

BY LUCILA OHNO-MACHADO, MD, PhD

# Bridging the Scientific Divide: Enabling Sharing through Biomedical Computing



Once upon a time,

a deep divide existed between scientists who did and those who did not have easy access to scientific content (journals, lectures, data), hardware (imaging devices, lab instruments, supercomputers) and people (professors, networks of peers, knowledgeable support personnel). Not surprisingly, most discoveries were limited to institutions in which these pillars were the strongest. Over time, libraries helped expand access to scientific content, but access to data, hardware and people were still constrained. Some academics preferred it this way, as they could be isolated and concentrate on their own scientific endeavors. Unfortunately, this isolation led some to completely lose perspective of the university as a place to create, propagate and disseminate meaningful scientific knowledge, not only to its own members or peers, but also to society as a whole. Research, teaching, and service became almost mutually exclusive. The achievement of prestigious academic awards essentially defined academic success. Enabling others to succeed and training the next generation of scientists remained desirable but not necessary. Translating basic scientific findings into practice remained useful but not required. For fear of change, faculty from some institutions prevented “strangers” from filling their ranks and gaining access to their resources. These “strangers” who crossed disciplinary boundaries and who were deemed collaborative were reviewed unfavorably. An unknown discipline like informatics was by definition an undeserving one.

What was then.

Then came inexpensive computers and networks and a few individuals with the vision to break the sacred circle. These individuals (librarians,<sup>1</sup> computer scientists, health-care providers, engineers, biologists, physicists, and informaticists) believed that everyone should have access to knowledge, data, and tools; that everyone could start the scientific race from approximately the same baseline; and that allowing anyone to test a new idea would help the

<sup>1</sup> PubMed epitomizes the spirit of this enlightened era.

best ones prevail. With more people accessing information, discoveries would be made sooner without the hindrance of dealing with politics stemming from data ownership, copyrights, academic recognition, and fundraising.

Some could now assemble large virtual cohorts of patients while still preserving human subjects’ privacy, increasing the power to study rare diseases, empower observational studies that compared effectiveness of interventions, and speed the detection of unsafe behaviors, medications, or medical devices. Others could use crowd sourcing to annotate large collections of data or construct extensive searchable knowledge bases and tools that allowed systems to interoperate. Some could build tools to generate hypotheses based on a combination of already publicly available and brand new data. Others could build resources that would help prevent the pursuit of failed ideas that were never made public because they were unpublishable. Some could use computational resources to find hidden patterns in millions of electronic medical records, images, laboratory tests, and billions of nucleotide sequences. And, enabled by computing resources, everyone would be able to discuss findings with peers across the globe, attend lectures and ask questions of world experts, and interact with peers no matter where they lived.

We can continue the bold vision started by those who challenged the establishment and dared to think beyond the ordinary. We can share knowledge, data, tools, and computational resources in a sustainable manner. While others have made this pledge here before [1-3], the current research funding climate, combined with tremendous advances in technology and social networking in the past few years makes it even more possible and imperative: let’s not waste this unique opportunity to make a difference.

[1] Altman RB. Share and Share Alike: A Proposed Set of Guidelines for Both Data and Software.

[2] Musen MA. It Takes a Village: Building the Next Generation of Biomedical Ontologies.

[3] Erdemir A. Recognizing and Encouraging Timely Dissemination.

Lucila Ohno-Machado, MD, PhD, is Professor of Medicine and founding Chief of the Division of Biomedical Informatics at UC San Diego. She is the editor-in-chief of the Journal of the American Medical Informatics Association and is principal investigator of iDASH (integrating Data for Anonymization, Analysis, and Sharing), a new National Center for Biomedical Computing. iDASH: <http://idash.ucsd.edu> □