

## From a benchtop microscope to a pocket microscope

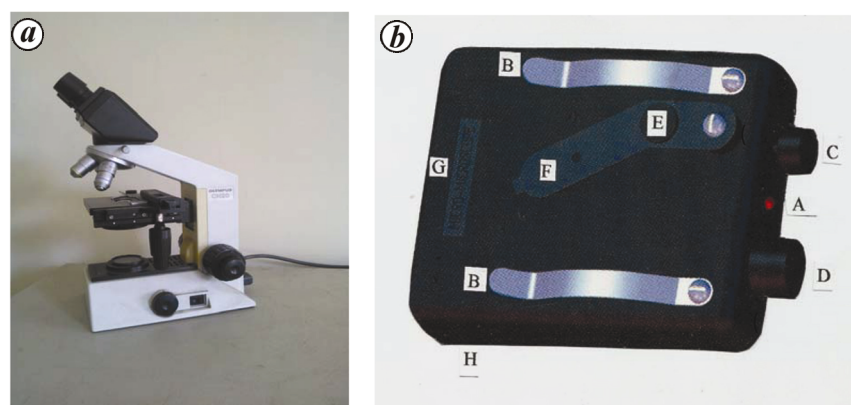
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Among the numerous inventions till date, the microscope has indeed been one of the most remarkable and significant. Considerable advancements have been taking place in the field of microscopy. On 8 October 2014, the Nobel Prize in Chemistry was awarded to Eric Betzig, William Moerner and Stefan Hell for 'the development of super-resolved fluorescence microscopy, which brings optical microscopy into the nano-dimension'<sup>1,2</sup>. Furthermore, with the advancement of technology numerous inventions have achieved a compact and user friendly version. A new entrant in this league is the micro microscope<sup>3,4</sup> (Figure 1 b).

The micro microscope is a hand-held, light weight, pocket-size microscope capable of 100× to 1000× magnification or more, using various lens combinations. In contrast to the conventional compound microscope which is bulky, the micro microscope weighs only 145 g (including the dry battery) and can be carried easily. It is also economical (costing around Rs 800)<sup>5</sup> compared to a compound microscope (e.g. Olympus CH20; which costs around Rs 36,600; Table 1)<sup>6</sup>.

The micro microscope consists of two slide clips for holding the slide. A metal plate (view-finder) is mounted on its top surface which has a small aperture

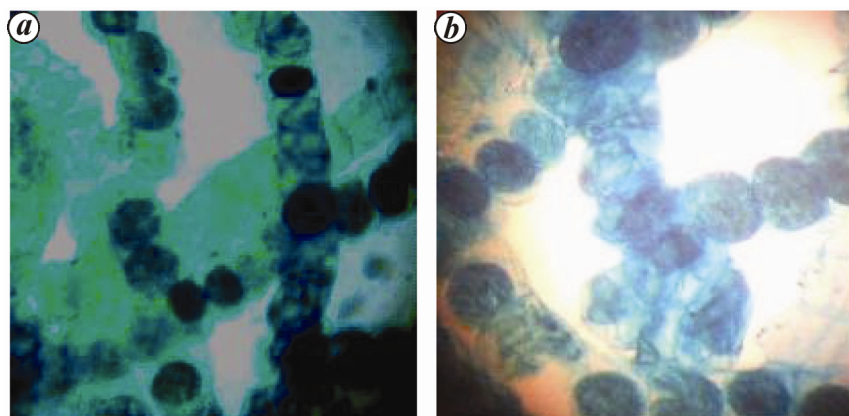
(view-point) which is used for total magnification purpose. The object to be viewed is placed there. A 9V battery is fitted on the bottom part of the micro microscope. There are two knobs, the bottom one is the on-off switch and changes brightness for proper illumination of the object to be viewed. The other knob is for fine focus. Red indicator LED is used for power indicator (Figure 1 b). The micro microscope comprises of extremely small-sized magnifying materials selected from extremely small solid transparent sphere/hemisphere, non-volatile transparent liquid hemisphere and/or semi-solid transparent sphere/hemisphere



Compound microscope (Olympus CH20)

Micro microscope (Model no: MM01)

**Figure 1.** **a**, Conventional compound microscope. **b**, Micro microscope model no. MM 01R. (A) Red indicator LED; (B) two slide clips; (C) focus knob; (D) on-off switch and brightness knob; (E) view-finder plate; (F) view-point; (G) top plate of microscope body and (H) battery position.



**Figure 2.** Algae (*Spirogyra*) as observed under (a) micro microscope and (b) a compound microscope (Olympus CH20).

**Table 1.** Comparison between compound microscope and micro microscope

Compound microscope	Micro microscope
Heavy. Difficult to carry	Weighs only 145 g and can be easily carried in the pocket
External light source is required.	No need of external light source
Expensive	Economical
Relatively difficult to operate for students without assistance	Easy to operate and has a battery-operated system

having radius in the range 0.10–3.00 mm and refractive index in the range 1.50–1.85. The micro microscope is cost-effective and can be used with various optical devices. The same principle can be used in astronomical telescopes or photographic cameras and even for magnified viewing of opaque objects.

Excellent microphotographs can be obtained using the micro microscope. A slide of algae (*Spirogyra* sp.) was observed under the micro microscope (Figure 2 *a*) and compound microscope (Olympus CH20; Figure 2 *b*) at 10× magnification.

The micro microscope holds the potential of revamping the usage of microscopes. Due to its meagre cost, it can be made easily available not only to high-tech laboratories and colleges, but also to school laboratories and even in remote

areas. It can be transported easily due to its small size and weight. With the invention of micro microscope the number of microscopes available per student will increase due to the reduced cost of the microscopes. Thus the micro microscope is the future of optical microscopes. The patent details are available in the following link: [www.allindianpatents.com/patents/206458](http://www.allindianpatents.com/patents/206458). More details about the invention are available at [www.hmrc.in](http://www.hmrc.in).

1. Ritter, K. and Rising, M., *AP News*, 8 October 2014.
2. Chang, K., *New York Times*, 8 October 2014.
3. <http://timesofindia.indiatimes.com/article-show/11509307.cm>
4. <http://timesofindia.indiatimes.com/article-show/162295.cms>

5. <http://www.indiamart.com/bikash-scientific/other-products.html#micro-microscope>

6. <http://www.amazon.in/Olympus-CH20i-Microscope/dp/B001HVPGG2>

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