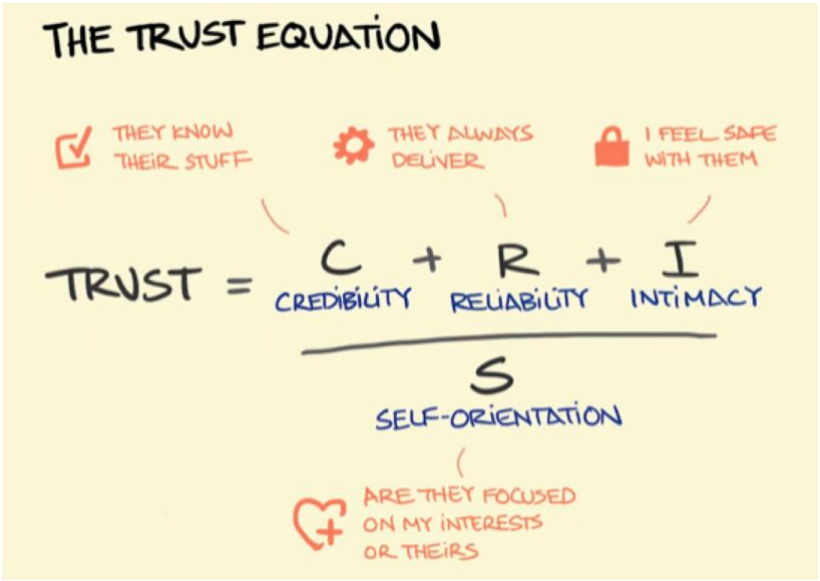
Introduction to Responsible Conduct of Research (RCR) - at Academic Institutions
Philip DeShong, Professor emeritus in the Department of Chemistry & Biochemistry and in the Division of Research, University of Maryland, College Park

The entire research enterprise is built on trust. Without it, progress is impossible because it depends on previous results published by others. Traditionally, these values are shared within each research group, where most of us began our scientific apprenticeship and started building the network of relationships that are the basis for our professional careers. We all heard about notorious examples of scientific misconduct, and we understood that bad actors would be caught when their results could not be reproduced. In his own laboratory, Professor Philip DeShong has always displayed the "Trust Equation" (taken from Charles Green):



Clearly, trust is built through good conduct and relationships. And, "Data are Sacred."

By 1981, U.S government agencies lost patience with this "self-correcting" process and created the Office of Research Integrity (ORI) to actively investigate suspected cases of research fraud. As we learned from Professor DeShong, this was the first step toward more formal regulation of academic research, leading to today's required training in **Responsible Conduct of Research (RCR).** Professor DeShong presented a webinar on Thursday, February 22nd that traced the path from 1981 to the current government oversight of research integrity through the training and reporting requirements of the 2022 CHIPS Act and other recent legislation (NSPM-33). Key excerpts from his slides:

ORI (1994) mandated that

- Universities receiving NIH funds must have formal scientific misconduct policy
- NIH requires training grant recipients (grad students/postdocs) to receive RCR education in person
- Today, most federal funding agencies require RCR education for *anyone* paid on federal funds

NSPM-33 (Jan. 2022)

"... [support] the values that distinguish the U.S. research enterprise: openness, transparency, honesty, equity, fair competition, objectivity, and democratic participation.

NSPM-33 directs a series of actions for Federal research agencies, with an emphasis on developing standardized policies and practices for disclosing information to assess conflicts of interest and conflicts of commitment among researchers and research organizations applying for Federal R&D awards."

Chips & Science Act (HR-4346; Aug. 2022)

(Sec. 10337) ...."NSF grant applicants [must receive] training and oversight in the responsible and ethical conduct of research. The section requires such training and oversight to be provided to postdoctoral researchers, faculty, and other senior personnel and requires the training and oversight to include (1) mentor training and mentorship; (2) training to raise awareness of potential research security threats; and (3) federal export control, disclosure, and reporting requirements."

Clearly, these regulations seek not just research integrity but also career equity and, in addition, compliance with export controls and protection of national security. Requirements for the disclosure of conflicts of interest are now explicit. Universities are charged with training students and staff, and with investigating allegations of misconduct. Professor DeShong described specific cases of misconduct, and identified faulty mentorship as the key failure in most cases. Students who lack guidance or supervision may be tempted to cheat. Students who are under too much pressure to complete a project may also be tempted to cheat, with the effective collusion of their mentor.

Over the past two decades, the teaching of Responsible Conduct of Research (RCR, previously called Professional Ethics) has become a regular curriculum item for both undergraduates, graduate students, and dedicated research professionals, including faculty, at academic institutions. Key topics:

- Responsible Authorship
- Responsible Peer Review
- Mentorship
- Research Misconduct
- Human Subjects
- Animal Subjects
- Data Management & Ownership
- Conflict of Interest
- Conflict of Commitment
- Collaborative Research
- Financial Management
- Biohazards & Biosafety

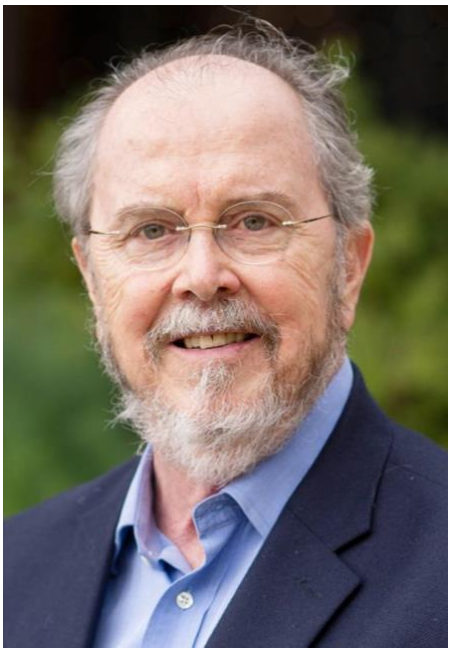
Emerging RCR topics include artificial intelligence and authorship, data integrity and management, and reproducibility of biological materials (cell lines, antibodies, reagents).

UMD offers a variety of online RCR courses; administration and record-keeping are the responsibility of individual departments, which may also offer more specialized training in relevant issues. In an entrepreneurial environment, conflict-of-interest is a critical issue. Like many universities, UMD uses online courses and infrastructure provide by CITI (a private company).

During the Q&A, Elaine Yamaguchi mentioned that Project SEED includes training on plagiarism. Professor DeShong noted that out of the two million research papers published last year, approximately 11,000 were retracted because of plagiarism, which is now easily detected by software. The role of the ACS should be to clarify issues and set standards, especially in publications. Because researchers in industry and in government laboratories tend to work in large teams, the standards are transparent.

My thanks to Professor DeShong for this timely presentation, and to Sushila Kanodia for introducing me to her colleague on the ACS Committee on Ethics. The webinar was recorded, and links to the recording and to Professor DeShong's slides can be found on the Cal ACS web site.

Alex Madonik (Councilor and 2024 Chair-Elect of the California Section)



Professor DeShong obtained his B.S. Chemistry with Honors and Special Honors in Chemistry at the University of Texas at Austin and his Sc. D. in Organic Chemistry (with Professor George H. Büchi) in 1971. He joined the University of Maryland as Associate Professor in 1986 and was promoted to Professor in 1990, retiring as Emeritus Professor in 2022.

His research interests include synthesis of nanomaterials with novel optical properties; synthesis and characterization of functionalized nanomaterials for applications in drug delivery, diagnostics and vaccine development; total synthesis of heterocyclic natural products, development of methodology for organic synthesis, mechanistic organometallic chemistry, synthesis of complex oligosaccharides and glycoprotein derivatives, chemistry of hypervalent silicon derivatives.