

Microscopy: “Swiss Army Knife” of Science

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Microscopy has been categorized as a technical field in which microscopes are used to observe samples that cannot be seen with the unassisted eye [1]. Microscopy is divided into three main divisions, optical (light), electron, scanning probe. Within each division there are even more methodologies. Using these methods, countless invaluable pieces of data, both qualitative and quantitative, can be amassed, thus making microscopy analogous to the Swiss army knife for the scientific community.

Microscopy has been instrumental in several scientific discoveries, such as Marcello Malpighi explanation of the circulatory system in 1661 [2]. From Robert Hooke's *Micrographia* and Antonie van Leeuwenhoek's letters to The Royal Society of London for Improving Natural Knowledge, the “unseen” world has fascinated and delighted young and old (see Figure 1). Today's microscopy tool box includes light microscopy, with the additions of digital, two photon, scanning electron, transmission electron, atomic force, fluorescence, confocal, infrared, and tunneling, just to name a few.

Not only is microscopy indispensable to science it has provided inspiration for art. To this day, prints of Francesco Stelluti's (1625), engravings from *Melissographia* are reproduced, framed and hung as wall decorations (see Figure 2) [3]. There are countless numbers of scientist/artists whose profession has become turning microscopy images into works of art. To go a step further there are those individuals who have modified or built microscopes to aid in their artistic quests.

Newton's third law of motion states “for every action there is an opposite and equal reaction”. Science is the opposite reaction to art, with microscopy as the bridge between these two ideas of the mind. With each of these concepts there has to be a certain amount of creativity for development. Without creativity nothing would be designed, there would be no search for new knowledge, or inspiring art would be conceived. Microscopy provides pathways for the search for knowledge, and if it happens to be aesthetically pleasing and or quirky, that is just a bonus (see Figure 3). To attest to this there are myriads of microscopic image contests, calendars, websites, images of the week, clothing times, etc.

One does not have to be a science nerd to appreciate microscopy. Microscopy spans the ages as well as the intellect. Microscopy means different things to different people. Microscopy allows one to see the beauty in the ugly (Figure 3b and 3c), the strength and weakness, as well as the building blocks of greatness. Since the invention of the microscope, microscopy has been an integral part of the advancement of the human condition. Microscopy created new fields of study and helped clarify older scientific ideas in areas of medicine, materials science, biology and art. Indeed microscopy is the quintessential Swiss army knife of science; it is also the connection of science to people of all walks of life.

References

- [1] http://en.wikipedia.org/wiki/Microscopy#Optical_microscopy
- [2] Pearce, J.M. *Eur. Neurol.* **2007**, *58*, 253-255.
- [3] <http://brunelleschi.imss.fi.it/apiarium/index.asp>



Figure 1. Home schooled pre-kindergarten children and an adult male teacher enjoy looking at bugs with microscopes, a) light microscope and b) scanning electron microscope.



Figure 2. Copy of Francesco Stelluti’s engraving from *Melissographia*, which was a gift to Pope Urban VII.

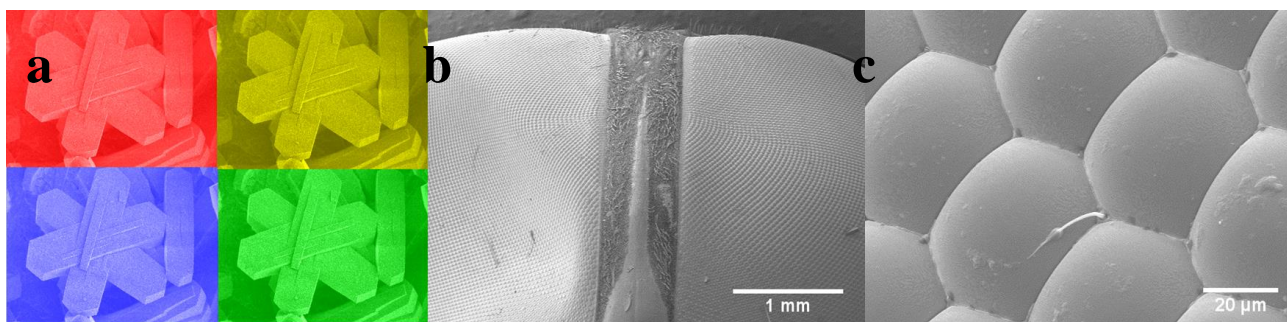


Figure 3. Scanning electron images for fun, a) calcium carbonate crystals on epitaxial gold film, b) fly head, and c) fly eye with sensory hair.