J. B. DANCER

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North Western
Museum
of
Science & Industry

10 p.

JOHN BENJAMIN DANCER

Optician and Scientific Instrument Maker

John Benjamin Dancer was born in London on 8th October 1812 and lived until 1887. He served to unite in his experiences all that was best in the older tradition of his arts until the coming of the newer ideas and techniques which his own century had devised. In himself, he was the product of a family of scientific instrument makers, for both his father and grandfather had been distinguished in this particular work and in them we can trace a descent from the impressive figures of the eighteenth century. Michael, the grandfather, had been taught his craft as an apprentice of Sandgate, an optical instrument maker of high repute, who in his turn had been taught by Jesse Ramsden. Ramsden is known to the present day by the Ramsden eyepiece (consisting of two equal plano-convex lenses having their curved surfaces facing each other separated by two-thirds of the focal length of one of them) for telescopes and microscopes, which was useful for the positioning of a graticule or scale. The exit pupil of a telescope, close to which the observer places his eye, (which is in effect the real image of the aperture of the objective formed by the eyepiece) is known as the "Ramsden Circle".

Michael's son Josiah, the father of J. B. Dancer, received his scientific education in his father's workshop and later became principal assistant to Edward Troughton. Michael at length became too ill to carry on working and Josiah returned to take charge of the family business. Michael died in 1817 and the following year Josiah, now head of the family, migrated with it to Liverpool from which location he continued to work for the rest of his days. From what we can learn of Josiah, he must have been a remarkable man; there

I Daguerreotype Portrait of J.B. Dancer, 1842.

is ample evidence that he was proficient in the sciences of the time and it is known that he was a considerable linguist. About the time of the migration to Liverpool, he had a family of four daughters and one son, J. B. Dancer, two other sons having died in infancy.

Early Career

It was obvious that J. B. Dancer should follow in the footsteps of both father and grandfather. The basis of his education was provided at a Dame School, on leaving which he received instruction from his father in arithmetic, algebra, trigonometry, Latin, Greek and French, and from a very early period he worked in the optical workshop. The atmosphere about Josiah Dancer was conducive to the future flowering of J. B. Dancer's genius. The days were those of great activity in the newly established Mechanics Institutions; Josiah was among the founders of the Liverpool Institution, giving many courses of lectures there. He also gave public lectures at which, if the weather were favourable, he used a large solar microscope with a condensing lens twelve inches in diameter which he had constructed himself. J. B. Dancer, besides assisting at the other lectures, was given particular care of this instrument which could magnify a human hair to six feet in diameter. As live objects were the most popular, he had to visit all the ponds around Liverpool to obtain the greatest variety of aquatic insects, larvae etc. J. B. Dancer also helped to assemble geological specimens on microscope slides for sale to customers. In addition he attended classes in chemistry and other subjects at the Institution so it will be appreciated that he became an exceedingly well-informed young man. We may pass over the remarkable qualities of Josiah Dancer who died in 1835 and left the business he had created to his son.

Now left to itself, the genius of J. B. Dancer commenced to flower but it is evident that his later success was based on the solid grounding he had received from his father. For a while he continued working as an optician and scientific instrument maker in Liverpool.

Move to Manchester

It was in 1841 that J. B. Dancer entered into partnership with W. Abraham, a well known Liverpool optician, and commenced business in Manchester at 43 Cross Street, under the name Abraham and Dancer. This partnership lasted for 4 years ending in 1845 and proved a lucrative one. The reason for its termination is not known, but Abraham was later associated with another Liverpool optician by the name of Wood and they in turn had establishments in Liverpool and Manchester under the joint name of Wood Abraham.

Dancer continued on his own for the rest of his life and a commemorative plaque now marks the site of these premises. During a considerable period of his life in Manchester, he lived at the Manor House, Ardwick Green, now demolished, but Manor Street remains as a reminder of its location. At that time, Ardwick was a very respectable suburb with many private houses. Throughout practically the whole of his life, Dancer made inventions and discoveries and at Manchester he continued to develop the experiments he had started in Liverpool.

Electrical Inventions

He was probably one of the first people to produce a deposit of copper by electrolysis. He stated that he had shown the depositing of copper to Thomas Spencer, a carver and guilder of Liverpool, who later made a claim to be the originator.

Like so many of his other discoveries, Dancer failed to take out a patent and the credit was claimed by others. He made this discovery as a consequence of the improvement in Daniel's Voltaic Battery in which he replaced the bladder and oxgalls etc. of the original by unglazed porous ceramic jars. These were later used in their thousands in Leclanche and other cells, but no credit was given to Dancer.

The Daniel battery seemed to fascinate him. He was with a group of friends in Spencer's house who, in their experiments with it, produced what is now recognised to be Ozone. A further series of experiments established the fact. This would be about twelve months before Schoenbein found the same thing and named it. Again in order to improve the efficiency of the Daniel battery, he crimped or corrugated the copper plates, thus doubling their surface area. Others took out a patent for this.

It seemed that he was fated to have his ideas taken over by others. It was a period when the induction coil was in fashion for medical purposes. J. B. Dancer arranged for the secondary wire to be divided into different lengths, thus enabling the operator to select at will the output voltage and hence the strength of the electric shock. In addition, he devised an improved form of contact-breaker, his magnetic vibrator. Both of these improvements were widely copied, and the vibrator is still used today in doorbells, buzzers and the like.

Projection Equipment

It is of interest to note that J. B. Dancer was the first person to apply the Drummond light (limelight), which had been used for searchlights, to the optical projection lantern. The limelight

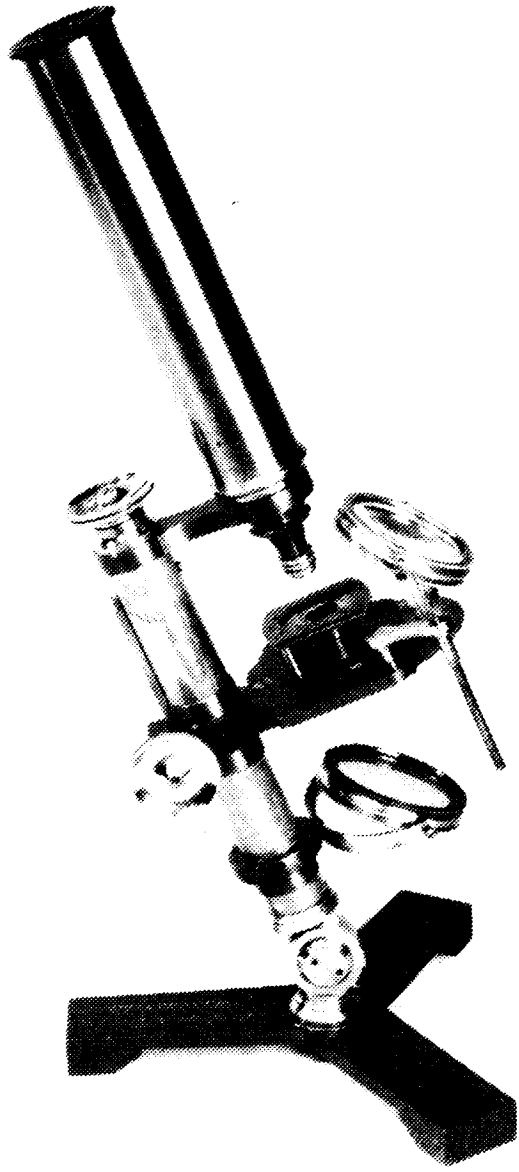
made use of the intense and concentrated light produced by the heat of combustion of a mixed jet of oxygen and hydrogen applied to a cylinder of lime. Using a triple lens condenser, up to 10 in. diameter, and a well corrected projection lens, a Dancer lantern could project a brilliant picture measuring 20 ft. by 20 ft. from the back of a large hall.

Dissolving views were produced by two or three lanterns one on top of the other. In this effect, as one picture faded out, another took its place. Abrupt transition from one to the other was thus avoided and the pleasing effect was much appreciated by audiences. Dancer made a special valve with a six way tap which was arranged to shut the gasses off from each lantern alternatively, thus dispensing with a mechanical dissolver and saving gas.

The Manchester Mechanics Institution had been in existance for some years and Dancer became closely associated with it. Full use was made of his improvements to the optical lantern and when he later fitted achromatic lenses, which freed the pictures projected from unwanted coloured fringes, a very satisfactory optical device was achieved. This lantern was in full use at the Mechanics Institution which it is of interest to note was the direct forerunner of the University of Manchester Institute of Science and Technology.

Microscopes

About this period, there was great and renewed interest in the microscope. The older microscopes, such as those of the eighteenth century and before, were limited by the fact that their lenses caused a dispersion of light, so that the objects seen through them were out-



11 Abraham & Dancer Microscope, c. 1841

lined by coloured fringes. Unless the microscope is made achromatic (without this colouring) it is of little practical use and is a sort of optical monstrosity. Instruments corrected for achromatism were expensive. In 1824 Lister had produced his remarkable lenses based on the discovery of the two aplanatic foci of an achromatic objective.

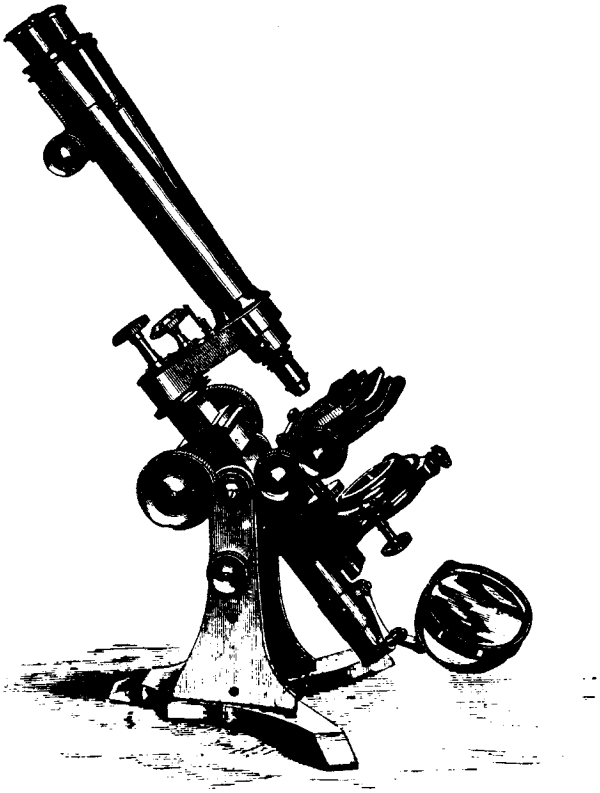
While in Liverpool, Dancer, in conjunction with his partner Abraham, produced cheap achromatic microscopes, and when he came to Manchester he brought a supply with him which were well received. Many medical men and other scientific gentlemen quickly discarded their old microscopes in favour of Dancer's new ones. Also microscopes were introduced into family circles where they proved a never ending source of wonder and enjoyment. Dancer was active in the formation of the Microscopic and Natural History sections of the Manchester Literary and Philosophical Society which was very much indebted to his work.

Manchester saw the birth of the Field Naturalists Society by Mr. Leo Grindon, the first Professor of Botany at Owen's College. Grindon was in his way a remarkable man; he lived in Rumford Street and his grave is in the church yard of St. Saviour's Church, a very short distance from the Museum. Dancer constructed binocular microscopes for the use of the Society.

Dancer was one of the first people to investigate what is known as the "Tyndall Phenomenon" which in its simplest form can be seen by the reflection of light from the particles of dust in a sunbeam. Using modern microscopic techniques, this phenomena is of considerable use for the study of the physics and chemistry of colloids.

BINOCULAR MICROSCOPE.

No. 1.



III Binocular Microscope from 1873 Catalogue

Experiments with Photography

Dancer gave evidence of his photographic interests fairly early when in 1839 Fox Talbot made the first attempts at photographic reproductions by producing copies of flowers and leaves on paper treated with silver chloride. Dancer obtained a translucient impression of the spectrum in a similar manner, and with the publication of Daguerre's remarkable efforts, he became fired with emulation and largely by his own efforts, he succeeded in obtaining true pictures in a similar fashion which were exhibited in Liverpool. It is reported that during a lecture he gave there, he produced several Daguerreotypes with the aid of a gas microscope. In 1840, he was experimenting with bromine, chlorine and iodine to sensitize the surface, but early attempts to produce the microphotographs with which his name is associated were a failure.

Dancer was one of the pioneers of photography and it can be said that, prior to his interest, photographic art was unknown in Manchester except for a few professional photographers. Certainly he was the first to demonstrate photography in the city, and in consequence he became closely associated with John Dale, F.C.S., of Cornbrook, and with him Joseph Sidebottom, F.R.A.S., of Bowden.

Microphotographs

In 1850/52 Scott Archer published the Collodion process which greatly simplified the method of photography, and in consequence of this, Dancer was enabled to return to his earlier attempts to produce microphotographs. This time his efforts were successful and from the results now in our possession, they fully entitled him to his niche of fame. It would be

IV Dancer's Family from a Microphotograph

V One of a pair of Stereo Daguerres, Manchester Exhibition of Art, 1856

about this time that Dancer and the distinguished scientist, Sir David Brewster, became acquainted and the latter became greatly interested in Dancer's production of the tiny but excellent photographs which he was able to mount on microscope slides. For example he was able to reduce a picture of the front page of the Times down to the size of a pin head. In 1856, Brewster exhibited some of the Dancer micro-photographs before the Academie des Sciences in Paris which was then showing intense activity under the inspiration of the third Napoleon. He went on to Florence and Rome and it is reported that the Pope of the day also showed considerable interest in them.

It is also worthy of note that during the seige of Paris, microphotographs were despatched by carrier pigeon into the city and we are also assured that they were concealed on the persons of French Secret Agents in spite of the vigilance of the Prussians.

Stereoscopic Photography

In 1838, Sir Charles Wheatstone published his experiments on stereoscopic (i.e. three dimensional) vision and the subsequent work done by him and Sir David Brewster caused considerable interest in scientific circles, posing important questions which even now have not received their final answers. Dancer succumbed to their fascination and did much experimentation on the production of photographs for viewing in a stereoscope. He must have commenced his experiments within twenty years of both Wheatstone's and Brewster's enunciation of the principles of stereoscopic vision. So far as is known, the first person to deal with this topic was an Edinburgh mathematical tutor by the name of Elliott in 1823. There is no evidence available to show that Dancer was

acquainted with Elliott's work although he had considerable personal contact with both Wheatstone and Brewster. Dancer placed the centres of the camera lenses at the same distance as the human eye and was therefore able to combine the two cameras into a single box. Many of his photographs have survived as well as several of his special stereoscopic cameras, and even to-day, stereoscopic cameras are based on his principles.

All Dancer's cameras show his ingenuity, for among the features he fitted to them were a universal joint, levelling aids, the instantaneous shutter, a magazine for glass plates, and a special device of a transparent spot to be fixed in the centre of the ground glass screen to provide accurate focussing.

Other Activities

Astronomy has always fascinated many people, Dancer among them, and he proved to be a competent astronomer, devising several improvements to existing instruments, particularly in the mounting of telescopes. Several of these instruments remain and we are able to appreciate their qualities. Other instruments and appliances to benefit from his attention were anemometers (for measuring wind velocity), rain gauges, speed counters (for revolving shafting), surveyor's levels and air-pumps. He provided an instrument for Whitworth for the checking of the accuracy of rifle barrels. In 1843, he made some of the extremely accurate thermometers as well as many of the other instruments with which J.P. Joule carried out his experiments on the mechanical equivalent of heat.

His Last Years

The energy displayed by this remarkable man took its physical toll. Diabetes was diagnosed in 1870 and about the same time his sight became affected. He underwent three surgical operations for glaucoma. Eight years after, the deterioration in his general health and the loss of his sight brought a cessation to his activities. He died in November 1887, having been living with his family at Hamsworth, Birmingham, for at least the two previous years. He is buried in Brooklands Cemetry, Sale. His business, having been transferred to Ardwick, Manchester, was conducted by his two daughters, Miss Eleanor Elizabeth Dancer and Miss Catherine Dancer under the title of E. E. Dancer & Co. This business was bought in 1900 by Richard Suter.

During his lifetime, J. B. Dancer received many honours and considerable scientific recognition. He was elected a Fellow of the Royal Astronomical Society in 1855 and the Manchester Literary and Philosophical Society elected him an Honorary Member in 1884. In 1869 he was appointed Optician in Manchester to H. R. H. the Prince of Wales. Since his death, he has been virtually forgotten, save for the interest of a few who have revived the memorary of one who by any standards was a truly distinguished man.

The museum is fortunate in having a number of Dancer's productions. It is true that he may not have had a hand in making all of them, but the fact that they bore his name is sufficient to say that he was prepared to guarantee their quality. Among them we may cite an astronomical telescope, dated about 1860/70, a lens system for a projector, various microscopes of different ages, and a spectroscope. There is a camera designed by him for the collodion process of

photography about 1855, several stereoscopic daguerreotypes, other early photographs and a collection of microphotographs. When one contemplates these exhibits, it is easy to be reminded of the words applied to another, "Si monumentum requires, circumspice".

List of Pictures

Front Cover	Dancer's Trade Plate, found in the lids of the boxes of the instruments he sold.
I	Portrait of J. B. Dancer from a Daguerreotype taken Nov. 1842 at Beard's Gallery, Manchester. Exposure time 10 mins. It shows an electric battery and a medical coil with contact breaker.
II	Early example of the achromatic microscope inscribed "Abraham Dancer, Manchester", date early 1840's.
III	Illustration of a binocular microscope taken from Dancer's catalogue of 1873.
IV	Dancer family picture enlarged from a microphotograph.
V	One of a pair of Stereoscopic Daguerreotypes taken by Dancer at the Exhibition of Arts, Manchester, 1856.

For Further Reading

Memoirs and Proceedings of the Manchester Literary and Philosophical Society,
Vol. 73, 1928/9, "J. B. Dancer", by H. Garnett,
Vol.107, 1964/5, "John Benjamin Dancer, F.R.A.S.", An Autobiographical Sketch.
Microscopes, Science Museum, London, Booklet.
Cameras, Science Museum, London, Booklet.