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Perspective

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Profiles in Chemistry: A Historical Perspective on the National Organic Symposium

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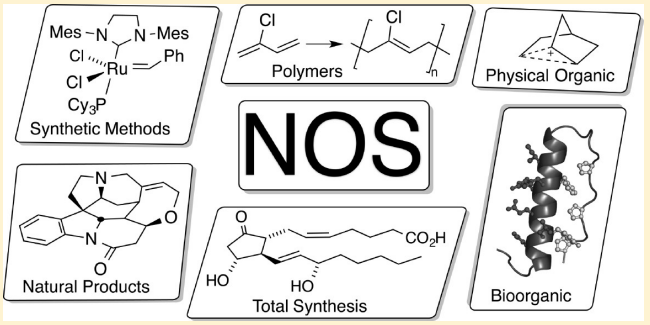
Supporting Information

ABSTRACT: This perspective delineates the history of the National Organic Chemistry Symposium (NOS) and, in doing so, traces the development of organic chemistry over the past 88 years. The NOS is the premier event sponsored by the ACS Division of Organic Chemistry (ORGN) and has been held in odd-numbered years since 1925, with the exceptions of 1943 and 1945. During the 42 symposia, 332 chemists have given 549 plenary lectures. The role the NOS played in the launch of *The Journal of Organic Chemistry* and *Organic Reactions* and the initiation of the Roger Adams Award are discussed. Representative examples highlighting the chemistry presented in each era are described, and the evolution of the field is examined by assigning each NOS talk to one of seven subdisciplines and analyzing how the number of talks in each subdiscipline has changed over time. Comparisons of the demographics of speakers, attendees, and ORGN members are made, and superlatives are noted. Personal interest stories of the speakers are discussed, along with the relationships among them, especially their academic lineage. Logistical aspects of the NOS and their historical trends are reviewed. Finally, the human side of science is examined, where over the past century, the NOS has been intertwined with some of the most heated debates in organic chemistry. Conflicts and controversies involving free radicals, reaction mechanisms, and nonclassical carbocations are discussed.



INTRODUCTION

On December 15, 1925, James F. Norris (Figure 1), President of the American Chemical Society (ACS), was in Richmond, Virginia on the last stop of one of his "swings around the circuit".[1] In just under a month, Norris had proceeded to visit 19 local ACS sections. The train from Boston took him first to Toledo, as far west as St. Louis, and as far south as Gainesville. After such a whirlwind tour, one can imagine he was looking forward to being home for the holidays. However, he also must have been thinking of his upcoming talk at the first Symposium on Organic Chemistry that was to begin in two weeks in Rochester, NY, because in the weeks leading up to the Symposium, Norris was inspired to change the title of his talk[2,3] from the advertised *Quantitative Measurement of Chemical Reactivity of Organic Compounds* to the actual talk he gave on December 29, which was entitled *The Opportunities for Research in Aliphatic Chemistry*.[4,5] The talk was well-received, and the Associated Press wrote a wire story focusing on his remarks that synthetic rubber might one day be made from petroleum.[6] Norris was prescient in some of his remarks, noting that "the mechanism of polymerization can be advantageously studied... [and] the structure of the polymers, ... [and] new methods of [their] synthesis should be investigated." Furthermore, he said "the olefins can be made the starting point in the synthesis of many compounds.... [and] a still more profitable field for research can be found in the diolefins."[4,5] What Norris could not know was that 86 years later, three of his academic descendants would address the 42nd meeting of the National Organic Chemistry Symposium (NOS) and demonstrate the

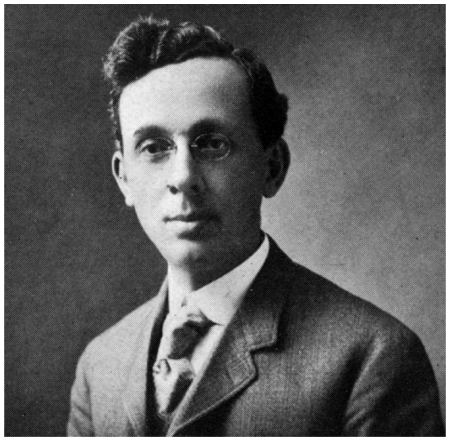


Figure 1. James Flack Norris gave the opening talk at the first National Organic Symposium in 1925. He also spoke in 1927 and 1933. Photograph of Norris in 1908 courtesy of Simmons College Archives.

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truth of his statements. His academic great-great grandson Robert H. Grubbs presented an overview of ruthenium-based olefin metathesis catalysis that has proven to be so valuable to today's chemists.[4] Amir Hoveyda, another of Norris' academic great-great grandsons, described the use of molybdenum- and tungsten-based metathesis catalysts to give (*Z*)-alkenes.[4] Of course, the changes that occurred in the intervening 86 years are monumental. For example, in 1925, Norris touted petroleum as America's "great natural resource" as a feedstock for polymers, and by the 2011 NOS, his academic great-great-great-great grandson Geoffrey Coates stressed the desire to "transition from fossil fuels to renewable resources" as polymer feedstocks.[4]

This Perspective delineates the history of the NOS and, in doing so, traces the development of organic chemistry in the U.S. through most of the 20th century and into the first decade of the 21st century. The NOS is the premier event sponsored by the ACS Division of Organic Chemistry (ORGN) and has been held in odd-numbered years since 1925 with the exceptions of 1943 and 1945, and during those 42 symposia 332 chemists have given 549 plenary lectures.[7] Changes in the demographics of speakers, attendees, and ORGN members and the chemistry presented in each of three eras are discussed.

The NOS itself has a tradition of examining history, and numerous talks have involved reminiscences of developments of organic chemistry. The first was Moses Gomberg's 1941 address,[8] but other examples include talks by Hermann O. L. Fischer (1953), Roger Adams (1955), John D. Roberts (1995), and Jeffrey I. Seeman (1997).[4] Furthermore, two NOS speakers, Treat B. Johnson[9] and Harry L. Fisher,[10] wrote papers about the history of organic chemistry in America, and D. Stanley Tarbell, one of the organizers of the 1957 symposium, wrote a monograph on the subject.[11,12]

THE THREE ERAS

To facilitate analysis, the 42 NOS were divided into three equal periods. Even though there are 14 symposia in each era, the number of talks in each period are not equal: the Genesis Era had 206, the Cold War Era had 164, and the Modern Era had 179 talks. The discussion begins with each individual era followed by a comprehensive analysis of how the number of talks in seven subdisciplines has changed over time.

Genesis Era (1925−1955). The early NOS had a relatively high percentage (>17%) of nonacademic speakers, an extremely low number of international speakers, and no women speakers. Figure 2 shows the decadal trends for each of these categories and the steady decrease in the nonacademic speakers from the high of 25% in the 1920s to the low of ∼3% at the end of the Genesis Era. The high number of nonacademic speakers was meant to promote collaborations between university, industrial, and government chemists. An example of this type of collaboration is the one between Father Julius A. Nieuwland (Figure 3), a chemist from Notre Dame, and chemists from DuPont. Nieuwland spoke in 1925 and 1927 on the catalytic reactions of acetylene, and his work provided key information for Elmer Bolton and Wallace Carothers of DuPont, who were investigating polymerization reactions to develop synthetic rubber (Figure 4a). Nieuwland consulted with DuPont as the industrial chemists developed DuPrene, which was first prepared in 1930.[13,14] Later renamed neoprene, this polymer is still widely used today. Nieuwland was also active in ORGN, serving as Secretary in 1924 and Chair in 1925. According to Fisher, during the time that Nieuwland was Secretary an alarm

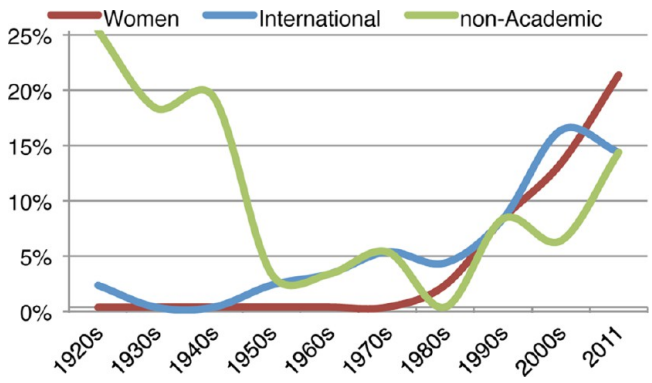

Figure 2. Decadal trends in the average percentage of female, international institutional, and nonacademic NOS speakers. The 2011 values are for one NOS, the values for 1920s and 1940s are an average of three NOS, and all other decades are an average of five NOS.

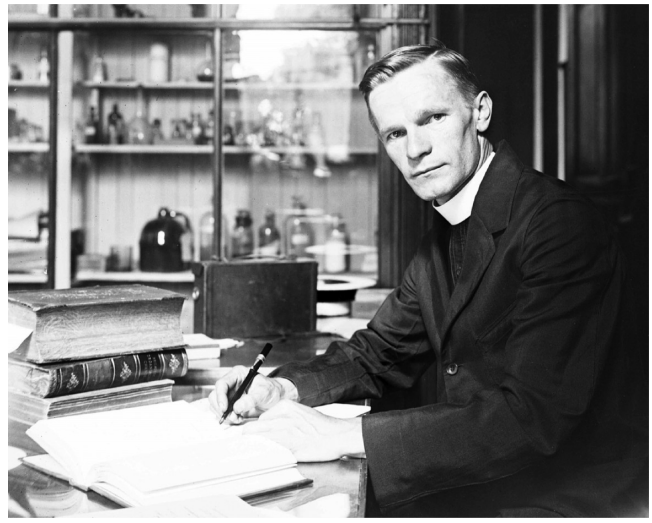

Figure 3. Julius Nieuwland, C.S.C., Ph. D., working at a desk in a laboratory at Notre Dame, c1910s. Nieuwland was born in Belgium, and his work on catalytic reactions of acetylene was presented at the first two NOS. Photograph courtesy of the University of Notre Dame Archives.

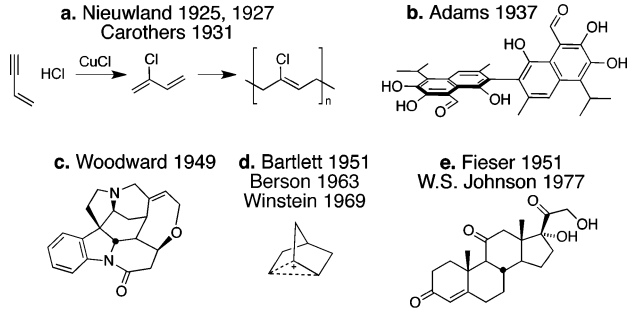

Figure 4. Molecules discussed at the NOS, principally from the Genesis Era. (a) Chemistry related to the synthesis of neoprene was presented by Julius Nieuwland and Wallace Carothers. (b) Roger Adams spoke on the structure of gossypol. (c) The structure of strychnine was discussed by R. B. Woodward. (d) Paul D. Bartlett, Jerry Berson, and Saul Winstein discussed nonclassical carbocations. (e) Approaches for the synthesis of cortisone were presented by Louis Fieser and William S. Johnson.

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clock was used as a reminder to conference speakers of their time limit. Unfortunately, as he "worked in acetylene chemistry and often had explosions in his laboratory, [he] never got used to the alarm.... He always jumped at the sound, even when he was looking at the face of the clock."[10]

Some aspects of science have changed over time. One example that predates the NOS is clearly demonstrated by Moses Gomberg's 1900 paper that reports the discovery of free radicals. The paper ends with this statement: "This work will be continued and I wish to reserve the field for myself."[15,16] The idea of exclusively reserving a research area was still pervasive in the Genesis Era, as Roger Adams (Figure 5) noted in a 1941

Figure 5. Roger Adams played a significant role in the development of the NOS. The Adams NOS academic tree is the third largest. The Roger Adams Award has been presented at the NOS since its inception in 1959. Photo by Bachrach and courtesy of the School of Chemical Sciences, University of Illinois.

paper, "It was assumed that [our] discovery and publication... would allow us a certain priority in the study of synthetic analogs and homologs of the tetrahydrocannabinols without competition."[17] He was peeved by recent publications by Alexander R. Todd (Lord Todd), which he felt encroached upon his territory and led him to "immediate publication... of the results... before they are complete [in] as great detail as had been hoped." As an aside, it is interesting to note the respect that Adams had for Gomberg; as Adams and five of his Illinois colleagues nominated him (unfortunately without success) for the Nobel Prize in 1940.[16]

Another bygone from this Era is the expectation that the NOS speaker personally conducted some of the experiments and analysis. During his New Year's Eve address[18] in 1935, James Conant "apologized at the outset of his address for appearing before the Symposium solely in the role of a reporter."[19] He explained that although he helped write the grant and started the research, his "duties as president of Harvard had prevented him from taking part in the chemical research" and his colleague Professor G. B. Kistiakowsky obtained the results presented.

The Genesis Era preceded most spectroscopic techniques and structure elucidation of natural products was an arduous and time-consuming process. Talks on structure determination during this era included Adams' *The Structure of Gossypol* in 1937 and Robert B. Woodward's *The Structure of Strychnine* in 1949 (parts b and c, respectively, of Figure 4).[20,21] The long-standing controversy over the structure of the 2-norbornyl cation[22] (Figure 4d) was discussed on several occasions at the NOS, including by Paul D. Bartlett (Figure 6) in 1951, by Jerome Berson in 1963, and by Saul Winstein shortly before his

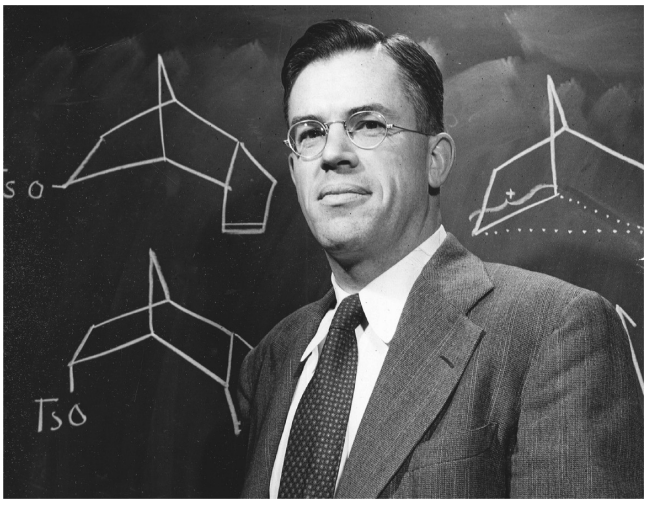

Figure 6. Paul D. Bartlett in 1951. His talk in Denver that year was entitled *Recent Developments in Carbonium Ion Theory*. In 1963, he was the third recipient of the Adams Award. Photograph courtesy of Harvard University Archives, HUP Bartlett, Paul D. (5).

death in 1969 (vide infra). Steroid chemistry was also prevalent during this era; for example, Louis F. Fieser's talk on cortisone chemistry (Figure 4e) was the lead in the *Chemical & Engineering News* report on the 1951 symposium.[23] Interest in steroid chemistry, and cortisone in particular, continued into the Cold War Era and was the subject of the Roger Adams Award talk given by William S. Johnson in 1977.

The launches of *The Journal of Organic Chemistry (JOC)* and *Organic Reactions* occurred during the Genesis Era, and both have direct ties to the NOS. During the afternoon session on December 31, 1935, it was announced that the Williams and Wilkins Company, with the assistance of the chemistry department of the University of Chicago, would start publishing *JOC* as long as enough subscriptions were ordered.[19,24] Morris Kharasch and Henry Gilman were instrumental in the launch of this journal, and the first issue was published in March 1936 with four of the seven articles by NOS speakers.[25,26] Otto Reinmuth, a friend of Kharasch, was the first editor-in-chief, as he retained his position as editor-in-chief of *The Journal of Chemical Education*.[27] At least part of Kharasch's motivation for starting *JOC* was his frustration with having some of his papers rejected by other journals.[28] Lyndon F. Small, who spoke at the 1933 and 1935 NOS, served as the *JOC* editor-in-chief from 1938 to 1951.[29] The journal always had an association with ORGN,[25] but it was not until 1954 that it became owned and published by the ACS,[30] thanks mostly to the initiative of Arthur C. Cope.[31]

The origins of *Organic Reactions* are traced to the eighth NOS held December 28−30, 1939, in St. Louis.[32] The concept for the series resulted from a meeting between chemists who served as editors of *Organic Syntheses* and representatives of John Wiley & Sons Publishers. During that meeting, they determined the general operational parameters, the topics, and the authors for the first volume, which was published in 1942 with 10 out of the 12 authors being NOS speakers.[32]

Cold War Era (1957−1983). During these years, one of the most important developments was the initiation of the Roger

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Adams Award. This biennial award was founded "to recognize and encourage outstanding contributions to research in organic chemistry in its broadest sense", and it has been presented at the NOS since its inception.[33] As explained by John D. Roberts in his autobiography, Nelson J. Leonard originally had the idea to use the tremendous financial successes from *Organic Syntheses* and *Organic Reactions* to fund an award honoring Adams.[34] The recipient receives a gold medal, a replica medallion, and a cash prize. The first recipient was Derek H. R. Barton at the 1959 NOS in Seattle, and his award address was *Photochemical Rearrangements*. After this initial selection, the award was then managed by the ACS with Organic Synthesis, Inc. and Organic Reactions, Inc. remaining as sponsors. Amusingly, as a member of the Organic Synthesis, Inc. board, Roberts voted to increase the cash prize from $5,000 to $10,000 in 1966 and then won the award the following year![34] Figure 7 shows Andrew Streitwieser (the 1973 ORGN Chair

Figure 7. Organic Division Chair Andrew Streitwieser, Jr. (L) presenting the Roger Adams Award Medal to Georg Wittig (R) at the 1973 NOS. Streitwieser was the oldest chemist to speak at the NOS when he won the Adams Award in 2009. Photograph courtesy of Andy Streitwieser.

and 2009 Adams Awardee) presenting the 1973 Adams Medal to Georg Wittig. Ten of the twenty-seven Adams Awardees have also won the Nobel Prize, and eight of the ten won the Adams Award first.

The height of physical organic chemistry occurred during the Cold War Era (vide infra) with talks by most of the leaders in the field. However, Howard Lucas, Christopher K. Ingold, and Louis P. Hammett, who never spoke at the NOS, were notable exceptions to this trend. At the 1961 NOS in Bloomington, IN, George Hammond presented *Organic Chemistry of Triplet States* and Howard Zimmerman presented *A Mechanistic Approach to Organic Photochemistry* (Figure 8a). Angelo Lamola and Nick Turro, who both spoke in 1975, view the 1961 talks as the birth of modern organic photochemistry.[35] NMR spectroscopy was developed in the Cold War Era, and John D. Roberts spoke on its use to address questions of conformational analysis and steric effects in 1965 and 1967 (Figure 8b). The number of total synthesis talks rose sharply in the Cold War Era (vide infra), and E. J. Corey's landmark prostaglandin work illustrates the state of the art from 1975 (Figure 8c). Natural products started to decline in this era, but in 1979, Jerrold Meinwald discussed the structure and chemical ecology of lucibufagins – steroidal defense compounds that make fireflies unpalatable to

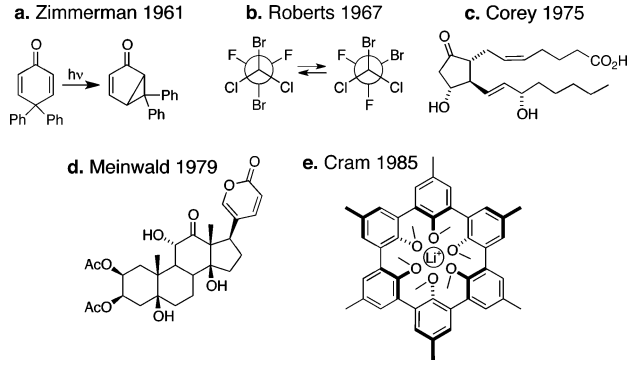

Figure 8. NOS talks from the Cold War Era. (a) Howard Zimmerman spoke on mechanistic organic photochemistry. (b) Jack Roberts discussed steric effects including restricted rotation in haloethanes during his Adams Award address. (c) E. J. Corey discussed prostaglandin syntheses. (d) The structure of lucibufagins from fireflies was presented by Jerrold Meinwald. (e) Donald Cram's Adams Award address included spherand guest complexes.

predators (Figure 8d). Molecular recognition was developed during this era and formed the basis of Donald J. Cram's 1985 talk *Molecular Cells, Their Guests, Portals, and Behavior* (Figure 8e). This era also marked a time with very few international institutional and nonacademic speakers (Figure 2).

Modern Era (1985–2011). This era is characterized by a number of significant changes (see Figure 2), and perhaps women chemists giving plenary lectures for the first time is the most noteworthy. In planning for the 1985 NOS, Symposium Executive Officer (SEO) Peter Stang and the ORGN Executive Committee selected Marye Anne Fox as a speaker (Figure 9).

Figure 9. Marye Anne Fox was the first woman to give a plenary lecture at the NOS when she spoke in 1985 in Newark, DE. Fox spoke again in 1995. Reprinted (adapted) with permission from *Chem. Rev.* **1993**, *93*, 341–357. Copyright 1993 American Chemical Society.

When asked about this, Stang said, "To the best of my recollection I was NOT aware that there had been no previous female speaker at an NOS (nor was there any discussion of this). I simply knew of Marye Anne and was impressed by her science. What I do recall, was consciously looking for outstanding 'younger persons' and she was clearly one of them."[36] Fox's talk was entitled *Chemical Control: Combining Photochemistry with Electrochemistry*. After Fox broke the glass ceiling, there were again only male speakers at the next three NOS. Then in 1993, Cynthia J. Burrows spoke on *Oxidation of*

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hydrocarbons and DNA using Nickel Catalysts, and ever since each NOS has had at least one woman speaker. In 1995, both Fox and Alanna Schepartz gave lectures, making this the first NOS with more than one female speaker. In 2011, a new milestone was achieved when three women (Carolyn Bertozzi, Vy Dong, and M. Christina White) gave talks.

During the Modern Era there was also a significant rise in the number of speakers from international institutions (Figure 2). The 2001 NOS in Bozeman set the record with three speakers from international institutions. The relative percentage of speakers from nonacademic institutions had a resurgence in the Modern Era because of talks given by chemists from the pharmaceutical industry (Figure 2).

The first poster sessions were introduced during the Modern Era. Since they began at the Vancouver NOS in 1987, poster sessions have been a part of every symposium.[37] The change had a significant impact, as the majority of attendees now actively participate by presenting their research to receive feedback from their peers. The 1987 poster session was apparently the first at an ORGN-sponsored national conference, taking place a year before the ORGN poster session at the 195th ACS National Meeting in Toronto in 1988.[38] In this regard, ORGN was a laggard, as poster sessions first appeared at ACS National Meetings in 1975 hosted by the Divisions of Chemical Education and Inorganic Chemistry.[39] By 1980, six ACS Divisions, Education, Inorganic, Nuclear, Polymer, Professional Relations, and Physical, had poster sessions at the National Meeting in Houston.

Figure 10 shows some of the important chemistry described at the NOS during the Modern Era including the growth of

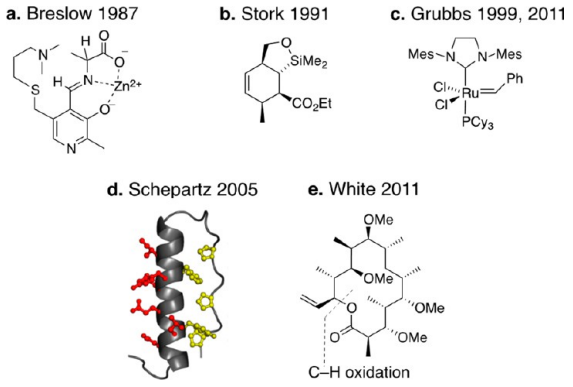

Figure 10. NOS talks from the Modern Era. (a) Ron Breslow discussed enzyme models including transaminase mimics such as aldimines. (b) Gilbert Stork's Adams Award address described the use of the temporary silicon connection for $[4\pi + 2\pi]$ cycloadditions. (c) Bob Grubbs discussed olefin metathesis, including his second-generation catalyst. (d) Alanna Schepartz described miniproteins based on an avian pancreatic polypeptide scaffold. (e) M. Christina White described several C–H oxidations including the macrocyclization step in the synthesis of 6-deoxyerythronolide B.

bioorganic chemistry, which became an important subdiscipline in the era. Ronald Breslow's 1987 talk on enzyme models, including transaminase mimics, typifies this work (Figure 10a). More recently, in 2005, Alanna Schepartz (Figure 10d) described her work on miniproteins that are engineered variants of avian pancreatic polypeptide and exhibit high levels of specificity for various DNA sequences or protein family members. Methodology development talks span the history of the NOS and Gilbert Stork's talk on the use of the temporary silicon connection for $[4\pi + 2\pi]$ cycloadditions is a good example of the state of the art from 1991 (Figure 10b). At his 1999 NOS talk, Robert Grubbs presented groundbreaking work on his olefin metathesis catalyst (Figure 10c). In the fall of 2005, he was awarded, jointly with Yves Chauvin and Richard Schrock, the Nobel Prize in Chemistry for developing ruthenium metathesis catalysts. He also presented metathesis work at the 2009 and 2011 NOS, the latter as the Roger Adams Awardee.

As noted in the opening of this perspective, research topics described by Norris are still important today. Likewise, although many chemists view C–H oxidation chemistry as a recent development in the field, for example, work presented by Justin Du Bois and M. Christina White at the NOS in 2005 and 2011, respectively, at the first NOS, E. Emmet Reid of Johns Hopkins presented a talk entitled *The Oxidation of Hydrocarbons by Air at High Temperature and Pressure*. Reid's talk was mostly "a general statement of the present situation and ... an effort to stimulate discussion and investigation" into this research area.[4] He stated that all common functional groups could be obtained by direct hydrocarbon oxidation, but selectivity was a problem, which he explained by the following analogy: "There are two problems in driving an auto, to get it started and to steer it. If it will go, there is a chance of making it go where we want to go." He went on to say that a solution involved "determining the exact conditions" and that "the search for a 'suitable catalyst' should not be abandoned."[4] Of course, this is what has been done in the intervening 88 years, as highlighted by White's talk entitled *The Emergence of Predictable Selectivity for Aliphatic C–H Oxidations*. White described many C–H oxidation examples, including the key stereoselective macrocyclization reaction in the synthesis of 6-deoxyerythronolide B. She also explained that, despite prevailing dogma, preorganization is not required for achieving the macrocyclization (Figure 10e).[4]

Organic Chemistry Research over the Three Eras. To address evolution of organic chemistry since 1925, all of the plenary talks have been categorized into subdisciplines and the number of talks in each category for each era has been compiled (see Figure 11). In this way, the trends in the field over this time period can be tracked. The task of choosing categories and pigeonholing each talk into only one category was difficult. The talk titles and abstracts were used to assign each talk into one of these categories: physical organic, synthetic methods, bioorganic, natural products, polymers/materials, total synthesis, and history of chemistry. The process used to classify the talks, a more detailed description of each category, and the assignment for each talk can be found in the Supporting Information. In many cases, the subject of the lecture spanned two or even three categories. In those cases, the perceived principal emphasis of the talk and the reputation of the chemist were used in assigning the category.

The synthetic methods category has been a prominent area of research over all three eras and constituted the most talks in both the Genesis and Modern Eras. Physical organic talks dominated the Cold War Era and were essentially equal in number to synthetic method talks in the Genesis Era; however, work in physical organic showed a sharp decline in the Modern Era. Natural products talks have also waned in number over the years, with the sharpest decline being observed between the Genesis and Cold War Eras. Conversely, bioorganic talks have shown the greatest increase in the Modern Era and they are second in number only to synthetic methods in that era.

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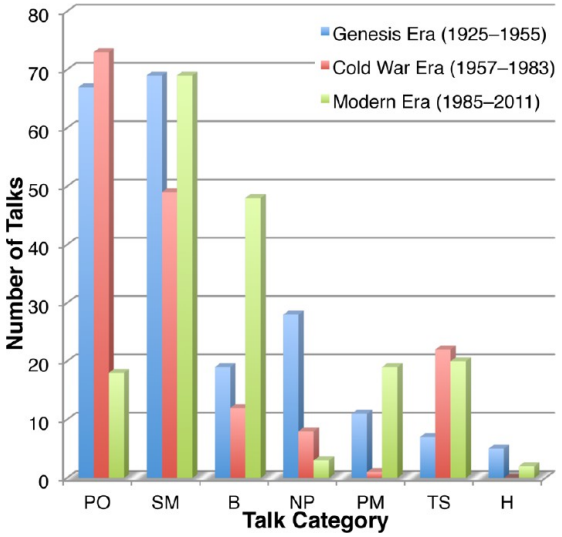

Figure 11. Number of talks in seven different categories presented at the NOS during each of the three eras. Key: PO, physical organic; SM, synthetic methods; B, bioorganic; NP, natural products; PM, polymers and materials; TS, total synthesis; H, history of chemistry.

Polymers and materials chemistry talks have bounced back after dropping to very low numbers during the Cold War Era. This is also true of history of chemistry talks, although this category has always been a minor contributor to the NOS. Finally, total synthesis talks were rare in the Genesis Era but have been the third most common category of talk in both the Cold War and Modern Eras.

DEMOGRAPHICS

Scope. To properly consider the demographic data of the 332 speakers, it helps to examine the constitution of ORGN members and NOS attendees. This data was gathered from various sources[40−43] and is presented in Table 1.[44] Academic chemists outnumber industrial chemists, in some cases approaching a 2:1 ratio, but the large number of people in the unknown/other category introduces uncertainty to these numbers. The relative percentage and absolute number of NOS attendees who were graduate and undergraduate students is significantly higher today than it was in 1937. The participation of international chemists (as defined by mailing address) has also increased. Today, the percentage of international chemists who are ORGN members and NOS attendees is approximately 20%, whereas in the 1920s it was less than 2% for both.[45] Likewise, in 2012, the percentage of female ORGN members is approximately 18%, whereas in 1921 it was merely 1.6%.[46] However, there is a general perception that organic chemistry has the fewest number of women of the chemistry subdisciplines.[47,48] Generally, NOS speakers have been men (95.5%) from academic institutions (91.4%) and from U.S. institutions (94.9%). How these percentages vary over time is discussed below.

Table 1. Demographic Information for Organic Division Members (ORGN) and NOS Attendees

demographic category[a]	ORGN 1921[40]	ORGN 2012[43]	NOS 1929[41]	NOS 1937[42]	NOS 2011[43]
total members/ attendees	308	15353	394	466	690
male	303	10255			484
female	5	2223			184
unknown gender		2875			22
industrial	74	6081		156	234
total academic	125	6892		233	450
professors/staff		2978		175	196
graduate students		2618		58	194
undergraduate students		1296		0	60
unknown/other	109	2380		77	6
U.S.[b]	304	12081	387		600
international[b]	4	3272	7		90

[a]Demographic data for additional NOS are available in the Supporting Information. [b]U.S. and international members/attendees geographic location is based on mailing address.

The issue of U.S. versus international speakers can be examined in other ways besides the location of the speaker's institution. The birthplace of the speakers is an alternative way to define this aspect.[7] NOS speakers were born on all six inhabitable continents. North America leads the way with 239 speakers, followed by 69 from Europe, 19 from Asia, 2 each from Africa (Magid Abou-Gharbia and Stephen Hanessian) and South America/Caribbean (F. Dean Toste and Bert Fraser-Reid), and one from Australia (Rowland Pettit). In terms of countries, 71% of NOS speakers were born in the U.S.; the remaining 29% were born in 34 different countries. Figure 12 shows the number of NOS speakers born in countries where more than one NOS speaker was born. An additional 19 countries were birthplaces to a single NOS speaker.[7] For speakers born outside of the U.S., England and Germany lead the way and together account for ∼10% of all NOS speakers. Within the U.S., speakers come from 39 different states. In terms of cities, New York City (all boroughs) leads by a large margin (22), followed by Chicago (11), Boston (9), Philadelphia (5), and Los Angeles (5). London leads all international cities with five speakers born there, and three each were born in Berlin, Budapest, and Vienna.

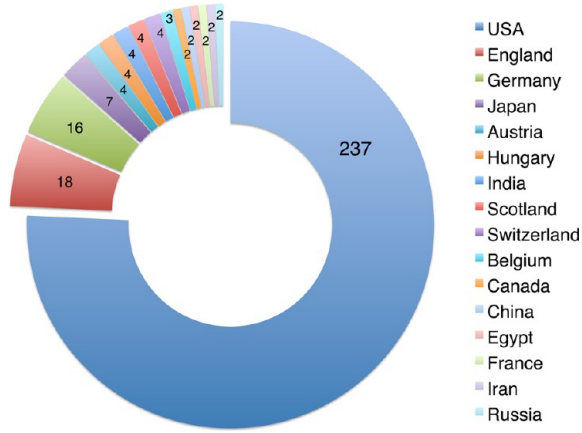

Figure 12. Birth countries for NOS speakers. An additional 19 countries had one NOS speaker.

Since only 5.1% of all of the talks were given by speakers from international institutions and 29% were presented by speakers of international birth, it is clear that many immigrated to the U.S. There are four possible combinations of birthplace and home institution:

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- 235 speakers were born in the U.S. and employed at a U.S. institution
- 69 speakers were born abroad but employed at a U.S. institution
- 26 speakers were born abroad and employed at an international institution
- 2 speakers were born in the U.S. but employed at an international institution

The two speakers in this final category are Donna Blackmond, who was born in Pittsburgh but was employed at the University of Hull when she spoke in 2003, and Vy Dong, who was born in Texas but was employed at the University of Toronto when she spoke in 2011. It is interesting that both of these cases involved women chemists who moved to U.S. institutions (Scripps, CA and UC Irvine, respectively) after their NOS talks.

Superlatives. Generally, the speakers at the NOS are at the height of their profession, and they have won numerous awards including the Nobel Prize (18), the Priestley Medal (24), and the National Medal of Science (28) (Figure 13).[7] Interestingly, 16 of the 18 Nobel Prize winners spoke prior to winning, and on average, their first talk was given 17 years before their Nobel was won. Every symposium has an outstanding lineup of speakers, but the 1969 NOS held in Salt Lake City holds a record—five of the eleven speakers had a future date in Stockholm. Kudos to SEO Jerry Berson and the Executive Committee for choosing future Nobel laureates Herbert C. Brown, Donald J. Cram, Roald Hoffmann, George A. Olah, and Vladimir Prelog. Other speakers at the 1969 symposium are also highly accomplished individuals. For example, some believe Saul Winstein may have been awarded a Nobel Prize if he had not died in late 1969 at the age of 57.[49,50] Additionally, Ronald Breslow, William Doering, and Jerrold Meinwald[51] have received numerous awards and honors including a combined total of 14 NOS lectures.

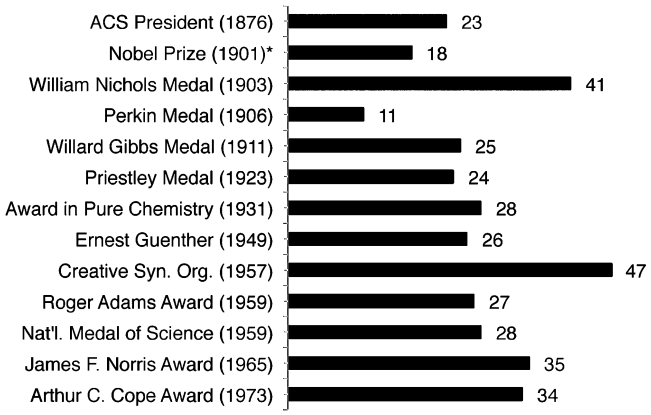

Figure 13. Awards won and ACS Presidencies held (year established) by the 332 NOS speakers. *Sixteen Nobel Prizes were for Chemistry and two were for Physiology or Medicine (see the Supporting Information for details of individual winners and when each prize was won).

It is interesting to analyze the institutional affiliations of the speakers. It is no surprise that Harvard University and the University of Illinois at Urbana−Champaign lead the pack, as these universities have a long and distinguished history of organic chemists. These two institutions alone account for almost 15% of the talks! As shown in Figure 14, scientists associated with 14 different institutions have given at least 10 talks. In terms of current associations with athletic conferences, the Ivy League leads with 132 talks, followed by the Big 10 with 113, and the Pac-12 with 62. Together these three conferences account for 56% of the talks.

For scientists associated with international institutions, the ETH with six talks is the leader followed by the Max-Planck Institute with three and Cambridge University, University of Tokyo, and University of Toronto, with two talks each. For nonacademic institutions, Merck is the leader with eight talks followed closely by Rockefeller Institute with seven,[52] DuPont is next with four talks, and the NIH had three. A handful of other international and nonacademic institutions have had one or two speakers.

It is fairly common for chemists to move from one institution to another during their career. Twenty-seven NOS speakers gave talks while affiliated with two different universities, and two chemists, Ralph L. Shriner and Samuel J. Danishefsky, presented three talks while associated with three different universities. Shriner was on the faculty at the University of Illinois, Indiana University, and University of Iowa when he

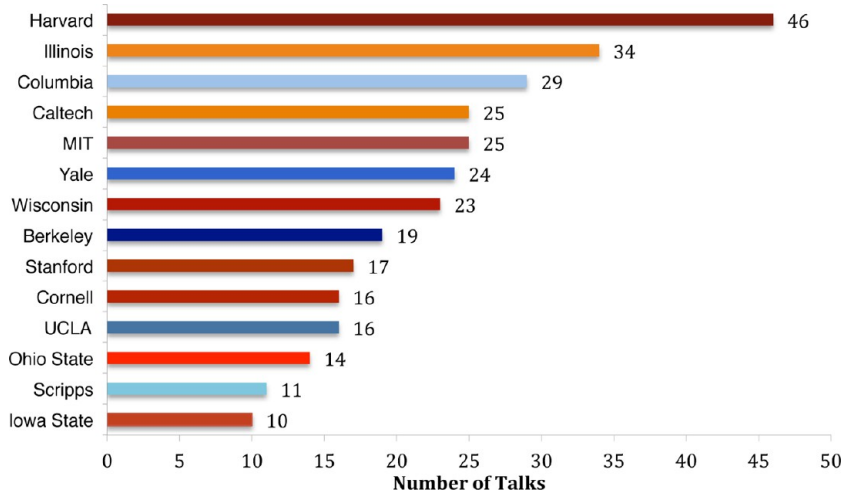

Figure 14. Ranking of the number of talks for academic institutions; bar colors correspond to school colors. In terms of athletic conferences, the Ivy League leads with 132 talks followed by the Big 10 with 113 and the Pac-12 with 62.

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spoke in 1933, 1941, and 1949, respectively. Danishefsky gave a lecture exactly every ten years: 1977, 1987, 1997, and 2007. He was on the faculty at the University of Pittsburgh and Yale for the first two talks and Columbia/Sloan-Kettering for the latter two.

In terms of individual superlatives, Figure 15 shows the 16 chemists who gave five or more talks along with the years they spoke. Most of these chemists also won the Roger Adams Award (vide supra), and four are Nobel Laureates. E. J. Corey (Figure 16) has given the most talks (8) and holds another distinction: In 1955, when he spoke on the *Structure of Friedelin*, Corey was a 26-year old assistant professor at Illinois and became the youngest speaker. C. Fred Koelsch, who was 28 when he spoke in 1935, previously held this record. In terms of multiple talks given by female chemists, Marye Anne Fox (vide supra), Alanna Schepartz, and Carolyn Bertozzi each gave two lectures. Schepartz (Figure 16) was the youngest woman to speak, as she was 33 years old at her first talk in 1995 on *A Chemical Perspective on Transcriptional Activation*.[53] The oldest chemist to present was Andy Streitwieser (Figure 7) who was just shy of 82 years old when he spoke in 2009. Streitwieser also holds the hard-to-believe record of a 50-year gap between talks (1959 and 2009). The most concentrated grouping of multiple talks were the six given by Homer Adkins between 1925 and 1949. In terms of the life spans of the speakers, Wallace H. Carothers (vide infra) had the shortest life when he died in 1937 at the age of 41 years. Charles D. Hurd, who spoke at three NOS, had the longest lifespan of any speaker, dying in 1998 at the age of 101.[54]

Chemist	Years of NOS Presentations
Elias J. Corey	1955, 1959, 1965, 1975, 1989, 1993*, 1999, 2007
Roger Adams	1925, 1927, 1931, 1937, 1939, 1955
Homer B. Adkins	1925, 1927, 1931, 1935, 1941, 1949
Paul D. Bartlett	1937, 1947, 1951, 1959, 1963*, 1973
Donald J. Cram	1953, 1957, 1963, 1969, 1977, 1985*
Jerrold Meinwald[51]	1963, (1969), 1979, 1991, 2001, 2005*
John D. Roberts	1951, 1955, 1959, 1965, 1967*, 1995
Gilbert Stork	1955, 1959, 1963, 1973, 1987, 1991*
R. B. Woodward	1949, 1953, 1957, 1961*, 1967, 1977
Ronald Breslow	1961, 1969, 1979, 1987, 2003
James B. Conant	1925, 1927, 1931, 1935, 1947
Arthur C. Cope	1939, 1947, 1951, 1955, 1965*
Louis F. Fieser	1931, 1935, 1939, 1947, 1951
Robert Grubbs	1983, 1991, 1999, 2009, 2011*
W. S. Johnson	1947, 1955, 1961, 1973, 1977*
Nelson Leonard	1951, 1955, 1961, 1971, 1981*

Figure 15. The 16 chemists who have given at least five plenary lectures and the years of their talks. *Roger Adams Award winner this year.

Figure 16. E. J. Corey (L) was only 26 years old in 1955 when he spoke at the first of his record eight NOS lectures, making him the youngest chemist ever to give a plenary lecture. Alanna Schepartz (R) was the youngest woman to speak; she was 33 years old at her first NOS lecture in 1995. Photograph of E. J. Corey from 1968 courtesy of the Harvard University Archives, UAV 605 Box 18 Corey, Negative #5−68. Photograph of A. Schepartz by Mike Marsland courtesy of A.S.

FAMILY TIES

We Are Family. The only blood relatives to talk at the NOS were Robert R. Williams (7th NOS) and his younger brother Roger J. Williams (9th NOS); see Figure 17.[55,56] They both won the Perkin Medal and were jointly awarded the Charles Frederick Chandler Medal by Columbia University in 1941,[57] and Roger served as ACS President in 1957. The brothers were independently involved in vitamin research; for example, Robert determined the structure of and synthesized thiamin (vitamin B_1)[55] as Roger discovered pantothenic acid (vitamin B_5).[56] Linus Pauling thought so highly of the Williams brothers that he tried to recruit them as faculty at Caltech.[58] In addition, there is another set of siblings with an NOS connection. William G. Dauben spoke at the 15th NOS, as his older brother Hyp J. Dauben, Jr. served as a local organizer for the 16th NOS. While a parent and child have never spoken at the NOS, a husband and wife have both given talks: Peter B. Dervan (29th and 32nd NOS) and his wife Jacqueline Barton (35th NOS).

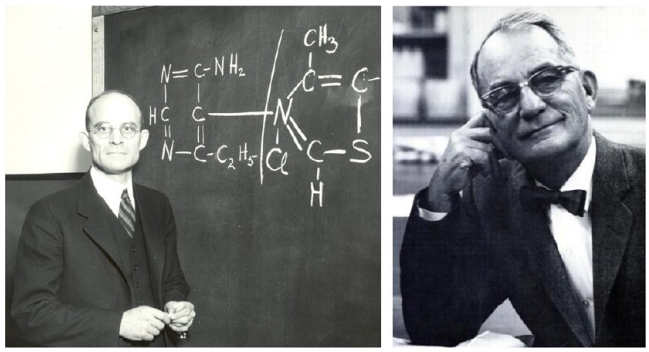

Figure 17. Brothers Robert R. Williams (L) and Roger J. Williams (R) are the only blood relatives to speak at the NOS. Robert's talk "The Chemistry of Thiamin" was given in 1937, and Roger spoke on Organic "Growth Substances" in 1941. Photograph of R. R. Williams reprinted with permission of Alcatel-Lucent USA, Inc. Photograph of R. J. Williams by Jim Seymour courtesy of Graham Seymour.

The most common family name among speakers is Johnson, accounting for 2.4% of all NOS talks. Four chemists had this surname: Treat B. Johnson (3 talks), John Raven Johnson (3 talks), William S. Johnson (5 talks), and Carl R. Johnson (2 talks). It does not appear that these Johnsons are related.[59,60] Other names appearing more than once but with no familial relationship are Bartlett, Barton, Bergman/Bergmann, Evans, Jones, Russell, Smith, Taylor, White, and Wood.

Academic NOS Lineage. Similar to having a traditional genealogical lineage, every chemist with a doctorate has an academic lineage traced through his or her mentor. The Ph.D. or D.Sc. advisor of 330 of the 332 NOS speakers has been

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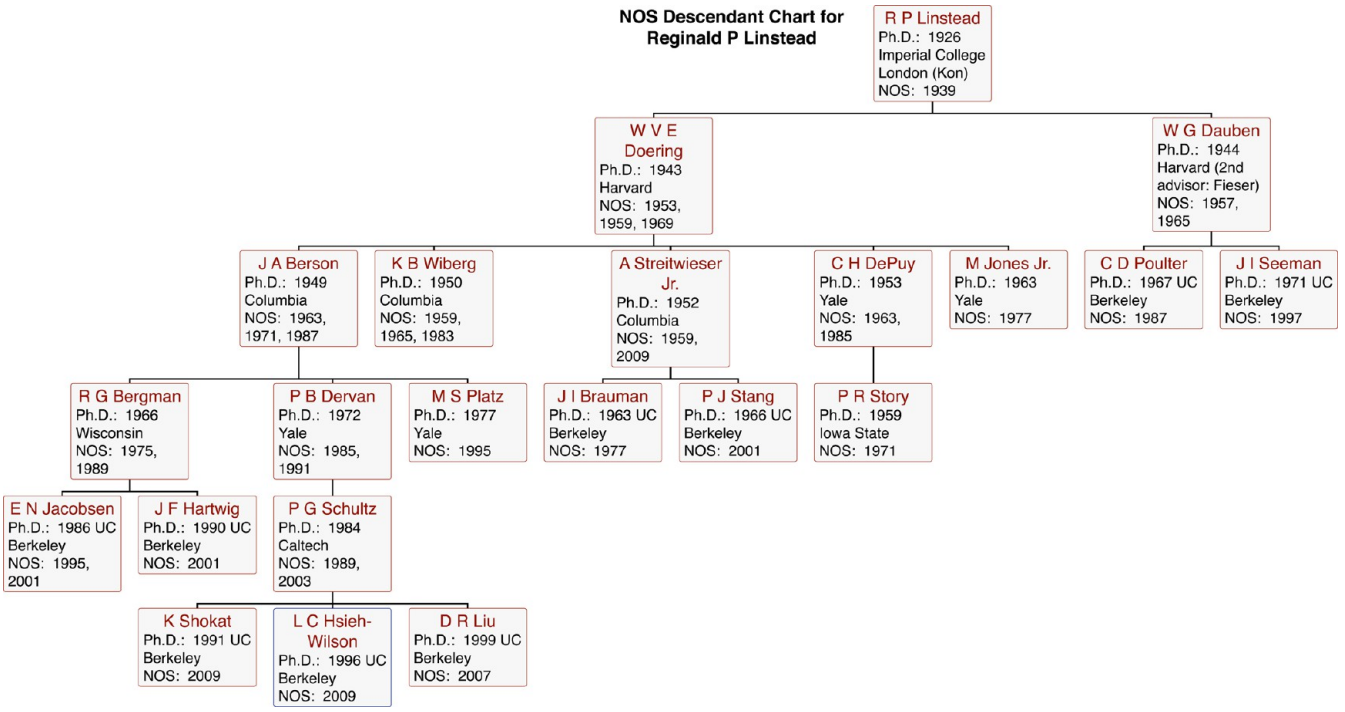

Figure 18. Family tree for Reginald Linstead showing his academic descendants who spoke at the NOS.

determined, and family trees based on these data have been constructed.[7,61] The Reginald Linstead tree provides an example; see Figure 18. The number of chemists and the number of talks for each NOS academic tree has been counted in two ways. The first allows the skipping of a person who did not speak[62] and the second does not; i.e., it only counts contiguous lineages. Data from the 11 trees with the largest number of chemists are presented in Table 2.

LOGISTICS AND STRUCTURE

Timing Is Everything. If you have attended the NOS anytime in the last 45 years, you know that the symposium is in June, the talks are held in the morning and evening, and the afternoons are free so that you may explore the area, check in with your research group back home, exercise, or discuss chemistry with colleagues. Prior to 1947, this was not the case. The NOS was held at the end of December, and in 1929 and 1935, the organikers spent New Year's Eve at the symposium! Initial advertisements for the 10th NOS showed that it was scheduled for December 28−30, 1943, in Boston.[63] After April 1943, the symposium was canceled, likely because of war travel restrictions.[64] After the war hiatus in 1943 and 1945, the 10th NOS resumed in 1947 in Boston with the now-familiar June date. The talks at the early NOS were in the mornings, afternoons, and evenings. "The program was purposely planned for serious business with no place for general excursions and the interest of all was evinced by an almost prompt and complete attendance at all of the sessions."[65] In 1967, the 20th symposium was the first to offer free time in the afternoons to attendees, and the seemingly ubiquitous poster sessions did not start until twenty years later at the 30th symposium.[4] The frequency of the NOS was debated in 1925. Early promotional notices stated that "it would be an excellent thing for the organic chemists of the country to assemble once a year,"[66] and several dispatched news reports noted that the symposium would meet again in 1926 in Columbus,[67] probably in June.[68,69]

Table 2. Top Eleven NOS Academic Family Trees

NOS family tree	generation skips allowed				contiguous lineage		
	no. of chemists	no. of talks	avg[b]	gen[c]	no. of chemists	no. of talks	gen[c]
James B. Conant	38	75	1.97	7	32	67	6
Robert B. Woodward[61]	31	59	1.90	5	23	47	4
Roger Adams	24	55	2.29	5	20	47	5
Reginald P. Linstead	22	35	1.59	6	22	35	6
Moses Gomberg	19	30	1.58	6	18	29	6
Reynold C. Fuson	10	15	1.50	4	10	15	4
William G. Young	7	15	2.14	4	7	15	4
William Lloyd Evans	5	13	2.60	3	5	13	3
Marston T. Bogert	5	10	2.00	3	4	8	2
Rudolph J. Anderson	5	9	1.80	3	5	9	3
Peter Yates	5	9	1.80	4	4	7	3
sum[a]	**168**	**321**	**1.91**		**149**	**292**	
% of NOS total	**51**	**58**			**45**	**53**	

[a]Three chemists who gave four talks appear on two trees.[7] [b]Average number of talks per chemist. [c]Number of generations in the tree.

However, the 1926 February issue of the *Journal of Chemical Education* correctly posted the date of the next symposium as December 1927.[70]

Location, Location, Location. The first NOS was held in Rochester because of a desire to make it accessible "to organic industrial enterprises".[66] Rochester hosted the NOS again in 1935 and 1957, making it one of only three sites to host three symposia. The other two were Ann Arbor (1941, 1953, 1971)

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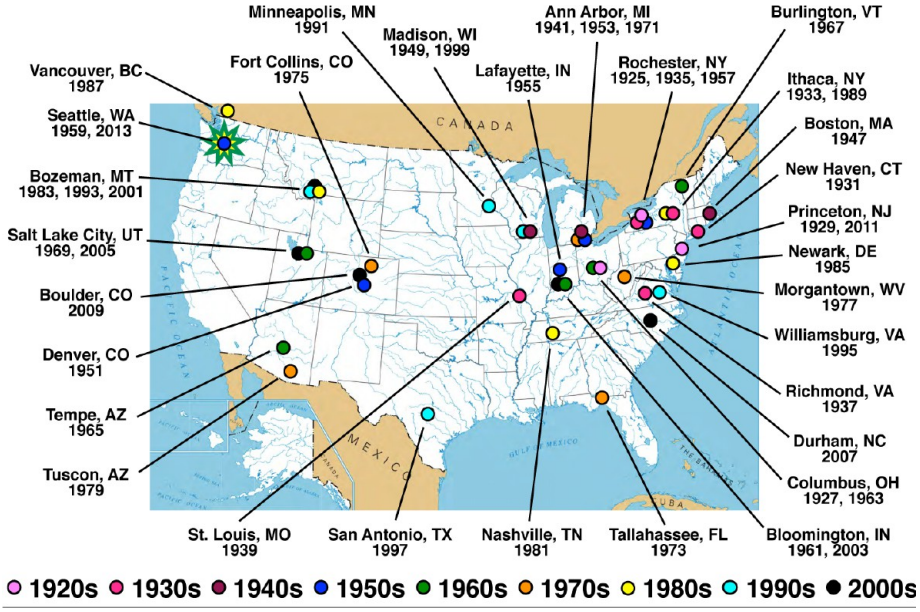

Figure 19. NOS locations from 1925 to 2013. Diagram courtesy of Scott McN. Sieburth. Underlying map from the National Atlas of the U.S., 2004.[71]

Figure 20. Speakers (S) and organizers (O) at the 30th NOS held in 1987 in Vancouver, British Columbia, Canada, the only NOS ever held outside the U.S. and the first to have a poster session. L to R: Larry Weiler (O), Gilbert Stork (S), Paul Gassman (S), Jerry Berson (S), David Dolphin (S), Dale Poulter (S), Ron Breslow (S), Jeremy Knowles (S), Peter Lansbury (S, substituting for E. T. Kaiser, see text), K.C. Nicolaou (S), Stuart Schreiber (S), Paul A. Bartlett (O), and Sam Danishefsky (S) in the totem pole. Photograph courtesy of P. A. Bartlett.

and Bozeman (1983, 1993, 2001); see Figure 19. In the 1960s, a general rotation was established wherein the meeting site would alternate between an eastern site for one symposium and a western site for the next. The symposium was held outside the continental U.S. only one time, in Vancouver, British Columbia, in 1987 (Figure 20). Surprisingly, sites in California and Illinois have never hosted the NOS despite the relatively large populations and numerous potential host institutions in these states.

History of the NOS Program Books. Modern NOS have a program book with a schedule, abstracts of plenary lectures, and poster titles. Correspondence[72] between ORGN Secretary Ralph L. Shriner and speaker Max Bergmann (Figure 21) indicate that these programs were first produced in 1937. The exchanged letters include a set of instructions for the speakers that describes Executive Committee deliberations on how to meet requests by ORGN members to make the material presented available to attendees. As an aside, Bergmann's talk on *Protein Structure in Relation to Biological Problems* generated significant interest from the scientific and popular press.[73,74] After the symposium, in a letter dated January 5, 1938, Shriner wrote to Bergmann, "I also wish to thank you personally for your cooperation in the preparation of the material for the printed program. Everyone has commented favorably on this experiment."[72]

At the ORGN website, portions of the programs from the 7th–42nd NOS, as well as the complete program for the first NOS, are available.[4] This latter volume is not a true program

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Figure 21. Ralph L. Shriner (L) and Max Bergmann (R). Correspondence between Organic Division Secretary Shriner and NOS speaker Bergmann provides insights into early NOS protocols. Photograph of R. L. Shriner courtesy of the Frederick W. Kent Collection, University of Iowa Libraries, Iowa City, Iowa. Photograph of M. Bergmann courtesy of the Rockefeller Archive Center.

but instead a series of full papers. It is hypothesized that it was assembled after the symposium, as it lacks a schedule of events and other typical information found in program books.[75] Additionally, papers from Morris Kharasch, Lauder W. Jones, and Frank C. Whitmore are missing from its contents even though they all spoke.[67,69,76] Ironically, the only known copy of the first NOS program book belonged to Whitmore. He donated it the Eastman Kodak Company Research Library in the 1920s, and it was later given to the University of Rochester Library and is currently in their rare book collection.[77]

Behind the Scenes. The work required to organize a NOS is tremendous. At present, the ORGN Executive Committee selects a SEO for a 2.5-year term. The SEO, Executive Committee, and local committee work closely throughout to plan and execute the symposium.

Historically, ORGN members have provided input for choosing future speakers.[10,78] In the past, this was done with paper ballots handed out at the NOS or mailed to members; more recently, email and social media sites have been used to solicit input. The organizers also arrange the Roger Adams Award Dinner that is held on the Sunday evening before the symposium. A photograph from the 1973 dinner is shown in Figure 22, and many additional photographs from 1973 and the other NOS can be found on the ORGN website.[79]

In addition to the Adams dinner, there is a banquet for all attendees that is typically held on Wednesday evening, and entertainment is often provided. In 1989, the attraction had a chemical connection as the *Borodin Ensemble*, a chamber music group composed largely of chemists, played a concert after the banquet. Three of the ensemble members are organic chemists: clarinetist Frank Mallory, flutist Jerry Meinwald, and pianist David Schuster. The other members of the group are pianist and harpsichordist Charlotte Greenspan (Meinwald's wife) and violist Melissa Stucky. Appropriately, the ensemble takes its name from the Russian organic chemist and composer Alexander Borodin.[80] The group's encore performance was a Brahms Hungarian Dance in honor of George Olah, the 1989 Adams Awardee who was born in Budapest.

The organizers often must deal with unforeseen circumstances, sometimes at the last minute. For example, in 1969 Jerry Meinwald tripped on his patio and broke both arms shortly before the symposium.[81] SEO Jerry Berson asked Fred Bordwell to give a replacement lecture, which he did despite the very short notice.[82] This was not the first example of substitute lectures at the NOS, at the previous symposium in

Figure 22. The 1973 NOS Adams Award banquet. Foreground, clockwise from left: Orville L. Chapman, Werner Herz, Edward C. Taylor, George M. Whitesides, John D. Roberts, and William S. Johnson; these chemists have given a total of 18 NOS talks. Photograph courtesy of Jack Saltiel and created by Steve Leukanech. The Board of Trustees of the Florida State University. Permission to use this material was granted by FSU, which reserves all rights in the material.

1967 (in Burlington, VT), Myron L. Bender had been scheduled to give a talk entitled *Enzyme Models and Model Enzymes*[83] but instead E. Thomas Kaiser and William Jencks shared a timeslot and each gave a talk about enzymes in his place. It is not known why the substitution occurred in this case. Interestingly, Kaiser was also involved in another substitution 20 years later when he was too ill to give his presentation so Peter Lansbury, a postdoctoral fellow in his group, gave the talk instead (see Figure 19).[84]

Ken Wiberg, SEO for the 1959 symposium in Seattle, recalled another instance of troubleshooting on the fly, "on the day the participants were arriving, a water main to the dormitory building at which they were staying decided to break and for the rest of that day I was involved with trying to get someone to fix it. The physical plant people were able to make a temporary but workable repair. There also were problems with the audio system and with one projector. I don't remember much about the talks at that meeting, but I remember being quite busy."[85]

THE HUMAN SIDE OF SCIENCE

Conflicts and Controversy. The NOS has been intertwined with some of the most heated debates in organic chemistry over the past century. When Moses Gomberg proposed free radicals in 1900 one of strongest voices of opposition came from James F. Norris.[16] According to John D. Roberts, during the after-dinner NOS presentation in 1941, Gomberg discussed "his life and enduring the criticism heaped on him from those who were sure free radicals would be far too reactive to exist for an extended time in solution."[8c] Similarly, a clash between Homer Adkins and Morris Kharasch occurred on the opening day of the 1949 symposium. After Adkins' talk about hydroformylation, Kharasch spoke about mechanisms of free radical reactions. Adkins "had little patience with mechanisms, and the Adkins–Kharasch exchanges became quite pointed."[86] Directly afterward, Adkins gave a tour of his hydrogenation laboratory, suffered a heart attack, and was taken to the hospital. Andy Streitwieser recalled that all of the attendees discussed Adkins' fate.[87] After a month in the hospital his condition improved and he was sent home. But then on August 10 he suddenly died; he was only 57 years old.[88]

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Twenty years later, another historic battle played out in Salt Lake City. The last talk of the symposium was *Neighboring Groups and Nonclassical Ions* by Saul Winstein. H. C. Brown and Winstein had a decade-long disagreement over the existence of nonclassical carbocations (Figure 4d).[22,49] An intense discussion period was anticipated by SEO Jerry Berson (and many others) so Jerry asked George Olah to serve as the moderator. Jerry recalls "this drew a big laugh when I introduced him, because George was at least a foot taller than either of the combatants and looked as though he could be a good referee."[50] The argument that ensued was indeed heated, but the tension was broken somewhat by the relative heights of the three chemists.

Tragedies and Triumphs. Troubled genius Wallace Carothers is perhaps the best-known tragic figure among the speakers. Carothers was a Ph.D. student of Roger Adams and counted Adams, John Raven Johnson, and Carl Marvel among his closest friends.[14] Carothers suffered from alcoholism and depression for many years. He disliked public speaking, as he wrote to his friend Wilko Machetanz in January 1932, "I did go up to New Haven during the holidays and made a speech at the organic symposium. It was pretty well received but the prospect of having to make it ruined the preceding weeks and it was necessary to resort to considerable amounts of alcohol to quiet my nerves for the occasion."[89] Carothers was being modest; the *New York Times* reported "the 400 chemists present applauded his address, and the discovery was hailed as a great triumph for American chemistry."[90] There is evidence he considered suicide for over a decade before he took his own life by cyanide poisoning on April 29, 1937, two days after his 41st birthday.[14]

A contemporary of Carothers was Raemer Rex Renshaw who spoke at the first two NOS and was Secretary and Chair of ORGN in 1923 and 1924, respectively. At the fall 1937 ACS meeting, he proposed using acetyl choline as a more humane agent for warfare because it would cause enemy soldiers to faint.[91] From 1937−1939, his work appeared in *J. Am. Chem. Soc.* ten times, some of which were published posthumously; on September 23, 1938, he and his second wife died after falling 19 stories from the window of their Tudor City Place apartment in Manhattan.[92,93] The circumstances surrounding the fall are unclear, and conflicting theories were posited.[94] Renshaw was 58 years old when he died. Ironically, Renshaw's first wife also died as the result of a fall at Bash Bish Falls in Taconic Tri-State Park in 1930.[95]

Fortunately, there are also many personal triumphs associated with the NOS. E. J. Corey recalls, "after my 1955 NOS talk at Purdue, Richard Arnold, a long-time professor at U. Minn. came up to me and asked me my age. When I answered 26, and just about to become ineligible for the military draft, he smiled and said: 'good, you will be hearing from me.' A few months later I received a letter from him with the good news that I had been selected as an Alfred P. Sloan Fellow and would receive a $3,000 research grant."[96] Arnold, who spoke at the NOS in 1947, had just become a program administrator with the Foundation.[97]

The 1993 NOS proved pivotal for Cindy Burrows' career. As she recalls, "Peter Stang said to me after my talk that I 'wouldn't last long at Stony Brook,' implying that some other department would make me an offer." Burrows explained to Stang that her husband was also a chemist and this would make such a move more difficult. She said Stang, who was the chairman at the University of Utah at the time, replied that this was "not a problem for a good administration".[98] By January 1995, Burrows and her husband had joined the faculty at Utah.

The Stories We Will Tell. Although the main focus of attending a chemical conference is to learn and discuss science, it is also an opportunity to have fellowship with colleagues and to explore a different part of the country. We do not have space to pass on all the wonderful human interest stories that we have heard regarding the NOS, but one event relayed by E. J. Corey about the 1959 symposium highlights the memorable experiences that can occur at these meetings:

> *"I had never been to Seattle before, so I took advantage of the trip to get acquainted. The Sunday before the meeting there was a great boat trip to the north of Seattle along the islands with a stop to enjoy absolutely delicious fire-grilled fresh-caught salmon. Of course, I enjoyed hearing all the different chemical talks at the meeting... [and afterwards] my University of Illinois colleague, the late Ken Rinehart, and I together with a few others climbed Mount Rainier, which was great fun. We were lucky that the snow was firm all the way going up. We used crampons, but did not need to chop steps in the ice. The return was very fast, glissading most of the way − so the whole descent took only about 2.5−3 h."*[99]

This month, the 43rd NOS will again be held in Seattle with a truly world-renowned group of speakers selected by the SEO Scott Sieburth and the Executive Committee.[100,101]

■ CONCLUSIONS

Biennially the NOS has showcased the tremendous progress of organic chemistry over the past four score and eight years. The knowledge and capabilities of the modern chemist would surely astound James F. Norris and E. Emmet Reid. Over this time, the demographic profile of speakers has changed. In the Modern Era, the emergence of women speakers and the increase in the number of speakers from international institutions mirrors the demographic changes in the attendees and ORGN membership. During the Modern Era the emphasis of the field has shifted, with a sharp rise in the number of bioorganic presentations and a steep decline in physical organic presentations. History demonstrates that the NOS is a terrific venue to see cutting-edge research of up-and-coming chemists; after all, 16 of the 18 Nobel Laureates who spoke at the NOS did so prior to winning the Prize.

In the larger view we can examine why the history of chemistry is important. Perhaps the best answer to this question comes from the inimitable Glenn T. Seaborg, who, as ACS President during the 100-year anniversary of the Society said, "The real purpose of looking back is not, of course, merely to obtain satisfaction from reflecting on past triumphs; rather, it is to discover as many clues as possible to the likely developments of the future."[102] So, what does the future hold for the NOS? Well, looking to the past we note that the celebration of the 10-year anniversary of the NOS was marked by holding the symposium in Rochester. So, perhaps, the 100-year anniversary of the symposium, in June 2025, will be held in its birthplace once again.

■ ASSOCIATED CONTENT

Supporting Information

The demographic data for ORGN members and NOS speakers, speaker name, affiliation, title, and category assignment for all talks; description of the talk classification system; Ph.D. advisor, postdoctoral advisor, birthplace, and birthdate for each speaker; top 13 NOS academic family trees; major awards won by NOS

speakers; host, attendance, and organizer data; citation list and references for Speakers' information and NOS announcements and reports. This material is available free of charge via the Internet at http://pubs.acs.org.

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Notes

The authors declare no competing financial interests.

Biography


Edward E. Fenlon (L) earned his Ph.D. in 1995 from the University Illinois, Urbana−Champaign with Steven C. Zimmerman. He became an Associate Professor at Xavier University in 2003 and currently holds that rank at Franklin & Marshall College. His research interests include synthesizing nucleoside analogues, stable carbon radicals, molecular knots, new musks, and the history of organic chemistry. Brian J. Myers (R) earned his Ph.D. from Indiana University, Bloomington in 2000 with David R. Williams. After a postdoctoral appointment with James H. Rigby at Wayne State University, he joined Ohio Northern University where he now holds the rank of Associate Professor. Since 2002, he has served as the Webmaster for the ACS Organic Division.

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(46) The five women who were ORGN members in 1921 were Miss Anne W. Davis, Princeton, NJ; Prof. Dorothy Hahn, Mt. Holyoke College, MA; Miss Emma L. Kemp, Lincoln HS, Jersey City, NJ; Miss Katharine Ogden, Ithaca, NY; and Mrs. W. T. Read, New Haven, CT; see ref 40.
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(62) The system used only allows skipping to connect grandparent to grandchild, not skipping of a parent to connect siblings, that is, the head of the tree must be an NOS speaker.
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(72) Max Bergmann Papers (Mss.B B445, Box 19: Folder 30), American Philosophical Society, Philadelphia, PA 19106. Collection index can be viewed at www.amphilsoc.org/mol/view?docId=ead/Mss.B.B445-ead.xml (accessed Mar 24, 2013).
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