

Opinion



Citizen Microscopy

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Telescope and microscope

It has been 400 years since both the microscope and telescope were invented. In fact if we can believe Zacharias Janssen [1], at that time it was basically one and the same instrument. Yet while 1608 was internationally celebrated this past year as the birthday of the telescope, the microscope—its twin—was scarcely acknowledged.

This neglectful bias is reflected in a number of startlingly odd ways. Many of us remember the late, great column “The Amateur Scientist” featured in *Scientific American*. For 73 years this column educated and delighted readers with articles illustrating how to conduct scientifically respectable experiments using homemade or “do-it-yourself” instruments constructed from readily available materials and using common household tools. Of the 296 articles published from 1928 to 1953, 99.3% had to do with astronomy and telescopes. The first article on microscopy didn’t appear until 1953, and then only seven of the remaining articles had anything to do with microscopes or microscopy. The column was abandoned in 2001.

That bias carries over into our more recent form of publication—the internet. The Open Directory Project (DMOZ) lists about 500 internet website hits when doing a search for “amateur astronomy organizations” (<http://www.dmoz.org/Science/Astronomy/Amateur/Organizations/>) with 300 in the USA alone. Moreover, that is only for organizations with website links; it does not include smaller local clubs with no internet presence. If you do an equivalent DMOZ search for “amateur microscopy” or “amateur microscope organizations,” you get nothing. “Microscopy” turns up about 17 organizations (http://www.dmoz.org/Science/Methods_and_Techniques/Microscopy/Institutions_and_Organizations/). The outcome is similar from listings of microscopy organizations on websites like *Molecular Expressions*.

The plain fact is that there is far more general interest in telescopes and astronomy than there is in microscopes and microscopy. In the UK, 1/10,000 in the population has an interest in and involvement with amateur astronomy; whereas about 1/60,000 have an equivalent connection with amateur microscopy, despite the fact that actual professional practitioners of microscopy (including pathologists, medical technologists, life scientists, metallographers, materials scientists, forensic scientists, etc.) probably outnumber professional astronomers and their technicians by as much as 10 to 1.

What is going on here? This astronomical bias cannot be blamed on Sputnik, NASA, and the space program or the marketing that followed. It dates back at least to 1928 and

probably well before that. This is clearly not a case of “either/or,” and there are many amateurs (mostly photographers) interested and active with both telescopes and microscopes.

Nevertheless, the opportunities to do direct observational astronomy with the telescope are extremely limited. It must be done at night with clear skies unencumbered with air or light-pollution. When these increasingly rare conditions are present, the viewer needs a rather large and expensive telescope to see anything more than the moons of Jupiter or the profile of craters on the moon. Compare that with microscopy, which practitioners can be do anywhere, any time of the day or night, under any weather conditions, and can have an incredible variety of specimens to look at—specimens that have color, shape, internal structure, and sometimes even move around. The instruments to see these objects are cheap, widely available, and completely portable. So why are not more people doing it?

Citizen Science

Consider the comparison of the terms “amateur” and “citizen.” While “amateur” literally means someone who does something out of love for the subject (from the Latin etymology “amore” or “to love”), the connotations are sometimes not quite so romantic. The word is often contrasted with “professional,” which implies certifiable training and marketable skills for which one can expect financial compensation or at least institutional recognition. Amateurs, by comparison, are unprofessional dabblers, hobbyists, or tinkerers. However, there is another connotation to the term “amateur,” and that is the aspect of “going it alone” and doing whatever it is that strikes your fancy. That is the playful, fun aspect of being an amateur hobbyist as opposed to the “serious” nature of professional work.

There is another term that crosses this invisible boundary. That term is “citizen”—as in “citizen scientist.” Citizen science is what some of our most celebrated pioneers engaged in, not only in the USA but around the world. People like Joseph Priestley, Benjamin Franklin, Thomas Jefferson, and yes, even old Anton von Leeuwenhoek and Robert Hooke. Although they were avid amateurs before the era of professional microscopy and microbiology, nonetheless they thought of themselves as members of a scientific civil society operating largely independently of universities, government-sponsored research institutes, and commercial corporations.

Today the term “citizen scientist” has taken on a more extended meaning. There are research projects using volunteers, supervised by professional scientists, to gather specific information about a large variety of phenomena and over a larger geographical area than could be personally sampled

by those scientists themselves. Although all of these “citizen scientists” are amateur volunteers, all of them are working as part of a larger project and social structure that is doing serious scientific “work” and not just “playing around” strictly for their own enjoyment. Some of them develop skills and knowledge sets that exceed their professional supervisors. This is not only “Science FOR the Citizen” (to borrow Lancelot Hogben’s book title [2]), it is “science BY the citizen.”

Maybe professional microscopists can be encouraged to take a few tentative steps outside of their academic or research specialties and participate in or even begin amateur microscopy initiatives with their children, their neighbors, or their local communities. Professional astronomers have already done this and with remarkable effect. I cannot think of a better way to ensure that direct observational science will grow and blossom in the future. **MT**

References

[1] See Microscopy Pioneers in this issue. Also there may be a book about Janssen by Huib J. Zuidervaart that was to be published in the spring of 2008.

[2] Lancelot Hogben, *Science for the Citizen*, W.W. Norton & Co, New York, 1938.

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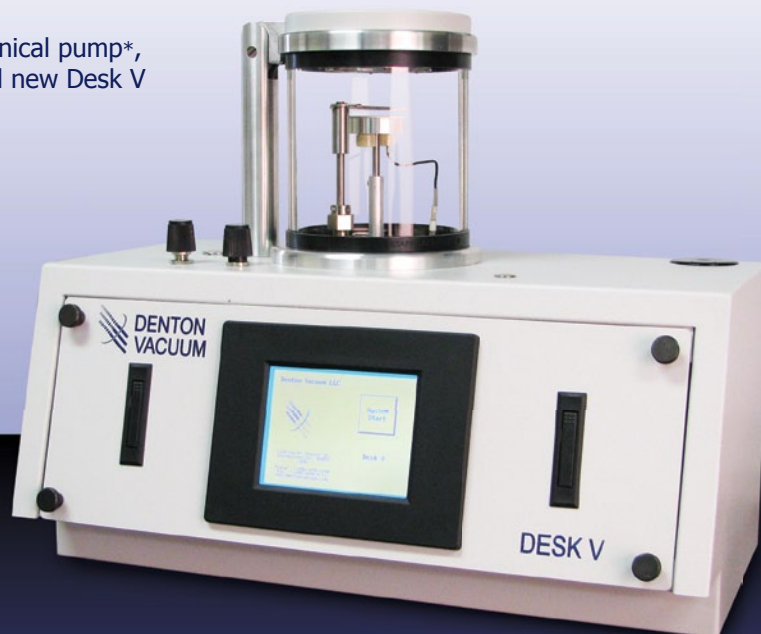
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