

SIMB News

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History of the Society for Industrial Microbiology & Biotechnology (SIMB)

Journal of Industrial Microbiology and Biotechnology



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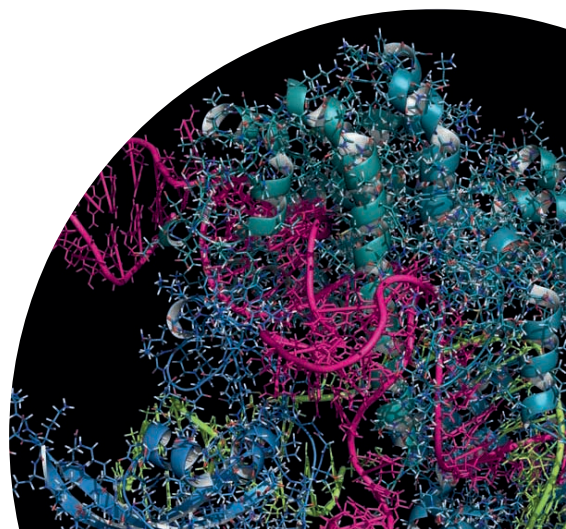
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EDITORIAL CORRESPONDENCE

Kris Rath

Email: kris.rath.4.0@gmail.com

ADVERTISING

For information regarding rates, contact

SIMB News

3929 Blenheim Blvd., Suite 92A

Fairfax, VA 22030-2421

P: 703-691-3357, ext 26

F: 703-691-7991

Email: haley.cox@simbhq.org

www.simbhq.org

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CONTACT SIMB

(703) 691-3357

Executive Director

Haley Cox, Ext. 26

Director of Member Services

Jennifer Johnson, Ext. 23

Meeting & Exhibits Coordinator

Tina Hockaday, Ext. 24

Visual Design & Web Manager

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Letter from the Editor-in-Chief

Dear SIMB Community,

The Society for Industrial Microbiology and Biotechnology (SIMB) has played a pivotal role in advancing microbiology and biotechnology for 75 years. As we approach the milestone 75th SIMB Annual Meeting, set to take place in San Francisco, California, from July 27–29, 2025, we reflect on the Society's remarkable journey and its contributions to the scientific community.

The historical overview, authored by senior SIMB leaders Kristien Mortelmans, Elisabeth Elder, and Erick Vandamme, highlights the foundation and evolution of SIMB into the thriving professional society it is today. Their dedication to *SIMB News* over the past two to three decades has been invaluable, and we extend our heartfelt gratitude for their contributions.

On this momentous occasion, we take the opportunity to express our sincere appreciation to all past and present Presidents, Board members, committee members, sponsors, and members who have shaped SIMB's legacy. Through their collective efforts, SIMB continues to foster innovation, collaboration, and professional growth in the field. Our various committees remain steadfast in their mission to introduce new initiatives that enhance opportunities for our members.

As the global landscape of microbiology and biotechnology rapidly evolves, the American Alliance for Biomanufacturing (AAB), launched in May 2021, brings together industry leaders committed to strengthening U.S. leadership in biomanufacturing innovation, competitiveness, and resilience. This coalition unites key stakeholders to address pressing challenges and seize emerging opportunities in a sector crucial to national security, economic growth, and public health. The National Security Commission on Emerging Biotechnology (NSCEB) has emphasized the need for a coordinated federal strategy to ensure sustained U.S. global leadership in industrial biomanufacturing.

In April 2025, NSCEB released a report urging swift Congressional action to safeguard U.S. leadership in biotechnology. The report highlights the risks of falling behind China in this critical sector, emphasizing biotechnology's role in securing supply chains, strengthening military capabilities, and fostering high-quality job creation across industries. The Commission underscores the intersection of biotechnology with artificial intelligence, further accelerating its impact beyond health into agriculture, infrastructure, and defense. To mitigate reliance on China and ensure strategic control, the report calls for federal policies that spur innovation and private-sector investment while outlining six key pillars for action, including prioritizing biotechnology, fostering private-sector growth, and reinforcing global partnerships.

With new policies aimed at strengthening domestic manufacturing and supply chains, the next few years present unprecedented opportunities for biomanufacturing. These advancements will create growth prospects for industry professionals as well as students in microbiology and biotechnology. In response to rapid technological progress, SIMB remains committed to equipping its members with essential insights and information in this evolving landscape.

To better serve our community, our team actively seeks member feedback to enhance *SIMB News*, refining topics and identifying key areas of interest that can most benefit our members. As we celebrate 75 years of SIMB, we reaffirm our dedication to fostering innovation, collaboration, and knowledge-sharing for the future of microbiology and biotechnology.

We always love to hear your thoughts and ideas—please feel free to connect with us!

Warm regards,

Kris Rath

Editor-in-Chief, *SIMB News*

Featured SIMB Corporate Member Profiles

SIMB Corporate Members represent a core of our community and provide key support, research, and applications in industrial microbiology and biotechnology. Check out the latest announcements or company introductions to get the latest information from SIMB Corporate Members.

QualiTru Sampling Systems® Announcement

QualiTru Sampling Systems® (formerly known as QMI), leaders in the science of aseptic and representative sampling equipment for the liquid food and dairy industries, announced June 17, 2025 that David Roesser, PhD is joining the company as its new Chief Executive Officer. A specialty chemical, agricultural and food processing industry veteran with over three decades of experience in commercializing new technologies across a range of industrial markets, Dr. Roesser is assuming the helm from former CEO Ian Davis, who is retiring.

Interested in Corporate Membership? Send us the completed form in the back of this issue. Already a Corporate Member and want to be featured in the next issue? Contact haley.cox@simbhq.org.

2024–2027 SIMB Strategic Plan

1

Scientific Excellence and Leadership

SIMB will identify the technical needs of our community to advance the industry and facilitate solutions

- Continue to foster collaboration and knowledge sharing between academic, industrial, and government stakeholders
- Offer educational opportunities and programs that focus on current and future trends with input and support from industry partners
- Elevate the Journal of Industrial Microbiology and Biotechnology to be a key information source for the SIMB community
- Recognize and promote the current leaders, future leaders, and scientific excellence of our community

2

Communication and Outreach

SIMB will connect and advocate for our community to internal and external stakeholders

- Increase capacity and opportunities for the SIMB community to advocate for industrial microbiology and biotechnology, the Society and the field's impact
- Partner with organizations to introduce SIMB to new audiences
- Provide tools to help the community develop and promote the industrial microbiology and biotechnology workforce
- Conduct, support, and/or amplify information gathering activities relevant to the SIMB community

3

Inclusion and Responsibility

SIMB will promote and maintain a responsible community that is welcoming to all

- Provide activities and communication that ensure a sense of belonging amongst members and the community
- Enable our community to work toward relevant sustainable development goals for a positive global impact
- Maintain an inclusive community supported by an enforceable Code of Conduct
- Foster a governance structure that embodies transparency and accountability

4

Value and Function

SIMB will enhance membership value and maintain its financial and operational viability

- Provide products and services to meet the needs of the SIMB individual membership
- Understand and answer the needs of SIMB corporate members
- Maintain product and service costs at sustainable levels while expanding or enhancing services to membership
- Strengthen stable, long-term revenue streams that work to support the Society's mission and vision

Keep Technology Transfer Pre-competitive, to encourage the Growth of Biomanufacturing

Summary: This review outlines the causes, effects, and some remedies for the current industry-wide challenges posed by non-standardized technology transfer processes.

Keywords: Technology Transfer, bioprocessing

To whom correspondence should be addressed: jgardner@lbl.gov, +1 925 586 6836

Introduction

On 02 August 2023, the Society for Industrial Microbiology and Biotechnology (SIMB) convened a panel of experts at their Annual Meeting to discuss the challenges & practices, as well as the stories of triumph and failure, when migrating microbial technologies across facilities and scales. The fundamental pursuit of so-called technology transfer (TT) is as old and ubiquitous as human ingenuity itself. There is no invention that benefited anyone beyond its inventor, without a careful exchange of information & material and in most instances, an expansion of production. Microbial technologies are no different. The universal need for excellence in technology transfer calls on the industry to address this issue with a singular voice so that the bioeconomy may thrive and grow. This text lays out the collective thoughts which arose from the SIMB 2023 Annual Meeting panel discussion and proposes tenets for establishing pre-competitive standards in technology transfer.

Toward a canon of technology transfer standards

Authors have pointed out how challenging technology transfer can be (Tech Transfer: Unraveling the Complexities - BioProcess International BioProcess International, n.d.) and leaving this step of the scale-up process unstandardized risks hampering the technological advancement of the entire industry. As a result of the dramatic drop in cost of reading and writing DNA, the advent of modern DNA editing tools such as CRISPR, and more generally, the rise of synthetic biology, strain construction is no longer the rate limiting step in developing biomanufacturing routes. The development, transfer and scaleup of the corresponding bioprocesses have become the key bottlenecks on the road to commercial production. Currently the industry is relying heavily on a limited number of contract manufacturing organizations (CMOs) to perform this work, and until advances in modeling technology trivialize these steps entirely, improving TT processes offers a way to increase efficiency at this next stage of development.

¹ Lawrence Berkeley National Laboratory, Berkeley, California, USA.

² Kerry Group, Beloit, Wisconsin, USA.

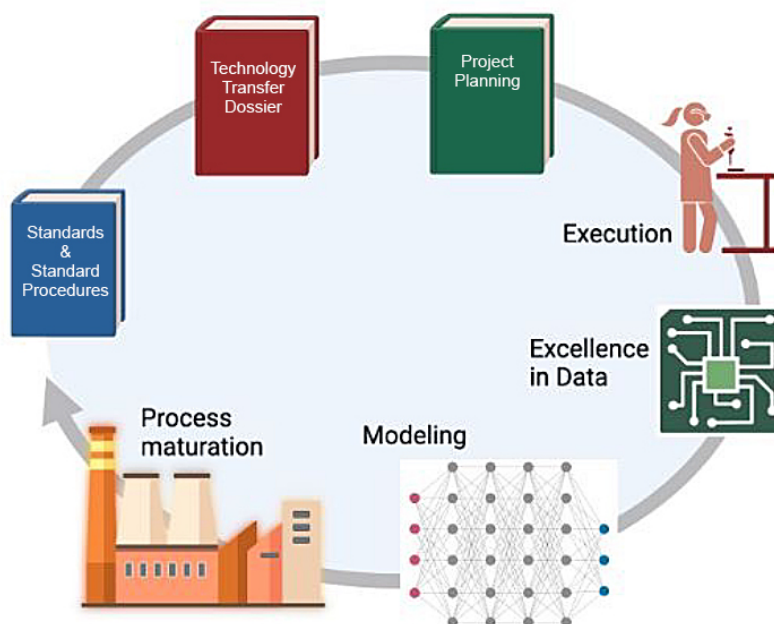


Figure 1. Standards and standard procedures in technology transfer would improve execution of experiments and enable faster and more efficient process maturation.

As Figure 1 depicts, and the aforementioned panel agreed, a shared body of published TT SOPs and training standards can provide a more solid basis for excellence in workforce development & training, operations, and gauge repeatability & reproducibility (GR&R). Furthermore, a widely shared, preferably open source, set of software tools can dramatically reduce the upfront costs companies incur, as well as the risks they bear, to undertake TT and scale-up. Such tools minimize clerical errors, streamline routine scale-up calculations and procedures, and thus ensure the establishment of a shared ground truth for all parties to the process. Common tools across the industry will also enable the community to work collectively to drive continuous improvement of the software and embedded methods, further reducing the rate of TT failures in the future.

Technology transfer excellence is best kept pre-competitive

One of the barriers to the adoption of standardized technology transfer is players in the biomanufacturing industry considering good TT as a competitive advantage. Rather, industry stakeholders should work collectively in a noncompetitive fashion to establish high standards for effective TT. Such an approach agrees with the John F. Kennedy slogan: A rising tide lifts all boats (Remarks in Heber Springs, Arkansas, at the Dedication of Greers Ferry Dam. | The American Presidency Project, n.d.). A lack of standardization here and

elsewhere in the industry results in overall drag on this rapidly evolving sector, where groups are destined to perennially reinvent the same wheel with little or no resulting benefit to the current or future value chain.

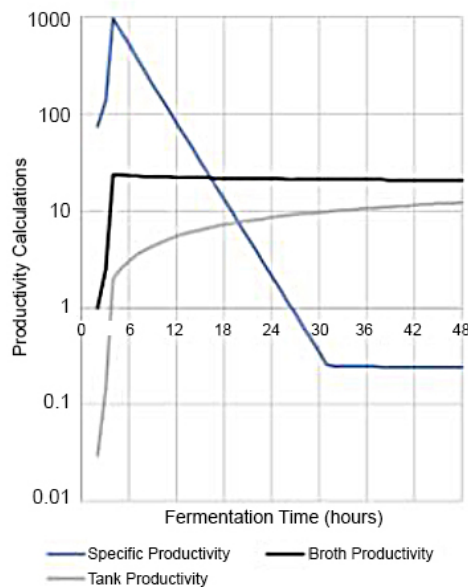
Equipment and material related challenges associated with transferring fermentation processes between facilities are common across the industry. Differences in raw materials at different scales, inconsistencies in analytical instruments and variability in key utilities (e.g., water, steam, air) are common and practically unavoidable. As a specific example which arose in the TT Panel discussion at the 2023 SIMB Annual meeting, collaborating facilities had to make ad hoc purchases of common spectrophotometers, in hopes of having comparable performance data. This example points to a distinct weakness in biomanufacturing - the general lack of standardization (dsm-ferminich, n.d.). Technology transfer needs to be able to rely on standard weights and measures. This could comprise requirements for analytical standards and performance evaluation in areas such as turbidity, feedstock metrics, metabolic outputs, along with published industry guidance for analytical tech transfer. Relatively straight-forward solutions like these fall well outside a scope that holds much if any meaningful advantage to individual groups, but stands to greatly benefit the whole.

This non-competitive principle could be further useful in technology transfers that also involve scale-up. For example, the most commonly used feedstock for industrial fermentation is 95-DE corn syrup, but it is rarely used in laboratories or at pilot facilities because it should remain heated during transportation and storage. This inherently creates a difference in the key carbon source across scales & facilities, resulting in a TT risk and inconsistency in the resulting data. While methods exist to minimize these differences, such methods have yet to be widely shared.

Good decisions can only spring from good data

The TT of bioprocesses involves a series of decisions as to which risk to mitigate versus ignore, based on the potential consequences. Decisions must be data driven. While this may sound obvious, for many, fermentation and biomanufacturing still often dwell somewhere between art and science. The industry needs to continue its push for: 1) adherence to operational excellence practices and 2) innovations and standardization in data collection, processing, modeling, such as Process Analytical Technology (van den Berg et al., 2013). Both endeavors contribute to repeatable, transferrable, well-defined workflows of both human and automated decision making. Standardization in data collection and analysis is key to a successful technology transfer. Today, our industry is plagued by the lack of a universal lexicon leading to the calculation of key performance indicators (KPIs) based

on different methodologies, leading to errors and unexpected changes during TT. One example is the different methods that can be used to calculate fermentation productivity as illustrated in Figure 2 below. Depending on the methodology used to calculate fermentation productivity, the exact value can range three orders of magnitude leading to substantial errors during TT. While it is less common to confuse specific productivity, which is based on the amount of biomass in the fermentation, with broth or tank volumetric productivity, it is unfortunately very common for the two sites to confuse broth and tank volumetric productivity since the calculations are fundamentally similar. Note that tank volumetric productivity is calculated using the full working volume of the tank (not the broth volume) and it also includes a penalty for time lost during tank turnaround (TA).



$$Sp \left(\frac{g \text{ product}}{g \text{ DCW} \cdot h} \right) = Y_{X_p} * \mu$$

$$VpB \left(\frac{g \text{ product}}{L_{\text{broth}} \cdot h} \right) = \frac{T \cdot L_{\text{broth}}}{L_{\text{broth}} \cdot \text{ferm age}}$$

$$VpT \left(\frac{g \text{ product}}{L_{\text{Tank}} \cdot h + TA} \right) = \frac{T \cdot L_{\text{broth}}}{L_{\text{Tank}} \cdot (\text{ferm age} + TA)}$$

Figure 2. Different versions of productivity measurements can drastically affect interpretation of results.

Artificial intelligence (AI) holds great promise as a way of finding non-intuitive solutions to problems which reside in very large parameter spaces. Experts foresee a tremendous impact on bioprocess development, as groups look to transfer across combinations of facilities, operators, and scales, among other parameters (Del Gallo et al., 2023). However, gaining access to such solutions means that otherwise competing groups must find paths to data-sharing mechanisms which follow the FAIR guidelines (findable, accessible, interoperable, reusable) (FAIR Principles - GO FAIR, n.d.). Data guidelines in technology transfer standardization would set the industry up long term to be able to develop, utilize, and leverage AI-based tools with the potential to exponentially improve the technology transfer and scale-up process.

Human interaction is key

While machinery, materials, protocols, processes, and data are the vital tools of technology transfer, at the end of the day, human beings and their interactions are and will remain to be at the center of the TT process. As such, standardization efforts must not ignore the need to establish the roles, responsibilities, norms and expectations for all parties to agree to follow, warranting careful articulation at the outset so that there is clarity of communication amongst stakeholders. Such an approach will contribute to the greatest chance of TT success, a position which the authors of this letter have taken previously. To this end, groups should consider developing standard procedures and guidelines for project teams to use, in developing and maintaining constructive relationships with internal and external collaborators, customers, clients, or stakeholders. Organizations may suffer from the prevailing assumption of effective person-to-person communication. This aspect of technology transfer can fail to receive the attention it is due, as a result of cultural differences, language barriers, and disparities in organizational styles & structures. Agreeing to a shared and codified set of norms and expectations at the outset can greatly reduce the risk of failed transfer and scale-up activities, for an incoming technology.

I.	Begin with the end in mind: This saying was coined by Stephen Covey [6]. Discuss the overarching goals and ensure clear understanding through dialog among the sending and receiving teams.
II.	Compare Goals and Capabilities: Carefully evaluate the operational readiness and fit of the receiving group, taking in account factors including process robustness, facility capabilities, operator experience, capacity & lead time, and overall track record.
III.	Build the Transfer Packet: It is incumbent on the transmitting team to provide an appropriate level of detail for relevant and accurate information. Ideally, packet generation should be preceded by in-depth discussions and should be guided by a shared template.
IV.	Genchi Genbutsu: Go to the place where work is done. A key facet of problem-solving in Lean Production, onsite discussions, where the given bioprocess will actually take place, is important for answering key questions that may not arise in virtual, remote meetings [7].
V.	Rehearse: Both sets of teams should as part of onsite discussions, go through 'dry runs' of the process to test the tractability of steps, which may seem viable in the abstract but have challenges that only reveal themselves through action.
VI.	Execute: The receiving team develops and shares the batch record (BR) with the sending team. Once all parties confer, the BR drives the execution of the transfer process, in accordance with all relevant standard operating procedures, safety practices, and other facets of operational excellence.
VII.	Evaluate: Both groups evaluate performance through predetermined performance specifications. Groups may separately evaluate, for instance, performance of execution by the receiving team or material performance in proprietary functional assays by the sending team and use such information for decision-making and future improvements.

Table 1. A proposed set of standards for the technology transfer process.

A Path Forward

As the U.S. biomanufacturing sector expands, buoyed by the accelerating growth of biotechnology, the U.S., and economies around the world, must strengthen their abilities to reliably transfer bioprocesses. With the advancement

of software tools, sensors, AI and process controls, the industry is poised for a step function improvement in how the execution of technology transfers, but such an improvement will require that groups who may otherwise compete in the market work together collectively as an industry to share learnings, best practices and tools.

The next steps are for leaders to convene industry association members and those with relevant expertise in technology transfer who will define an overarching standards framework specifically dedicated to industrial microbiology. Standards in technology transfer would include: 1) procedures to guide collaborating groups in their efforts to prepare for collaboration and validate a technology across facilities and evaluate performance across scales; 2) reference materials to reduce interpretation differences; 3) data standards, including batch record templates and formulations, aligning collection and storage methods to existing data standards, to smooth TT and enable full collection of relevant data & metadata.

Conclusion

The challenges of technology transfer in bioprocess development have become a considerable stumbling block on the road to widespread commercialization of bioproducts. Allowing individual organizations to continue addressing common and recurring issues, in the name of maintaining competitive advantage, has only intensified the new bottleneck the industry is facing. Collectively, leaders in the biotechnology space have the opportunity to greatly improve scale-up efficiency by developing TT standards for the industry. This strategy has both short and long term benefits, ranging from saving time and preventing safety incidents, to slashing costs through streamlining and use of advanced modeling tools, to collapsing the time from concept to commercial product.

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Congressional BIOTech Caucus Launches to Advance U.S. Bioeconomy and Global Leadership

On June 26, 2025, Representatives Chrissy Houlahan (D-PA) and Stephanie Bice (R-OK) announced the formation of the bipartisan BIOTech Caucus in the U.S. House of Representatives. The new caucus aims to keep the United States at the forefront of global biotechnology by promoting bipartisan policy solutions, engaging with sector leaders, and increasing bioliteracy among lawmakers. Joining the co-chairs are Vice-Chairs Representatives Ro Khanna (D-CA), Gus Bilirakis (R-FL), Jake Auchincloss (D-MA), and Pete Sessions (R-TX).

The BIOTech Caucus was established in response to the recent National Security Commission on Emerging Biotechnology (NSCEB) report, which warned that the U.S. risks falling behind China in key biotech sectors without urgent congressional action. With the bioscience industry contributing \$2.9 trillion to the U.S. economy in 2021 and supporting 2.1 million jobs, the Caucus underscores biotechnology's critical role in economic growth, national security, and public health.

The Caucus will focus on three main pillars: ensuring domestic biosecurity, driving bio-innovation, and unlocking bio-opportunity, in particular job creation. In a statement, Caucus members emphasized the importance of bipartisan collaboration to foster innovation, protect intellectual property, invest in research, and streamline regulations.

SIMB welcomes the Caucus as a vital step to strengthen national competitiveness in biotechnology and grow the bioeconomy and looks forward to engaging with them in upcoming meetings and events.

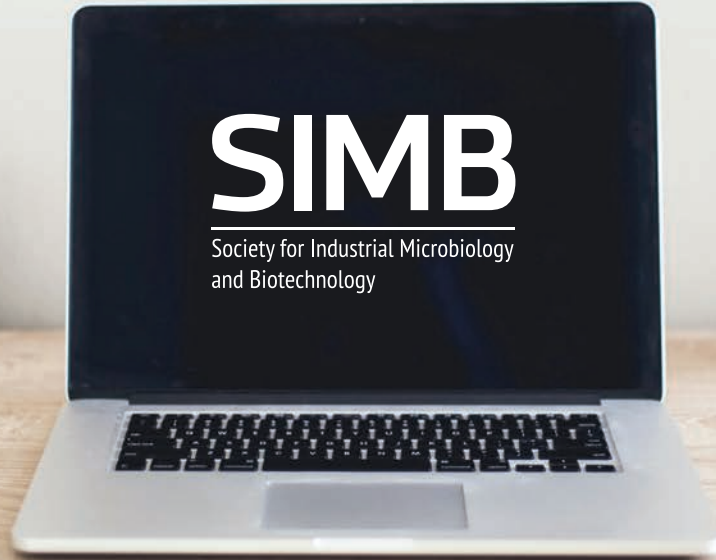
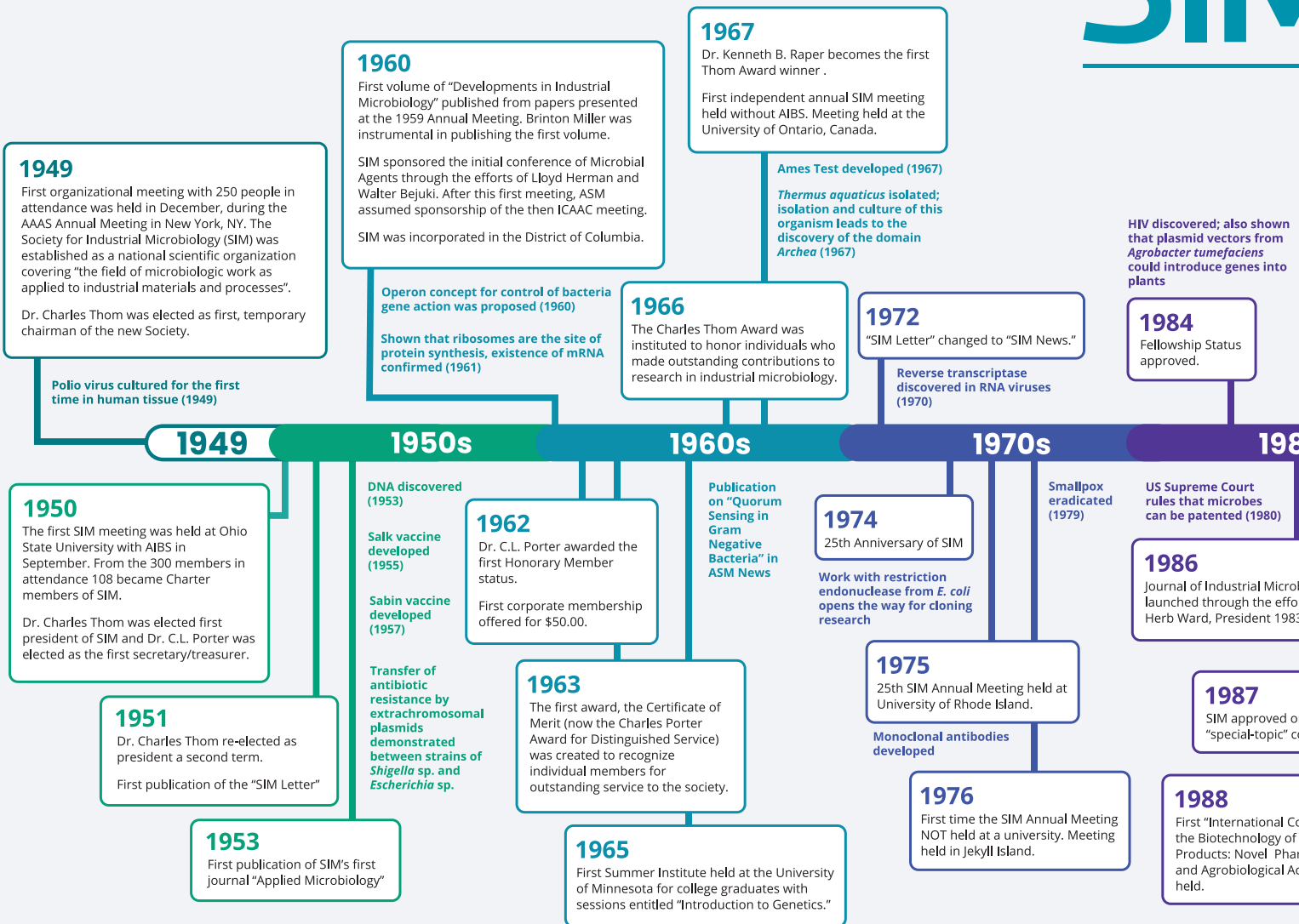


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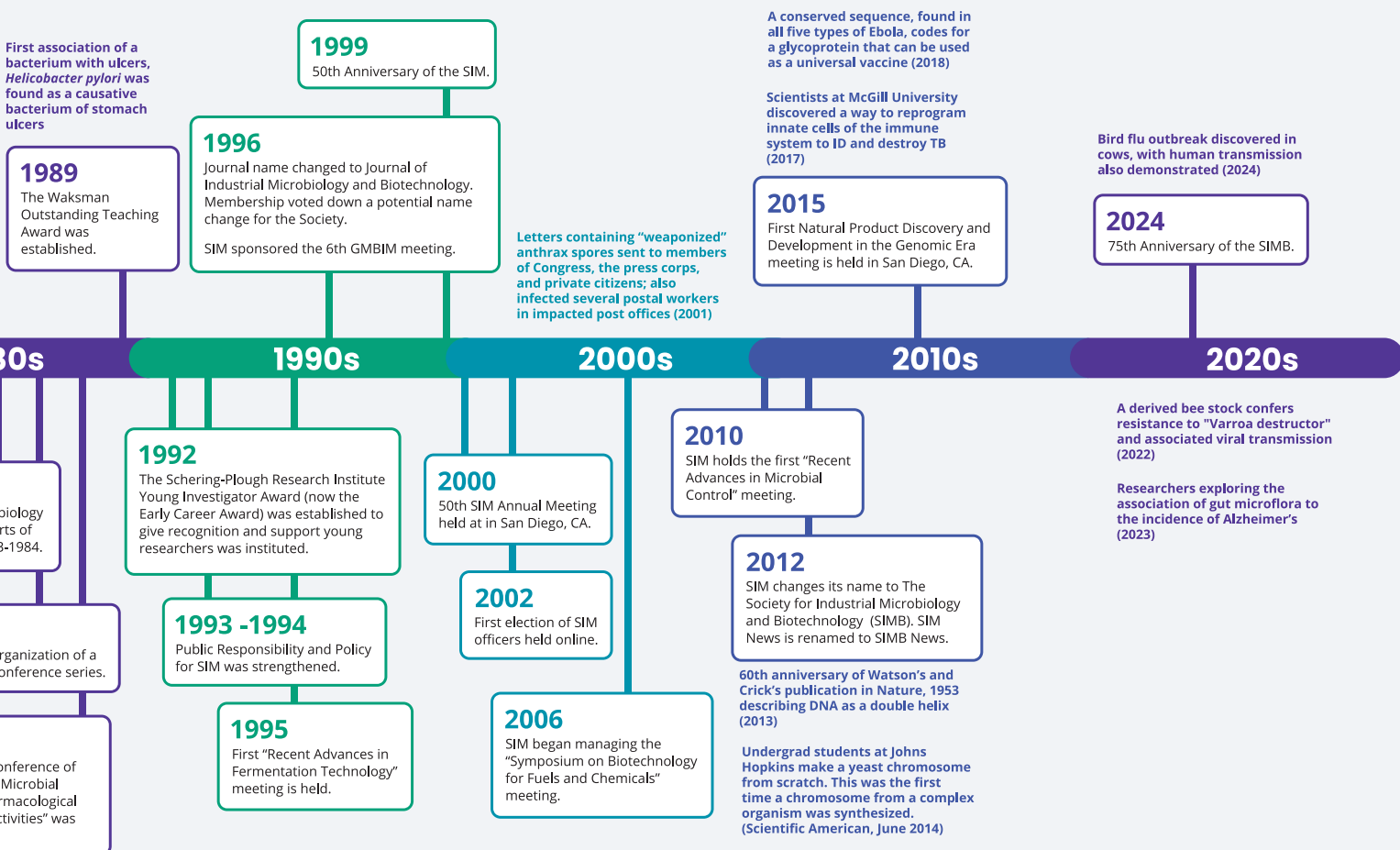
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History of the Society for Industrial Microbiology & Biotechnology (SIMB)

The 75th anniversary of SIMB will be celebrated at the 75th SIMB Annual Meeting in San Francisco, California on 27-29, 2025. Following is a historical overview of how the Society was established and made into a very successful professional society today. The authors are SIMB members: Kristien Mortelmans, Elisabeth Elder and Erick Vandamme.

Introduction

The American Institute of Biological Sciences (AIBS) played a key role in the establishment of the Society for Industrial Microbiology (SIM) in 1949 when it served as the initial affiliation for the newly formed society. This allowed SIM to be founded in connection with AIBS and hold its first annual meeting alongside an AIBS conference in 1950. It essentially provided a platform for the society to launch and gain recognition within the broader biological sciences community. In 2011, the name of the Society of Industrial Microbiology (SIM) was changed to Society of Industrial Microbiology and Biotechnology (SIMB), which will be explored in the coming sections. At the end of 2024, SIMB had 837 individual members of which 115 were members from non-US countries, totaling about 14%, and 25 corporate members.

Early History of SIM

A very important overview on the early history of SIM was written by Leland A. Underkofler, President of SIM in 1967-1968 and appeared in the *SIM News* magazine, 39 (3), 1989. The full transcript of the publication follows.

A Brief History of the Society for Industrial Microbiology

The organization of the Society for Industrial Microbiology (SIM) in 1949, and the very early history of the Society has been reviewed several times (Porter, 1960; Ezekiel 1967, Yeager 1974, Rogers 1975). Since these references are not easily available to most present-day individuals it is worthwhile to again outline the early history of our Society. Then can be added a few selected important events which have occurred during the past few years.

Shortly after World War II, workers of varying scientific backgrounds who were involved in various aspects of applied microbiology became unhappy because there was no place where they could present their views and their research papers. Dr. Walter Ezekiel, Bureau of Ordnance, Department of the Navy, Washington, DC, during the summer and autumn of 1949 wrote to a number of individuals suggesting formation of a new Society for Industrial Microbiology, and arranged with Dr. Raymond L. Tayler, Associate Administrative Secretary of the American Association for the Advancement of Science (AAAS) to schedule and advertise a meeting of interested persons on December 29, 1949, during the AAS meeting in New York. On this date over 20 interested persons met in the ballroom of the Hotel McAlpin in New York City. There it was decided to form a new society to affiliate with the newly formed American Institute of Biological Sciences (AIBS), with Dr. Charles Thom, Northern Regional Research Laboratory, Peoria, IL, as Acting Chairman.

Dr. Thom appointed an organization committee which prepared a program and wrote a constitution for the new society in preparation for the first annual meeting held with AIBS at Ohio State University, September 1950. Here Dr. Thom was elected the first President, and Dr. Charles Porter, Purdue, West

Lafayette, IN, the Secretary Treasurer. In 1951 the new SIM met with AIBS at the University in Minnesota, and Dr. Thom was elected President for a second term. In 1952 the meeting was at Cornell University, and in 1953 at the University of Wisconsin. Here, in addition to the scientific sessions, was instituted the first social hour which has become a fixture at all subsequent annual meetings.

For many years the annual SIM meetings were held along with AIBS on university campuses; in 1954 at Gainesville, FL, in 1955 at East Lansing, MI, in 1957 at Stanford University, in 1958 at University of Indiana, in 1959 at Pennsylvania State College. At this meeting for the first time all SIM'ers stayed together, at the Beta House. For the years 1960 through 1966 SIM members always stayed in either a university fraternity or sorority house at Oklahoma State, Purdue, Oregon State, University of Massachusetts, University of Colorado, University of Illinois and University of Maryland.

At the 1959 meeting, following enthusiastic and persuasive effort of Lloyd Hermann and Walter Bejuki, it was decided to sponsor the initial Conference on Microbial Agents, which was a mammoth undertaking. It was a one-time event for SIM, with ASM taking it over the following year.

Through the efforts of Dr. Brinton Miller (President, 1963-64), the first volume of *Developments in Industrial Microbiology* was published in 1960. This peer-reviewed publication each year contained the papers from the annual SIM meetings. Twenty-six years later, in 1986, the first issue of the new *SIM Journal of Industrial Microbiology* made its appearance, resulting from the creative foresight of Dr. C. Herb Ward (President, 1983-84).

In 1967 SIM held its first independent annual meeting, not in connection with AIBS, at the University of Western Ontario. Subsequent separate meetings were held in 1970 at the University of Rhode Island, in 1973 at Northwestern University, and in 1974 (silver anniversary of the society) in Memphis State University. This first independent meeting not held at a university was in 1983 at the Hyatt House

in Sarasota, FL. After meeting at Colorado State the next year, all subsequent SIM annual meetings have been at independent locations, the last one in 1987 at the Hyatt Regency, Baltimore, MD.

In 1987, reaffirming its commitment to the service of microbial biotechnologists, the Society approved the organization of a special-topic Conference Series, initiated by Dr. George A. Somkuti (President, 1985-86). The first event in the series was the International Conference on the Biotechnology of Microbial Products: Novel Pharmacological and Aerobiological Activities, held March 13-16, in San Diego, California. This was followed by the Comprehensive Conference on *Listeria monocytogenes*, held October 2-5, 1988, in Rohnert Park, CA. bringing together experts in microbiological food safety.

The Porter Award for Distinguished Service to the Society was established in 1963, and the Charles Thom Award, the highest honor of the Society was instituted in 1966. The first recipient of the Thom Award was Dr. Kenneth R. Raper at the 1967 meeting.

In 1984 Fellowship status for specially distinguished SIM members was approved. In 1985 nine individuals were elected as the first SIM fellows, all of them being previous Thom Award winners. A Porter awardee and past president became the tenth Fellow in 1986.

Truly our Society has matured well during the past 39 years. The SIM membership at the present includes over 2,000 individual members plus 106 corporate members. But the Society continues to be a closely knit and friendly group, with the annual meetings still down-to-earth, first-name-bases, events. A distinguished and important future for SIM seems inevitable.

Literature Cited:

Ezekiel, W.N., 1967. Genesis of the Society for Industrial Microbiology. *Dev. Ind. Microbiol.* 8:431-433.

Porter, C. L. 1960. Presidential Address: The past and future of the Society for Industrial Microbiology. *Dev. Ind. Microbiol.* 1:261-267.

Rogers, M.R. 1975. A reflection of the history of the Society for Industrial Microbiology. *ASM News*, 41, No. 8:642-647.

Yeager, C.C. 1974. Tales of SIM-In retrospect. *SIM News*. 24:12-13, 21.

According to Underkofler's above publication, 1989 SIM had become a functional and professional Society that would serve the need of individuals interested in the field of industrial microbiology and other areas related to microbiology.

Name Change of the Society

The SIM Board of Directors had been considering for a while in the years 2009 to 2011 a name change for SIM that would include biotechnology. The name change would now cover research and the use of recombinant microbial strains in an industrial microbiology setting. That would include the name change of SIM to SIMB and *SIM News* to *SIMB News*. The first issue of the *Journal of Industrial Microbiology (JIM)* was published in 1986 and the name *JIM* was changed to *JIMB* in 1996.

It was announced in the first issue of *SIM News* in 2011 that the 62nd SIM Annual Meeting would take place August 12-16. The name change of SIM to the Society of Industrial Microbiology and Biotechnology (SIMB) was announced in *SIM News*, 2011, 61 (3) p.69. The printed issue of *SIM News*, 2011, 61(5) was still named *SIM News*, but the next issue is *SIMB News*, 2011, 61 (6).

History of the Office and Headquarter Staff

The Headquarters of SIMB are located at 3929 Blenheim Boulevard, Suite 92A and 92B, in Fairfax, Virginia 22030, an office space that was purchased in 1994 as part of a Board of Directors initiative. The office and staff play a very important role in ensuring that the SIMB is able to provide programs and services that advance SIMB's mission. The staff works to promote the ability of SIMB members and their community the exchange of scientific information through the Society's meetings and publications. SIMB staff also work to keep members up to date on what is

going on in the Society and industry. The office also serves as liaison among the specialized fields of microbiology and biotechnology, as well as encouraging partnerships and connections with other like-minded societies. Membership in the Society is extended to all scientists and companies in the general field of microbiology and biotechnology. The office staff is generally made up of individuals who work to lead the organization's operations, deliver member services, coordinate meetings and conferences, manage websites and communications, and practice accounting and bookkeeping of the Society's resources.

Ann Kulback, the first Executive Director of SIM, who was working at AIBS when SIM was initially founded, played a very important role in the establishment of SIM. This was acknowledged in a quote by R.P. Elander, President of SIM 1973-1974, published in *SIM News*, Volume 49, No. 4, in 1999. As we all know, Ann is perhaps our most important SIM member, and I often think of where SIM would be today without the services of our most capable Executive Secretary". Ann served for 28 years as Executive Director of SIM from 1974 through 2002. Prior to renting and then purchasing office space, the first office work for SIM was carried out in her basement.

The following Executive Director of the Society was Demetra Pavlidis from 2002 to 2005, who brought about the successful transition from the first and long-term staff executive for SIMB along with early adoption of online tools for SIMB's membership. Christine Lowe took the helm next between 2005 and 2021, bringing about the next era for SIMB including the management of SBFC, the name change from SIM to SIMB, and steering the organization through the COVID-19 pandemic. The current Executive Director is Haley Cox whose service began in 2022 focusing on office technology upgrades, championing SIMB's 2024-2027 Strategic Plan, and celebrating SIMB's 75th anniversary.

The current staff members who work tirelessly to advance SIMB's mission are Jennifer Johnson, Director of Member Services who has worked for SIMB since 2008, Suzannah Citrenbaum, Visual Design and Web Manager who has served SIMB since 2004, Tina Hockaday, Meeting and Exhibits Coordinator who has been with SIMB since 2018, and Almirante Trapal, Accountant who joined the team in 2021.

Make-up of the Board of Directors

The Board of Directors play an important role in overseeing the Society with three main responsibilities: making sure the Society's Constitution is followed, providing oversight to ensure the resources of the Society are appropriately and legally managed, and setting the strategic direction of the organization. According to the Constitution, the Board of Directors shall consist of the President, the Immediate Past President, President-Elect, Secretary, Treasurer and four (4) additional Directors elected by the membership of the Society. Elections determine the make-up of the Board of Directors. Each year the election will determine the next President-Elect, who will serve that position for one year, then as President, and finally as Past President. The Secretary and Treasurer will at first serve for three years, a position that can be prolonged once making it possible for the Secretary and Treasurer to serve in these positions for a total of six years respectively. Directors will serve once for three years. Individuals running for any of the above positions need to be approved by the full Board of Directors.

Establishment of Committees

SIMB members are encouraged to be active in Society business. One possible activity is to volunteer for a committee. Most are classified as Standing Committees with some variations in their composition depending on the complexity of the duties. Chairs are nominated by the President and approved by the Board of Directors (BOD) for three-year terms. The Chairs recruit, and the President will appoint, at least two additional members. For some committees, members must be approved by the BOD. Chairs and committee members may be reappointed. The committees and the Business Office staff will frequently interact to develop the goals of the Society which are carried out by the BOD. Each committee must submit a yearly budget for review by the Finance Committee and approval by the BOD.

This is a quick review of the committee's responsibilities.

- » Annual Meetings Program: developing and arranging the scientific program of the Annual Meeting, other duties assigned by the President
- » Archives: updating the history section of the website and maintaining historical files

- » Audit: reviewing and overseeing financial records, internal control systems, antifraud programs, and procedures for anonymous submissions of information regarding improper financial practices
- » Awards and Honors: selecting award winners from nominations and making recommendations to the BOD for establishment and administration of awards and honors
- » Corporate Affairs: recruit institutions and corporations as corporate members, solicit meeting sponsorship and be responsible for exhibits
- » Diversity, Equity, and Inclusion: promote participation of women and underrepresented minorities in all areas of the Society, be involved in career development and leadership opportunities
- » Education and Outreach: promote continuing education of members and nonmembers in applied microbiology, hold educational workshops, provide career pathway information, and outreach to other societies for shared educational opportunities
- » Election: count valid ballots and confirm the results with the Secretary for notifications
- » Ethics: promote appropriate ethical behavior and practices within Society and Society-sponsored meetings and events, including serving as the procedural body for any complaint issued against the SIMB Code of Conduct
- » Finance: work with the Business Office to prepare an operating budget for the ensuing year and present it to the BOD for approval, along with quarterly tracking reports
- » Investment Advisory: provide investment advice to the BOD and the Treasurer
- » Membership – Individual: recruit regular and student members, assist or advise start-up or operation of Local Sections
- » Nominations: select, for BOD approval and submission to Society members, a slate of officers for the following year, send the ballot to the Business Office for dispersal to members
- » Publications: oversee and integrate all publishing activities of the Society including the *Journal of Industrial Microbiology and Biotechnology (JIMB)* and *SIMB News*
- » Special Conferences: develop and arrange the scientific program of all special conferences
- » Ad Hoc Presidential Committees are appointed by the current President for a one-year term but may be reappointed by the next President. Each Ad Hoc Committee must make at least one report to the Board of Directors through the current President.

For more information, go to the SIMB website (simbhq.org) and click on the About SIMB then the Bylaws. A list of the committees and the people involved is printed in each issue of *SIMB News*. For any interest in joining a committee, members are encouraged to reach out to any of the following: the specific committee chair, the President, or the office (info@simbhq.org).

SIM[B] Annual Meetings

Since the early history mentioned previously in this article, SIMB's Annual Meetings have become more than a scientific gathering but also a social gathering. Since 1985, all Annual Meetings have been held in well-known hotels in major cities all over the United States as well as a few taking place in Canada. Annual Meetings typically have 500-600 people who attend. The SIMB Headquarters have provided a lot of opportunities for socializing during coffee breaks and lunch during which time there is the opportunity to view the posters and visit the exhibits by Corporate Members and industry representatives. There is also the SIMB banquet during which time the SIMB President issues awards to SIMB members such as Fellowship Award, Charles Porter Award, Charles Thom Award, Diversity Award, Early Career Award and Waksman Outstanding Teaching Award in addition to various student awards. In addition to these activities, there is also the early morning 5K Run Walk and the lunch provided for

the SIMB members that have been SIMB members for at least 25 years. During coffee and lunch breaks there is a chance to visit the Placement exhibit that posts possible jobs.

SIMB Special Meetings/Conferences

In addition to the Annual Meeting and Exhibition which is held every year, SIMB is very pleased to offer a selection of special meetings and conferences. Since the content of these meetings changes with each offering, this article will provide a short review of the most recent offering or the ones that will occur soon. One purpose is to show the pride of the Society in what we have done and where we are heading. Another is to thank the members who have been so supportive of the Society in developing these meetings.

The 47th Symposium on Biomaterials, Fuels and Chemicals (SBFC) will be held May 4–7, 2025, in Milwaukee, WI. Ben Woolston (Northeastern University) will chair the meeting with Rebecca Ong (Michigan Technical University) as the program co-chair and Kevin Solomon (University of Delaware) as the past program chair. The topics of the conference will include:

- » Biofuels, Bioproducts and Synthetic Biology
- » Alternative Feedstocks and Biosynthetic Materials
- » Engineering and Deconstruction of Biomass
- » Celebrating the Midwest Bioeconomy (Special Session)

The first SBFC was hosted by Oak Ridge National Laboratory (ORNL) in 1978. This was the first technical meeting with biotechnology-mediated conversion of renewable feedstocks, particularly lignocellulosic plant biomass, to fuels and chemicals as the exclusive focus. Increasing attendance resulted in co-sponsorship by the predecessor of the National Renewable Energy Lab (NREL). The dual sponsorship resulted in meetings being held in alternating locations – Tennessee and Colorado. In 2008, at the request of NREL and ORNL, SIMB took over the logistics for the conference. Consistent characteristics of the conference include:

- » The focus on the latest technology in biotechnology for fuels and chemicals
- » The same broad topic areas including feedstocks, pretreatment/fractionation, bioprocessing integration, process techno-economics/commercialization/sustainability
- » A split between oral and poster presentations

Changes in the conference include:

- » Expansion of feedstock coverage beyond dedicated energy crops and agricultural /forestry residues to include non-lignocelluloses such as algae and carbon oxides
- » Extension of the conference from Sunday through Wednesday



- » The banquet on Wednesday night where awards are presented
- » A highlight of this meeting is the presentation of the Bioeconomy Leadership Award, the Charles D. Scott Award, the Raphael Katzen Award, the SBFC Diversity Award, and student presentation awards. Approximately 300 people attend SBFC.

The International Conference on Natural Product Discovery and Development in the Genomic Era (NP) was held January 5–9, 2025, in San Diego, CA. This meeting was chaired by Yi Tang (SIMB, UCLA); co-chaired by Bradley Moore (SIMB, UC San Diego), Jaclyn Winter (SIMB, University of Utah) and Alessandra Eustaquio (SIMB, University of Chicago). The meeting was held in conjunction with the Korean Society for Microbiology and Biotechnology (KMB) represented by Yeo Joon Yoon (Seoul National University) and Byung Kwon Cho (Korean Advanced Institute of Science and Technology) plus the Society for Actinomycetes Japan (SAJ) Programming Committee represented by Kenji Ueda (Nihon University). The fifth meeting served as a venue for the dissemination of cutting-edge research on natural product biosynthesis and discovery. To document the current advances in natural products discovery and development, the *Journal of Industrial Microbiology and Biotechnology (JIMB)* will publish a Special Issue devoted to the presentations at this meeting in 2025. NP attendance is generally close to 300 people.

This conference can be traced to the Genetics and Molecular Biology on Industrial Microbiology (GMBIM)

and Biotechnology of Microbial Products (BMP) meetings. The first GMBIM was sponsored by the American Society for Microbiology (ASM) in Orlando, FL, in 1976. The ASM sponsorship continued from 1980 through 1992. SIM(B) sponsored the meetings from 1996 and 2000. The first BMP meeting was held in 1988. At this point GMBIM and BMP held a combined meeting in 2004. SIMB also held NP meetings in 2015, 2018, 2020, and 2023. It is a pleasure to have KMB and SAJ involved in the 2025 meeting. The award presented at this meeting is the NP Diversity Award and student presentation awards.

Connecting Microbiome Communities (CMiC) was held November 3–6, 2024, in San Diego, CA. The purpose of the conference was to bring people studying microbiomes in industry, academia, and government labs plus bioinformaticians, policymakers, advocacy leaders, and regulators together to explore common challenges, create shared solutions, and establish new collaborations. The meeting was chaired by Elisha M. Wood-Charlson of Lawrence Berkely National Laboratory and co-chaired by Nigel Mouncey of the DOE Joint Genome Institute. The topics covered included:

- » Biodiversity and Ecology
- » Bioinformatics and Machine Learning
- » Engineering Microbiomes for Human and Ecosystem Health
- » Microbiomes and the Bioeconomy



» Microbiome Policy, Advocacy, and Regulation

Approximately 100 people attended the initial meeting. A highlight of this meeting was the presentation of the CMiC Diversity Award and student presentation awards. This was a new conference for SIMB and a way to introduce microbiome professionals into the fitting folds of SIMB.

Recent Advances in Fermentation Technology (RAFT®)
The 2025 RAFT® conference will be held November 9–12, 2025, in Myrtle Beach, SC. If/when a general search is done to locate a conference on fermentation technology, the conference that pops up is RAFT®. RAFT® provides a unique forum of oral and poster scientific sessions of interest to fermentation professional from multi-national organizations, biotech companies currently being developed, and academics. It also provides opportunities for interactions including poster sessions, exhibits, vendor showcases, receptions, lunches, coffee breaks, and a banquet. RAFT® will continue the tradition of being in a beautiful beach location. RAFT® is a predictable meeting – in spite of the hurricane potential, the attendees seem to be drawn the Florida beaches with the initial meeting having been in 2004. The only meeting missed in the sequence was 2021 due to COVID, which was rescheduled for 2023. Otherwise, this meeting is held on a biannual basis. A highlight of this meeting is the presentation of the David Perlman Award and the RAFT® Diversity Award. Approximately 300 people attend RAFT®.

The 2025 chairs are Daniel Dong and Gisela Nadal Rey with Kat Allikian as the Past Chair. At the time this article was written, the organizers were finalizing the program for the upcoming conference. Stay tuned for all the details. It will definitely live up to its reputation. Yes, you are being enticed to attend!

Interaction of SIMB with Professional Societies in Europe

Erick Vandamme, Emeritus Professor at the University of Ghent in Belgium, played a major role in establishing the interaction of SIMB with professional Societies in Belgium and Europe. It started in 2015-2016 when the SIMB Outreach Committee with Suzanne Kleff as Chair was installed to activate collaboration with other national/international “applied and industrial microbiology” societies. Erick was elected SIMB Director in 2010 to 2013

and was the only non-USA SIMB member of the Outreach Committee. He tried to convince – largely in vain - the larger European professional societies to negotiate potential cooperation. Strong well flourishing national “applied microbiology societies” preferred to organize meetings as per/in their country. In the end SIMB’s Outreach Committee succeeded only with the Ghent-based series of conferences on Renewable Resources and Biorefineries (RRB). In 2018 one of SIMB’s Directors, Thomas Klasson, was present as an observer and lectured at RRB 2014 held in Ghent, Belgium. Also Jonathan Mielenz, an SIMB member, attended and lectured at several RRB editions. In 2018 this link was realized in having SIMB Outreach Committee representative Michael Resch as speaker at the 15th edition of RRB held in Toulouse, France. The corona-virus pandemic prevented this exchange to realize in 2020. In 2021 the 17th RRB meeting was held in Aveiro, Portugal, where Nigel Mouncey lectured -on line - as SIMB speaker, and in 2022 as well at the 18th RRB meeting held in Bruges, Belgium. In the 2023 and 2024 RRB editions, held respectively in Riga, Latvia (19th edition) and in Brussels, Belgium (20th edition) where Nigel Mouncey represented SIMB and lectured and chaired sessions. He is again lecturing and chairing sessions at the upcoming 21st RRB edition, which will be held in Turku, Finland, 2-4 June 2025, indicating a desired interaction and strong link between SIMB, Symposium on Biomaterials, Fuels and Chemicals (SBFC) and RRB activities in Europe. RRB conferences attract yearly about 270 to 300 people, mainly from all over Europe.

Special Acknowledgment

It is important to acknowledge the service of Haley Cox, the current SIMB Executive Director, and SIMB member Debbie Chadick. Haley provided important feedback on the write-up of the History of SIMB that includes the present make-up of the staff and function of the SIMB Headquarters. Debbie has been SIMB’s Archivist for 6 years and has agreed for another 6 year term so she can archive documents related to the upcoming 75th anniversary of SIMB.



75th SIMB Annual Meeting and Exhibition

Hyatt Regency San Francisco
San Francisco, CA

July 27–30, 2025
www.simbhq.org/annual

Important Dates

Registration: Online registration deadline July 11, 2025

Exhibits and sponsorships: Still spots available! Deadline for inclusion in printed materials is June 30, 2025

<https://www.simbhq.org/annual/exhibitsponsor/>

Housing: Deadline July 7, 2025, Rate of \$224 plus taxes per night

Premeeting Workshop

Sunday, July 27, 2025

Fermentation Basics Workshop

Organized by Tim Cooper and Chris Stowers

Awardees Announced!

The Society is delighted to announce the awardees and honorees who will be recognized at the 75th SIMB Annual Meeting. These exceptional members of the SIMB

community have made outstanding contributions to the industry and Society and demonstrated great promise in their work and careers.

For full details, go to: <https://www.simbhq.org/annual/awards/>

- » Charles Porter Awardee: Ramaraj “Raj” Boopathy, Nicholls State University
- » Charles Thom Awardee and Lecturer: Wilfred Chen, University of Delaware
- » Early Career Awardee: Benjamin “Ben” Woolston, Northeastern University
- » SIMB Fellowship Status:
 - » Tim Cooper, Brazen Snake Bio
 - » Laura Jarboe, Iowa State University
 - » Alexander “Alex” Beliaev, Pacific Northwest National Laboratory
- » Waksman Outstanding Teaching Award: Tochukwu Nwamaka Nwagu, University of Nigeria
- » Student Diversity Travel Awardee: Darcy Hunstiger, Colorado State University

Celebrate these awardees during the Tuesday evening activities on July 29 including the Thom Lecture and Banquet and Award Ceremony.

Chair and Keynote

2025 Program Chair:

José Avalos, Princeton University

Keynote Speaker

Douglas Cameron, Foundation for Food & Agriculture Research

2025 Program

Full online program now available!

Biocatalysis Sessions:

Cell-free and orthogonal biocatalysis

Depolymerization and valorization of alternative feedstocks

Enzyme engineering: Strategies and applications

Biocatalysis at scale

Frontiers of chemistry

Cell Culture & Fermentation Sessions:

Challenges and successes in scale-up and scale-down of fermentation and downstream processing

Advancements in process development for biopharmaceuticals

Applications of data analytics to accelerate fermentation and cell culture

Advances and challenges in live microbes as products

Environmental Sessions:

Genetically modified microbes in complex environmental and human microbiomes

Sustainable biological production of inorganic materials

Microbial nutrient cycling in agriculture and anthropogenic waste processing

Metabolic Engineering Sessions:

Synthetic biology in metabolic engineering

Valorizing non-carbohydrate feedstocks

Computational and systems biology approaches

Biosynthesis I (commodity chemicals & biomaterials)
Sponsored by Braskem

Biosynthesis II (specialty chemical and food ingredients)

Natural Products Sessions:

Synthetic and systems biology of natural products
Sponsored by Syngens

Enzymology in natural product biosynthesis

Modern natural product discovery

Mode of action of natural products - (New modes of natural product bioactivity)

Informatics and data science for natural products research

Special Sessions:

Biomanufacturing of alternative proteins for future food security - Session A

Biomanufacturing of alternative proteins for future food security - Session B

Sponsored by GEA Systems North America LLC

Marine Bioresources

Student Oral Session and Science Slam

SIMB 75th Celebration Panel (during Banquet)

Exhibit Prospectus & Other ways to engage with the Annual Meeting

Exhibit booths are available to be booked: <https://www.simbhq.org/annual/exhibitsponsor/>

Sponsorship and online or print advertisement opportunities to increase visibility and awareness of your organization or product

<https://www.simbhq.org/annual/exhibitsponsor/sponsorship/>

Note the special opportunities for the SIMB 75th Anniversary that extend beyond the conference!

<https://www.simbhq.org/annual/exhibitsponsor/advertising/>



RAFT[®] 16 – Recent Advances in Fermentation Technology

Marriott Myrtle Beach Resort & Spa
Myrtle Beach, SC

November 9–12, 2025
www.simbhq.org/raft

Important Dates

Awards: Nomination deadline is July 9, 2025

Registration: Now open! Early registration deadline July 14, 2025

Abstract Submissions: Deadline August 26, 2025

Exhibits and sponsorships: Now open! Deadline for inclusion in program is September 29, 2025

<https://www.simbhq.org/raft/exhibitsponsor/>

Housing: Deadline October 17, Rate of \$199 plus taxes per night

Premeeting Workshop

Saturday, November 8, 2025

Advanced Fermentation Workshop

Organized by Tim Cooper and Chris Stowers

Chairs and Keynote

2025 Program Chairs:

Daniel Dong, DSM-Firmenich (Chair)
Gisela Nadal Rey, Novonesis (Co-Chair)

Keynote Speaker

Mark Warner, Co-Founder and CEO at Liberation Labs

2025 Program

The program is open for submissions for poster, contributed oral, or invited oral presentations. The deadline for contributed submission is August 25, 2025. The current draft of the program's sessions can be seen below.

Session: Engineering strains for high performance in industrial fermenters

Conveners

Hayley Speirs – Cargill
Stefan de Kok – Genomatica

Session: Successes and failures of scaling up and scaling down non-model systems

Conveners

Alex McVey – Ogibiotec (OGI Bio Ltd)
Alison Arnold – Ingenza Ltd
Chris Stowers – Kerry

Session: Navigating the challenges of upstream and downstream integration in biomanufacturing

Conveners

Sarita Chauhan – GEA
Brad Cox – Corteva

Session: Digitalization of biomanufacturing and PAT

Conveners

Tim Davies – Corteva
Stuart M. Stocks – Novonesis

Session: Fermentation modeling for process understanding and novel process control development

Conveners

Keith Smith – Applied Materials
Zhiguo Liu – Merck

Session: Novel fermentation concepts and operation modes

Conveners

Mickel Jansen – dsm-firmenich
Benny Cassells – Novonesis

Special session: Production of heterologous proteins (jointly organized with DECHEMA)

Conveners

Michael Resch – National Renewable Energy Laboratory
Ralf Takors – University of Stuttgart

Poster Sessions

Conveners

Ed Talideh – Lallemand Bio-Ingredients
Heather Jones

Awards

Honors and Awards Open for Applications/Nominations

Open Now – All deadlines July 9, 2025. For full details, go to:

<https://www.simbhq.org/raft/awards/>

David Perlman Award and Lecture: This award recognizes individuals who have made outstanding contributions to the area of Industrial Fermentation, Process Development and/or Manufacturing.

Student Diversity Travel Award: Apply for yourself for the chance to be recognized!

Exhibit Prospectus & Other ways to engage with the Annual Meeting

Exhibit booths are available to be booked:

<https://www.simbhq.org/raft/exhibitsponsor>

Sponsorship and online or print advertisement opportunities to increase visibility and awareness of your organization or product

<https://www.simbhq.org/raft/exhibitsponsor/sponsorship/>

<https://www.simbhq.org/raft/exhibitsponsor/advertising-information/>



by Elisabeth Elder

Technical Report on Mirror Bacteria: Feasibility and Risks

This report covers the feasibility of creating mirror bacteria along with possible serious and wide-ranging risks to humans, other animals, plants and environments plus possible countermeasures. The report relies on expertise in synthetic biology, immunology, and ecology as the first comprehensive assessment of the risks from mirror bacteria. It starts with a general introduction then moves on to examining the initial creation of mirror bacteria along with biosecurity and biosafety implications. The last 5 chapters cover the risks of the organisms and potential ecological consequences. This work was licensed, and is being presented in *SIMB News*, under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License (CC BY-NC-SA 4.0). This report accompanied “Confronting risks of mirror life” published in the Policy Forum in *Science* 386: 1351-1353. The authors involved in the report and the policy forum included:

- » Katarzyna P. Adamala, University of Minnesota
- » Deepa Agashe, National Centre for Biological Sciences, Bengaluru
- » Damon J. Binder, Open Philanthropy
- » Yizhi Cai, University of Manchester
- » Vaughn S. Cooper, University of Pittsburgh
- » Ryan K. Duncombe, Mirror Biology Dialogues Fund
- » Kevin M. Esvelt, Massachusetts Institute of Technology
- » John I. Glass, J. Craig Venter Institute
- » Timothy W. Hand, University of Pittsburgh
- » Thomas V. Inglesby, Johns Hopkins Center for Health Security
- » Farren J. Isaacs, Yale University

- » Jonathan D. G. Jones, Sainsbury Laboratory, University of East Anglia
- » Richard E. Lenski, Michigan State University
- » Gregory Lewis, Massachusetts Institute of Technology
- » Ruslan Medzhitov, Yale University
- » Matthew L. Nicotra, Johns Hopkins Center for Health Security
- » Sebastian B. Oehm, University of Cambridge
- » Jaspreet Pan nu, Johns Hopkins Center for Health Security and Stanford University
- » David A. Relman, Stanford University
- » Hiroaki Suga, University of Tokyo
- » Johanna M. Sweere, Mirror Biology Dialogues Fund
- » Jack W. Szostak, University of Chicago
- » Nicholas J. Talbot, Sainsbury Laboratory, University of East Anglia
- » Brian Wang, Panoplia Laboratories

The authors may be contacted via technical-report@mbdialogues.org.

The following is a summary of the nearly 300 page technical report. Many of the key molecules common to all living organisms are chiral: their mirror images cannot be superimposed upon one another. In nature, nearly all amino acids and sugars are predominantly present as only one of their two possible mirror-image forms. Synthetic mirror polypeptides and nucleic acids fold into perfect mirror images of their natural counterparts and interact identically with the mirror images of their natural substrates. The same principle applies to other biological structures. Scaling this logic, a mirror cell in which all molecules were replaced with their mirror-images would function identically to a natural-chirality cell, but with everything precisely mirrored.

Scientists have long considered the possibility of creating mirror cells, including mirror bacteria. In isolation, they would behave identically to natural-chirality bacteria-mirror bacteria and would grow under the same physical conditions, and would grow at the same rates on achiral nutrients. But because natural life is chiral, interactions between natural organisms and mirror bacteria would be profoundly altered. This report describes the technical feasibility of creating mirror bacteria, and the potentially serious risks that mirror life could pose to humans, other animals, plants, and the environment.

Robust mirror bacteria could be developed in the coming years and would be vulnerable to accidental or deliberate misuse. It is not yet possible to create a living cell from non-living precursors. Despite major technical challenges, it appears plausible that this feat could be achieved within as little as a decade given sufficient resources. Once methods of creating natural-chirality cells have been established, a similar approach could be used to create mirror cells from mirror components. A small group of researchers and funders have begun to explicitly work toward the creation of mirror life, with a focus on a “bottom-up” approach, in which a mirror genome as well as transcription and translation machinery are used to build other mirror cellular-components. Modern methods for protein synthesis are in principle sufficient to synthesize most of the mirror proteins that would be needed to construct a mirror cell, though currently at prohibitive costs. Mirror-image enzymes have recently been used to construct kilobase-length mirror RNA and DNA, and research is progressing toward building a mirror ribosome.

Other pathways to mirror bacteria appear possible. For example, a “top-down” approach, in which a natural-chirality bacterium is stepwise converted into a mirror bacterium, may become technically feasible as translational engineering advances.

The first mirror bacterium would likely be a fragile microbe exhibiting metabolic defects, which would limit its growth and durability outside the laboratory. Once created, however, mirror bacteria could be readily engineered to become more robust by using standard techniques to deliver mirror versions of existing bacterial genes. This could confer new capabilities or even transform them into mirrored versions of robust existing bacteria. Adding mirrored versions of known metabolic pathways would allow mirror bacteria to utilize natural-chirality glucose and other common sugars.

Biocontainment measures could ensure that mirror bacteria are incapable of survival outside of a lab. However, these measures would be vulnerable to human error or deliberate misuse. Achieving robust biocontainment that could not be removed by a moderately skilled actor with access to mirror DNA does not appear feasible.

Mirror bacteria could evade many aspects of human immunity and potentially cause life-threatening infections. Most immunological mechanisms rely on precise stereospecific interactions between host and pathogen macromolecules. The mirror-image macromolecules of mirror bacteria would likely not properly bind to host receptors, enzymes, or other host effectors, as they would have the “wrong” chirality. This could grant mirror bacteria a degree of intrinsic immune evasion well beyond any known natural pathogen.

The immune system could be compromised in three key ways. First, the innate immune response relies upon initial detection of conserved microbial biomolecules, such as bacterial lipopolysaccharides and peptidoglycans, by host pattern recognition receptors. Because these molecules are almost exclusively chiral, immune recognition of mirror bacteria could be substantially impaired. Second, many innate immune mechanisms of pathogen control could be directly compromised; for example, phagocytosis, antimicrobial enzymes, and several complement system pathways rely on stereospecific protein interactions. Finally, mirror proteins would resist degradation and other stereospecific mechanisms necessary for antigen processing and presentation by innate immune cells, which would impair the activation of adaptive T and B immune cells and antibody production.

Human exposure to intrinsically immune-evasive mirror organisms may lead to infection and possibly death. While mirror bacteria would lack functional virulence factors that facilitate invasion, transient bacteremias caused by environmental bacteria are common, suggesting that exposure to mirror bacteria through inhalation, ingestion, microabrasions, or wounds could result in passive translocation across epithelial barriers.

Once inside, mirror versions of common bacteria such as *Escherichia coli* would be able to grow on achiral nutrients such as glycerol and, with suitable engineering, on glucose and other common chiral nutrients. Impaired immunity would likely permit extensive replication within the bloodstream. The exact clinical presentation of a mirror bacterial infection is unclear, but absent an effective immune response, a lethal outcome appears highly plausible.

Treatment options would be limited. Most antibiotics interact stereospecifically with their microbial targets, so existing stocks would be restricted to a few achiral or racemic antibiotics. As an emerging infectious disease, there would be no pre-existing vaccine. It should be possible to develop novel antimirror compounds and conjugate vaccines; nevertheless, as with a new pandemic, the practical challenges to developing such measures quickly and at scale would be considerable.

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75th SIMB Annual Meeting
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www.simbhq.org/annual

NOV. 9-12, 2025

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Bioprocess Engineering 2025

Bremen, Germany

[https://dechema.de/en/
BioPro25.html](https://dechema.de/en/BioPro25.html)

JUNE 2-4, 2026

ASM Microbe 2026

Washington, DC

<https://www.asm.org>

AUG. 16-21, 2026

20 th International
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[https://isme-microbiology.org/
events/isme20-in-auckland](https://isme-microbiology.org/events/isme20-in-auckland)

OCT. 7-8, 2026

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New York, New York

<https://waset.org>

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