Robert Brown’s Microscope

One of the Linnean Society’s greatest treasures is packed in a small mahogany box. It gave us a term commonly used in cell biology—the nucleus—and it also revealed a phenomenon known to all scientists, Brownian Motion. This little instrument is a single-lensed microscope belonging to Robert Brown (1773–1858), a physician, pioneering botanist, and the Society’s President 1849–53. It had been made for him by an instrument maker named Robert Bancks who lived and worked at 441 The Strand, in central London. Bancks set up in business in 1796 and was joined by his son in 1820, later moving to New Bond Street.

Some Astonishing Observations

This modest microscope played a key role in the early days of microscopy, though it was simply made. A brass column screwed into a boss fitted into the box lid, and a circular stage bearing a concave glass was fitted into a tapering support. At the top went a brass rod supporting the lens arm, while below the stage was a mirror to reflect light up through the specimen. Stage forceps were provided to hold a solid object, like a small insect or a flower. A set of six lenses was provided, ranging in magnification from 5x to 170x, two of which had Lieberkühn mounts—silvered reflectors that cast light downwards onto the top of an opaque specimen, such as a rock sample or a fragment of leaf. It was this instrument that launched Brown’s remarkable career in botanical microscopy. He discovered the naked ovule of the gymnosperms, an extremely difficult demonstration even today, and recorded the streaming flow of cytoplasm within the cells of Tradescantia.

Yet it was in his observations of orchid epidermis that he made one of his best-known coinages. He wrote in 1831:

“I shall conclude my observations on Orchideae, with a notice of some points of their general structure, which chiefly relate to the cellular tissue. In each cell of the epidermis of a great part of this family, especially those with membranous leaves, a single circular areola, generally somewhat more opaque than the membrane of the cell, is observable … There is no regularity as to its place in the cell; it is not infrequently, however, central or nearly so. As only one areola belongs to each cell, and as in many cases where it exists in the common cells of the epidermis, it is also visible in the cutaneous glands or stomata, and in these is always double—one being on each side of the limb—it is highly probable that the cutaneous gland is in all cases composed of two cells of peculiar form, the line of union being the longitudinal axis of the disk or pore.”

After this meticulous observation, Brown adds the historical words: “This areola, or nucleus of the cell as perhaps it might be termed, is not confined to the epidermis …” It is here that the term first appeared; Brown’s “areola” was thereafter known as the cell nucleus. As he recorded, others had seen it previously; indeed, the pioneering amateur Antony van Leeuwenhoek had drawings made in 1719 that showed the erythrocytes of fish, each containing a well-defined nucleus, so the feature had been observed more than a century before Robert Brown named it. These were astonishing observations recorded by Brown, yet all were made with a simple, single-lensed microscope.

A Gift of Great Importance

The instrument was in use from 1810 and, after Brown’s death on 10 June 1858, his estate was administered by John Bennett, who had been his assistant since 1827. The year after Brown’s death, on 5 February, Bennett penned a letter to the surgeon and naturalist Thomas Bell, who served as the Society’s President from 1853–61. “I have been looking round for some trifling memorial of our late dear friend Rbt. Brown …,” he wrote, adding that it was an object of
Dry specimens were mounted between slivers of mica in ivory sliders, the ancestors of today's slides. Around the circular brass stage was engraved the name of the manufacturer.

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BELOW LEFT: Most conspicuous among the disassembled components are the body pillar (TOP), the substage mirror (LEFT) and the stage assembly (RIGHT). Six lenses provided a range of magnifications. © Brian J Ford

BELOW RIGHT: TOP: The BBC used our microscope in an attempt to resolve the cell nucleus (as Brown had done) for their documentary programme "The Cell". The results were blurred and indistinct.

BOTTOM: When the lighting and focus of the diminutive microscope were correctly adjusted, it did prove possible to show fine detail (with a nucleus visible in each cell and three stomata). © BBC / Brian J Ford