SIMB News

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October/November/December 2020 v.70 n.4 • *www.simbhq.org*

Global COVID-19 Pandemic

The Emergency That Was Not on the Disaster Planning List of Living Stock Collections

October/November/December 2020 v.70 n.4

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On the cover
Arabidopsis is shown growing in the ABRC greenhouses. Photo by James Mann, an ABRC curator.

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Letter from the Editor-in-Chief

The year 2020 has been one of great disruptions and hardships due to the COVID-19 pandemic. However, this year has also highlighted how critical industrial microbiology and biotechnology are to the general public. As I am preparing this letter, there is wonderful news announced daily about the efficacy and safety of the vaccines that have been developed throughout this year.

Basic and government funded research have played key roles enabling the rapid development of five vaccines approved by the Centers for Disease Control and Prevention (CDC) for Phase 3 clinical trials. The vaccines developed by Oxford-AstraZeneca and Janssen Pharmaceuticals, a subsidiary of Johnson and Johnson, are vector vaccines that rely on utilizing harmless viruses modified to contain genetic material from the SARS-CoV-2 virus. The Novavax vaccine relies on the mass production of a modified viral spike protein. Moderna and Pfizer mRNA vaccines are reliant on research that has been performed on RNA modifications. Each of these vaccines results in eliciting an immune response to either direct injection of antigens or to antigens produced by the host's cells in response to exposure to mRNA introduced via a viral vector or mRNA enclosed within lipid nanoparticles. The decision and ability to focus on the spike proteins of SARS-CoV-2 to stimulate immune responses were facilitated by research conducted on the viruses that caused the Middle East Respiratory Syndrome (MERS) and Sudden Acute Respiratory Syndrome (SARS) epidemics. If it was not for basic research on viral protein structures, mRNA modifications, lipid nanoparticles, and many other related studies, the vaccines that are now becoming available to the public would have taken a much longer time to develop.

A critical component enabling this basic research is the availability of biological materials found in culture collections. The feature article published in this issue of *SIMB News* written by Dr. Kyria Boundy-Mills and her colleagues presents lessons learned during the COVID-19 pandemic while keeping eight different stock collections operational and the stocks alive. The article details unanticipated problems that members of the United States Culture Collection Network (USCCN) encountered, how these problems were dealt with, and proposed suggestions for best practices that were formed to address the possibility of future pandemics. Many of their suggestions for best practices can be applied beyond the USCCN.

I sincerely hope to see many SIMB members at one or more SIMB meetings during 2021!

Melanie R. Mormile

Editor-in-Chief, *SIMB News*

mmormile@mst.edu

SYMPOSIUM ON BIOMATERIALS, FUELS AND CHEMICALS

The first-ever SBFC virtual event!
April 26–28, 2021

2021 Symposium Chairs:
Scott Baker, PNL
Davinia Salvachua, NREL

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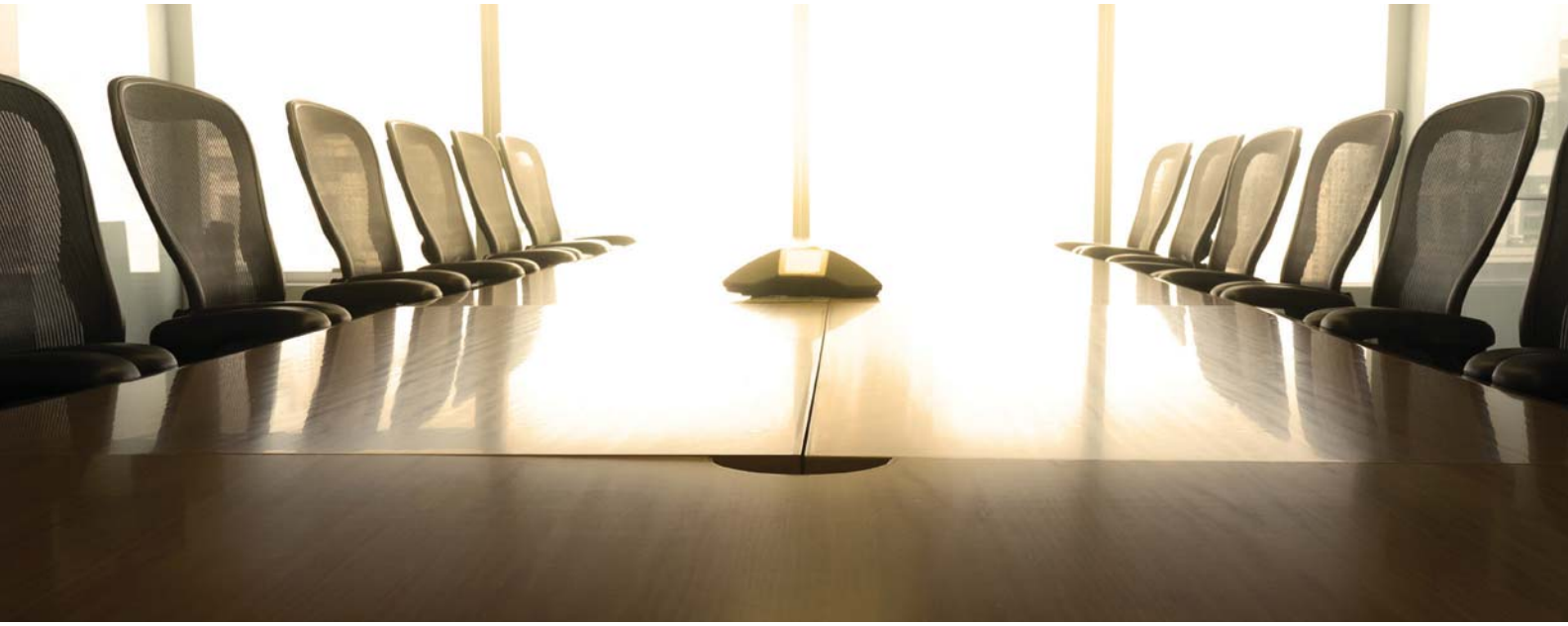

SIMB Strategic Plan

Vision

To be the leading international professional society in industrial microbiology and biotechnology

Mission

Empower our members and others to address current and future challenges facing humanity using industrial microbiology and biotechnology.

Core values

Scientific excellence (innovation, rigor, multi-disciplinary science and engineering, translational technology)

Leadership (collaboration, continuity, advocacy)

Diversity (promotion, inclusion, openness, internationality)

Responsibility (ethics, integrity, transparency, societal impact)

Communication (education, information, outreach, responsiveness)

Passion for science (fun, inspiration)

Goals

1. Provide information to increase global knowledge, understanding, and application of industrial microbiology and biotechnology.

2. Organize preeminent meetings in our core scientific disciplines.

3. Publish the leading journal in industrial microbiology and biotechnology.

4. Promote and increase diversity in all aspects of the Society, with membership open to anyone interested in our vision and mission.

5. Enhance the value of membership in the Society for both individual and corporate members.

6 Offer educational/professional development opportunities for the membership and the general public.

7. Communicate our activities and accomplishments in industrial microbiology and biotechnology to both the global scientific community and the general public.

8. Expand our global reach.

9. Ensure the financial and operational stability of the Society.

Letter from SIMB President

Dear Friends and Colleagues,

I began my term as SIMB President-elect at the end of the 2019 SIMB Annual Meeting in Washington D.C. as Jan Westpheling became SIMB President. This was the culmination of her decades-long history of service to the Society and I have never seen her so excited. Jan had been dreaming of this since she was seven years old. She couldn't wait to preside over the conferences and meetings- seeing friends and colleagues old and new and learning about all the latest advances generated by our members. The Annual Meeting was a great start and was followed in turn with an outstanding Recent Advances in Fermentation Technology (RAFT®) conference in Bonita Springs, FL. That was my first RAFT® meeting, but I'll guarantee it won't be my last. Then, as we turned our focus towards the Symposium on Biomaterials, Fuels and Chemicals (SBFC) in New Orleans, we, like the rest of the world, were struck head-on with the COVID-19 pandemic.

With much heartache, the SIMB Board of Directors cancelled the 2020 SBFC. We were torn at the time and it was not an easy decision, but when April 2020 arrived, outbreaks in major cities including New Orleans confirmed we had made the correct decision. Cancelling the 2020 SIMB Annual Meeting and deferring the inaugural Industrial Microbiology Meets Microbiome conference was just as heartbreaking, but by that point, we had a much better sense that it was the correct thing to do. Chris Lowe and the SIMB office staff were critical in negotiating with the venue hotels and they deserve a huge thank you for minimizing SIMB's financial impact from these cancellations. Virtual meetings were still clunky and many of us were in limbo waiting to see if our workplaces were going to shut down, limit travel, or impose other restrictions on our work life. Planning alternative meeting formats for these canceled conferences simply was not doable at the time, however, as the summer of 2020 wound down, the Board knew that the Society had to begin holding meetings again.

I began my term as SIMB President in August of 2020, not with a grand introduction in front of hundreds of attendees at the annual meeting, but during an online Teams meeting with the outgoing and incoming SIMB Board members. In taking the reins from Jan, I cannot thank her enough, both personally and on behalf of the Board and all of SIMB's members. The decisions to cancel the meetings were certainly the most difficult ever faced by an SIMB President. Jan's leadership throughout what has been the most difficult year ever in the history of SIMB has proven critical to maintaining a functional Society. I have known Jan as a colleague, collaborator, and friend for many years, but during her term as SIMB President, she also became a mentor and for that, I am deeply appreciative.

As I took office, additional difficult decisions lay before us. We will have the 2021 SBFC meeting, however it will be virtual. The SIMB office staff, SBFC Chairs, and the SIMB Board of Directors have been discussing and looking into different platforms and formats and a decision will be announced soon. We are planning SBFC to be as interactive as possible while keeping it focused and productive. A primary focus is maintaining the personal connections and interactions that are the hallmarks of SIMB meetings. I strongly encourage you to attend and to encourage your colleagues, students, and collaborators to consider it as well. This meeting will serve as the test case for potential future virtual meetings and receiving feedback on the good, bad, and ugly aspects of the event will provide improvements to any needed future virtual meetings. I would like to thank the SBFC Chairs, Scott Baker and Davinia Salvachua for undertaking this new endeavor and being the test case for any future SIMB virtual meetings.

As I write this letter, the 2021 SIMB Annual Meeting and 2021 RAFT formats are still uncertain, though the news of an effective vaccine is encouraging me to hope for a return to in-person formats. The meeting program chairs Adam Guss (Annual) and Mark Berge and Kat Allikian (RAFT) are anxious to get planning. The inaugural IMMM, chaired by Debbie Yaver , Yoram Barak and George Garrity, is scheduled for late January 2022. We hope to hold these upcoming conferences fully or at least partially in person, but your health and safety are paramount. Please stay tuned.

Despite the shadow of COVID-19, there are many positive things happening in our Society. Our committee structure has been streamlined and the bylaws are updated and clarified. Mark Berge and Tim Cooper held an outstanding virtual fermentation workshop in August with over 100 attendees. Despite the cancellation of the Annual and SBFC meetings, we still recognized several outstanding award winners. Nancy Cooper was awarded the 2020 Charles Thom Award for exceptional merit in industrial microbiology, Debbie Yaver received the Charles Porter Award for service to the Society, Krishna Madduri and Jonathan Mielenz received SIMB Fellowship, King Zhou received the Young Investigator Award and Rajesh Sani received the Waksman Teaching Award for outstanding contributions to teaching in the fields of industrial microbiology and biotechnology. Greg Beckham was honored with the Charles D. Scott Award for outstanding science in biotechnology for biofuels while Mara Cuebas-Irizarry, North Carolina State University and Patricia Kerner, Idaho State University, were awarded SIMB Diversity Travel Awards.

On January 1, 2021 SIMB will transition the Journal for Industrial Microbiology and Biotechnology (JIMB) from Springer to Oxford University Press. We are very excited by this move and while Springer has been a solid partner for years, OUP is enabling a switch to open access and has brought a new vigor to the publication process through an updated format and online access system. This move is a huge improvement for JIMB and a big thank you to Nigel Mouncey and Ramon Gonzalez for making it happen. The new JIMB will need reviewers, so please be generous with your time and help us get this new chapter in SIMB publications off to a great start. Our SIMB members will receive discounted open access charges so please consider JIMB for publishing your outstanding science.

During the coming year, it is essential for all of us to remember that the first term in SIMB is SOCIETY. Whether we meet in-person or online, the meetings are just events. It is the colleagues, collaborators, and friends we have made through SIMB and these meetings that form the basis of our Society. It is the science, technology, and engineering presented during the meeting that drive our curiosity and feeds our motivation to move forward. All of this is still possible with virtual meetings. In-person meetings have long been an enjoyable way to initiate, grow, and maintain these relationships, but the absence of airport delays, weak coffee, and $12 drinks should not deter us from continuing to strengthen our existing relationships and forming new ones. The SIMB continues to be a very effective means to do this so I encourage you to renew your membership, attend the meetings in whatever format they end up, submit your science to the new JIMB, volunteer as a reviewer, and continue the function of our Society. COVID-19 and its associated inconveniences, limitations, and impositions will pass, but the relationships and connections formed within the SIMB family will endure. Please continue to create, foster, and strengthen these relationships. They are what matter.

I look forward to seeing you either online or in person. Be safe and stay well.

Steve Decker

SIMB President

Fit to Print

Webinar Series: Resources for Natural History Collections in a New Virtual World

Recognizing the rapid changes happening within museum communities and the efforts being made throughout the community to adapt to these changes, iDigBio is organizing a webinar series, entitled "Adapting to COVID-19: Resources for Natural History Collections in a New Virtual World." The webinar series aims to help provide insight into how different groups and institutions are adapting to life in a quickly evolving world. The American Institute of Biological Sciences, the Society for the Preservation of Natural History Collections (SPNHC), and the Natural Science Collections Alliance contributed to the planning of these programs.

All their webinars will be recorded and held in Zoom.

Engaging Public Participation in Collections Digitization

Learn about opportunities to use the Zooniverse platform for collections digitization, including examples of Notes from Nature related to transcription and phenology scoring projects. There will be a demo of available project management tools for NfN, followed by a higher-level explanation of the technology behind the platform that makes it all possible.

Speakers:

Austin Mast; iDigBio, Florida State University

Katie Pearson, Project Manager California Phenology TCN

To access this webinar and others, visit the webinar series page for more information https://www.idigbio.org/content/webinar-series-adapting-covid-resources-natural-history-collections-new-virtual-world

Appreciation

Esperanza Montesa

The SIMB headquarters staff would like to acknowledge the passing in October of our friend and colleague, Esperanza (Espie) Montesa. Espie served as SIMB accountant on a part-time basis beginning in 2002 after retiring from George Mason University. Espie was a crucial staff member and handled the Society's finances with professionalism, patience and good humor. Her loss to our small staff is hard to comprehend and we all miss her. Thank you Espie for your friendship, kindness and commitment.

Christine Lowe
Jennifer Johnson
Suzi Citrenbaum
Tina Hockaday
Katherine Devins
Todd Carlisle
Jen Ruben

Journal of Industrial Microbiology & Biotechnology

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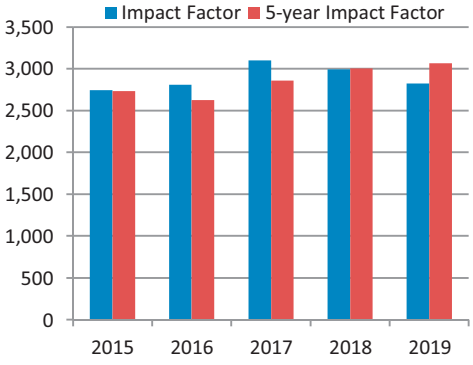

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SIMB
Society for Industrial Microbiology and Biotechnology

The Journal of Industrial Microbiology and Biotechnology is an international journal which publishes papers in metabolic engineering & synthetic biology; biocatalysis; fermentation & cell culture; natural products discovery & biosynthesis; bioenergy/biofuels/biochemicals; environmental microbiology; biotechnology methods; applied genomics & systems biotechnology; and food biotechnology & probiotics

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10 Most Cited Articles Published in 2017 & 2018 cited in 2019 (Data from Web of Science: July 17th, 2020)

Senior Author(s)	Title	Citations in 2019
Baltz, Richard H.	Gifted microbes for genome mining and natural product discovery	37
Joshi, Sumit	Microbial healing of cracks in concrete: a review	14
Yoo, Young Ji	An overview of rapamycin: from discovery to future perspectives	14
Zhang, Yi-Heng Percival	Biomanufacturing: history and perspective	12
Baltz, Richard H.	Synthetic biology, genome mining, and combinatorial biosynthesis of NRPS-derived antibiotics: a perspective	10
De Paepe, Brecht	Tailor-made transcriptional biosensors for optimizing microbial cell factories	9
Liu, Di	Dynamic metabolic control: towards precision engineering of metabolism	9
Zhang, Yu-Qi	Purification, characterization, and application of a thermostable dextranase from Talaromyces pinophilus	9
Katz, Leonard	Synthetic biology advances and applications in the biotechnology industry: a perspective	9
Kang, Min-Kyoung	Biobased production of alkanes and alkenes through metabolic engineering of microorganisms	8

Submission information
▸ ww.springer.com/10295

Electronic access
▸ link.springer.com/journal/10295

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Number of Submissions

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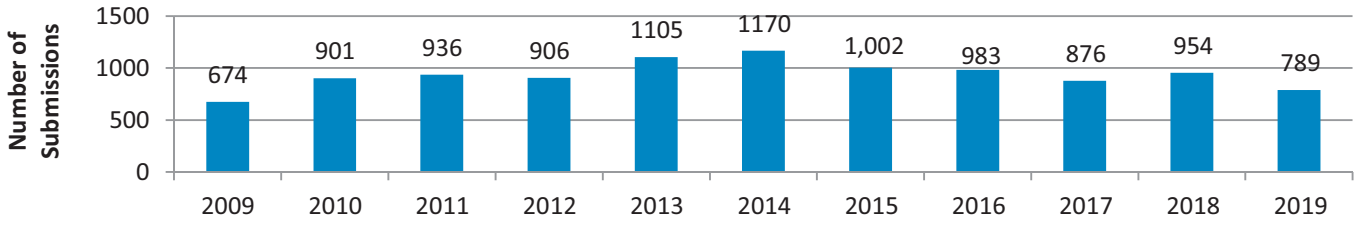

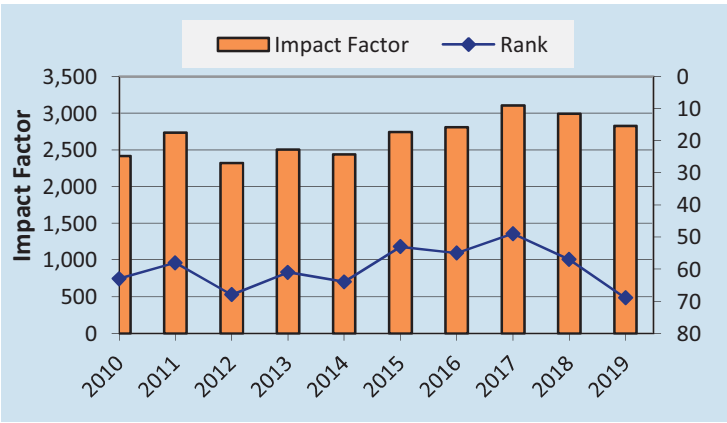

Year	IF	Rank (Biotechn. + Appl. Microbiol.)	Total no of listed journals
2010	2.416	63	159
2011	2.735	58	157
2012	2.321	68	159
2013	2.505	61	162
2014	2.439	64	163
2015	2.745	53	161
2016	2.810	55	158
2017	3.103	49	160
2018	2.993	57	162
2019	2.824	69	156

Top 10 Full-Text Article Downloads in 2019:

Title	Authors	Article Type	Year	Downloads
Towards sustainable bioplastic production using the photoautotrophic bacterium Rhodopseudomonas palustris TIE-1	Tahina Onina Ranaivoarisoa *et al.*	Original Paper (SI Frontiers 2019)	2019	2,713
Natural product discovery: past, present, and future	Leonard Katz *et al.*	Review Paper (SI Nat. Prod. 2016)	2016	2,693
Current perspectives on biosimilars	Frank K. Agbogbo *et al.*	Original Paper (SI Frontiers 2019)	2019	2,241
Advancing biotechnology with CRISPR/Cas9: recent applications and patent landscape	Raphael Ferreira *et al.*	Original Paper (SI Synthetic Biology)	2018	2,056
Impact of mammalian cell culture conditions on monoclonal antibody charge heterogeneity: an accessory monitoring tool for process development	Bernhard Sissolak *et al.*	Original Paper	2019	1,775
Biobased production of alkanes and alkenes through metabolic engineering of microorganisms	Min-Kyoung Kang *et al.*	Review Paper (SI Arny Demain)	2017	1,549
Harmful algal blooms: causes, impacts and detection	Kevin G. Sellner *et al.*	Review Paper	2003	1,444
Discovery of novel glycerolated quinazolinones from Streptomyces sp. MBT27	Nataliia V. Machushynets *et al.*	Original Paper (SI Nat. Prod. 2019)	2019	1,430
Natural product drug discovery in the genomic era: realities, conjectures, misconceptions, and opportunities	Richard H. Baltz	Original Paper (SI Nat. Prod. 2019)	2019	1,358
Hemicellulose bioconversion	Badal C. Saha	Review PaperSI (SI Biotransf. & Biocatalysis)	2003	1,333

Global COVID-19 Pandemic: The Emergency That Was Not on the Disaster Planning List of Living Stock Collections

Kyria Boundy-Mills[1], Stephanie L. Greene[2], Emma M. Knee[3], David Nobles[4], Michael Lomas[5], Rebecca Bradford[6], Marco Riojas[6], Manzour Hernando Hazbón[6], Cale Whitworth[7], Renee Araiza[8]

1. Phaff Yeast Culture Collection (UCDFST), University of California Davis, Davis, California; 2.USDA, Agricultural Research Service, National Laboratory for Genetic Resource Preservation (NLGRP), Fort Collins, Colorado; 3. Arabidopsis Biological Resource Center (ABRC), The Ohio State University, Columbus, Ohio; 4. Curator, Culture Collection of Algae at the University of Texas at Austin (UTEX), Austin, Texas; 5. National Center for Marine Algae and Microbiota (NCMA), Bigelow Laboratory for Ocean Sciences, Boothbay Harbor, Maine; 6. American Type Culture Collection (ATCC), Manassas, Virginia; 6. Bloomington Drosophila Stock Center (BDSC), Indiana University; 7. Bloomington, Indiana; 7. Mutant Mouse Resource and Research Center (MMRRC), University of California Davis, Davis, California

INTRODUCTION

Living stock collections housing bacteria, algae, fungi, plants, vertebrates and invertebrates are an essential element of the infrastructure of life science research, including industrial microbiology. Many living stock collections have existed for decades, some over a century. During the COVID-19 pandemic, these collections are facing many of the same challenges as research laboratories, with an additional crucial activity of keeping the stocks alive. Most specimens in living stock collections are irreplaceable. Loss of the collected biomaterials could impact hundreds or thousands of research labs around the world. Collections staff have been busy developing emergency contingency plans that can be useful to all types of research laboratories.

Because their mandate is to continue preserving and distributing specimens for generations to come, having effective emergency contingency plans is particularly important. Before COVID-19, these emergency plans covered events such as earthquakes, fires, floods, tornadoes, droughts, hurricanes, power outages, funding fluctuations, and sudden loss of primary personnel. For example, many publicly available cryopreserved microbe collections have preserved copies of their collection at the USDA National Laboratory for Genetic Resource Preservation (NLGRP) in Fort Collins, Colorado, where they are stored hundreds of miles away in liquid nitrogen tanks, less prone to damage from earthquakes, floods, fires, and other disasters.

A global pandemic was not high on the list of likely events.

Some collections face fewer existential threats than others. Bacteria, molds, yeasts, viruses, some species of microalgae, tissue cultures, and some mammalian embryos can be cryopreserved or lyophilized. Many plants can be preserved for decades in the form of seeds. As long as the appropriate storage conditions are maintained (e.g., the freezers and refrigerators are functional), the stock's viability should be maintained. In contrast, collections which cannot be preserved and require continuous care to be maintained as living stocks face more immediate threats.

DIFFERENT TYPES OF LIVING STOCK CULTURE COLLECTIONS

Personnel from several different types of living stock collections shown in Table 1 shared unexpected challenges that arose during the COVID-19 pandemic, and strategies they developed to overcome those challenges. Here, we present a summary of challenges and best practices to adjust disaster planning to be better prepared in the future.

DISASTER PLAN

UCDFST: Like most living stock collections, we have a disaster plan to mitigate threats to yeast stocks in case of earthquake, flood, fire, power loss, and loss of key personnel. The freezers are on an emergency backup generator. We are now adding pandemic planning to our disaster plan.

COLLECTION IDENTIFIER	COLLECTION	DESCRIPTION	URL
UCDFST	Phaff Yeast Culture Collection	9,000 wild-type isolates of yeast, approximately 1,000 different species (Figure 1)	*https://phaffcollection.ucdavis.edu*
NLGRP	USDA National Laboratory for Genetic Resource Preservation	Over 1 million seed, plant propagule and semen specimens, plus security backup storage for 20 microbe culture collections, approximately 113,000 isolates of bacteria, fungi, and virus	*https://www.ars.usda.gov/plains-area/fort-collins-co/center-for-agricultural-resources-research/paagrpru/*
ABRC	Arabidopsis Biological Resource Center	Approximately 530,000 seed lines and 450,000 plasmids and other resources of the plant *Arabidopsis thaliana* and other members of the Brassicceae (Figure 2)	*https://abrc.osu.edu/*
UTEX	University of Texas Culture Collection of Algae	More than 3,000 unique strains of algae comprising 6 kingdoms, with 1,469 named species spanning 565 genera (Figure 3)	*https://utex.org/pages/discover-algae*
NCMA	National Center for Marine Algae and Microbiota at Bigelow Laboratory for Ocean Sciences	2,800 isolates of marine microalgae, macroalgae and bacteria, and freshwater microalgae	*https://ncma.bigelow.org*
ATCC	American Type Culture Collection	3,400 continuous cell lines; induced pluripotent stem cell (iPSC); human primary cells and hTERT immortalized cells; 18,000 bacterial strains; 3,000 human and animal viruses; fungi and yeast representing over 7,600 species; protists including, parasitic protozoa and algae; genomic and synthetic nucleic acids (Figure 4)	*https://www.atcc.org/*
MMRRC	Mutant Mouse Resource and Research Center at UC Davis	The MMRRC is a consortium of 4 repository and distribution nodes and a data and coordination site, funded by grants from NIH-DPCPSI. The MMRRC node at UC Davis maintains and distributes over 8,900 mouse models as mice and germplasm, 41,400 ES cell lines, and 473 hybridoma lines (Figure 5)	*National MMRRC site: https://www.mmrrc.org/* *MMRRC at UC Davis: https://mmrrc.ucdavis.edu/*
BDSC	Bloomington Drosophila Stock Center	77,000+ genetically defined strains of *Drosophila melanogaster* maintained in duplicate copy (Figure 6)	*https://bdsc.indiana.edu*

Table 1: Information about the Living Stock Collections

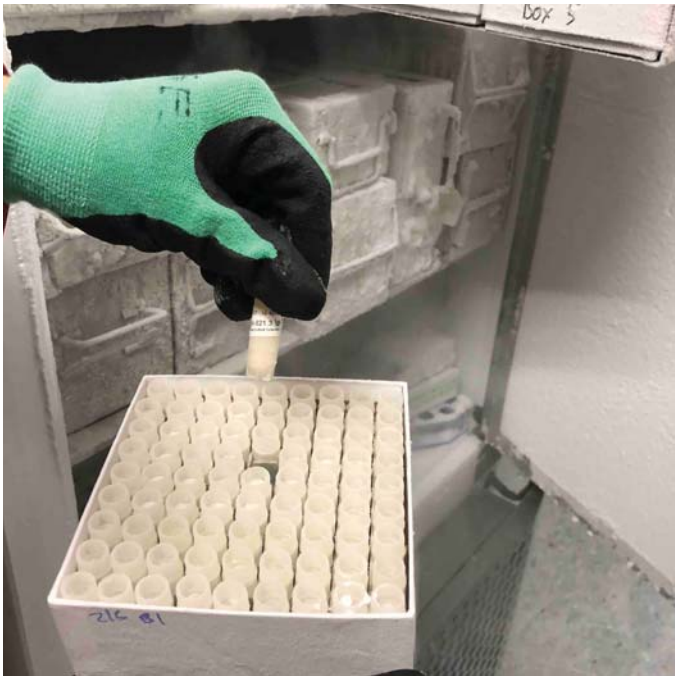

Figure 1: Cryopreserved yeast cultures at the Phaff Yeast Culture Collection, UC Davis. Photo by Kyria Boundy-Mills.

Fun Fact: The late Dr. Arnold Demain was very active in SIMB for many decades. As a student at UC Berkeley in the early 1950s, he had a part-time job maintaining the yeast collection stocks. Kitty Oppenheimer, wife of Manhattan Project Director Robert Oppenheimer, also maintained the yeast stocks.

BDSC: Since the turnaround time for the fly lifecycle is 2 weeks, someone has to manually manipulate each of our ~150,000 samples every 2 weeks. Any large-scale loss of staff effort (such as illness) would be a massive disruption to our operation.

ABRC: Our disaster plans were designed to address short term interruptions to activities and involved allowing essential staff temporary access to buildings to ramp down research and move living specimens to an alternate facility. They did not anticipate long term disruption of activities on a global scale and maintenance of the collection with reduced staffing for many months.

Best practice: Because the world may see other pandemics in the future, laboratories need to add epidemics and pandemics to their list of possible events in their emergency plans.

PRIORITIZING ACTIVITIES

Some collections pivoted to prioritize serving the needs of the COVID-19 research community, while others reduced in-person maintenance activities.

ATCC: Since February 2020, the focus at ATCC has shifted to coronavirus and respiratory pathogens. A large number of new and existing products essential to the pandemic response were made available including standards and controls for clinical laboratories, reference strains and their derivatives, and critical materials for assay development. The increasing COVID-19 related production activities resulted in a redirection of many lab personnel to SARS-CoV-2-focused activities.

ATCC delegated some of the workforce to function remotely. However, the laboratory, quality control, shipping, receiving, and other logistics teams continue to work onsite under very controlled measures consistent with CDC and the Virginia Occupational Safety and Health guidelines.

MMRRC: The MMRRC at UC Davis has culled back live colonies to minimal breeder pairs to maintain live stocks, and bred recently recovered stocks to maintain minimally, all other lines are cryopreserved as germplasm. While we had discontinued all of our product shipping for about 3 months, we did slowly resume shipments of mice and germplasm in late June.

Best practice: Collections should develop a multi-phased emergency collection management plan that involves less in-person labor, and that can be quickly implemented in case of emergency. Developing methods to preserve living research organisms that are less labor-intensive, or that could be automated or performed remotely, should rise in priority when feasible.

ESSENTIAL PERSONNEL

State, local, and institutional regulations affected which people were allowed to enter a workplace. For example, COVID-19 policies at the University of Texas at Austin, the University of California Davis, and Indiana University specifically allowed personnel to enter the workplace to maintain vulnerable research materials, such as living research organisms.

Figure 2. Arabidopsis is shown growing in the ABRC greenhouses. Photo by James Mann, an ABRC curator.

ATCC: ATCC has supported infectious disease research since 1925 and has played a key role in epidemic and pandemic support. From early on in the outbreak, ATCC staff were considered essential due to their direct role in the response. ATCC manages several government contracts with federal agencies including NIAID, CDC, and BARDA to acquire, produce, preserve, qualify, and distribute key biological materials to supply the global scientific community, as well diagnostic assays required by public entities to diagnose the disease.

NLGRP: At the start of the pandemic, the USDA Agricultural Research Service deemed that keeping plants, animals, and microbes alive was an essential task. Although much of the staff at the lab is teleworking, we have staff at the lab daily to check that our storage facilities are keeping our collections of seeds, livestock (stored as semen), and microbes alive.

NCMA: The State of Maine allowed our staff to be considered 'essential' so we could come into the lab to maintain the cultures and conduct other tasks necessary to maintain the collection such as filling liquid nitrogen dewars for the cryopreserved portion of the collection.

ABRC: When the Ohio State University instituted a ramp-down of research activities in March 2020, the ABRC had more than 2000 live plants growing in their greenhouses. Although most resources distributed by ABRC are maintained either as cryo-preserved cultures or seed lines stored in dehumidified cold rooms, many of these plants represented new donations for which we did not yet have seeds in long term storage. Fortunately, the *Arabidopsis* life cycle is relatively short and a single staff member was able to harvest all the seed lines in a matter of weeks. The University designated three ABRC staff members as essential to allow for care of living specimens. Six months later laboratories are still operating at 50% capacity and non-laboratory staff continue to work remotely.

Best practices: Collections should plan which collection management activities must continue for the survival of the collection and identify personnel to perform them.

PROTECTION OF PERSONNEL

Institutions scrambled to develop and institute safety procedures to protect personnel. Collections that handle non-pathogenic

organisms did not have a stockpile of PPE to protect workers. As the pandemic spread, items such as procedure masks, gloves and hand sanitizer became quite rare.

ATCC: ATCC imparted careful coordination and oversight of onsite activities to minimize the risk of exposure between employees. This included training and education of staff, facility engineering controls, social distancing, and the use of personal protective equipment.

MMRRC: Our facility has policies in place per the UCD requirements for entering and working in the buildings, including temperature screening and using the daily online Symptom Survey to receive authorization to enter the workplace.

NLGRP: USDA Agricultural Research Service implemented procedures to keep on-site staff safe, including social distancing, use of masks, stepped up facility cleaning and mandatory use of a cellphone app that contained a symptom survey as well as locations occupied and other personnel encountered throughout the day to facilitate contact tracing.

Best practice: Collections of non-pathogenic organisms that don't normally need PPE such as face masks should consider maintaining an emergency supply of PPE to protect workers from infectious agents that can spread between personnel.

SOCIAL DISTANCING

Work stations, work schedules, and stock management practices were not set up for social distancing. Many living stock collections are maintained by groups of people working at closely-spaced lab benches.

NCMA: We completely revamped what a 'work week' looked like. We set up shifts for our curators so that they could keep transferring cultures and other tasks, just not side-by-side as normal. As Bigelow Lab as a whole began to have more staff coming in, an online document was developed so all staff could record when and where they would be in the lab facilitating keeping our social distance.

MMRRC: Our vivarium and laboratory staff are rotating shifts to maintain minimal contact with other staff in their lab areas. Our customer service team is all working from home, with the exception of a few that now go in for shipping days. We keep a cap on numbers of crates of mice and cryo shippers that go out, again to ensure safe distancing of personnel in the vivarium, laboratory, and offices.

Figure 3. Microalgae cultures are maintained as active cultures in liquid media at the UTEX Culture Collection of Algae at the University of Texas at Austin. Photo by David Nobles.

BDSC: Our collection of 77,000+ *Drosophila* strains, maintained in duplicate, cannot be cryopreserved and has required continuous care throughout the pandemic. Every two weeks, our staff of ~68 employees evaluate the health of and manually transfer live flies from each stock into fresh vials with enough food for the strain to live for about one month. This totals over 300,000 individual transfers each month. When Indiana University ended all non-essential operations, we also took advantage of newly unoccupied space to spread out our staff.

ATCC: The schedules for onsite personnel were staggered throughout the day in order to limit the number of biologists working in the same room at one time. Social-distancing between employees is further encouraged through virtual laboratory meetings and other team communication.

NLGRP: On-site staff were separated by relocating work space and staggering work schedules. Social distance was maintained physically, and through the use of virtual meetings.

UTEX: The UTEX Collection has decreased on-site interactions of staff by assigning some staff members to work remotely and by

Figure 4. Manzour Hazbón is shown with part of his Bacteriology team working (socially distanced) at ATCC. Photo by Manzour Hazbón.

maintaining cohort schedules that separate staff schedules. In addition, UTEX set up strict procedures for signing in and out of laboratory spaces to facilitate contact tracing.

Best practice: The epidemic/pandemic plan should include how to allow essential work to continue while minimizing contact among workers, such as physical separation and working in shifts.

SUPPLY CHAIN

Potential disruption of crucial supplies such as liquid nitrogen or media ingredients threatened the viability of stocks.

NCMA: The NCMA collection is split roughly 50/50 between the cryopreserved portion, and a portion that needs to be serially transferred. While on the surface, the cryopreserved portion might have been viewed as stable, the relative remoteness of Bigelow Laboratory in Maine amplified concerns about supply chain disruptions, in this case, the supply of liquid nitrogen. Not knowing if, or how long, any disruptions might happen, we had to quickly enter a stockpiling mode for consumables from liquid nitrogen to all the test tubes needed for serial transfers. Fortunately, in the end there were no real supply chain disruptions, just delays.

BDSC: To avoid impacts of possible supply chain disruptions, we purchased two months of all ingredients used to make fly food, vials used to house stocks, and chemicals necessary for washing used vials.

Best practice: The emergency management plan should prepare for potential supply chain disruption, such as liquid nitrogen and other consumable lab supplies.

PERSONNEL TRAINING

Maintaining living organisms requires a range of expertise, including preparation of a broad range of media, operation of equipment, lab safety, chemical and biological waste disposal, management of budgets, and database and website operation. The expertise is often divided among several different staff members. However, if a limited number of personnel are allowed to enter the facility, duties may fall on other personnel.

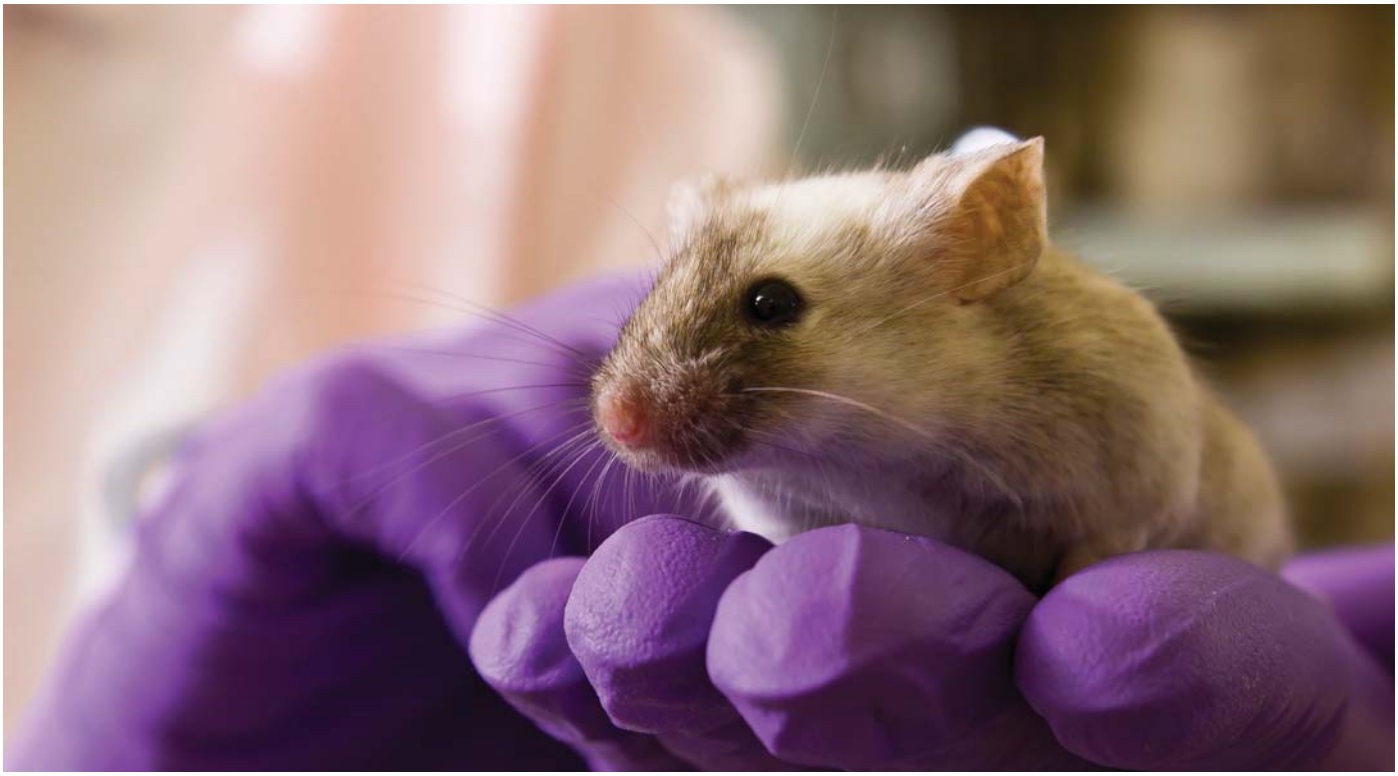

Figure 5. This is a chimera mouse generated by the Mouse Biology Program, MMRRC. Photo by Mauricio Romero Valenzuela.

UTEX: Although 50% of our algal species are cryopreserved and relatively unaffected by the COVID-19 pandemic, more than 1,500 strains must be maintained as active cultures that are maintained by regular serial transfers. Additionally, each month, the maintenance and distribution of strains requires the production of an average of 100 liters of diverse culture media, processing and disposing of large volumes of biological waste, cleaning and sterilizing thousands of pieces of glassware, and various other tasks related to facilities maintenance and strain distribution. The bulk of this work is normally done by several part-time undergraduate student research assistants and four senior staff members, approximately the equivalent of five to six full time staff equivalents. However, due to our campus COVID-19 mitigation program, which does not currently allow undergraduate students to work in laboratories, and other factors related to the COVID-19 pandemic, all of the work of operating the Collection has been on the shoulders of the curator and one other staff member for the last few months.

BDSC: Multiple people were trained for each activity in the event that some became sick or quarantined. Because Indiana University has a large fly research community with experience in fly husbandry, we recruited volunteers from local labs as emergency backups for stock maintenance, food preparation, and dishwashing. We used the backups for dishwashing activities when some of the dishwashing staff were quarantined.

Best practice: Collection maintenance staff and administrators should be trained in all crucial activities and protocols should be detailed in Standard Operating Procedures in case select personnel become unavailable.

REMOTE BACKUP

NLGRP: One of our missions is to provide off-site storage of agriculturally-relevant microbe collections that are actively distributed for the public good. This service is free of charge.

UCDFST: A copy of the Phaff collection is stored off-site at the National Laboratory for Genetic Resource Preservation in Fort Collins, Colorado, where it is safe from earthquakes and the California wildfires that came within 15 miles of the UC Davis campus in the fall of 2020.

ABRC: A sample of each Arabidopsis thaliana seed line in the ABRC is deposited in the Nottingham *Arabidopsis* stock center in the UK

Figure 6. 77,000 Drosophila genetic stocks are maintained as live flies in vials containing fly food at the Bloomington Drosophila Stock Center, University of Indiana. Each stock must be transferred to fresh media every two weeks. The stock center recently distributed their 3,500,000th stock. Photo by Cale Whitworth.

where the collection is mirrored – as we have learned, storage of a copy of the collection at a distant location can be crucial in an emergency.

BDSC: Pre-pandemic, we had some protocols for redundancy and backups but they were certainly insufficient in the face of COVID.

Best practice: Secondary storage of living organisms at the collection facility, as well as at a distant location, using a long-term storage format such as lyophilization or cryopreservation, should continue to be essential elements of emergency planning.

FINANCIAL IMPACTS

BDSC: The largest impact has been on our finances. We stopped processing orders for 2 months as we deemed this a non-essential activity for the continued operation of the Center. The lack of income coupled with new expenses such as hazard pay for our staff and purchase of emergency supplies has resulted in a large deficit.

UCDFST: Orders for yeast strains dropped dramatically in spring/summer 2020, which impacted the income stream for the collection. As collection users wrote many proposals over the summer, the Phaff collection helped several researchers locate yeast strains and associated data that will be useful for future experiments, once laboratories return to normal activities.

ABRC: Orders for *Arabidopsis* resources dropped each month from January 2020 to a low of 30% of 2019 levels in April 2020. Although demand for resources did recover over the following months, orders for the year are projected to reach only 70% of 2019 levels. This represents a significant financial challenge for an operation relying on cost recovery for more than half of total funding.

NCMA: The dramatic reduction in orders for living cultures had a clear negative impact on our finances but the impact was mitigated to some degree by orders for other 'products' such as media kits, extracted DNA/RNA and patent deposit holdings. Having a diversified 'product catalog' was a benefit for NCMA.

CONCLUSIONS

The life science research community, including industrial research laboratories as well as facilities that provide living organisms for research, faced unexpected challenges during the COVID-19 pandemic. Living stock collections, which have a mission to preserve living research materials for future generations, have particularly encompassing disaster plans. Many lessons have been learned during the current pandemic, some the hard way. Disaster plans should be amended while these lessons are still fresh in our minds.

ACKNOWLEDGMENT

Several coauthors are part of the United States Culture Collection Network (USCCN), a platform to promote the safe and responsible use of microbial resources. Users of collections, and collection personnel, are encouraged to find out more about the benefits of participating in this network at *http://www.usccn.org*. The USCCN is supported by a grant DBI 1203112 from the U.S. National Science Foundation.

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SIMB WORKSHOPS

SIMB Annual Meeting 2021

Fermentation Basics • Organizer: Tim Cooper. Novozymes

RAFT® 2021

Fermentation-Advanced Concepts • Tim Cooper, Novozymes

Modern DOE and Quality By Design • Organizers: Tiffany Rau, Rau Biotech and Phil Ramsey, U. New Hampshire

SIMB | Society for Industrial Microbiology and Biotechnology

2020 RESOLUTIONS

1. To the 2019-2020 Officers of the Society:

President	Janet Westpheling, PhD, University of Georgia
Past President	Stephen Van DIen, PhD, Persephone Biome
President-elect	Steve Decker, PhD, NREL
Secretary 2018-2021	Elisabeth Elder, PhD, Georgia State University
Treasurer 2017-2020	Laura Jarboe, PhD, Iowa State University
Directors	Katy Kao, PhD, San Jose State University
	Priti Pharkya, PhD, Genomatica
	Tiffany Rau, PhD, Rau Biotech
	Michael Resch, PhD, NREL
Executive Director	Christine Lowe, SIMB

2. To the outgoing members of the Board for their dedicated service:

Stephen Van Dien, PhD
Michael Resch, PhD

3. To the incoming members of the Board for 2020-2021, beginning August 12, 2020:

President	Steve Decker, PhD, NREL
President-elect	Noel Fong, PhD, Nucelis
Director	Rob Donofrio, PhD, Neogen

4. To Ramon Gonzalez, PhD, Editor-in-Chief of the *Journal of Industrial Microbiology and Biotechnology,* for outstanding editorial services during the year.

5. To the Editors: Dr. S.T. Bagley, Dr. R.H. Baltz, Dr. T.W. Jeffries, Dr. T.D. Leathers, Dr. M.J. Lopez Lopez, Dr. C.D. Maranas, Dr. S. Park, Dr. J.L. Revuelta, Dr. Ben Shen, Dr. D.K. Solaiman, Dr. Y. Tang, Dr. E.J. Vandamme, Dr. X.(Jerry) Yang, Dr. H. Zhao; to Nigel Mouncey, Publications Chair, and to Springer Nature for producing a distinguished international journal of industrial microbiology and biotechnology.

6. To Melanie Mormile PhD, Editor-in-Chief of *SIMB News*, Stephanie Gleason, PhD, Kristien Mortelmans, PhD, Vanessa Nepomuceno, PhD and Elisabeth Elder, PhD, Associate Editors; and to Ms. Katherine Devins, Production Manager, for providing the membership with an attractive and professional publication throughout the year.

7. To Mr. Bob Berger, Exhibits Chair, Placement Chair, and SIMB official photographer, for his efforts throughout the year on behalf of the Society.

8.. To the Society's committee chairs and committee members for their dedicated service to the Society,

9. To Mark Berge and Tim Cooper who organized the virtual Fermentation Basics Workshop.

10. To the 2020 Quarter Century Club inductees:

Daniel Beacom
George Bennett
Richard Burlingame
Raul Cano

Shu-Jen Chiang
Melvin Czechowski
Harold Hayden
Russell Hill
Lisa Lee
Michael Matheny
Stephen VanderBloomer

11. To the SIMB Headquarters Office Staff: Ms. Suzi Citrenbaum, Web Manager; Ms. Jennifer Johnson, Director of Member Services; Ms. Espie Montesa, Accountant; Ms. Tina Hockaday, Meeting Coordinator, Ms. Katherine Devins, Production Manager, Ms. Jen Ruben, Marketing and Mr. Todd Carlisle, IT and networking, for their devotion and dedicated service to the Society.

Contributions by the other dedicated members of the Society are acknowledged.

SIMB would like to acknowledge those members we have lost during 2019-2020:

Robert Coons
Arnold Demain
Douglas Eveleigh
Lonnie Ingram

The SIMB headquarters and staff would like to knowledge the passing of Mrs. Esperanza (Espie) Montesa, SIMB accountant since 2002.

These Resolutions are respectfully submitted.

Christine Lowe
Executive Director
September 2020

ANNUAL MEETING RESOLUTIONS

Due to cancellation of the 2020 SIMB annual meeting it is resolved that the 2020 awardees will be recognized at the 2021 SIMB annual meeting in Austin, Texas:

Charles Thom Award – Nancy Keller, University of Wisconsin

Charles Porter Award – Debbie Yaver, Novozymes

Waksman Outstanding Teaching Award – Rajesh Sani, South Dakota School of Mines

SIMB Fellows – Jonathan Mielenz, White Cliffs Biosystems, Krishna Madduri, Corteva

SIMB Young Investigator Award – Kang Zhou, National University of Singapore

To acknowledge the 2020 annual meeting chair, Adam Guss ORNL, annual meeting program committee and session conveners for developing excellent technical sessions and who are invited to participate in the 2021 annual meeting.

SIMB is grateful to Mark Berge, AstraZeneca and Tim Cooper, Novozymes, for presenting the virtual workshop "Fermentation Basics" in lieu of the traditional workshop held onsite during the annual meeting.

These Resolutions are respectfully submitted.

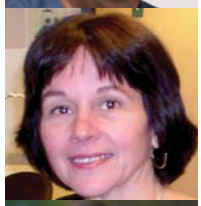
Christine Lowe
Executive Director
October 2020

2020–2021 SIMB Board of Directors

President

Steve Decker,
NREL

Past President



Jan Westpheling,
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President-elect

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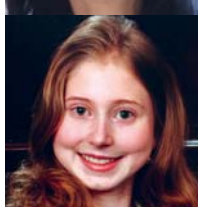
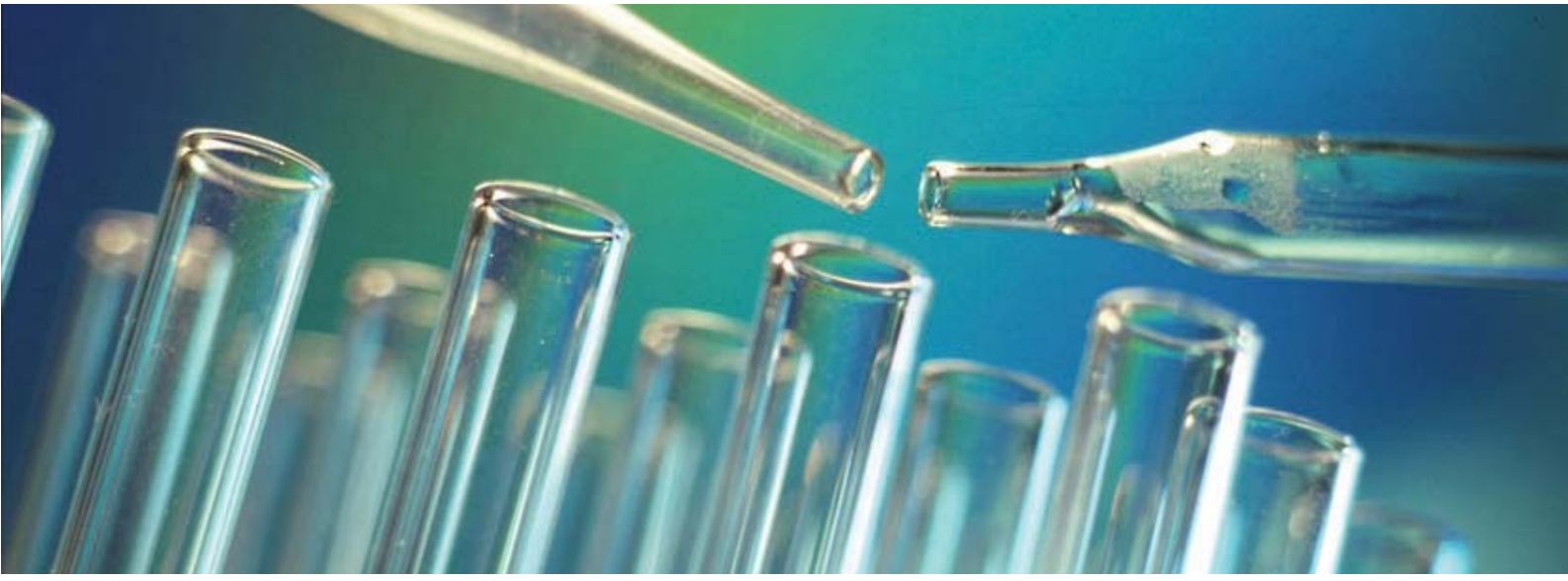


Tiffany Rau,
Rau Biotech



2021 SIMB Election for Board of Directors

The SIMB Election for positions on the Board of Directors will commence March 1, 2021. The election will end at noon EDT on March 31, 2021, and members must join/renew by March 30, 2021, noon EDT, to be eligible to vote.

Current members for 2021 will receive login instructions for accessing the voting module.

The first step in the election process is the identification of the Nominations Committee (NC) consisting of the chair and least two members. The committee members are approved by the Board and serve only for the current year and cannot be reappointed within a three-year period. The NC proposes a slate of candidates (usually at least two candidates for each position) with input from the membership. The candidates must be current SIMB members with a demonstrated interest and involvement in SIMB. Upon acceptance of the nomination, the NC informs the candidates of the duties and responsibilities required by each position. In addition to the NC, candidates can be identified via Article 5, Section 4 in the SIMB Constitution using a petition process.

The final slate of candidates is due to the president by the first board meeting during the annual meeting. Candidates must submit a biography and photograph by October 1, 2020, for publication in the October-November-December issue of *SIMB News* and for posting on the website. After voting ends, the Election Committee, consisting of a minimum of two SIMB members, receives access to the voting module and certifies counts from online voting, as well as any paper ballots previously requested and postmarked no later than the deadline date for electronic voting ballots, and delivers the results to the SIMB President and SIMB Secretary for announcement.

The election process and ballots are available for inspection for at least 30 days following the annual meeting. Ballots and records are destroyed six months after the election (unless otherwise directed by the Board) and final tabulation of the votes is preserved.

Candidate for President
Hal Alper

Dr. Hal Alper is the Z.D. Bonner Professor of Chemical Engineering at The University of Texas at Austin where he leads the Laboratory for Cellular and Metabolic Engineering. Since earning his PhD from MIT he has been focusing on development strategies and tools for the rewiring of fungal and bacterial systems for new biochemicals, biofuels, and biopharmaceuticals. His primary area of focus is on the strain engineering and development of synthetic biology tools in oleaginous organisms.

Dr. Alper has been an active member of SIMB since first serving as a session chair for the 2009 annual meeting in Toronto and has since served as session chair, as a presenter at several SIMB conferences, as a programming committee member for metabolic engineering, and as Chair of the 2017 annual meeting in Denver. Dr. Alper also serves as a frequent reviewer and contributor to *JIMB*.

Among several recognitions of his work, Dr. Alper is the recipient of the 2015 SIMB Young Investigator Award and a fellow of the National Academy of Inventors for his research on engineered cells and synthetic biology tools.

SIMB Vision Statement:

I am strongly committed to improving the quality and diversity of societies and conferences (as can be seen in my planning for the 2017 annual meeting as well as more recent conferences including the Metabolic Engineering conference). I plan to formalize these policies and best practices within SIMB to ensure that we plan conferences and events in a meaningful manner with the mission to establish a professional community that is welcoming and inclusive for all researchers. Likewise, young researchers (at the graduate and post-graduate level) are the future of any society and we must foster newer ways to engage, mentor, and involve more young professionals into our society. I plan to create a young professionals group within SIMB and subsequently create a focus group to assess and respond to needs from the society. Finally, we should recognize that we live in a very challenging time that has brought a number of issues to the forefront (including the future of conferences, the importance of connectivity, and the systemic injustices that have been a part of our society). I seek to create a strategic plan that will integrate technology and in-person events to create a sustainable model for engaging conferences in the future while recognizing the importance of work-life balance.

Candidate for President-Elect Nigel Mouncey

Since March 2017, I am the Director of the Department of Energy's Joint Genome Institute, located at Berkeley Lab. I have a long-standing interest in microbial genetics that started with my education (BSc Hons, Microbiology, University of Glasgow; DPhil, Biochemistry, University of Sussex) and carried forward into my roles in industry at Roche Vitamins, DSM Nutritional Products and Dow AgroSciences. where I directed R&D teams that focused on the discovery, development and commercialization of novel production organisms and fermentation processes for vitamins, insecticides, fungicides, platform chemicals, cosmetics and new crop traits. I have successfully built integrated, inclusive and highly effective multi-disciplinary teams, and today, focus on continuing to build and position JGI as a leading integrative genome science user facility. My research interests are in the biosynthesis, regulation and roles of novel secondary metabolites and biomaterials, and in the field of synthetic biology.

I have been actively engaged in helping lead SIMB by serving as Chair of the SIMB Publications Committee, leading the *JIMB* contract negotiations for the Springer Nature renewal and now the transition to Open Access with Oxford University Press. I also serve as a co-Chair of the SIMB Natural Products conference in 2020 and 2023 and as a member of the 2020 SIMB Nominations Committee and an ad hoc member of the SIMB Diversity Committee. I have given many talks at SIMB meetings, including the keynote address at the 2018 SIMB Natural Products conference.

As President-Elect and President of SIMB, my mission will be to strengthen and position SIMB as the leading industrial microbiology society that fosters an inclusive, diverse and equitable community of industrial microbiologists spanning academia and industry from students, to early- and late-career researchers. I will achieve this through comprehensively updating the SIMB strategic plan and establishing new mentorship and internship programs, educational resources and expert forums.

Candidate for Secretary Elizabeth Elder

Elisabeth (Betty) D. Elder appreciates the opportunity to be re-elected as Secretary of SIMB. Her degrees are from SMU, SFA, and Texas A&M. She held academic positions at GSW, LSUA, and AU which involved teaching a broad spectrum of biology courses plus research in applied and environmental microbiology. Research support came through grants from the NSF, NIH, NASA, and through the universities. In addition, she has experience in developing best practices in a food microbiology laboratory. Both the teaching and research activities were greatly supported by participating in SIMB which facilitated remaining current in microbiology and having productive interactions with SIMB members. She is retired but remains active in SIMB.

Betty has been a member of SIMB for approximately 35 years. In addition to attending meetings, convening sessions, and making presentations, her activities in SIMB have included serving as Chair of the Education Committee (six years); Editor-in-Chief of *SIMB News* (two terms; ten years); a member of the Publications Committee (10 years and ongoing); Chair of the Exhibits Committee (two years); and working with Bob Schwartz to organize the Annual Meeting 5K Run Walk (many years). She is in her third term as Secretary (nine years to date). Her position as Secretary has resulted in her serving as a member of the Finance Committee (nine years to date). Her goals as Secretary will be to attend the four Board of Directors (BOD) meetings and the Business Meeting held annually; to participate in any additional BOD meetings that are called; to contribute to, and provide broad support for, the activities of the BOD; to maintain records of the Society's BOD meetings and business meetings; to review and sign contracts for the Society; to support the activities of the headquarters staff as needed; and to support the Society's committees as needed. With all members of the Board of Directors (BOD) having been asked to do committee work, Betty has volunteered to be a member of the Archives Committee. An immediate goal will be to support the efforts of the Society to develop hybrid/virtual meetings and to resume in-person meetings. She will rely on past experience and ongoing interests to do her best to serve the Society if re-elected to this position.

Candidate for Secretary Melanie Mormile

Melanie Mormile currently serves as the Associate Dean for Research and External Relations for the College of Arts, Sciences, and Business at the Missouri University for Science and Technology (Missouri S&T). She started as an Assistant Professor at Missouri S&T in 1999 and has since risen through the ranks to Professor. Her research is focused on environmental microbiology with an emphasis on extremophilic bacteria. This research has resulted in numerous publications and three patents. Melanie also teaches courses that include Environmental Microbiology, Bioremediation, Geomicrobiology, and Astrobiology.

Melanie earned her B.S. in Biological Sciences at the University of Cincinnati. She was also able to perform research as a student worker at the U.S. Environmental Protection Agency Branch in Cincinnati, Ohio. She earned a Master's degree in Biological Sciences at the University of Louisville. Melanie then went to the University of Oklahoma to work on her PhD After completing her PhD, she accepted a Postdoctoral Fellowship at the Pacific Northwest National Lab.

In 2010, Melanie received an invitation to give a talk during the SIMB Annual meeting. Two years later, she organized and convened two sessions at the Annual meeting. She found the members of SIMB to be very warm and welcoming and felt a part of this community. From 2013 until 2018, Melanie served as an associate editor for *SIMB News*. In January of 2019, she took on the responsibilities of Editor-in-Chief of *SIMB News*. She would welcome the opportunity to continue to serve SIMB as the Society's secretary.

Candidate for Board of Directors
Yoram Barak

An Industrial Microbiologist, Environmental Microbiologist specialized in enzymes discovery and evolution as well as microbial production of biobased chemicals. Dr. Barak is currently a Global Product Manager in Applied Materials Automation Group. Dr. Barak held various positions at BASF with latest a Scientific Marketing Manager and New Business Development for NA at BASF Human Nutrition Division. Prior to this Dr. Barak held an Innovation Manager Position for BASF Biosciences R&D division and Group Leader position at BASF White Biotechnology Department. Prior to BASF Dr. Barak was at Codexis Inc. Leading R&D team for development of novel biobased chemicals and fuels. Dr. Barak got his PhD from the Hebrew University of Jerusalem and carried a PostDoc at the Microbiology & Immunology Department at Stanford University.

Dr. Barak's activities at SIMB:

- Co-chairing Membership and Sponsorship committee since 2017
- Program committee of newly established Microbiome conference (IMMM)
- Part of 2019 nomination committee
- Fermentation Session Program Committee since 2018 (chair in 2019)
- Convener and speaker

I'm passionate about the SIMB mission and vision and find it a great home for the community of experts we are. I'm a strong believer in Industry, Academia & Government working together for a better future and SIMB is one of the best places to enable such fruitful discussions and knowledge sharing. I see the SIMB role in acting across the many Industrial Microbiology domains and training new scientists in this space to be an effective source of innovation and new ways to help humanity without harming the environment. The family spirit and democratized nature of SIMB made me feel at home right from the beginning and I will be more than happy to maintain and promote this spirit further.

Candidate for Board of Directors
Ben Shen

Born and raised in China, Ben Shen received B.Sc. from Hangzhou University (1982), M.S. from the Chinese Academy of Sciences (1984), Ph.D. from Oregon State University (1990), all in chemistry, and carried out postdoctoral research in molecular biology and biochemistry at University of Wisconsin-Madison (1991-1995). He served on the faculty at the University of California, Davis (1995-2001) and University of Wisconsin-Madison (2001-2010) before joining The Scripps Research Institute (TSRI) in 2011. Currently, he is Professor of Chemistry and Molecular Medicine and serves as the Chair of Department of Chemistry, Florida Campus and Director of Natural Products Discovery Center at Scripps Research. Current research in the Shen Lab concerns chemistry, biochemistry, and genetics of natural product biosynthesis and engineering in actinobacteria and development of enabling technologies to leverage the large strain collection at TSRI for natural products and drug discovery. The Shen lab has authored >280 publications and 11 published patents.

He has been an active member of SIMB for the past 20+ years. He has attended and presented at 13 SIM(B) annual meetings, co-chairing the natural products program for five of them, attended and presented at six SIM(B)-organized natural products meetings, serving as the program chair for one of them, and served on the Editorial Board since 2002 and as an Editor since 2017 for *JIMB*. He was recognized by SIMB with the Charles Thom Award in 2018. He has fondly called SIMB his professional home and is committed to serve SIMB by promoting science, sharing knowledge, encouraging participation, and building community.

by Elisabeth Elder

Microbial Biofilms Current Research and Practical Implications

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In *Microbial Biofilms Current Research and Practical Implications*, the editor, Arindam Mitra, has collected contributions from an international group of authors with each chapter written as a review by an individual expert or a group of experts. The first chapter, written by Öykü Irigül-Sönmez, Öznar Pehlivan, and Ayten Yazgan-Karataş with all the authors representing institutions from Turkey, focuses on a broad group of Gram-positive bacteria including Bacillus and Staphylococcus aureus. This chapter reminds the reader that the biofilms are large complex sessile communities that depend on the interactions of complex regulatory molecular mechanisms with a variety of signaling messengers and molecular effectors responsible for biofilm formation and biofilm dispersal. The figures are schematics that present the life-cycle of a biofilm; activation and repression patterns in biofilm formation; plus biofilm formation and treatment. Increasing the knowledge base on biofilm formation and dispersal will be important in finding agents that will be useful in inhibiting biofilms in clinical and industrial settings. This chapter also points out difficulties in controlling multispecies environmental biofilms and the need for more in-vivo experiments. The second chapter, written by Ulrich Vasconcelos (Brazil), Palashpriya Das (India), Diogo Simas Benardes Dias (Brazil), Tarcisio Tárcio Correa Bonifácio (Brazil), Ray Ravilly Alves Arruda (Brazil), Bianca Teixeira Morais de Oliveira (Brazil), and Thiago Gonçalves Cavalcanti (Brazil), focuses on mechanisms of biofilm formation in Gram-negative bacteria with *Pseudomonas aeruginosa* having undergone extensive studies. Biofilm formation occurs in phases that include cellular migration, adhesion, maturation through communication, and detachment and is dependent on temperature, oxygen, light, antibiotic presence, and genetics. From the human standpoint, this chapter points out the economic losses related to biofilm formations well as the beneficial effects of biofilms on human microbiota and human health. It also covers the significance of biofilms in biotechnology, engineering, environmental sciences, materials sciences, and medicine. From the standpoint of the organisms involved, biofilms are beneficial to the organisms in terms of responding and adapting to environmental changes, conserving nutrients and oxygen, and accumulating metabolites. The third chapter, written by Paramita Basu (USA), reviews traditional and new techniques used to study biofilms. In terms of biofilm formation, the chapter explains common assessment mechanisms including the microtiter plate assay, the tube method, the flow cell method, the modified Robbins device, and a variety of microscopic procedures. In looking at the effects of antibiotics and biocides on biofilms, the chapter explains the modified Robbins device, the Calgary biofilm device, plexiglass flow cells, polycarbonate filters, and drip flow reactors with stainless steel slides. For identifying biofilm organisms, the chapter covers genetic methods such

as polymerase chain reaction and gene probes. Identification and detection of biofilm organisms can be accomplished by using fluorescent labeled antibodies as well as using mono- or poly-clonal antibodies which allow the cells to remain viable. The fourth chapter, written by John-Jairo Aguilera-Correa, Jaime Esteban, and David Romera-Garcia with all the authors from Spain, focuses on mechanisms of biofilm formation in clinically used biomaterials. This chapter points out the broad spectrum of medical devices are used in intravascular, cardiovascular, neurosurgical, digestive, orthopedic, urological, plastic surgery, otolaryngologic, ophthalmological, and dental applications. The devices used include at least one biomaterial which can be synthetic or semisynthetic. The implants must be biocompatible, bio functional, stable (chemically and mechanically), and sterilizable. The bacteria commonly involved in clinical studies/infections include *Staphylococcus aureus* and *Pseudomonas aeruginosa* with the fungi commonly studied being Candida. Biofilm development by these organisms is a complex process which starts with a conditioning layer of organic/inorganic material followed by adhesion, aggregation, maturation, detachment, and dispersal. The fifth chapter, written by Pradeep Kumar Singh, Vivek Kumar Yadav Deepmala Sharma, Vishnu Agarwal, and Vandan Nagarwith all the authors from India, covers interactions between biofilms and the host immune response. Common bacterial biofilm-based infections include cystic fibrosis pneumonia, necrotizing fasciitis, vascular grafts, urinary catheter cystitis, sutures, periodontitis, and arteriovenous shunts. Combined bacterial/fungal biofilm-based infections include Hickman catheters, peritoneal dialysis peritonitis, and osteomyelitis. Treatment of these infections may be difficult since components of the biofilms may decrease the efficacy of antibiotics. While neutrophils, macrophages, T cells, and B cells may all be involved in immune responses to biofilms, the immune responses may be stimulated or repressed. Current treatments of biofilm-based infections generally require collaborative efforts of clinical microbiologists, internists, surgeons, and pharmacists. The sixth chapter, written by Akash Mitra and Arindam Mitra with both authors from India, covers the beneficial applications of biofilms in generating electricity, treating wastewater, and bioremediation. In microbial fuel cells, biofilms can be deposited on electroconductive surfaces such as anodes and cathodes. During electron transfer, chemical energy is converted into usable electronic energy. Using microbial fuel cells reduces reliance on fossil fuels so benefits the environment/climate and is cost effective. During wastewater treatment and bioremediation, the microbes within the biofilms enhance the degradation of contaminants. Applications of the biofilms are cost effective, reliable, and widely used and stand to be improved by recombinant technology and metagenomics.

This book will be of interest to faculty teaching advanced microbiology courses, researchers working to develop biofilms, researchers working to prevent biofilms, physicians and dentists dealing with biofilm-based infections, and advanced graduate students. While each chapter can stand alone, the combined chapters complement each other in providing a broad review. Each chapter provides extensive references and several chapters provide web resources.

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