Building core strength

The scientific community benefits from infrastructure that facilitates the dissemination of cutting-edge methods.

At *Nature Methods*, we strive to publish methods that range from the immediately useful to those with important implications in the long term. Even for those in the former category, however, without an effective means of dissemination there is often a disconnect between a method being immediately practically useful and its being immediately used in practice.

The dissemination of some types of tools is already quite sophisticated. For example, Addgene has dramatically changed the landscape for sharing plasmid-based tools. At the other end of the price spectrum, shared facilities such as synchrotrons and X-ray free-electron lasers make otherwise prohibitively expensive instruments available to many users. The latter model may even help new fields such as single-particle cryo-electron microscopy (cryo-EM) become mainstream, as discussed in a Correspondence on page 607 of this issue.

But there is a wide middle ground of methodological advances that could benefit from facilities that help bring these advances to users. Such methods may be challenging to implement, difficult to scale in-house, not yet commercially available, or too expensive for individual users. Microscopy centers, for example, can be truly enabling of scientific discovery. In the United States, the Advanced Imaging Center (AIC) at the Janelia Research Campus is home to several microscopes developed by researchers at Janelia that are published but not yet commercially available. In Europe, the continent-wide Euro-BioImaging consortium enables users to access more than 30 state-of-the-art imaging technologies in ten countries.

In both cases, users from around the world can submit proposals that are judged by experts on scientific merit as well as technical feasibility. At the AIC, high-risk, high-reward projects that require the unique microscopes the center provides are most likely to be accepted. At Euro-BioImaging, proposals are judged on the basis of their potential scientific impact, but also on the potential benefit for the applicant's career. Once accepted, users are not only granted access to the instrumentation but also helped by trained staff to optimize scientific outcomes.

The benefits of such core facilities for individual users are fairly obvious. Users gain access to cutting-edge or one-of-a-kind instruments, or they can take a microscope for a test run before deciding whether to build or purchase it themselves, with low overall risk. In addition, the chances of experimental success are improved by the guidance and training provided by technical experts.

Perhaps less obvious are the benefits to the community at large. New microscopes are often built and optimized sufficiently to execute proof-of-principle experiments, but this does not always tell the whole story regarding the robustness of the optical setup, the types of experiments that can (or cannot) be done using a given system or the practical ease of use. In this sense, use by experimentalists asking a range of questions can be crucial for identifying problems and developing improvements to either hardware or software. In addition, making an instrument available through a core facility helps take the burden of maintenance and training off the original methods developers. An influx of users publishing high-quality data with a cutting-edge instrument can also help generate the excitement necessary to drive commercialization or to increase interest in an available product.

These arguments do not apply just to the dissemination of sophisticated light microscopes. For example, the National Resource for Automated Molecular Microscopy (NRAMM), funded in part by the US National Institutes of Health, is dedicated to developing, testing and sharing methods to improve automated structure solution by cryo-EM. The scientific platforms at the Broad Institute, which cover a range of applications including genomics, imaging, metabolomics and proteomics, are another example. These platforms are composed of teams of experts that help facilitate the use of cutting-edge technologies by users and develop new advances in those technologies.

Although such centers and core facilities have numerous benefits, they are not without cost—specifically, the cost of building the infrastructure, building and maintaining instruments, supporting associated computation and hiring expert staff. Perhaps not surprisingly, some of the facilities mentioned here are found within very well-funded institutions. At AIC, the funding comes from the Howard Hughes Medical Institute and the Gordon and Betty Moore Foundation, and it covers the full costs of use of the facility and lodging for scientists. Other initiatives mentioned here are funded by countries, institutions and dedicated research grants, and charge fees to users to cover associated costs. Both funding models increase accessibility at relatively low costs to individuals.

We encourage readers to seek out facilities with access to methodology that could help them solve otherwise intractable biological problems.