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## The materials research community studies magnitude of “Big Data”

The term “Big Data” is being increasingly heard, primarily in the context of business and data analysis and mining, but also more recently in the popular press. The definition of Big Data remains somewhat nebulous and subjective, but it broadly refers to very large data sets of information that can be analyzed using software tools to obtain useful actionable information that can impact society.

Big Data is also being talked about more frequently in the scientific community including our own materials community. This is not necessarily something new, for in several materials subdisciplines the analysis of large data sets is an important aspect of research. Data here can refer to experimental data, whether from large facilities, such as neutron sources or synchrotron sources, or smaller laboratory experiments, including data on materials synthesis and properties, computational data, or electron microscopy data from a broad range of materials under investigation. There is a confluence of rapid advances in computational power, advances in instrumentation, and lower digital information storage costs, all leading to Big Data in materials research. Recent government programs, such as the European Commission’s Big Data Public Private Forum (BIG) and the Materials Genome Initiative (MGI) in the United States, have also spurred interest in Big Data.

The Materials Research Society has been very aware of the burgeoning interest, and concern, in Big Data in the worldwide materials community. A related aspect is Open Data and sharing of research information. We have had a number of discussions within the Society to try to understand this space, to proactively engage the materials community, and to provide avenues for discussions.

To this end, MRS in conjunction with The Minerals, Metals & Materials Society conducted a survey earlier this year in an effort to collect the opinions of the materials community. Around 675 respondents provided a range of opinions and feedback including open-ended comments. The results of the survey were published recently in *MRS Bulletin* and *Materials360*<sup>®</sup>. The survey responses clearly show a need for databases in a broad range of materials areas. While the advantages of data sharing were recognized, concerns were raised about intellectual property issues and the



proprietary nature of many data sets. The survey comments indicated the need for better quality and validated data (not necessarily more data), compatibility and accessibility of information, concerns about open international sharing of information, and finding time and funding to implement and comply with any related policies.

The survey results broadly indicate that while the advantages of Big Data and Open Data are evident, there are concerns about implementation and usage. How do we use standards and appropriate metadata? How can we mesh heterogeneous data sets from different materials communities? How do we ensure Open Data is not inappropriately and unethically used? Importantly, is the worldwide materials community going to embrace Big Data or will only a small number of countries provide access to data from their researchers, openly available to researchers in every country in the world without reciprocity? Will Open Data allow for exposure of data from a small number of researchers to many others who might benefit without providing access to their own data?

The answers are not yet clear. However, we will continue to discuss these issues through forums at MRS Meetings and in MRS publications. At the upcoming 2013 MRS Fall Meeting, a Symposium X session on Thursday, December 5 will focus on Big Data and Open Data. Additional articles, aimed at analyzing the issues and engaging the community, are planned for *MRS Bulletin* and *Materials360*<sup>®</sup>. Our intent is to provide the appropriate platforms for these discussions and to spur dialogue, and by doing so, ensure that the voices of members of the materials research community are heard. While the ultimate goal is better processes and tools for sharing information to advance the overall field of materials, the differing and disparate opinions suggest that a number of discussions need to occur before specific policies can be recommended or implemented.

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