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The Merck Index, an Encyclopedia of Chemicals and Natural Products

Interview with Maryadele O'Neil

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Maryadele O'Neil is the Senior Editor of *The Merck Index* and the Director of Scientific Nomenclature Services. She obtained her Master's of Library Science from Rutgers University and her BA in Bacteriology (minor in Chemistry) from Douglass College at the same university. After working as a lab-bench researcher for several years, she became involved with *The Merck Index*. Now she directs all aspects of researching, writing, and publishing of this famous book and is responsible for its content and editorial style, as well as for the authorized product nomenclature and the development of official non-proprietary names for all Merck products.

Ms O'Neil has founded the Women in Chemistry Scholarship Program to encourage women to pursue PhDs in medicinal or synthetic organic chemistry. This program has provided \$5,000 scholarships, plus travel stipends for winners, to present their research at American Chemical Society national meetings. She has started different initiatives to provide networking opportunities for scholarship winners with their colleagues at the ACS.

SB: The Merck Index has been an icon for chemists for decades, and it has served them very well. Could you tell our readers a little bit of its history and the people who have contributed to it?

MO: The first edition, known as *Merck's Index*, was published in 1889 by the German chemical company, E. Merck, in order to communicate with customers in the United States. The company's American subsidiary was established 2 years later as Merck & Company. While the first edition was little more than a sales catalog, the second edition, published as *Merck's 1896 Index*, grew in scope to include important medicines from the US Pharmacopeia and the National Formulary as well as common laboratory and manufacturing chemicals. Already, *The Index* was more of a reference handbook than a price list and included physical properties and medicinal uses for the compounds. Because of the popular demand, a Third Edition was published in 1907. Chemists were now an important part of the readership, and additional physical properties and line formulae were added for their use.

Ties between the German and American companies were severed by the impact of World War I, but Merck & Co. continued to publish *The Merck Index*. An ever-growing number of compounds would be added in succeeding editions to increase the utility of the information for researchers. Still today, *The Index* is published on a not-for-profit basis as a service to the scientific community.

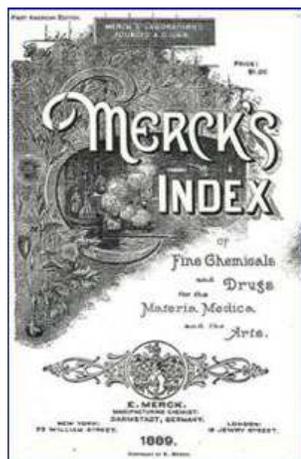
The material in *The Index* has been written over the last 120+ years by generations of Merck scientists. No editors were specifically named until Paul G. Stecher was appointed as such for the Seventh Edition in 1960. Martha Windholz, also a Merck chemist, was named Editor for the Ninth Edition, followed by Susan Budavari, from whom I took over in 1999.

The scientists of Merck Research Laboratories have always been very generous with their expertise and advice, and I am most grateful to them for their continued support.

SB: As the editor of The Merck Index, what do your responsibilities include?

MO: Most importantly, I author a significant amount of the material in the monograph section and tables. I am responsible for the selection of new compounds to be included as well as monographs that are retired from each edition. It is very difficult to select the compounds that will no longer appear in print, but it is necessary to maintain the single volume size. The retired monographs are still available in the online editions, although the information is no longer updated.

If you look through previous print editions of *The Index*, you will notice that the contents are really an encapsulation of what was happening in science during a particular period of time. I so much enjoy reading and scanning journals and news articles for the latest developments, and I have been privileged to read and write about a number of significant scientific advancements.



Perhaps the most enjoyable aspect of my role as editor is the opportunity to interact directly with those who use *The Index* in their daily work. Their specialties span a wide range of scientific disciplines and include researchers in the lab, emergency first responders, information professionals, educators, and, of course, students. It is most gratifying to speak with these individuals to learn how *The Index* has contributed to their ability to do their work. Many of them have great suggestions for us that they are willing to share. We try to incorporate their ideas into our workflow to continually improve both the information we provide and the way we deliver it. I and some of my team regularly attend the ACS National Meetings and would welcome everyone to stop by at our booth in the exhibition center.

SB: With the many new resources available online, what is the niche that The Merck Index occupies now and which is its audience today? What is unique about it? Why would people use it rather than go to other resources?

MO: There is an overwhelming amount of information available now through the internet and some of it is very good. However, it is often difficult to find authoritative information while weeding through thousands of leads in your search engine of choice. Scientists have come to rely on the accuracy of the physical properties and chemical structures presented in *The Index*. It's also viewed as a key to the literature — a first stop for an overview of a compound's use or its significance.

The Merck Index centralizes a lot of information that is critical to many different research disciplines. Approximately half of the monographs cover human and veterinary drugs, traditional and herbal medicines, and diagnostic aids. The remainder includes standard lab reagents, agricultural and commercial chemicals, plants and natural products, and compounds of environmental significance. We try to select the most important compounds across this broad sweep of science to retain the

ready reference characteristic.

In our user survey conducted last year, lab scientists surprisingly told us that they still prefer the printed handbook to keep nearby them at the bench. The encyclopedic organization of the data makes it easy for them to look up a particular compound and find all of the information together in a single monograph.

SB: What is the publication process for the manual? How are new data added and how are these data verified?

MO: All of the data included in *The Index* come from published sources, usually peer-reviewed journal articles that are cited within the monographs. We evaluate multiple sources before selecting the best values to report. If it is not possible to choose between varying data, both values are reported. Citations



are also given so that our users may read the experimental details on their own. The online versions now include digital object identifiers (DOIs) and PubMed IDs for many of the cited articles to make it even easier to review the original sources.

After a new compound has been selected for inclusion, the writer of the monograph performs a search of the scientific literature to immerse him or herself in the topic. Chemical names, trademarks, and generic names are gathered and verified as well as registry numbers and drug codes, if applicable. The chemical structure is drawn to TMI specifications and physical properties are gleaned as described above. Finally, literature citations, such as syntheses and analytical methods, are selected based on the information they provide and their applicability to our end users' needs.

As early as 1984, *The Index* has been available as an online database. We knew very early on that a publication cycle of 5-6 years had become too long for many of our readers to wait for new material. The online versions are updated twice per year with new and revised monographs. To accommodate this rapid cycle time, our manuscript is always publication-ready. Each monograph is written or updated and released into the manuscript as a completed entity. New monographs are appended in the order of completion, which is why they are not in alphabetical order in the electronic editions. Database extracts are prepared by our technical staff and exported to our online partners to be processed and published in their format.

Publishing the print edition is somewhat more complicated. After the retired material is removed, monographs are re-alphabetized and re-numbered. The various indices for the printed edition are automatically created by the attributes assigned to specific data elements, such as registry number, formula, and synonyms. Extracts for each section and index are prepared and sent to the typesetter to produce the pages according to our specifications. Once the page proofs are reviewed to ensure accuracy, the work of the editorial staff is essentially done. Our good colleagues in the Merck Publishing Group take over and handle the printing and production. They also are responsible for the sales, marketing, and distribution of the new books.

SB: Who are the people who are involved with *The Merck Index* now?

MO: You may be surprised that the editorial staff of *The Index* is quite small. There are only 4 editors who write original content, each with a specific area of expertise. For example, Dr. Peter Dobbelaar is an experienced synthetic chemist who prepares the monographs on chemical reagents and is responsible for the Organic Name Reactions (ONR) section. We are fortunate to be able to call upon the expertise of chemists from outside of Merck as well. For the upcoming 15th edition, Dr. David MacMillan has been of great assistance in reviewing the ONRs. In previous editions, we have been privileged to work with Dr. David Evans and Dr. Barry Trost.

Senior Associate Editor Patricia Heckelman has an advanced degree in toxicology. In addition to writing, she is responsible for all of the operational activities, manages the interactions with the typesetter and co-publishers, and ensures the accuracy of each of the electronic editions.

Assistant Editor Kristin Roman utilizes her Masters Degree in Biotechnology to author new material pertaining to this field. Rounding out the team, we have excellent support from the senior editorial assistants, Catherine Kenny and Edwin Enraca, and the technical specialist, Linda Karaffa. We also have assistance from Merck's nomenclature expert, Margaret Hill, who is always on-call to answer naming and structure questions.

The Merck Index is part of a family of publications that include *The Merck Manual of Diagnosis and Therapy*, *The Merck Veterinary Manual*, and the *Home Health and Pet Health* editions. As publisher, Gary Zelko brings his years of experience in print publications to oversee the production and marketing of the entire set of handbooks. I would be remiss if I did not also mention my manager, Matthew Cahill, who also brings valuable expertise from the publishing world.

SB: You have been passionate about creating opportunities for women to get involved and advance in science. What are the main issues women scientists are facing now?

MO: I do believe that it is easier today for women to pursue a career in science than it was 30 or 40 years ago. While the number of women chemists at the master's level continues to grow, the number of female PhD chemists is dropping precipitously. The choice to continue past the master's level is a difficult one for women who continue to worry about balancing their work with a family. The availability of day care options is certainly more prevalent now, but it is still difficult for young mothers to cope with long hours in the laboratory. Experienced, successful women have a responsibility to mentor and encourage young talent. I have had the opportunity to speak with many young women as they are beginning their advanced studies. Overwhelmingly, they tell me that the opportunity to network with their female colleagues is invaluable.

SB: Could you tell us what your background and professional and personal interests are?

MO: My undergraduate degree is from Douglass College, which is part of Rutgers University and sister to the then all-male Rutgers College. While I had planned to pursue a career in the medical field, my professors convinced me that I had an aptitude for chemistry and I found myself spending more and more time in the chemistry building. I still maintained my love of the biological sciences and ended up with a degree in Microbiology.

My first position at Merck was as a research assistant in the laboratories, working in the immunology department. There was an opening on *The Index* staff after the 10th Edition was published, and I thought that it would be the ideal job for someone like me who loved to read and write science. After joining the staff, I returned to Rutgers University part-time to pursue my Master's Degree in Information Management, with two small children in tow.

The decision to come to *The Index* was absolutely the right one for me. I have enjoyed my many years on the staff and have continued to learn something new every day.

Not surprisingly, I do have a passion for reading, and enjoy non-fiction as well as novels of many different genres. One of my favorite hobbies is working in my perennial garden which is probably why I enjoy writing material on natural products and traditional medicines for *The Index*. I am an avid baseball fan and have been able to attend baseball games in the wonderful stadiums throughout the US, whenever my travel coincided with the home team's schedule.

SB: What is your relationship with the ACS?

MO: I have personally been a member of ACS and the Chemical Information Division for many years and regularly attend the ACS national meetings. When not at the booth in the exhibit hall, you will more than likely find me attending one or more of the CINF sessions. I have also enjoyed being associated with the Women Chemists' Committee and the great work they are doing to advance the careers of women in science.

The Merck Index has had a long partnership with the ACS, particularly in support of various educational initiatives. Last year, in conjunction with National Chemistry Week, Merck donated 12,000 copies of *The Index* to local ACS sections to distribute to high school students and teachers across the country. I had the privilege of attending a science fair at Ballou High School in Washington DC with ACS President Tom Lane when the first books were distributed. The students and their teachers were most inspiring and I was delighted to be able to meet them and present them with copies of *The Merck Index* for use in their classrooms.

SB: Why is the online version of *The Merck Index* accessible through different platforms rather than having it available like other similar resources directly from a web page?

MO: The editorial staff prepares all of the material and maintains our content management system, but we do not have any search software with which to produce an online edition ourselves. Because of the richness of our indexing and the granularity of the data, *The Merck Index Online* is much more than a text-searchable eBook. Our co-publishers process our data and apply their specific tools to enhance the searchability of the material.

The Merck Index has a diverse user base ranging from healthcare professionals, to engineers, to bench researchers. It is important to us that our end users

are able to easily access the information, regardless of their discipline. The various platforms have been strategically selected based on the way the data are presented and/or paired with other resources to meet the needs of their specific target audience.

SB: As science is becoming more and more interdisciplinary, how do you see the evolution of *The Merck Index*?

MO: In the preface to the Tenth Edition (1983), Martha Windholz described her most important challenge as being able to "effectively report major developments at the forefront of the life sciences and to reflect the complex and inextricable interdependence of chemistry, biology, and medicine." This began the incorporation of biologics into *The Index* to provide research chemists with access to a broader scope of information than they previously needed.

Speaking selfishly, I was quite happy with this decision, since I was purposefully hired to bring my blended perspective of biology and chemistry to the staff. There is always the temptation to stray too far from our true niche, and we must not forget that our readers have relied on *The Index* as a key core reference for organic chemistry.

Future editors of *The Merck Index* must balance the need for this interdisciplinary information without abandoning the original purpose set forth in the First Edition to provide a summary of whatever chemical products are today adjudged as being useful in either medicine or technology.

SB: Thank you, Maryadele, for giving this interesting interview. Our readers will have a better idea now how this "icon" of chemical information is being published.