WHEN MICROSCOPY HIT THE HEADLINES

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Twenty years of the Leeuwenhoek specimens

In 1981 biologist Brian J Ford discovered Leeuwenhoek’s original specimens, lying forgotten among papers at the Royal Society. Laboratory News asked him to look back over the two decades since he uncovered them.

When Leeuwenhoek, the father of modern biological microscopy, sent his original specimens to London on 1 June 1674 he assumed they’d become the centre of attention. He was wrong. There was nobody in London up to the task — and that’s how they came to lie for over three centuries in the vaults of the Royal Society in London.

I was looking into the dawn of microscopy with a giant from the Rodolfo Buransky, and it was the then President of the Society, Sir Andrew Huxley, who suggested that I might care to examine the original letters. I assumed they’d been seen by many scholars. They were being systematically translated by the Dutch, but it turned out that the microfilm operator had never been given microfilm copies of the originals, and had not worked through the actual documents. Nobody had been through the letters since they had been bound for the archive many decades earlier.

Just a few pages from the front of the first volume, I experienced something nobody would have expected: the final page of one of the earliest letters was unexpectedly heavy. It had something stuck to the back. As I turned the folio, I saw that the final, blank page had a white handmade envelope glued to the paper. The microfilm operator had apparently ignored it. There’s little point in photographing a blank page.

Carefully, I opened the envelope. Inside were four neat little packets of paper. I held my breath as I eased them open to photograph the contents — not so much a dramatic response, but in order to avoid contamination. There were original specimens inside three of the four packets. Two were of plant sections, the discrete hand-cut specimens compacted into a single mass with the passage of centuries. A search through the letters later turned up five more. Eventually we had nine specimen packets from the dawn of the modern era of science; a curious counterpoint to the nine microscopes associated with Leeuwenhoek that also survive.

Clearly, detailed microscopy of small portions of these materials would be a wonderful opportunity, but borrowing such unique material from a major Society involves a deal of form-filling for committees. Not this time, though. There was no record in the Society’s catalogue that the specimens existed, so I was allowed to take my samples away without difficulty. I was borrowing a copy of Robert Hooke’s Micrographia Restaurata that day, too, and was working with the microscope of Robert Brown with which he first observed Brownian Movement.

Thus I hopped in a cab to the station that day with Leeuwenhoek’s specimens in my breast pocket, Brown’s original microscope in my coat, and the great folio book in my briefcase. It was the most nerve-shaking journey of the year.

There were several projects I had in mind. One was to identify the nature of the material, so that we could confirm exactly what Leeuwenhoek had been observing. Another was to carry out optical microscopy on the material, both to determine its nature but also to see how diligently the specimens had been prepared. I was equally keen to subject samples to scanning electron microscopy, so that one could obtain finely detailed images. These would be suitable, first, to see changes and deterioration or contamination over the centuries, and secondly to provide a reference that revealed the finest detail in the specimens. These would be of the greatest value in assessing the view through an original Leeuwenhoek microscope, for one could compare the finest detail he could have observed with identifiable structures viewed at high resolution.

The head of my old department at Cardiff University, Denis Bellamy, was always a wise source of advice and he arranged for me to book time on the Cambridge Stereoscan, assisted by Carol Morgan, our first-rate SEM technician. Many hours of microscopy followed, and the extraordinary manual dexterity of Leeuwenhoek began to emerge.

His specimen-cutting technique involved a slowly rising path for the razor, offering a progressively thinner section, until the tissue broke up. He would then cut a fraction deeper and repeat the process.

The resulting sections contained material that compares favourably with many present-day preparations. Some modern texts have reprised the process.

Meanwhile the publishers Heinemann were keen to publish a popular book on the research — it emerged as Single Lens, the Story of the Simple Microscope, with overseas editions including the USA and Japan — while Biopress and Farrand arranged a programme for me to work with their silver Leeuwenhoek microscopes.

The research was exacting and arduous though immensely rewarding. Although I had numerous other commitments there was little time to spare, for R.V. Jones, Churchill’s wartime scientific adviser who had been the editor of the Royal Society’s journal Notes and Records, wanted my paper for publication in the summer. New Scientist and Nature were both eager for accounts of the work, while Scientific American wanted a report of their own.

The Royal Society paper was written piece by piece as the research unfolded, the finished version narrowly made its deadline and publication was set for 31 July 1981. New Scientist and Nature both had issues on the same date, and I spoke to several science correspondents who agreed not to break the embargo until Notes and Records had been safely published.

Publication day was frantic. National papers and magazines were all keen to cover the story, and so were newspapers abroad. In Brussels I recorded a television documentary, and was kept busy with broadcasters anxious for interviews. As chance would have it, 31 July was also the day of the wedding of Prince Charles and Lady Diana, so I had the
unusual experience of being interviewed by Robin Day after he had commented on the exhibits at St Paul's. There were even television shows where these producers eager to embrace this unusual affair. One of them said 'I'd like the toast of Townsendham, only smaller' and the phone soon stuck.

In some ways, the lecture presentations on the research were the most rewarding. The Natural History Museum arranged a special public lecture, which was followed by lectures at Oxford and Cambridge, while the Autonomos University of Barcelona arranged the first of many lectures abroad. Americans were particularly fascinated by the work, and organisations in many states arranged for lectures. Meanwhile, the Spencer-Tulles Fund of the American Microscopical Society, and the Roswell Park Fund of the Linnean Society were among those offering grant funding for the continuing programme of research.

Once the project was well under way, Sir Andrew Hadley arranged a private meeting at the Royal Society with a dozen of our most eminent microscopists. The event, in President's room, was reminiscent of eighteenth-century science and allowed me to demonstrate the single lens microscopes and the proportion of the sections in seventeenth-century Holland. Illustrated demonstrations were given by the Curator of the Royal Society, and we were again requested for their Swedes. Not only were microscopists fascinated by it: Harald Weste was among those who spent much time going through the work. We had acquired genuine interest in the ramifications of science of which he was such a devout proponent.

In England, Irene Manton offered great interest in the work and showed eager enthusiasm for these new developments. Cyril Burch at Bristol was equally supportive. In the United States, Walter McCrone arranged for me to give a major presentation at his Inter Micro Symposium, and Derek de Solla Price put at my disposal his book on the Leewonsehuis microscope. Meanwhile, J van Roijen in the Netherlands brought in his uniquely detailed knowledge of the lens, while in Belgium Henri Hennens and his son Erik offered their insights into the production of replica Leewoonsehuis microscopes. They gave me more replica for further research. I visited George Soltis at his home laboratory in Indiana, where he showed me how he had produced many of Leewoonsehuis's observations of oat cells. That great amateur enthusiast Horace Duff of London helped with microscopy, and presented me with one of his handmade simple microscopes with a fine lens made of silver.

Had been inspired by Clifford Dobell's biography of Leewoonsehuis since boyhood, and was given so much help and insights by his widow Nellie, who lived in the original family home until her death a few years ago. She gave me his annotated copy of the original biography, which remains a treasured possession. I always regarded my modest Leewoonsehuis replica as a modest appendix to Dobell's great work. A host of Dutch scientists became involved, including Pieter Brou who helped with a major paper in the Netherlands and Lodevijk C Palm of the Leewoonsehuis Commission. My lifelong friend Ben Collins worked on the translation of Leewoonsehuis's writings. Elsewhere there were subtle signs of a resurgence: some Dutch historians put together a travelling exhibition on Leewoonsehuis, the catalogue for which made no mention of the research, but simply carried on as though nothing had happened to change our view of Leewoonsehuis. Holland has never made much of its great pioneer. A plaque in Delft announcing Leewoonsehuis's residence was erected in the wrong place, and there is no more than a little lane near the station named after him which a few miles east and has.

As some Dutch scholars have observed, it is curious that the nation that gave us this phariseeically skilled investigator should show relatively little interest in promoting his work, or the research that has excelled him. The Leiden museum does have several of the Leewoonsehuis microscopes, of which one was clumsily stuck together with glue for many years. But it's high time that Leewoonsehuis was effectively celebrated. His work was all-embracing, and laid the groundwork for our modern era of biology. The cells, genomes and nuclei which we work today were studied by this admirable Dutchman three centuries ago, and his legacy is amongst the greatest in the history of science.

By Brian Ford