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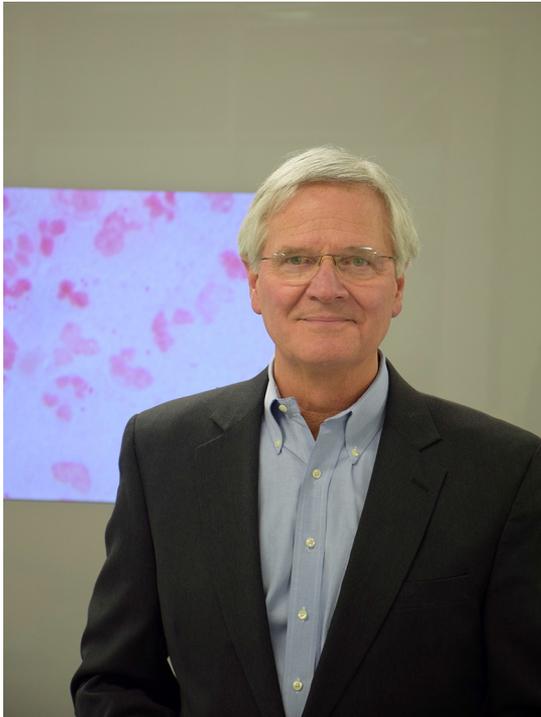
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The previous era was characterized by house staff laboratories in every ward, and house staff and attending physicians often spent long periods performing a diagnostic examination of the expectorated sputum specimen, which had been obtained with great care and plated for prompt incubation in incubators on the ward. Therapeutic decisions were generally based on these results. During the past 30 years, there has been a notable decline in the quality of this exercise. Some of this decline can be ascribed to the Clinical Laboratory Improvement Amendments of 1988, which required that staff have credentials to interpret Gram stains of any specimens, thus essentially eliminating the house staff laboratory. Additional factors in the decline of microbiology were the outsourcing of specimens, which led to delays in processing and poor communication between the microbiologist and the physician.

—John G. Bartlett (1).

The responsibility for interpretation of the Gram-stained smear should not be delegated. Technicians often are highly skilled in the recognition

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of bacteria but may have had little training in the interpretation of background material and cell types as they appear in Gram-stained smears of clinical specimens. Furthermore, the laboratory technician is usually not privy to important clinical facts...which may influence the interpretation of the smear. Therefore, it is our feeling that the Gram-stained smear should be considered part of the physical examination of the patient with an acute bacterial infection and belongs in the repertoire of all physicians delivering primary care in acutely ill patients.

—Harriet Provine and Pierce Gardner (2).

The preceding passages are direct quotations from papers written by clinicians in 2004 (1) and 1974 (reference 2, as quoted in reference 3), which essentially describe a perceived decline in the quality of laboratory microbiology, particularly as it pertains to the direct Gram stain examination. How do the bench-level clinical microbiologist, the doctoral-level medical microbiologist, and the general laboratory professional react to statements such as these, leveled against one of “our” fundamental, rapid diagnostic assays? Egocentric statements bellowed from the thrones of clinicians in a never-ending doctor-versus-laboratory battle? Halcyon days of 1950s infectious diseases (ID) practice? Offense? Humiliation? An affront? A call to arms? Motivation to change/improve our practice? One medical microbiologist who, in the eyes of many of his professional colleagues, has largely assumed the challenge of reversing this trend by championing the clinical value of the direct Gram stain examination is Richard B. (Tom) Thomson, Jr., Ph.D., the recipient of the 2017 Sonnenwirth Award for Leadership in Clinical Microbiology and the subject of this biographical feature.

Tom Thomson was born in 1949. His father, a former World War II flier turned manufacturing engineer, and mother settled in a newly subdivided area of Saginaw, MI. In a recent interview, Thomson spoke highly of his parents, exclaiming that “what is important is having parents that do it right.” Because no one lived near the family at the time, Thomson spent much of his free time with builders and carpenters who were erecting new housing developments in the area (perhaps applying his excellent math and science skills). Thomson considered himself a good student and a good athlete (soccer, baseball, and basketball) and yet “pathologically shy.” As the local public-school system was in its infancy, Thomson’s parents elected to send him to Deerfield Academy in Massachusetts (in the vicinity of a family relative) for grades 10 through 12. Thomson could not recall the exact thought process that resulted in this decision but remarked that the school had phenomenal facilities and that matriculation at this academy was the “best decision ever made from an academic and social position. Deerfield turned me around as far as reading and writing skills.”

Thomson subsequently entered Trinity College (Hartford, CT) and was graduated with a baccalaureate degree in biology in 1971. Thomson remarked that the years of U.S. involvement in the Vietnam War were interesting and difficult times to be a college student. In serendipitous fashion, the years at Trinity College proved to be the transformative years with respect to Thomson becoming a scientist. A chain of events, including applying to medical school, receiving a high draft lottery position making conscription unlikely, and postponing medical school entrance, resulted in Thomson’s moving to Philadelphia, PA, and taking a technician position at William Pepper Laboratories (Hospital of the University of Pennsylvania [HUP]) despite having never completed a microbiology course at the collegiate level. It was there that Harry E. Morton, Sc.D., director of microbiology at HUP and an early American Society for Microbiology (ASM) leader, personally taught Thomson the craft of clinical microbiology. According to Thomson, one of Dr. Morton’s philosophies was “give me smart, motivated people and I can make a microbiologist out of them.” Thomson lauded the carefulness of Dr. Morton’s science and teaching. James A. Poupard, Ph.D., who was the HUP microbiology supervisor at the time, remembered that Thomson’s job application was expedited “due to his biology degree, interest in medicine, and because Dr. Morton was also a

native of Michigan and Tom was our first applicant from that state." Dr. Poupard further remarked that Thomson had "a very flexible personality, was ambitious, and still maintained that Midwestern Michigan openness. He was initially perceived as naive in his younger days at HUP and exposed to big city life." Even at that time, Thomson "was a quick learner, got along well with the other techs, and liked to teach." It was here that he was first asked by Dr. Dick Root, head of infectious diseases at HUP, to accompany the infectious diseases team, with laboratory results in hand, as they made clinical rounds.

As a result of the 3 years spent in the laboratory at HUP, Thomson decided to forego medical school and medicine as a career and enter graduate school to become a medical scientist. Learning that science rather than patient care was his passion was the transformative moment in his career. His first stop was the clinical microbiology master's degree program at Thomas Jefferson University. It was through this program and subsequent association with the Eastern Pennsylvania branch of ASM that Thomson first met Eileen Randall, Ph.D. (4). At the time, the Philadelphia area was a hotbed of microbiology talent (5), particularly in application to infectious diseases, and Thomson took advantage of this landscape to forge relationships with individuals who were influential in his career. Thomson lists as his mentor "an amalgam of people." Thomson described Mr. Elvyn Scott, lead microbiologist at the Wilmington (Delaware) Medical Center, as a kind, gentle, and knowledgeable man "who knew how to get things done. While being a fastidious scientist, he also understood people." Thomson credits the influence of Mr. Scott toward his own laboratory management skills and ability to interact with others.

Thomson completed his master's thesis in 1976 and moved to the Thomas Jefferson University Department of Microbiology/Immunology for doctoral work. His studies were focused in the basic sciences (sophisticated electrophoretic techniques designed to isolate *Aspergillus* sp. antigens for subsequent pathogenesis and diagnostics studies) and essentially represented a means to an end. During graduate school, Thomson "moonlighted" as a clinical microbiologist, as he was employed on weekends as a clinical microbiology laboratory supervisor in Trenton, NJ, and taught courses in clinical microbiology at local academic institutions. During these years, Thomson additionally interacted with William (Bill) Holloway, M.D., an infectious diseases specialist at the Wilmington Medical Center. Thomson recalled that participation in clinical infectious diseases rounds with Dr. Holloway helped germinate the seeds first planted at HUP by Dr. Root, illustrating the value of the direct Gram stain in clinical practice. "I was able to correlate Gram stain with culture result and with what we were seeing bedside." Dr. Holloway also organized a local infectious diseases symposium every spring that would attract national leaders in both infectious diseases and medical microbiology. During those years, Thomson "met nearly every ID expert and microbiology expert in the U.S."

One of the experts Thomson met through these interactions was John A. Washington II, M.D. (6), head of the Mayo Clinic Section of Clinical Microbiology at the time. This budding relationship spurred Thomson to enter an ASM Committee on Postgraduate Educational Programs (CPEP)-approved fellowship program at Mayo Clinic in 1980. Thomson recollected that clinical microbiology at the Mayo Clinic was executed differently from what he was familiar with. "Their focus was developing the best scientific result; their delivery lacked a consultative component." Thomson subsequently infused his developing clinical interactive skills into delivery of microbiology findings. Thomas F. Smith, Ph.D. (7), emeritus chair of the Division of Clinical Microbiology at Mayo Clinic, stated that "Dr. Thomson throughout his career emphasized the role of the clinical microbiologist in interacting with the clinician regarding the implication of laboratory results. He always had a close relationship with clinicians so they could take the proper approach together. That's the way he practiced clinical microbiology—it was really ideal." Dr. Smith also credited Thomson as becoming "a gifted and conversant teacher and having a research perspective in every laboratory during his rotations."

In 1982, Thomson was recruited by Raymond Clarke, M.D., chair of pathology at Akron (Ohio) City Hospital, to serve as medical microbiologist and director of the clinical microbiology laboratory at this location as well as director of clinical virology at the Children's Hospital Medical Center in Akron. Dr. Clarke wrote, "We needed a microbiologist in Akron—at Akron City Hospital, Akron Children's Hospital, and the medical school (Northeast Ohio Medical University). Tom was more than we expected. I still cannot believe that he came to Akron and stayed as long as he did. As a microbiologist he raised the quality of talent and productivity of the microbiology lab at Akron City Hospital, the virology laboratory at Children's Hospital, and the teaching at the medical school. Tom raised his position to such a level that it was extremely difficult to fill his shoes when he left." In 1991, Thomson succeeded his friend and former mentor Dr. Randall as director of microbiology laboratories at Evanston Hospital in Evanston, IL (now known as NorthShore University HealthSystem), and has held variations of this position for the past 27 years. One of Thomson's primary collaborators at this institution, Lance R. Peterson, M.D., professor of medicine and of pathology and laboratory medicine, remarked that "over the years, Tom has really turned the microbiology laboratory into a top-level, academic diagnostic laboratory. He is also one of the most active members of our department in teaching and is one of the most collegial people at NorthShore, wanting people to collaborate in the effort of improving patient care." Thomson himself reflected, "I take great satisfaction in having arrived in a lab that had been without a director for nearly a year and, over time, recruiting and collaborating with other colleagues to establish one of the most scientifically productive and clinically focused clinical microbiology laboratories in the country."

Several attributes of Thomson have been noted by colleagues as contributing to his overriding success and excellence in the fields of clinical and medical microbiology. Dr. Smith remarked that Thomson "expresses unique views and he is always right!" Dr. Poupard described Thomson as being sincere yet not afraid to express his opinion. In support of her primary nomination of Thomson for the Sonnenwirth Award, Dena Shibib, D.O., assistant professor and associate director of microbiology and virology laboratories in the University of Oklahoma College of Medicine, cited Thomson's genuine enthusiasm for microbiology, positive attitude, approach to problem solving, and teaching acumen. During her anatomic/clinical pathology residency training at NorthShore University HealthSystem, Dr. Shibib related that it was Thomson's daily microbiology laboratory rounds that inspired her to choose a career in clinical microbiology over transfusion medicine. "The rounds were very clinical. In addition to the organism, we would think about pathogenesis of disease and how the patient may have acquired the infection. Pharmacy would also chime in on therapeutic options." Dr. Shibib also credits Thomson for "opening up the eyes of trainees (and other attending clinicians) to the fascination and enjoyment of microbiology" and for sometimes interjecting during the middle of rounds, "Isn't this fun?" Karen C. Carroll, M.D., professor of pathology at Johns Hopkins School of Medicine and editor for *Journal of Clinical Microbiology*, first met Thomson nearly 20 years ago as part of an invited laboratory inspection team. She wrote that she was "so impressed by his microbiology knowledge and mostly by his collegiality, his ability to recognize the contributions of all members of the team, and his fantastic sense of humor that over the years was used effectively to diffuse uncomfortable situations. Tom had a knack for bringing groups back to the question at hand in an objective way." Dr. Shibib added that if a trainee was unsure of the answer to a question during laboratory rounds, Thomson "would nicely let them think about it or gently prompt them." Irene K. Dusich, M.T., microbiology laboratory manager at NorthShore University HealthSystem, stated that Thomson takes his directorship very seriously and demonstrates commitment to patient care, day-to-day operations of the laboratory, and consultative interactions with bench-level microbiologists. Finally, Peter H. Gilligan, Ph.D., professor in the Departments of Microbiology-Immunology and Pathology-Laboratory Medicine at the University of North Carolina School of Medicine, in summarizing his 4-decade association with Thomson, wrote that "his willingness to spend his vast knowledge and experience with

seemingly anyone who needs it to improve their delivery of quality diagnostic microbiology is a mark of his kindness and generosity . . . I cannot think of anyone I respect more in our profession."

When asked about lasting contributions or innovations made by Thomson, Patrick R. Murray, Ph.D. (8), senior director of worldwide scientific affairs, BD Life Sciences, simply referred to him as a "visionary microbiologist." Dr. Murray acknowledged Thomson's "ability to view technology as a means to do things he has never done before" and specifically cites Thomson's adaptation of molecular diagnostics to the paradigm of methicillin-resistant *Staphylococcus aureus* (MRSA) colonization in hospitalized patients. Dr. Peterson, a major collaborator in these early efforts, recalled, "NorthShore was the first multihospital system in North America to introduce a universal MRSA admissions screening program. Tom was very enthusiastic about this program and was instrumental in getting testing systems organized in just a 2-month period." Since the inception of the program (in which approximately 40,000 molecular MRSA screens are performed on an annual basis) in August 2005, Dr. Peterson has reported a 70% sustained MRSA disease reduction rate as a result of the program, leading him to conclude, "we have established a benchmark for overall reduction of [nosocomial] MRSA disease." Such efforts have recently been extrapolated to reduction of nosocomial *Clostridium difficile* infection at NorthShore University HealthSystem.

Thomson's contributions to the fields of medical microbiology and clinical microbiology are indeed visionary because they range anywhere from a simple, rapid staining procedure to those involved in total laboratory automation. As described previously, Thomson's interest and fascination with the clinical utility of the direct Gram stain preparation stem back to his days as an aspiring medical microbiologist in Philadelphia and continued through his fellowship training at Mayo Clinic. Dr. Smith stated, "The value of the Gram stain has grown throughout his clinical practice. He would show series of Gram stains and reveal what sort of information you could transmit to the clinician in terms of *caring* for the patient—not just treating the patient." When personally queried about the importance of this test, Thomson provided a rather didactic response. Pattern recognition skills are necessary to appreciate a Gram stain. "You must train yourself to recognize patterns, so that you know what's going on in a second. That's what I did when I was younger. The ID doctors back in Wilmington wanted to know what I thought of the Gram stains. However, the ability to do this [pattern recognition] is not uniform." Thomson equated this skill to that possessed by cytopathologists and hematopathologists in terms of rapid and accurate interpretations of "abnormal/normal" and "malignant/benign" cellular profiles. At the same time, Thomson lamented the fact that this service element of the clinical microbiology laboratory appears to be "less in demand nowadays" and is "not where it should be" in terms of overall quality, training, and proficiency. Thomson essentially lent support to the aforementioned commentaries by Bartlett (1) and Provine and Gardner (2) and yet has attempted to change the paradigm of disconnection between microbiology and clinical service (sometimes augmented by distantly located, consolidated laboratories [9]) through his own practice. Dr. Shibib remarked that Thomson is personally "sought out by clinicians for knowledge and advice." Dr. Carroll characterized Thomson's laboratory as a "model of state-of-the-art microbiology and the impact of daily consultative services on patient care." Thomson pursues the application of electronic advancements (electronic consultation and secure transmission of direct Gram stain digital imagery) toward establishment of real-time communication lines between the laboratory and clinicians and yet noted that "there is so much we overlook every day in the delivery of microbiology results."

Several experts in the field view Thomson as a pioneer in total microbiology laboratory automation. Dr. Murray stated that Thomson, particularly in the context of early digital interpretation of primary culture plates (10), is "pushing boundaries to see what can actually be accomplished." Not only can this be important from an efficiency perspective; Dr. Murray also cites the prospect of "providing clinically relevant information as early as possible." However, when posed with an inquiry to describe the

impetus for investigating total laboratory automation, Thomson provided an interesting retort. He recalled his early days as a practicing medical microbiologist in Ohio, when he discovered that his inherited low-fill-volume, semiautomated blood culture system lacked the necessary sensitivity for detection of clinically significant bacteremia. The system was decommissioned and replaced by a conventional bottle system until years later, when automation could accommodate a 20-ml blood fill. Thomson also advocated utilization of spot testing-based identification and disk diffusion susceptibility testing methods versus commercial automated identification and susceptibility testing systems on the basis of overall cost and flexibility for tested antimicrobial agents. These decisions caused him to be labeled antiautomation by peers. (Ms. Dusich, upon assuming her managerial position in Thomson's laboratory 12 years ago, reminisced that she had set out to change Thomson's philosophy regarding automation but was unsuccessful and has since admitted that disk diffusion testing would now be her chosen method.) Thomson's rebuttal to charges of being the least automated and most old-fashioned laboratory in the region was simple: "Oh, I'll be automated—just give me something that works."

In general, Thomson claims not to be a strong advocate of the consolidated-microbiology-laboratory paradigm, largely citing issues with specimen integrity (antibiotic-induced damage of specimens *ex vivo* and processing delays "significantly impairing what you could be doing on site"). Yet Thomson is of the opinion that this consolidation paradigm provides a segue for future total microbiology laboratory automation in every clinical laboratory. He maintains that a business case for "putting a limited number of total laboratory automated components in remote hospitals where local plate images are interpreted centrally in a core facility" would be compelling. Thomson challenges commercial manufacturers of automation to design and build systems that are modular in nature to meet this future need.

Thomson's scholarly activities have been evidenced by over 100 publications, more than 35 book chapters, and numerous abstracts and oral presentations. During the course of formal presentation, Janet Hindler, M.S., past microbiology specialist at UCLA Medical Center, stated that Thomson "always explains a topic in the context of what it means for the patient and how the laboratory can provide the most-meaningful results." Thomson has frequently contributed chapters to both *Manual of Clinical Microbiology* and *Clinical Microbiology Procedures Handbook*. He has served on the editorial boards of journals such as *Journal of Clinical Microbiology*, *Infectious Diseases in Clinical Practice*, and *Diagnostic Microbiology and Infectious Disease* and is an *ad hoc* reviewer for outlets such as *Clinical Infectious Diseases*, *Antimicrobial Agents and Chemotherapy*, and *Clinical Microbiology Reviews*. Thomson has actively participated in professional societies such as ASM (chair, Clinical Microbiology Division C, in 2017), the Illinois Society for Microbiology (Pasteur Award recipient in 2016), the Infectious Diseases Society of America (Clinical Practice Guidelines Committee—Clinical Microbiology from 2008 to 2012), the American Society for Clinical Pathology, and the Medical Mycological Society of the Americas. Thomson earned fellowship in the American Academy of Microbiology in 2005. In recent years, Thomson has been a member of the College of American Pathologists (CAP) Microbiology Resource Committee. On a personal note, Thomson feels that the Evanston Hospital House Staff Attending of the Year Award for 1996-1997 was especially significant, as he became the first (and only) nonphysician to receive the honor. "I think that I received this award because of my consultative interactions. In retrospect, the house staff may not have known that I was a scientist, not a physician."

Thomson is also a diplomate of the American Board of Medical Microbiology and has served as dean of the American College of Microbiology, charged with oversight of all ASM board certification and fellowship training activities. He spoke at length about the evolution of the ABMM certification program, stating that credibility is what built it. "Early support by M.D. microbiologists expanded credibility of the certification into the medical microbiology community." More and more clinicians were encouraged to take the examination not only in terms of positioning themselves favorably during recruit-

ment but also due to the significant role that diplomates play in the medical community as a whole. Thomson also chaired the CPEP program from 2004 to 2010. He stated that the program “transformed clinical microbiology by providing superbly trained professionals both scientifically and clinically. Nearly every significant discovery/advancement in the field has a vein that goes back to a CPEP trainee.” Thomson was a voting member of the Clinical and Laboratory Standards Institute (CLSI) Subcommittee on Antimicrobial Susceptibility Testing from 2008 to 2012 and has held the chair of the Expert Committee on Microbiology since 2012. Pertinent to this role, Ms. Hindler stated that Thomson “ensures that CLSI is addressing contemporary needs of clinical microbiology through their approved standards and guidelines.” Thomson himself remarked that CLSI functions differently from other professional societies in that it adds the element of “consensus based on experience. Here’s what science tells us (approved standards), but we should be doing so much more—here’s what experience tells us (consensus guidelines).” Thomson additionally underscored the role of CAP in the routine function of the clinical microbiology laboratory. “It touches everything we do every day [accreditation, proficiency testing, education, CPT payment]—a lot of us do not appreciate this.”

In many ways, Thomson’s scholarly activity and service contributions have provided a template for how bench-level microbiologists and laboratory directors should perform their duties. Dr. Gilligan, past editor of the *Journal of Clinical Microbiology* Point-Counterpoint feature, summarized, “Dr. Thomson’s generosity has extended to his willingness to make important contributions to our conversations about our profession and practice of clinical microbiology. Examples of those contributions can be found in the pages of this journal. Two in particular stand out. In one [11], Dr. Thomson agrees with the use of nucleic acid amplification testing for the diagnosis of group A streptococcal pharyngitis but argues about the shortcomings of this technology if used as a stand-alone test. Further he emphasized gaps in our knowledge in diagnosing emerging agents of pharyngitis such as *Fusobacterium* spp. In a 2010 commentary [12], he describes the important, often unseen role that doctoral-level clinical microbiologists play in quality patient care.”

Dr. Thomson has reduced his vocational commitment to 50% time and is poised to retire at the end of 2018. He plans to remain active in written scholarship and fulfill pending obligations to ASM, CAP, and CLSI. Importantly, he plans to spend additional time with Nancy, his wife of 39 years, and their grandchildren and to further his hobbies of photography, gardening, history, golfing, and restoring a family collection of bamboo fly rods. He is also an avid philatelist and opines that his collection is in dire need of reorganization. Thomson reflected that “microbiology has been an identity for me and I’ll miss it” and hopes that technologists that have been family for all of these years have enjoyed the times as much as he. He ultimately hopes to “tee up my laboratory with structure and leadership that will push it ahead another 20 to 30 years.” In the opinion of Thomson, the greatest challenge encountered by the fields of clinical and medical microbiology is making sure our value is recognized. While it is true that clinical microbiologists need to select and implement the latest technology and ensure that each technologist is “trained, educated, and motivated,” we ultimately need to be that interface or interpretive consultative service between result and clinician. On that note, Thomson provides us with a final thought: “Medical microbiologists need to do what no one else in the hospital can do. If we are not recognized for these unique contributions, we will disappear.”

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