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EDITORIAL

A Tribute to George A. Jacoby

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George A. Jacoby
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It is with great fondness that we remember George A. Jacoby, a colleague, a friend, and a giant in the area of antibacterial drug resistance. George was born in Michigan but lived most of his life in New England. He completed his undergraduate studies at Yale University and then trained at Harvard Medical School (HMS), Massachusetts General Hospital (MGH), the National Institutes of Health, and the National Institute for Medical Research at Mill Hill before joining the Infectious Diseases Unit at MGH, where

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he was on the faculty for 25 years. He was an associate professor of medicine at HMS, where he taught students for over 40 years. In 1993 he moved to the Lahey Clinic in Burlington, MA, where he headed the Infectious Disease Department. Although he retired from clinical work in 2002, he continued to maintain a laboratory where he studied the genetics and biochemistry of bacterial resistance to antibiotics, especially quinolones and β-lactams. George was a member of multiple editorial boards for a variety of biochemical and medical journals, including the *New England Journal of Medicine* and *Antimicrobial Agents and Chemotherapy*. One of the roles for which he was most noted was that of editor-in-chief of AAC from 1995–2000. Many of us who worked with him as an editor, as a member of the AAC Editorial Board, or as an *ad hoc* reviewer recognized him as a fair and impartial advocate for good science who could overlook occasional grammatical errors in international contributions if the science was sound. He was noted for his speed and accuracy as an editor, a role in which he took great pride. His comments to authors were often laced with his quiet humor amid the constructive criticism that made all of our papers better.

George's contributions to our understanding of antibiotic resistance are broad and unrivaled, with collaborations established across international borders as well as across antibiotic classes. When he began working on β-lactamases in 1963 (1), he likely did not realize the impact he would make on this research area. His publications in the early 1970s recognized the potential for widespread dissemination of antibiotic resistance due to the mobility of R factors that carried antibiotic resistance genes (2, 3). He described plasmid-encoded R factors in *Pseudomonas aeruginosa* responsible for resistance to aminoglycosides and penicillins, leading to his increased attention to β-lactamases. His work on identification of new β-lactamases included studies on the OXA family of enzymes; he studied the oxacillin-hydrolyzing PSE-2 β-lactamase in the early 1980s in a collaboration with Alain Philippon (4), followed by the molecular classification of this enzyme as a member of a fourth molecular class of β-lactamases, i.e., Class D, together with Pentti Huovinen (5). His laboratory was the first to recognize the existence of extended-spectrum β-lactamases (ESBLs) in the United States (6). His 2009 review of AmpC β-lactamases remains one of the most readable and authoritative compilations for that set of enzymes (7). In addition to his many contributions to the study of β-lactamases, he was a pioneer in the first recognition of plasmid-encoded quinolone resistance in Gram-negative bacteria, with the identification of the *qnr* gene in ESBL-producing enteric bacteria (8). In collaboration with David Hooper, he identified and studied multiple plasmid-mediated quinolone resistance genes for over 20 years (9). He claimed that his interest in quinolone resistance overshadowed his β-lactamase work at the end of his career, as he continued to contribute to David Hooper's group into early 2022.

One of his greatest contributions was his attention to antibiotic resistance nomenclature. During his tenure as AAC editor-in-chief, the β-lactamase community was dealing with serious issues concerning the naming of new enzymes. George, together with Karen Bush and Antone Medeiros, published a functional classification scheme for all the known unique β-lactamases in 1995 in an AAC Minireview that for many years was the most cited publication in the journal (10). However, many more enzymes were yet to be identified as nucleotide sequencing became easier and cheaper, resulting in duplicative naming of the many new ESBLS that were being identified worldwide. Following a β-lactamase symposium at the 1996 ICAAC meeting, representatives from the β-lactamase community requested that George serve as the arbitrator for assigning names to new β-lactamases. He then established a widely-referenced website supported by the Lahey Clinic, lahey.org/studies/, with the original intention to adjudicate the naming of ESBLs. From 1997–2015, this website expanded to become the authoritative source for the naming of not only all new β-lactamases, but also for the naming of the scores of *qnr* genes and gene products later identified. George retained the curation of the Lahey database through mid-2015, with the exception of a few months in the winter when he would retreat to Florida, where he claimed not to have sufficient

computing power to determine possible duplications in submitted sequences. After the resistance data were transferred to NCBI in 2015, George took on the role of advisor to the new curators. An updated consensus nomenclature document has recently been published in AAC, with George as a coauthor of the draft manuscript that incorporated his editorial comments earlier this year (11).

George was not only a commanding presence in the scientific world, but he was a good friend who never spoke an unkind word about anyone. His intelligence was unmatched, but one never felt intimidated by him. He was gentle, soft-spoken, considerate, humble, sympathetic, and a listener rather than a talker. George was a highly respected infectious disease clinician as well as a thoughtful teacher. To his students he was supervisor, instructor, editor, and mentor, but before all, a role model of a skillful and respected researcher. He was always kind to and supportive of colleagues and trainees. George also had a wry sense of humor and a way of capturing the essence of scientific findings as well as various situations concisely with just the right words, both in number and choice. He will be greatly missed, but we are fortunate to have had the opportunity to work with and learn from him and to have benefited from his friendship.

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