

## Using nanoHUB.org in Research and Education – a Tutorial

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If you had easy access simulation tools, which need no installation, would you use them to help guide your experiments? If you did not have to worry about compute cycles, would you benchmark your own tools against other state-of-the-art approaches? If you had access to interactive modeling and simulation tools that run in any browser, could you introduce interactive learning into your classes? If you had your own tools and could easily share them with the community, would you do it?

This tutorial will provide an overview of nanoHUB.org. If you have never used nanoHUB.org, learn how it might help you; if you have used it, learn about new and upcoming features and share your story with the nanoHUB team and other participants.

Annually, nanoHUB provides a library of 4,600+ learning resources to 1.4 million users worldwide. Its 440+ simulation tools, free from the limitations of running software locally, are used in the cloud by over 12,000 annually. Its impact is demonstrated by 1,700+ citations in the scientific literature with over 25,500 secondary citations, yielding an h-index of 74, and by a median time from publication of a research simulation program to classroom use of less than 6 months. Cumulatively, over 29,910 students in over 1,501 formal classes in over 185 institutions have used 200+ nanoHUB simulation tools.

nanoHUB.org is a community-driven, virtual nanotechnology user facility funded by the National Science Foundation and supports the National Nanotechnology Initiative with a highly successful cyber-infrastructure. nanoHUB.org has been supported by the U.S. National Science Foundation since 2002 to serve the nanotechnology community.

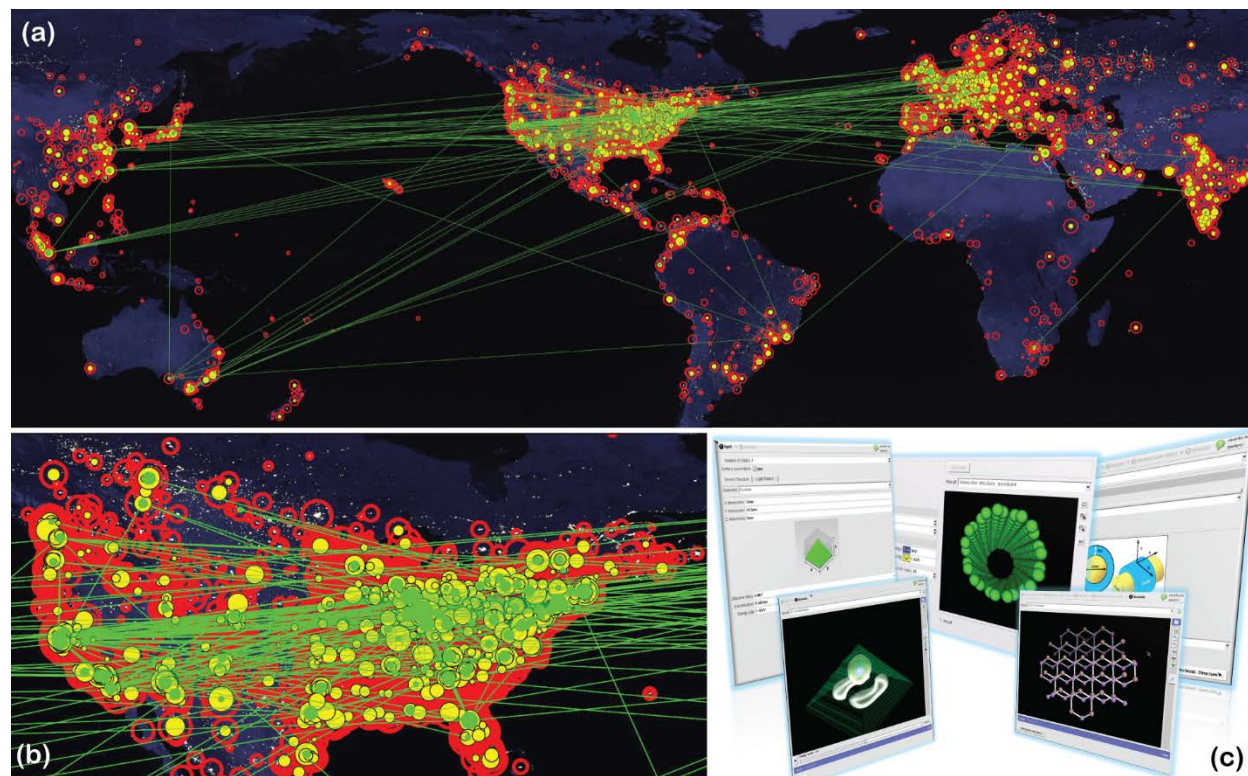


Figure 1. (a) Annual nanoHUB user map superposed on NASA's world at night. Red circles designate users viewing lectures, tutorials, or homework assignments. Yellow dots are users of simulation. Green dots indicate authors of over 1,200 scientific publications citing nanoHUB. Dot size corresponds to the number of users, and lines show author-to-author connections providing evidence for intense research collaboration networks. (b) U.S. enlarged. (c) a collage of typical nanoHUB interactive tool sessions and 3D-rendered interactively explorable results (quantum dots, carbon nanotubes, nanowires).

