow

Project: Molecular regulation of bacteria-induced inflammatory responses



Ritu Chakravarti, Ph.D. (AAI '18), Assistant Professor, University of Toledo College of Medicine and Life Sciences

Trainee: Rathinam Ayyasamy, Ph.D. (AAI '22), Postdoctoral Fellow

Project: Understanding the role of 14-3-3 in inflammatory arthritis



Philip B. Busbee, Ph.D. (AAI '19), Assistant Professor, University of South Carolina School of Medicine

Trainee: Archana Saxena, Ph.D. (AAI '21), Postdoctoral Fellow

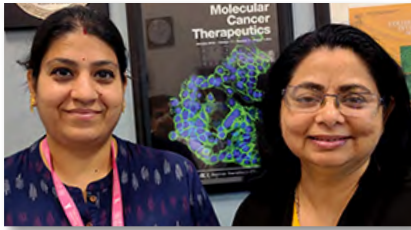
Project: Role of AhR in colonic epithelial cells during I3C-mediated protection against colitis



Angela M. Christiano, Ph.D. (AAI '21), Professor, Columbia University

Trainee: Yuqian Chang, Ph.D. (AAI '22), Postdoctoral Fellow

Project: Role of CX3CR1⁺CD8⁺ T cells in alopecia areata



Meena Jaggi, Ph.D. (AAI '19), Professor, University of Texas, Rio Grande Valley

Trainee: Swati Dhasmana, Ph.D. (AAI '22), Postdoctoral Fellow

Project: MUC13 based multi-epitopes nano-vaccine for liver cancer



Michael D. Kornberg, M.D., Ph.D. (AAI '22), Assistant Professor, Johns Hopkins University

Trainee: Wesley H. Godfrey (AAI '21), Graduate Student

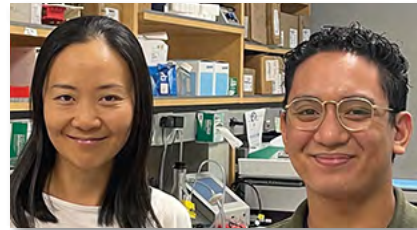
Project: Effects of a ketogenic diet on immune function



George S. Karagiannis, D.V.M., Ph.D. (AAI '22), Assistant Professor, Albert Einstein College of Medicine

Trainee: Maria Lagou, D.V.M. (AAI '21), Postdoctoral Fellow

Project: The role of CXCL12 in endogenous repair following chemotherapy-induced thymic involution



Lin-Xi Li, Ph.D. (AAI '15), Associate Professor, University of Arkansas for Medical Sciences

Trainee: Miguel A.B. Mercado (AAI '20), Graduate Student

Project: Transcription factor Bhlhe40 and cytotoxic CD4 T cells: novel players in protective immunity to *Chlamydia*



W. Martin Kast, Ph.D. (AAI '97), Professor, University of Southern California, Norris Comprehensive Cancer Center

Trainee: Ruben Prins (AAI '22), Graduate Student

Project: The role of IL17 and IL23 in HPV-driven tumor immune escape



Cindy S. Ma, Ph.D. (AAI '21), Associate Professor, Garvan Institute of Medical Research, Australia

Trainee: Antoine M. Guerin, Ph.D. (AAI '22), Postdoctoral Fellow

Project: Harnessing inborn errors of immunity to understand and treat human allergic disease

AWARDS



Penelope A. Morel, M.D. (AAI '93), Professor, University of Pittsburgh

Trainee: Tristan Al White (AAI '19), Graduate Student

Project: Understanding how Akt phosphorylation of hnRNPA1 and hnRNPL modulates T cell fate and function



Jim J. Song, Ph.D. (AAI '03), Professor, Texas A&M University Health Science Center

Trainee: Jugal K. Das, Ph.D. (AAI '22), Postdoctoral Fellow

Project: Designing and improving the efficacy of antigen-specific Treg cells for treatment of type 1 diabetes mellitus in non-obese diabetic mice



Laura Piccio, M.D., Ph.D. (AAI '22), Associate Professor, University of Sydney, Australia

Trainee: Monokesh Kumer Sen, Ph.D. (AAI '22), Postdoctoral Fellow

Project: Potential role of the butyrate-GPR109A pathway in mediating the beneficial effects of fasting in a model of multiple sclerosis



Sara A. Suliman, Ph.D., M.P.H. (AAI '20), Assistant Professor, University of California, San Francisco

Trainee: Josephine F. Reijneveld, Ph.D. (AAI '22), Postdoctoral Fellow

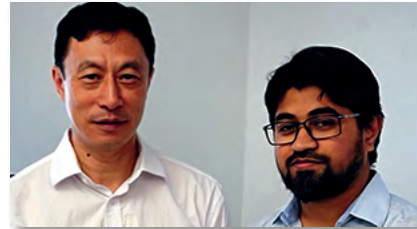
Project: Impact of SARS-CoV-2 infection on risk of TB disease and anti-mycobacterial immunity



Parvathi Ranganathan, Ph.D. (AAI '17), Assistant Professor, The Ohio State University

Trainee: Katiri J. Snyder (AAI '22), Graduate Student

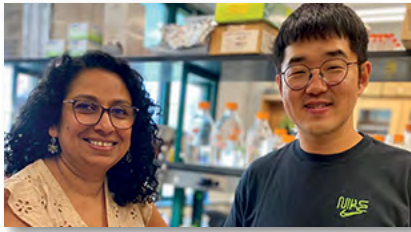
Project: Investigating the role of prohibitin in acute graft-versus-host disease



Xiaolei Tang, M.D., Ph.D. (AAI '14), Associate Professor, Long Island University College of Veterinary Medicine

Trainee: FNU Shaikh Nisar Ali, Ph.D. (AAI '22), Postdoctoral Fellow

Project: The role of zinc in the immune regulatory function of 1,25(OH)₂D and retinoic acid



Shipra Vaishnav, Ph.D. (AAI '18), Assistant Professor, Brown University

Trainee: Geongoo Han, Ph.D. (AAI '22), Postdoctoral Fellow

Project: Regulation of vitamin A metabolism by gut bacteria

Andrew J. Wiemer, Ph.D. (AAI '14), Associate Professor, University of Connecticut

Trainee: Xueting Huang (AAI '22), Graduate Student

Project: Discovery of TIGIT inhibitors for improving ovarian cancer immunotherapy



Stefanie N. Vogel, Ph.D. (AAI '80), Professor, University of Maryland School of Medicine

Trainee: Alexandra M. Vlck (AAI '20), Graduate Student

Project: Innate immune mechanisms contributing to inflammatory bowel disease severity

GRIP

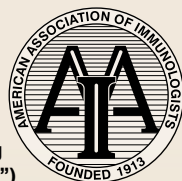
Grant Review for Immunologists Program

Get a GRIP: An AAI program designed to help new investigators prepare their NIH grant proposals

The AAI Grant Review for Immunologists Program (GRIP) offers new principal investigators (PIs) access to established PIs for guidance in preparing grant proposals as they embark on their independent careers. Early-career PIs (assistant professors or equivalents) are invited to submit their grants' "Specific Aims" pages to the GRIP coordinator who, with the assistance of a small volunteer subcommittee, will attempt to match each topic of the proposal with the research experience of an established PI. Matches will be made as quickly as possible to allow participants to meet upcoming NIH grant deadlines. Participation is open only to AAI regular members and is strictly voluntary. The program is not intended to supplant internal mentoring programs at applicants' institutions.

To apply, please send your CV and the grant's "Specific Aims" page to infoaai@aai.org. (please write "GRIP" in the subject line)

To volunteer as a mentor, please send your CV and a brief description of your grant-reviewing experience to infoaai@aai.org. (subject line "GRIP")



Program details at aai.org/Education/GRIP

AAI Outreach Program Update

The AAI Outreach Program provides career development opportunities for young investigators by supporting podium and poster presentation awards at member-organized immunology meetings throughout the United States. The program most recently provided sponsorship at the conferences highlighted in this section.

International Transplant Science Meeting (ITS)

The European Society for Organ Transplantation (ESOT), the American Society of Transplantation (AST), and The Transplantation Society (TTS) collaborated to organize the International Transplant Science (ITS) Meeting on May 15–18, 2022, in Berlin, Germany. The meeting drew approximately 170 local and international attendees. This meeting features in-depth, cutting-edge basic science with talks by leading experts in select topics in transplantation and immunology in a small meeting format to maximize networking between attendees. Florent Ginhoux, Ph.D., principal senior investigator, Singapore Immunology Network, delivered the keynote address entitled “Single-Cell Profiling of Myeloid Cell in Health and Disease.”

AAI supported six Young Investigator Awards at the ITS meeting, three for podium presentations and three for poster presentations.

The awardees for podium presentations were:

- Aravind Cherukuri, Ph.D., M.B.B.S., M.R.C.P., assistant professor, University of Pittsburgh Medical Center
- Caroline Dudreuilh, Ph.D., postdoctoral fellow, King’s College London, England
- Romy Steiner, graduate student, Medical University of Vienna, Austria

The awardees for poster presentations were:

- Andras T. Meszaros, M.D., doctor assistant, Medical University of Innsbruck, Austria
- Amy van der List, graduate student, Erasmus MC, The Netherlands
- Wouter Woud, graduate student, Erasmus MC, The Netherlands



Cherukuri with Nina Pilat, Ph.D., Associate Professor, Scientific Organizing Committee Member, Medical University of Vienna, Vienna, Austria



Dudreuilh and Pilat



Steiner and Pilat



Meszaros and Pilat



van der List and Pilat

Southeastern Immunology Symposium (SIS)

The ninth Annual Southeastern Immunology Symposium (SIS) was held June 11–12, 2022, at Duke University School of Medicine in Durham, NC. The meeting, which drew 290 attendees, was organized by Michael S. Krangel, Ph.D., DFAAI (AAI '90), professor and chair, Duke University Medical Center; AAI Past President Jeremy M. Boss, Ph.D., DFAAI (AAI '94), professor and chair, Emory University; John Altman, Ph.D., associate professor, Emory University; Irving C. Allen, Ph.D. (AAI '12), associate professor, Virginia Tech; Francis K. Chan, Ph.D. (AAI '06), professor, Duke University School of Medicine; Laurie E. Harrington, Ph.D. (AAI '07), professor, University of Alabama at Birmingham; Sebastian Joyce, Ph.D. (AAI '15), professor, Vanderbilt University Medical Center; Jacob E. Kohlmeier, Ph.D. (AAI '08), associate professor, Emory University School of Medicine; Michele M. Kosiewicz, Ph.D. (AAI '97), associate professor, University of Louisville; Qi-Jing Li, Ph.D. (AAI '10), associate professor, Duke University Medical Center; John R. Lukens, Ph.D. (AAI '15), associate professor, University of Virginia; Frances Lund, Ph.D. (AAI '98), professor and chair, University of Alabama at Birmingham; Jennifer Martinez, Ph.D., principal investigator, National Institute of Environmental Health Sciences; Craig Maynard, Ph.D. (AAI '14), assistant professor, University of Alabama at Birmingham; Edward A. Miao, M.D., Ph.D. (AAI '11), professor, Duke University; E. Ashley Moseman, Ph.D., (AAI '18), assistant professor, Duke University School of Medicine; Jeff C. Rathmell, Ph.D. (AAI '04), professor, Vanderbilt University Medical Center; Ignacio Sanz, M.D. (AAI '07), professor, Emory University School of Medicine; Laura A. Solt, Ph.D. (AAI '13), associate professor, Scripps Research; Mark S. Sundrud, Ph.D. (AAI '13), associate professor, Scripps Research; Luc Van Kaer, Ph.D. (AAI '97), professor, Vanderbilt University School of Medicine; and Jason K. Whitmire, Ph.D. (AAI '09), professor, University of North Carolina at Chapel Hill.

The SIS featured three keynote addresses. Leslie J. Berg, Ph.D., DFAAI (AAI '94), professor and chair, University of Colorado School of Medicine, spoke about “Linking TCR Signaling to Variations in Gene Expression and T cell Function;” Marion Pepper, Ph.D. (AAI '11), associate professor, University of Washington, presented a lecture entitled “Immune Memory to COVID-19;” and Marco Colonna, M.D. (AAI '02), professor, Washington University School of Medicine, gave a presentation on “TREM2-based Strategies in Neurodegeneration and Cancer.”

AAI supported 15 Young Investigator Awards for podium and poster presentations at the SIS.



Top row (pictured from left) are Krangel, Clark, Plebanek, Laurie, Bader, and Park. Bottom row (pictured from left) are Arroyo Diaz, Sivasami, Elkins, Barnett, Abele, and Voss. Not pictured are Malewana, Mosure, Patterson, and Sugiura.

The awardees for podium presentations were:

- Jackie Bader, Ph.D., postdoctoral fellow, Vanderbilt University
- Katherine Barnett, Ph.D., postdoctoral fellow, University of North Carolina at Chapel Hill
- Danielle Clark, graduate student, Duke University
- Michael Plebanek, Ph.D., postdoctoral fellow, Duke University
- Kelsey Voss, Ph.D., postdoctoral fellow, Vanderbilt University

The awardees for poster presentations were:

- Taylor Abele, graduate student, Duke University
- Nicole Arroyo Diaz, graduate student, University of Alabama at Birmingham
- Cody Elkins, graduate student, Emory University
- Sonia Laurie, Ph.D., postdoctoral fellow, University of North Carolina at Chapel Hill
- Dilshan Malewana, graduate student, Duke University
- Sarah Mosure, graduate student, Scripps Research Institute
- Eunchong Park, graduate student, Duke University
- Andrew Patterson, Ph.D., postdoctoral fellow, Vanderbilt University
- Pulavendran Sivasami, Ph.D., postdoctoral fellow, Emory University
- Ayaka Sugiura, graduate student, Vanderbilt University

AAI Education Committee Highlight: Teaching Tools

In 2016, the AAI Education Committee initiated a new session focused on improving immunology education: the Immunology Teaching Interest Group (ITIG). The ITIG is an informal group comprised of past speakers and attendees of the ITIG sessions, including current immunology educators spanning a range of institutions and levels. It serves as a resource for novel teaching tools and practices that can be implemented in courses to enhance immunology education. The session has grown from an audience of 20 in 2016 to more than 200 participants today. Because of the great interest in this topic, the AAI Newsletter features "Teaching Tools" articles highlighting ITIG presentations.

Expanding the Reach of Immunology with the Help of an Interdisciplinary Approach to a Faculty Community of Practice



Louis B. Justement, Ph.D. (AAI '91)
professor
University of Alabama at
Birmingham, Birmingham, AL



Rebekah T. Taylor, Ph.D. (AAI '13)
associate professor
Frostburg State University,
Frostburg, MD



Sumali Pandey, Ph.D. (AAI '21)
associate professor
Minnesota State University
Moorhead, Moorhead, MN

American Association for the Advancement of Science (AAAS) identifies five key concepts for life science education that undergraduate students must understand.³ These include:

- Evolution
- Pathways and Transformation of Energy and Matter
- Information Flow, Exchange, and Storage
- Structure and Function
- Systems³

In the fall of 2019, ImmunoReach initiated a nationwide effort to solicit input from immunology educators, requesting them to weigh in on key topics,³ concepts, and competencies for undergraduate immunology education. We aligned these concepts and competencies with those listed in the AAAS report with the intention of highlighting interdisciplinary connections (see this video at <https://bit.ly/3cmdd4X> and Table 1).^{4,5}

This alignment of immunological concepts with general concepts in life science education allows educators from outside of the immunological niche to appreciate the interdisciplinary connections and make those connections obvious to students by using examples of immunological processes. For instance, the core concept of "Evolution" can be aligned with the germinal center B cell reaction, a process that features molecular selection

Immunology has taken center stage in public life as a result of the ongoing pandemic and is poised to inspire youth to pursue the field. Traditional undergraduate biology programs, however, may not be ready. The inclusion of immunology and related topics in introductory undergraduate biology curricula is limited.^{1,2} To bridge this gap, we built a coordinated and diverse international network of educators called *ImmunoReach*, representing two-year, four-year, R1 and R2 post-secondary educational institutions (see Figure 1). A two-pronged approach adopted by ImmunoReach aims to integrate immunology into undergraduate biology curricula using the following approach:

Creating a Common Language that Highlights the Interdisciplinary Nature of Immunology

The *Vision and Change in Undergraduate Biology Education: A Call to Action* report published by the

and adaptation to create the most effective antibody response. Similarly, the core concept of “Information Flow, Exchange, and Storage” can be related to the process of antigen presentation, which relays important signals required for T cell activation. Overall, creating a common language that highlights interdisciplinary concepts would aid in forming the next generation of immunologists.⁶

Faculty Community of Practice to Integrate Immunology Education into the Curricula

The next step was to take these interdisciplinary concepts to the classroom. For this, we invited immunology educators to collaborate with non-immunology educators who teach biology at the undergraduate introductory level. The goal was to develop classroom activities that could be used to teach foundational biology concepts in an immunological context.

Within a faculty community of practice created in collaboration with the BioQUEST curriculum consortium (see <https://bit.ly/3aFF0gA>), instructors participated in a semester-long process to create pedagogical resources that address interdisciplinary immunology-focused learning outcomes. This community of practice was created to provide ongoing support to educators to develop, assess, and implement immunology-focused interdisciplinary curricula. With the help of these collaborators, multiple activities using evidence-based pedagogical practices have been created. For example, a puzzle-based activity modelling the molecular components of tetanus toxin and the role of antibodies in neutralization allowed introductory biology students to connect the concept of structure and function to an immunological topic. A

similar connection is made when students model the diversity of antigen receptors using multi-shaped clay subunits. Still other activities used immunology to make connections with the fields of nutrition, animal behavior, evolution, ecology, and chemistry.

This approach allows instructors to integrate immunology in a general biology classroom setting where immunology is not typically taught. The activities were discussed during group seminars throughout the semester, and participants received verbal and written feedback from network participants. These activities are currently being vetted by the instructors within their classrooms and will be disseminated to a broader audience through publication and/or presentation.

If you would like to get involved and participate in the next cohort, please contact one of the co-authors of this article to introduce yourself and request membership to this group on QUBES (see <https://bit.ly/3IHpP2R>).

Conclusions

Interdisciplinary approaches to immunology education are critical to broadening the awareness of immunology across the life sciences and establishing that immunology education can be adapted for all levels of student learning. Our two-pronged approach allows us to respond to the call for interdisciplinary education articulated in the *Vision and Change* report and to ensure that we are training scientists who are able to respond to a rapidly changing world. We look forward to many more ImmunoReach-facilitated projects that bring immunology to more classrooms to foster the development of future scientists.

Figure 1: ImmunoReach’s Interdisciplinary Approach to Expanding the Scope of Immunology Education in Undergraduate Curricula

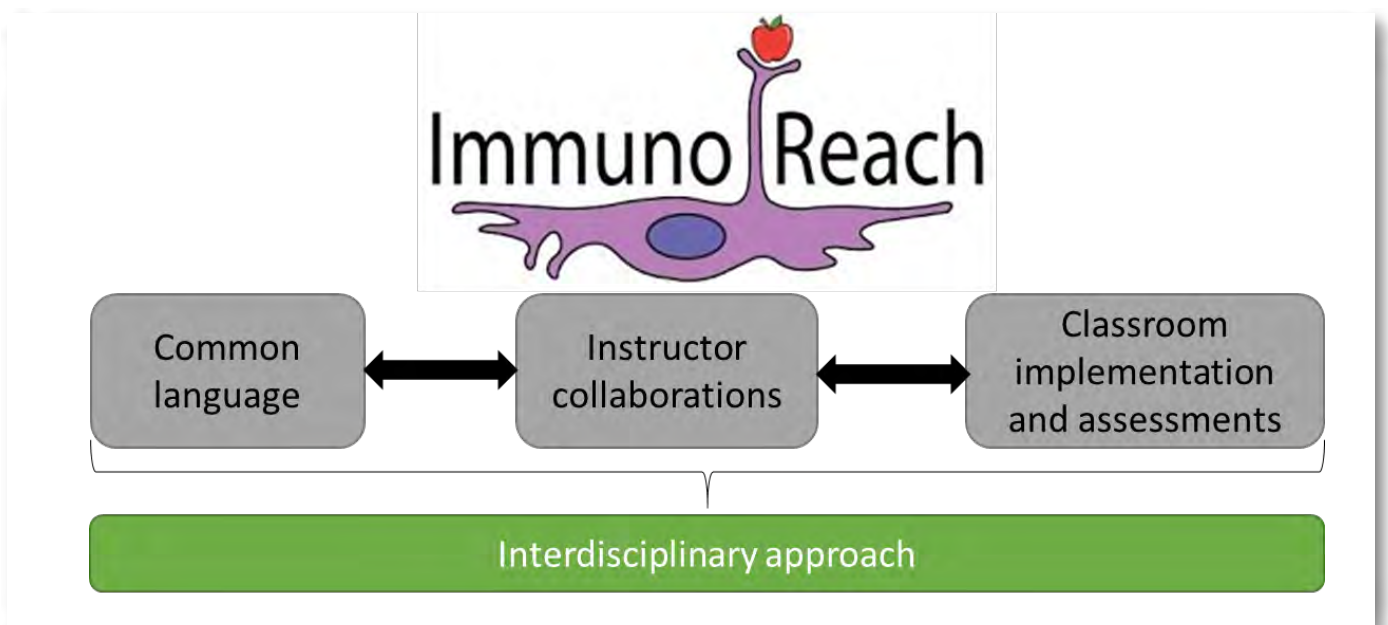


Table 1: Aligning Immunological Concepts with Core Concepts for Undergraduate Life Science Education, Based on *Vision and Change*

Core Concept in Life Sciences	Immunology-Specific Illustrative Concept	Example Learning Outcome
Evolution	Microbes and hosts dynamically co-evolve	Describe the mechanisms of seasonal antigenic shift and drift in the influenza virus and how that influences immunological memory. Describe how this relates to the germinal center B cell reaction, where B cells evolve and become better able to recognize their antigen.
Pathways and Transformation of Energy and Matter	Cells of the immune system utilize biochemical pathways for transport, synthesis, and breakdown of nutrients and macromolecules	List the bioenergetic demands of an immune cell.
Information Flow, Exchange, and Storage	Genome organization determines antigen receptor diversity	Describe the process of V(D)J recombination in T-Cell Receptor and B-Cell Receptor generation. Describe how this relates to MHC antigen presentation, where Antigen-Presenting Cells (APC) present antigen to T cells, resulting in their activation.
Structure and Function	Immune cell size, shape, and/or granularity can aid in its laboratory identification	Distinguish between dendritic cells (DC) and granulocytes based on overall cell morphology, staining patterns, and granule contents.
Systems	Immune system plays a role in defense and repair processes	Compare and contrast the role of M1 and M2 macrophages in an immune response.

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AAI 2022 Summer Immunology Courses Back in Person!

The courses were back onsite for the first time since 2019

The AAI Introductory and Advanced Courses in Immunology are held annually each summer, bringing students and top names in immunology research together for an intensive week of immunology education. This year, instructors, attendees, and staff of the two courses were thrilled to convene in person for separate weeks of intensive learning in Boston, MA, and Los Angeles, CA!

AAI 2022 Advanced Course in Immunology

The 2022 AAI Advanced Course in Immunology drew 281 registrants from the United States and seven foreign countries in its first year at the Westin Copley Place in Boston, MA, July 24–29. Wayne M. Yokoyama, M.D., DFAAI (AAI '84), professor, Washington University School of Medicine, returned as course director.

Designed for advanced trainees and scientists who wish to expand or update their understanding of the field, the intensive AAI Advanced Course is taught by world-renowned immunologists, highlighting recent advances in the biology of the immune system and addressing its role in health and disease.

Scientists participating as 2022 course faculty, along with the topics they covered, appear at www.aai.org/AdvancedCourse. One course attendee stated, “The faculty were very generous with their time, and I loved how we had at least twice daily breakout sessions built in to connect with them.” Another said, “The course was fantastic. I gained new insights into the areas of immunology I am mainly interested in as well as getting a broad understanding of others which impact upon it.”

Overseas attendees at this year’s course included representatives of Argentina, Belgium, Canada, Denmark, Sweden, Uganda, and the United Kingdom. Among them were two International Union of Immunological Societies (IUIS) Scholars, recipients of support from AAI and the IUIS to attend the AAI course:

- Zacchaeus Anywaine, M.Sc., M.B.Ch.B., graduate student, Medical Research Council, Uganda Virus Research Institute, Uganda
- Cecilia Ana Langellotti, Ph.D., Researcher, CONICET, Argentina

The 2023 AAI Advanced Course will be held July 23–28 at The Westin Copley Place in Boston. Details will be published on the AAI website in March 2023 at www.aai.org/ImmunologyCourses.



Eugene Oltz welcomes further discussion with attendees after his lecture on the generation and modification of lymphocyte antigen receptor genes.



Claudia Jakubzick takes questions after her lecture on myeloid cells in immune responses.



Deepta Bhattacharya answers attendees' questions about his lecture on B cell memory.



Course Director Yokoyama welcomes participants on the first day.



Ulrich von Andrian (right) addresses an attendee question during the networking reception.



AAI-IUIS Awardee Zachaeus Anywaine (on left) appears with Course Director Yokoyama.



Joanne Viney presents her lecture on immunotherapeutics.



A course attendee asks a question following one of the lectures.



Course participants meet and mingle with colleagues during the networking reception on the first day.



Avery August lectures on T cell development.



Michael Cancro speaks with attendees during a breakout session about his lecture on B cell development.



AAI-IUIS Awardee Cecilia Ana Langellotti (on left) and AAI Director of Educational and Career Development Mary Litzinger.

AAI 2022 Introductory Course in Immunology

After two years of virtual courses due to the coronavirus pandemic, the 2022 AAI Introductory Course in Immunology reconvened in person at the UCLA Luskin Conference Center in Los Angeles, CA, July 12–17. The event drew 272 registrants from the United States and six foreign countries. Helen S. Goodridge, Ph.D. (AAI '09), professor, Cedars-Sinai Medical Center, served as course director for a fourth year.

Designed for students new to the discipline of immunology or those seeking more information to complement general biology or science training, the intensive, two-part AAI Introductory Course is taught by world-renowned immunologists, providing a comprehensive overview of the basics of immunology.

Scientists participating as 2022 course faculty, along with the topics they covered, appear at www.aai.org/IntroCourse. Responses to the course survey were favorable. One attendee wrote, “I thought the course was excellent and I learned a lot! I will recommend it to others with similar backgrounds as mine.” Another attendee commented, “Most of the presentations were excellent, and the Part 2 lectures reinforced and built on concepts that were presented in Part 1.”

International attendees at this year’s course included representatives of Denmark, Indonesia, South Korea, Tanzania, Tunisia, and Uganda. Among them were four IUIS Scholars, recipients of support from AAI and the IUIS to attend the AAI course:

- Sara Habouria, graduate student, Pasteur Institute Tunis, Tunisia
- Jane Kagoli Maganga, M.D., M.P.H., graduate student, National Institute for Medical Research, Mwanza Research Centre, Tanzania
- Kate Naluwu, laboratory technologist, Medical Research Council, Uganda Virus Research Institute, Uganda

- Enda Cindylosa Sitepu, M.D., clinical study coordinator, Gatot Soebroto Presidential Hospital, Indonesia

Participants in the AAI High School Teachers Program are offered the opportunity to attend this intensive introductory course and take part in a research experience with the goal of enhancing their ability to convey the excitement of immunology to their students. This year’s Introductory Course attendees included four AAI High School Teachers Program participants:

- Jessica Dorman, New Albany High School, New Albany, OH
- Jason G. Econome, Stuyvesant High School, New York City, NY
- Penny Kelly, CREC Academy of Aerospace, Windsor, CT
- Alexander T. Paulchell, Beachwood High School, Beachwood, OH

The 2023 AAI Introductory Course in Immunology will be held July 11–16 at the UCLA Luskin Conference Center in Los Angeles, California. Details will be published on the AAI website in March 2023 at www.aai.org/ImmunologyCourses.



Attendees enjoying the networking reception.



Lisa Osborne lectures on immunotherapeutics targeting cytokines.



Viviana Ferreira gives her lecture on the complement system.



Prosper Boyaka discusses questions with students after his lecture on mucosal immunology.



Lisa Denzin answers a question from an attendee after her presentation on antigen processing and presentation.



Instructor Lewis Lanier (second from left) with attendees during networking reception.



Jakob von Moltke presents his lecture on type 2 immunity.



John Chang answers questions from attendees after his lecture on effector T cell differentiation and response.



Course Director Helen Goodridge (left) speaks with attendees at the networking reception.



AAI Director of Education Mary Litzinger (left) with AAI High School Teachers Program participants Kelly, Paulchell, Dorman, Econome, and Course Director Goodridge



AAI-IUIS Scholars (from left) Habouria, Naluwu, Cindylosa Sitepu, and Kagoli Maganga

Catching Up With...

The American Association of Immunologists (AAI) offers more than 30 award, career development, and educational programs that help to advance the field of immunology. The AAI Newsletter is revisiting past awardees and program participants to talk about the positive impact of their AAI experience and what their participation has enabled them to do.



Lyndsay Avery, Ph.D.

Assistant Professor of Biology, Saint Michael's College, Colchester, VT

2015 AAI Careers in Immunology Fellow

Every journey, no matter the destination, begins with a single step. In this spirit, AAI offers the Careers in Immunology Fellowship Program (CIFP), developed in 2014 as the association's first fellowship program providing trainee salary support. The program supports the career development of young scientists by providing eligible principal investigators (PIs) with one year of salary support for a trainee in their labs. The program funds about 20–25 trainees each year and awards approximately \$1 million annually.

First-generation college graduate Lyndsay Avery, Ph.D. (AAI '22), was a graduate student at the University of Pittsburgh in 2015 when she took that step, applying for the CIFP while in the lab of Lawrence Kane in the Department of Immunology. The lab focuses on delineating the molecular mechanisms that govern T cell phenotypes as a function of T cell receptor (TCR) ligation and understanding T cell signaling pathways, which is critical to discovering drug targets for treatment of human morbidities both infectious and non-infectious.

The fellowship program aims to support labs with limited funding or those in need of bridge funding between grants. At the time of Avery's application, most of the funding for the Kane lab came from a multi-PI R01, which supported a different project. "This program is great for building a bridge and allowing people who are doing excellent work to stay on board," said Dr. Avery.

The CIFP award provided critical support for her work on defining the role of Tim-3 in T cells. Her research project aimed to investigate the effects of inducible Tim-3 expression *in vivo* on TCR signaling and T cell activation and to determine the effect of chronic Tim-3 expression on the development of T cell exhaustion. She was able to develop techniques needed to establish the murine LCMV system in the laboratory. Using novel genetic mouse models to

either induce or knock out Tim-3, Avery and lab colleagues investigated the role for Tim-3 in T cells during acute and chronic viral infection. They were now able to infect the mice and analyze important read-outs for viral titer (by qPCR) and T cell function (by multi-color flow cytometry). Using this model, she found that the presence of Tim-3 enhances T cell activation after acute *in vitro* stimulation.

Besides the very real benefit of funding her research, Avery discovered two additional and unexpected benefits: first, the initial CIFP funding positioned her to later receive additional funding; second, she gained important new skills and confidence throughout the application process. "Putting everything together, I felt much more confident in my writing abilities as well as my potential to be a scientist," said Avery. "The process forced me to organize my work and thoughts and see the true meaning of my work."

Avery gave a poster presentation at the 2016 AAI annual meeting. "Having the opportunity to be funded is huge," said Avery, "and then to have the money to take your funded work to a meeting and get feedback and new ideas about your work from peers and other experts, I think it's one of the most valuable things." As a result of the fellowship, Avery's work was published in *Proceedings of the National Academy of Sciences (PNAS)* in 2018.

After the CIFP, she went on to become a Penn-PORT Postdoctoral Fellow at Children's Hospital of Philadelphia. This NIH K12 IRACDA fellowship to the University of Pennsylvania focused on fellows developing teaching skills and enhancing diversity in STEM. It was during this time that Avery fell in love with teaching. She is now assistant professor of biology at Saint Michael's College in Vermont. "Those first experiences allow you to understand what it means to be an academic or even a teaching scientist," said Avery.

Since then, with help from the Vermont Biomedical Research Network, an NIH-funded program, she was able to establish the first tissue culture facility at Saint Michael's College in 2022. "Less than a year after its inception, summer research students have begun culturing mammalian cells to address my research aims," said Avery.

To learn more about the CIFP, visit www.aai.org/CIFP.

Longtime CEO Michele Hogan Steps Down After 26 Years of Service

August marked the culmination of the 26-year tenure of M. Michele Hogan, Ph.D., DFAAI (AAI '88), as executive director and later chief executive officer of AAI. Hogan, who joined the association in the fall of 1995, advised the AAI Council earlier this year of her decision to step down from her position as of August 31.

In his April message to AAI members conveying the departure announcement on behalf of the AAI Council, then-president Gary A. Koretzky, M.D., Ph.D. (AAI '92), cited Hogan's contributions during her tenure in helping guide AAI to its place as "a financially sound society that provides outstanding services to its members." Koretzky continued: "The Council recognizes the enormous contributions Michele has made to AAI in the years she has led our society. Michele brought a unique skill set to AAI: a passion for and knowledge of immunology, an insider's understanding of NIH and funding, and a keen business acumen. We are a completely different organization



At the 2022 AAI meeting in Portland, Hogan acknowledged the ovation of AAI members and meeting attendees following a tribute to her presented by then-President Koretzky during the meeting's opening night keynote session.

than we were when she joined. Through her leadership, we have become a financially sound society that provides outstanding services to its members."

Hogan, a native of Ely, MN, received her Ph.D. in pathobiology from the University of Minnesota School of Medicine, Minneapolis, and was a postdoctoral fellow with Stefanie N. Vogel, Ph.D., DFAAI (AAI '80), at the Uniformed Services University of the Health Sciences, Bethesda, MD. She then spent seven years at NIH, ultimately as chief of the Basic Immunology Branch, Division of Allergy, Immunology, and Transplantation, National Institute of Allergy and Infectious Diseases, before joining AAI. She was recruited to AAI in 1995 by then-past president Irv Weissman, M.D. (AAI '71), and joined as executive director in September of that year.

In addition to her role as CEO, Hogan served as the executive editor for AAI publications: *The Journal of Immunology* (*The JI*), the largest and most highly cited journal in the field, and *ImmunoHorizons*, a fully open-access journal. She also served as an *ex officio* member of the AAI Executive Committee and Council. Additionally, Hogan represented AAI on several committees with the Federation of the American Societies for Experimental Biology (FASEB), including the FASEB Leadership Development Committee. She also served as an AAI delegate to the International Union of Immunological Societies General Assembly and advised many other organizations in her AAI capacity. Hogan was deeply involved in the evolution of scholarly publishing from print into the digital realm as *The JI* was among the



Early in her tenure as AAI executive director, Hogan with her AAI member colleague (and previous boss) NIAID Director Anthony S. Fauci at the 1997 AAI Public Service Award presentation ceremony



At the last Fall Council meeting held in person prior to the COVID-19 pandemic (December 2019), Hogan with members of the AAI Council and staff



At the 2018 AAI Meeting in Austin, TX, Hogan with past AAI presidents (from left) Susan L. Swain, Katherine L. Knight, Olivera J. Finn, Linda A. Sherman, JoAnne L. Flynn, Gail A. Bishop, and Leslie J. Berg

earliest biomedical journals to go online over 20 years ago. As executive editor, she was closely involved in the integrity of peer review and the unbiased and broad dissemination of science, and she was also a strong advocate for society publishers.

Milestones of Hogan's career were highlighted in a tribute presented by Koretzky in May in conjunction with his 2022 AAI President's Address at the AAI meeting in Portland, OR. Before an audience of nearly 2,000 AAI members and other attendees, Koretzky highlighted the transformation of AAI during Hogan's tenure from The AAI of 1995 to the notably larger, stronger society it is today. In 1995, AAI had 5,300 members, annual meeting sponsorships of \$32,000, and net assets of \$3.7 million. At the end of 2021, AAI had over 7,600 members (a 43% increase) and net assets of more than \$85 million (an increase of more than 2,200%), and sponsorships exceeded \$500,000 for the 2022 meeting.

Just as important as the growth of AAI, Koretzky noted, was the commitment Hogan demonstrated—and conveyed to members of Council—to turning this growth in AAI resources into expanded services and

career development programs for AAI members. This commitment was apparent to the nearly 30 AAI presidents with whom Hogan interacted, as well as to the five editors-in-chief of the AAI journals, six secretary-treasurers of AAI, and all the members of the AAI Council for whom she was a guiding force.

During Hogan's tenure, AAI went from supporting a handful of annual awards and grants to funding almost 1,000 talented scientists per year. She also oversaw the development of fellowship programs for trainees, young investigators, and principal investigators. Together, these programs have come to benefit members with funding of nearly \$3 million per year. Hogan positioned the AAI annual meetings as independent events, increasing attendance and program diversity at what is now the world's leading annual, all-immunology meeting. She established a unique program focused on the history of immunology that is staffed by professional historians, expanded the AAI courses, oversaw the start of a new journal, and supported the work of the AAI Committee on Public Affairs in advocating for increased funding for biomedical research and for the needs

of the immunological research workforce. For these accomplishments and more, the AAI Council honored Hogan with a Distinguished Fellow of AAI award in the inaugural class of 2019.

In her statement advising Council of her decision to step down, Hogan said, “I have been honored and privileged to have held this position with AAI and to have served the incredible community of immunologists worldwide.”

Hogan also noted, “The critical role of the discoveries in basic and translational immunology in medicine and health have never been more apparent than over the past few years. The advent of life-changing modalities for infectious diseases, cancer, and autoimmune disease—to name a few—has transformed treatment options and offers the promise of a healthy future. AAI supports immunologists across the span of their careers, from undergraduate and graduate students and postdoctoral trainees to the field’s most notable senior investigators. It is incredibly rich with historic discoveries in the field of biomedicine attributable to its members. Over the past 26 years, AAI has grown into a financially and programmatically strong organization supporting its members and giving voice to their accomplishments. It is well poised to carry this momentum into the future.”

Hogan expressed her thanks for the outstanding support and dedication of the AAI Councils—present and past—and the gift of time so generously given to AAI by thousands of members serving in volunteer positions. She also acknowledged the remarkable AAI staff, whose dedication to their positions and passion for AAI have represented the “lift” under all its success.

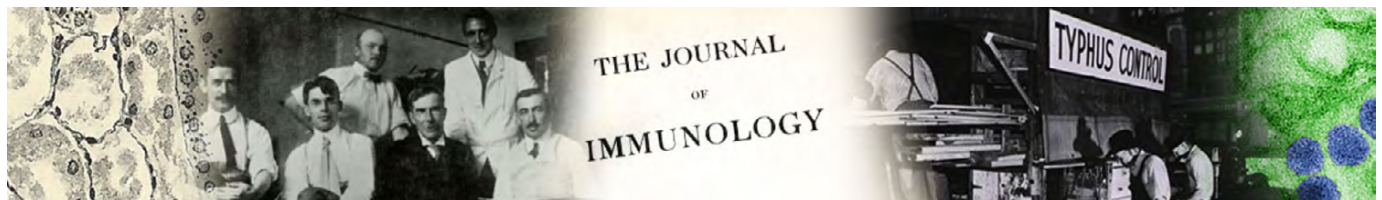
Current AAI President Mark M. Davis, Ph.D. (AAI ’88), conveyed the gratitude of Council in his July 2022 President’s Message (printed in full above) marking the launch of his 2022–2023 presidential term. “...[F]or 26 years we have benefited from the incredible leadership of Dr. Michele Hogan, the CEO of AAI. When she first came, we were struggling financially, barely making it from one



Hogan with AAI staff at the AAI booth at IMMUNOLOGY2016™ in Seattle, WA

year to the next, and had a skeleton staff. Now thanks to her tireless efforts, we are among the most financially secure of professional societies, hosting one of the largest annual meetings for immunologists, and able to fund the plethora of awards and programs briefly mentioned [in this message]. . . . Thank you, Michele—you will be an incredibly hard act to follow!”

Davis’s words echoed those of Past President Koretzky. “While we are sad to see Michele leave, we are well positioned for this change in leadership,” he said. “Michele has the gratitude of each of the Councilors, and we wish her well in her next chapter.”



More Than 100 Years of AAI History

Visit www.aai.org/history for stories of immunology past and present, the Oral History Project, and the AAI Timeline, which chronicles 100-plus years of immunology history—and more.

CONNECT THE DOTS: THINK HUNTER SYNDROME



Silas, age 2

Silas, age 5

A rare combination of common childhood complaints could be an indicator for **Hunter syndrome** (MPS II), a genetic disorder mainly affecting males.¹

If you suspect Hunter syndrome, refer to a geneticist today.



Hearing Loss¹



Otitis Media¹



Sleep Apnea¹



Enlarged Tonsils
/Tongue¹

Visit www.hunterpatients.com/healthcare-professionals for more information about Hunter syndrome



1. Wraith JE et al. Genet Med. 2008; 10(7): 508-516

2022 AAI Annual Meeting Highlights

May 6–10, 2022 | Portland, Oregon

Attendees from 35 countries joined nearly 3,300 participants at **IMMUNOLOGY2022™** in Portland, Oregon, from May 6–10.

The 105th AAI annual meeting featured leading-edge immunology presented in 230 sessions spotlighting more than 800 AAI members and guests, as well as more than 1,600 poster presentations.

Meeting registrants also took advantage of numerous careers sessions, networking events, and access to

immunology job postings, and nearly 700 attendees received AAI career or travel awards.

Additionally, attendees enjoyed opportunities to connect, socialize, and enjoy the beautiful city of Portland, most notably at the **IMMUNOLOGY2022™ Gala** held at the Portland Art Museum.

To see more photos from **IMMUNOLOGY2022™**, visit the online gallery at www.immunology2023.org/immunology2022-highlights/.

Opening Day and Night



Gary Koretzky, AAI President 2021–2022, and departing CEO Michele Hogan (both pictured center) convened with AAI Council and staff members prior to the start of **IMMUNOLOGY2022™**.



Attendees, excited to be at the first in-person AAI annual meeting since 2019, picked up their registration bags in the Oregon Convention Center.



After the President's Address, attendees gathered across the street from the Oregon Convention Center for the Welcome Back! Reception, which featured some of Portland's many excellent food carts.



AAI President Gary Koretzky (center) recognized the Distinguished Fellows of AAI Class of 2022 during opening night ceremonies.

Scientific and Committee Sessions



Attendees enjoyed hundreds of scientific sessions throughout the week.



The Careers in Science Roundtables, co-sponsored by the AAI Education Committee and Committee on the Status of Women, offered attendees an opportunity to explore specific career issues.



In many sessions, attendees could take advantage of participating in Q&As.

Exhibit Hall and Poster Sessions



The more than 1,600 poster presentations drew thousands of registrants to the Exhibit Hall to speak with researchers about their work.



AAI staff, including Marissa Locke and Nikki Beauchamp, were available in the Exhibit Hall to answer attendees' questions.



Meeting registrants flocked to the Exhibit Hall for posters, exhibits, and workshops.

IMMUNOLOGY2022™ Gala



The Gala, held at the Portland Art Museum, included a fabulous band that packed the dance floor.



Attendees "heart" the Gala!



Colleagues and friends enjoyed the unique venue, food, and music throughout the night.





IMMUNOLOGY2023™

THE ANNUAL MEETING OF THE AMERICAN ASSOCIATION OF IMMUNOLOGISTS

MAY 11-15, 2023 | WASHINGTON, DC

WWW.IMMUNOLOGY2023.ORG

IMPORTANT DATES

AWARDS

- Career Awards Nominations Now Open
- Career Awards Nominations Due. October 12, 2022
- Travel Award & Grant Applications Open November 1, 2022
- Travel Award & Grant Applications Due December 19, 2022

HOUSING

- Discounted Housing Reservations Now Open
- Discounted Hotel Rates End April 17, 2023

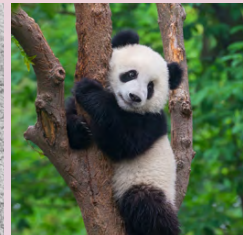
ABSTRACT SUBMISSION

- Abstract Submission Opens. November 1, 2022
- Abstract Submission Closes. December 19, 2022

REGISTRATION

- Registration Opens December 6, 2022
- Early Registration Discount Ends March 31, 2023

IMMUNOLOGY2023™ attendees receive deep discounts on hotels in the official AAI room block. Reserve yours now at www.IMMUNOLOGY2023.org. Book now, pay later!





Blue Bloods: Bang, Levin, and the Horseshoe Crabs

Horseshoe crabs coming ashore to spawn
Greg Breece, US Fish and Wildlife Service

For almost half a billion years, this planet has been home to a strange creature that looks like something from another world and whose blood has become a precious commodity. Horseshoe crabs, arthropods that comprise the family Limulidae, are shallow-water animals protected by a round carapace about a foot across that covers most of their body, with a long, spiny tail dragging behind. Flip them over, and you'll find 10 legs and a gill assembly.

Inside these odd animals is a circulatory fluid that has proven invaluable for pharmaceutical testing for decades—recently, by ensuring the purity of the COVID-19 vaccines.

First Looks at the Horseshoe Crab

At the turn of the 20th century, when scientists began investigating the blood of *Limulus polyphemus*, the Atlantic horseshoe crab, some of the earliest research was stymied by the blood's propensity for quick coagulation. In 1908, Carl Alsberg and Ernest Clark decided to study the clotting mechanism itself. They found that the clot was formed of a substance they called cell fibrin, whose chemical composition was initially perplexing.¹ It was practically insoluble in all but the most caustic alkaline solutions.

The chemical that makes horseshoe crabs' blood blue is hemocyanin, a copper-protein, oxygen-transporting compound also found in many crustaceans and mollusks. Unlike hemoglobin, which is a component of the red blood cells of vertebrates,² hemocyanin is an extracellular compound floating freely in the circulatory system.

Alsberg and Clark had access to abundant populations of Atlantic horseshoe crabs at the U.S. Bureau of Fisheries Woods Hole Marine Biological Laboratory (MBL) on Cape Cod, Massachusetts.³ In the early summer, typically during spring neap tide, countless horseshoe crabs crawl onto the



A horseshoe crab on the beach at Monomoy National Wildlife Refuge, Massachusetts
Bill Perry, US Fish & Wildlife Service



The Marine Biological Laboratory at Woods Hole
Falmouth Public Library

beach to spawn and nest, leaving millions of tiny eggs in the sand. Juvenile crabs spend their first two years in the shallow intertidal waters before moving into deeper water until it is time to spawn.

The researchers could get up to 400 cc of blood out of a single crab by pumping the two halves of its body “like opening and closing a bellows.”⁴ Comparative studies quickly showed that the hemocyanin of *Limulus* was distinct from that of other invertebrates such as octopus. Alsberg eventually demonstrated that aside from hemocyanin and the clotting protein, there was almost no other protein matter in the blue blood.⁵

Limulus in *The JJ*

After Karl Landsteiner (AAI 1922, president 1927–28) described human blood groups in 1901, comparative studies of the blood of various species filled biomedical journals, including *The Journal of Immunology (The JJ)*, and *Limulus* blood was not left out. The first mention of horseshoe crabs in *The JJ* appeared in 1920, when Carl Schmidt showed that hemocyanin, unlike hemoglobin, is antigenic in mammals. Although Schmidt was working with hemocyanin derived from abalones, he interpreted earlier research with an immunological perspective, identifying the *Limulus* hemocyanin reaction seen by Alsberg and Clark as globulin-like behavior.⁶

Bang’s Discovery



Frederick B. Bang
AAAS

In 1953, a researcher from Johns Hopkins University was spending a summer at the MBL studying horseshoe crabs, just as Alsberg and Clark had decades before. Frederick Bang (AAI 1953) noticed a strange reaction in the crabs’ already unusual clotting mechanism. It was known that the blood of horseshoe crabs has the ability to form a quick clot at the site of injury in response to the presence of foreign bacteria, but Bang observed an out-of-control clotting reaction that solidified nearly the entire circulatory system into a gel. He cultured a Gram-negative bacterium from the first crab and verified that it provoked the same reaction in other crabs, even when killed. His findings were quietly published in *The Biological Bulletin* and a few years later in *The Bulletin of Johns Hopkins Hospital*, but rather than continuing to pursue this line of research, Bang went back to his previous work on Rous sarcoma virus at the end of the summer.⁷

A decade later, Bang returned to that odd coagulation he found in *Limulus* when a colleague at Hopkins recommended that he work with a young hematology research fellow, Jack Levin, who was at the time

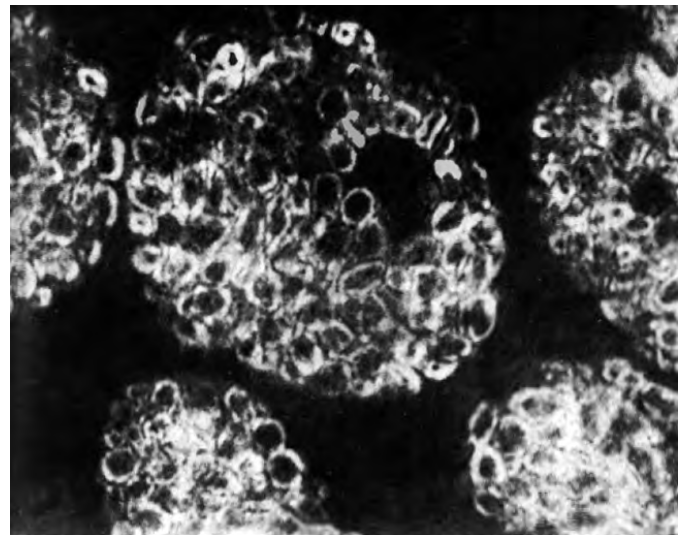
researching how blood clots formed in rabbits in response to bacterial endotoxins. Bang took Levin to the MBL for another summer with the horseshoe crabs.

Levin’s Development

At Woods Hole, Levin showed that in order for *Limulus* blood to clot from bacterial exposure, the presence of amebocytes—the only cellular component of the blood—was required. However, his samples of whole blood kept coagulating even in the absence of any known bacteria. He considered the possibility of endotoxin contamination. Levin ran his experiment again using glassware that had been sterilized at a temperature high enough to destroy endotoxins.

When the new samples did not clot, Levin had his “aha moment.” He knew that the blood of the horseshoe crab had to be particularly sensitive to endotoxins.⁸

Further explorations confirmed the endotoxin reaction and narrowed the clotting mechanism down to specific enzymes held by granules within the amebocyte cells. Levin and Bang first published these findings in 1964.⁹ The pair also presented their findings at the 1966 Federation of American Societies for Experimental Biology meeting.¹⁰



Photomicrograph of *Limulus* amebocytes, 3500x
Levin & Bang

The LAL Test

Levin recognized that this discovery had enormous potential as a reliable, sensitive, and rapid test for the presence of endotoxins in pharmaceuticals. In the 1960s, the only way to test a batch of injectable drugs for endotoxin contamination was the rabbit pyrogen test, which required injecting a rabbit with a sample and waiting 4–6 hours to see if it developed a fever.

The *Limulus* amebocyte lysate (LAL) assay that Levin created can detect endotoxins at a concentration of one part per trillion, and in only 45 minutes. Furthermore, the rate of

production of the clot is proportional to the endotoxin's concentration, so the test can indicate to what degree a sample is contaminated.¹¹ Best of all for the horseshoe crabs, the blood can be drawn non-lethally, and they can be released back into the ocean after their donation.

FDA Approval

It was not until 1983 that the LAL was fully approved by the U.S. Food and Drug Administration as a finished product test. Concerns about the sustainability of horseshoe crabs delayed approval for several years as marine biologists debated whether the species could be used responsibly as a natural resource. The potential application of the LAL prompted an increase in research on the behavior and ecology of horseshoe crabs so that scientific advances would “not endanger the elegantly adapted species and bring its long story to an end.”¹²

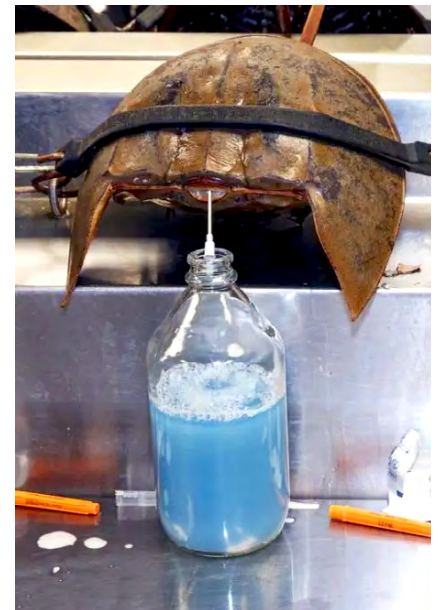
When testing vaccines, LAL is used at multiple steps in the production process to ensure that the containers, stoppers, and ingredients are free of endotoxins before the finished product is tested. LAL is also instrumental in assuring the safety of injectable drugs, implantable medical devices, and IV fluids.¹³

Conservation

Medical use of *Limulus* was not the first impact to the horseshoe crab population. Beginning in the 1850s and continuing into the 1940s, Americans harvested over a million horseshoe crabs per year for bait, fertilizer, and livestock feed. Although there was no baseline population data to compare, this level of predation likely had a



*Jack Levin manually collects Limulus blood at the MBL in 1977.
Marine Biological Laboratory*



*Modern blood extraction from living horseshoe crabs
Shark River Cleanup Coalition*

significant impact on the overall population, prompting wildlife authorities to consider conservation measures. Horseshoe crabs can live close to 20 years and take seven to nine years to reach sexual maturity. When they are taken as they crowd the beaches during a spawn, fewer eggs may be laid, reducing the size of the next generation.¹⁴

Today, around half a million horseshoe crabs are captured for blood collection and returned to their ocean habitat, with a survival rate of 85–90%. Some crabs that are harvested for bait production are bled for the biomedical industry before processing, which has effectively increased the quota of blood available for production of LAL. The Atlantic States Marine Fisheries Commission monitors the estimated population and recommends limits on capture and harvest each year, and as of 2019,



*Horseshoe crab harvest for fertilizer, 1928
Delaware Public Archives*

has determined that biomedical use has had no impact on the population.¹⁵

Bang’s Legacy

Fred Bang, who made the original discovery that led to the LAL assay, died in 1981. Five years later, his widow, Betsy Bang, bequeathed \$50,000 to AAI to establish the Frederick B. Bang Scholarships. This gift provided for “support of scholarly research in the science of marine invertebrate immunology” through awards of up to \$10,000 per year through 1994, when the fund was exhausted.¹⁶

The LAL assay is still used today in clinical settings and to test drugs and vaccines for the presence of dangerous endotoxins before they are released. It has been an

essential part of making sure that the COVID-19 vaccines are free from contamination. One manufacturer estimated that one day’s production of LAL at all U.S. facilities would be enough to test five billion doses of COVID-19 vaccine.¹⁷

Bang could not have guessed the impact his discovery would have on the world when he first noticed the odd clotting in the blood of the horseshoe crab. Although he and Levin never received a major scientific award for their work, they were finally recognized in 2019 with the Golden Goose Award by the American Association for the Advancement of Science, a prize designed to encourage basic science funding by highlighting “seemingly obscure studies that have led to major breakthroughs and resulted in significant societal impact.”¹⁸

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- ¹ Carl L. Alsberg and Ernest D. Clark, “The Blood Clot of *Limulus polyphemus*,” *Journal of Biological Chemistry* 5, no 4: 324.
- ² The lone exception to this is the fish family Channichthyidae, which lack hemoglobin as adults and have colorless blood.
- ³ Today, the MBL is an international research center affiliated with the University of Chicago, which began in 2013.
- ⁴ Carl L. Alsberg and Ernest D. Clark, “The Haemocyanin of *Limulus polyphemus*,” *Journal of Biological Chemistry* 8, no. 1: 2.
- ⁵ Carl L. Alsberg, “Notes on the Properties of the Blood of *Limulus polyphemus*,” *Journal of Biological Chemistry* 19, no. 1: 80.
- ⁶ Carl L. A. Schmidt, “The Antigenic Properties of Haemocyanin,” *The Journal of Immunology* 5, no. 3: 259–60. Schmidt refers to Carl L. Alsberg and William M. Clark, “The Solubility of Oxygen in the Serum of *Limulus polyphemus* L. and in Solutions of Pure *Limulus* Haemocyanin,” *Journal of Biological Chemistry* 19, no 4: 503–10.
- ⁷ Frederick B. Bang and J. L. Frost, “The Toxic Effect of a Marine Bacterium on *Limulus* and the Formation of Blood Clots,” *The Biological Bulletin* 105, no 2: 361–2; Frederick B. Bang, “A Bacterial Disease of *Limulus polyphemus*,” *Bulletin of Johns Hopkins Hospital* 98, no. 5: 325–51.
- ⁸ “2019: The Blood of the Horseshoe Crab,” American Association for the Advancement of Science, accessed June 28, 2022, www.goldengooseaward.org/01awardees/horseshoe-crab-blood.
- ⁹ Jack Levin and Frederick B. Bang, “The role of endotoxin in the extracellular coagulation of *Limulus* blood,” *Bulletin of the Johns Hopkins Hospital* 115: 265–6.
- ¹⁰ Jack Levin and Frederick B. Bang, “Clottable Protein in *Limulus*: Its Localization and Kinetics of Its Coagulation by Endotoxin,” *Thrombosis et Diathesis Haemorrhagica* 19. no. 1: 186–97.
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- ¹² Anne Rudloe, “*Limulus polyphemus*: A review of the ecologically significant literature,” in *Progress in Clinical and Biological Research, Vol. 29, Biomedical Applications of the Horseshoe Crab* (Limulidae), eds. Elias Cohen, et. al. (New York: Alan R. Liss, Inc.). (This volume comprised the proceedings of a symposium held at the Marine Biological Laboratory, Woods Hole, Massachusetts, October, 1978).
- ¹³ Food and Drug Administration, *Guide for Industry—Pyrogen and Endotoxins Testing: Questions and Answers*, June 2012, 8–9.
- ¹⁴ “Conservation.” The Ecological Research & Development Group, accessed June 27, 2022, <https://www.horseshoecrab.org/info/conservation.html>.
- ¹⁵ Brett Hoffmeister et al., “COVID-19 and the Sustainability of the LAL Supply,” *PDA Letter* (Parenteral Drug Association), April 22, 2021.
- ¹⁶ “Deed of Gift,” Box 1, Folder 2, Council: Executive Director/Correspondence (Bang Scholarship), The American Association of Immunologists Collection, University of Maryland, Baltimore County; Arthur M. Silverstein to Raymond Palmer, March 23, 1994, in AAI Council Book, Spring 1994, AAI Archive, Rockville, MD.
- ¹⁷ James Gorman, “Tests for Coronavirus Vaccine Need This Ingredient: Horseshoe Crabs,” *New York Times*, June 3, 2020.
- ¹⁸ “About the Golden Goose Award,” American Association for the Advancement of Science, accessed July 7, 2022, <https://www.goldengooseaward.org/history>.

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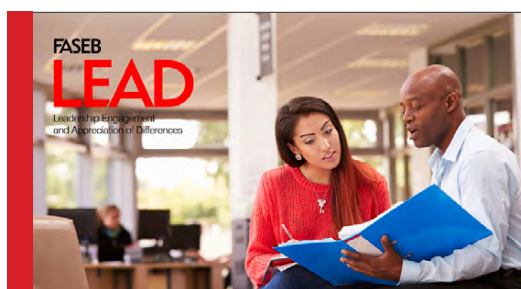
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AAI Grants and Awards

October 12

2023 AAI Career Awards

- **Prizes/Awards:** Recognizing investigators over various career stages, multiple awards honoring scientific achievement in immunology (including achievement specifically related to human immunology), excellence in mentoring the next generation of scientists, and outstanding early career research accomplishment; included are awards conferring prizes ranging from \$5,000 to \$10,000
- **Eligibility:** Any AAI member in good standing nominated by another AAI member in good standing
- **Details:** www.aai.org/Awards/Career
- **Contact:** awards@aai.org

October 12

2023 AAI ASPIRE Award

- **Prizes/Awards:** Recognizes up to five outstanding early career investigators for research accomplishments and professional promise in the field. Recipients will receive a \$2,000 cash award, complimentary AAI annual meeting registration, and travel support to the AAI annual meeting for presentation of their research in a symposium preceded by the award presentation
- **Eligibility:** Principal investigators who are Regular AAI members within 10 years of their advanced degree (Ph.D., M.D., or equivalent) or the end of postgraduate clinical training (whichever date is later at the time of application) are eligible to apply
- **Details:** www.aai.org/ASPIRE
- **Contact:** awards@aai.org

October 17

AAI Travel for Techniques Awards

- **Prize/Award:** Multiple awards providing up to \$1,500 each in reimbursement of travel expenses for a visit to another laboratory specifically to learn a technique beneficial to award applicant's research
- **Eligibility:** AAI regular and associate member scientists with independent research programs; awarded travel may be that of the applicant, applicant's trainee, or applicant's lab member (traveler must be an AAI member); award selection is based on relevance of the technique to the applicant's program and financial need
- **Details:** www.aai.org/TravelforTechniques
- **Contact:** awards@aai.org

December 19

AAI Travel Awards to IMMUNOLOGY2023™, Washington, DC

- **Prize/Award:** Awards in 11 categories recognizing the promise and bolstering the professional development of investigators of all career stages through support for travel to the AAI annual meeting
- **Eligibility:** AAI members in good standing who meet specific conditions for each award (see program details at link below)
- **Details:** www.aai.org/Awards/Travel
- **Contact:** awards@aai.org

Non-AAI Grants and Awards

Visit the AAI website at www.aai.org/GrantsAwardsDeadlines for links to non-AAI grant and award program listings and deadlines.

Mark Your Calendar for These Important Dates!

Dear readers, please note that the meetings listed on this page were still scheduled at press time, but due to the global COVID-19 pandemic, cancellations or scheduling changes may occur. Please check an individual meeting's website to confirm scheduling and other details.

2022

October 17–20

24th Annual Upstate New York Immunology Conference

The Otesaga Resort Hotel,
Cooperstown, NY

www.amc.edu/NYIC/index.cfm

October 26–29

55th Annual Meeting of the Society for Leukocyte Biology: Leukocytes on the Wave for Translating Medicine

Hilton Waikoloa Village, Big Island, HI

www.leukocytebiology.org/meetings

November 7–10

The 1st ImmunoSensation2-IFReC International School on Advanced Immunology

Awaji, Japan

www.advanced-immunology.net

November 14–15

Great Lakes Transplant Immunology Forum

Joseph and Kathleen Bryan Research Building Auditorium, Durham, NC

<https://surgery.duke.edu/divisions/abdominal-transplant-surgery/news/xxi-great-lakes-transplant-immunology-forum>

2023

May 11–15

IMMUNOLOGY2023™

106th AAI Annual Meeting

Walter E. Washington Convention Center, Washington, DC

www.IMMUNOLOGY2023.org



Fall 2023 (exact dates TBD)

17th International Workshop on Langerhans Cells and Related Myeloid Cells of the Skin

Jerusalem, Israel

www.lc2021.org

September 1–5

29th International Complement Workshop 2023

New Castle, United Kingdom

www.complement.org/

November 27–December 2

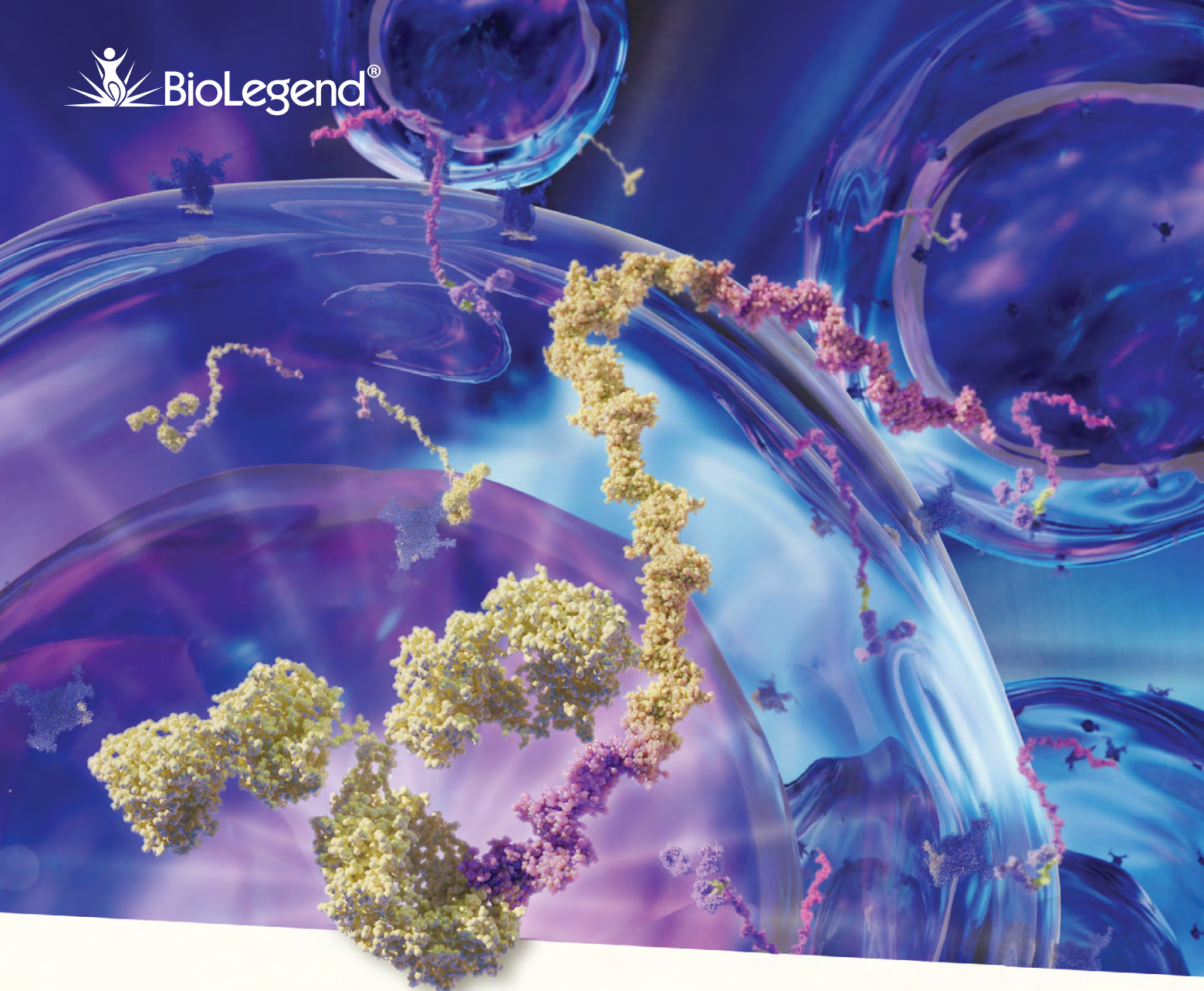
IUIS 2023: 18th International Congress of Immunology

Cape Town, South Africa

<https://iuis2023.org/>

gives immunologists a forum to publish their incremental work—insightful and potentially impactful stepping stones that add to the greater knowledge and benefit other researchers!

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