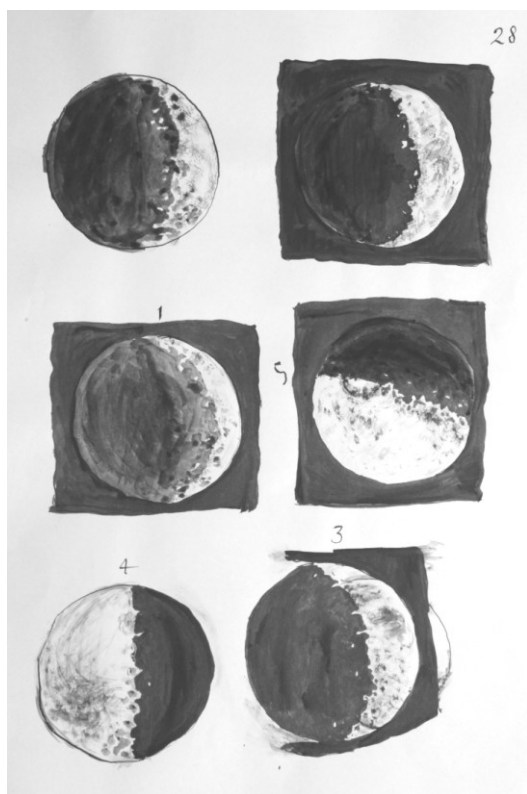


THE MOON AND HATFIELD

LUNAR PHOTOGRAPHY FROM ENGLAND ACROSS TWO CENTURIES



PRESENTED WITH GRATEFUL THANKS TO



EUROPEAN WEEK OF ASTRONOMY & SPACE
SCIENCE

UNIVERSITY OF HERTFORDSHIRE

APRIL 19TH – 25TH 2009

COVER

ALICE WILLIAMSON (AFTER GALILEO) *Pen and wash sketches of the Moon 2008 – a prop from the film 'The Starry Messenger' written by University Research Fellow Robert Priddey and shot in Hatfield and its environs in 2008/9. The film commemorates Galileo's first telescopic observations in 1609/10.*



DAVID CAMPBELL *A beautiful mosaic of webcam images of the waning gibbous Moon taken by a current University of*

Hertfordshire undergraduate on the BSc Astrophysics programme

In early September 2006, I received a letter from Miss Betty Ewens BEM. She had been asked to sort out various papers from the estate of R. M. Clarkson, formerly Research Director at the de Havilland Aircraft Company which was based in Hatfield for many years. Amongst the papers was a set of photographs of the Moon taken by Clarkson's uncle - C.C. Walker CBE - when he was a young man. Miss Ewens had watched the University of Hertfordshire team battling to the quarter finals of *University Challenge* and had noticed two members of the team were studying astrophysics. Deducing that astronomy must be an important subject in the University, she wondered if a donation of the pictures would be welcome and got in touch. The photographs had been printed with rather atmospheric vignettes and as Miss Ewens withdrew each century-old image from the reinforced envelope in which they had been stored, we enjoyed glimpses of the challenge and excitement that must have accompanied early lunar photography. These weren't the first photographs of the Moon – there is a tiny daguerreotype that shows a sequence of exposure tests made by Samuel Dwight Humphrey in 1849 from Canandaigua, New York. Nevertheless, they were rather impressive pictures for a young man of 22 without formal training. So what happened to C.C. after he'd taken these pictures? In fact he was to become a true pioneer, not in scientific photography, but in another field – aviation.

Before we tell C.C. Walker's story, let's go back even further in time because our general theme is Hatfield and its connections with space and the Moon in particular. We're three hundred years before Galileo's first telescopic observation of the Moon, and we've come to St Albans, a few miles from Hatfield. In November each year, graduands of the University of the Hertfordshire gather in the Cathedral and Abbey Church of St Alban to take their degrees. For physics and astronomy students, this is a particularly apt setting: seven hundred years ago the abbot of the Great Abbey was one of England's most remarkable medieval scientists – Richard of Wallingford. His importance to our story is his development of novel computing machines to very accurately represent and predict, amongst other things, the motion of the Moon.

Richard was a Benedictine monk with a fascination for mechanical devices that could be used to calculate and represent celestial motions. Educated at Oxford, he had written the *Quadripartitum*, a major treatise on spherical geometry, and invented the *Albion*, a medieval astronomical supercomputer. The ingenious and intricate geometrical construction of the Albion facilitated the determination of parallax, planetary motions, conjunctions and eclipses, alongside the normal functions of an astrolabe and quadrant. Richard also designed one of Europe's earliest (and certainly most elaborate) mechanical clocks with its own suite of astronomical functions including gearings for solar and lunar motions and the variation in the tides. The clock was to be

fabricated in iron and installed in the Abbey on the wall of the southern transept. Construction began whilst Richard was Abbot and Edward II is reported to have been shocked that making it was given precedence over the restoration of the fabric of the Abbey: Richard rejoined that whilst those that succeeded him would doubtless be capable of organising repairs, he alone knew how to design and make the clock – his father had been a blacksmith. It is unsurprising then that when Richard died of leprosy, work on the clock was suspended although reports suggest it was eventually finished in 1390, over fifty years after Richard's death. The original clock sadly no longer exists although a reconstruction can be found in Illinois.

There is also one rather interesting historical lunar detail in Hatfield itself. Ben Jonson had the lunar goddess Cynthia represent Queen Elizabeth I in the satirical play *Cynthia's Revels* or *The Fountain of Self-Love* in 1600. The use of this appellation was not unique to Jonson and is also subtly suggested in the Rainbow Portrait of the Queen in Hatfield House, painted by Isaac Oliver at about the same time Jonson's play was first performed at the Blackfriars Theatre. The first details that strike most people are eerie eyes and ears that cover the Queen's cloak. But there are subtle reminders of Richard of Wallingford's *Albion* here too. In a painting laced with symbolism, there is a tiny celestial sphere on her right arm and a crescent jewel to represent the lunar goddess Cynthia in her headdress. Elizabeth herself is the Sun described in the painting's motto – *non sine sole iris* (no

rainbow without the Sun). She holds the rainbow in her right hand like a steering wheel as a symbol of peace in her realm.



*C.C Walker as a young man.
(image courtesy Miss B
Ewens BEM)*



C.C. WALKER. *Gibbous Moon
15/10/1899 2" telescope 7s
exposure on Ilford Chromatic*

We've mentioned Richard of Wallingford's innovative clock but the next clock in our story is rather more modest and returns us to the story of the historic lunar photographs. It belonged to C.C. Walker's parents who lived in Highgate in Victorian England. Unbeknown to the family, their son Charles ('C.C.') had liberated the mechanism from the clock and adapted it to drive his small telescope – the removal was only revealed when the clock was sent to a jumble sale and

the empty shell returned by its irate purchaser! From his pencil scribbling on the card mounts for the photographs, we see that the telescope was small (perhaps 2 inches - 50mm - in diameter) and the drive was necessary as exposures could reach up to 20 seconds or so. It says something for the speed of film emulsions in the late nineteenth century that the exposures were typically about a thousand times what might be required today. Indeed the plates that C.C. used – Ilford Chromatic 4.5 ASA - had been introduced in 1897, just two years before he took his Moon shots so they were at the forefront of contemporary technology. As a young man, C.C. became interested in aviation and wrote to Geoffrey de Havilland asking if he might work for him, without salary at first, at least until he had proved his usefulness. De Havilland had built his own plane from scratch sponsored by his grandfather and designed a modified motorcycle engine to power it. These were the pioneering days of powered flight and, on its first successful flight, a colleague was required to lie on the ground as the plane attempted to gather lift to confirm it had indeed become airborne. Although he didn't start his own business immediately, this was the seed of the de Havilland Aircraft Company. C.C. must have impressed Geoffrey de Havilland because he was a founding director of the de Havilland Aircraft Company which moved its base to Hatfield in the early nineteen thirties.

Around Hatfield, road and building names recall the golden age of aviation and allow us to forget for a moment the indignity of a vestigial hangar that currently houses a fitness

centre. Outside the Comet Hotel, a short walk from the de Havilland campus, is a model of the DH aircraft, the twin-piston engine Comet Racer named 'Grosvenor House', which won the MacRobertson Trophy in 1934 – a speed race from London to Melbourne. It has the beautiful lines that characterize so many de Havilland aircraft. Indeed, these reflect the recurrent design philosophy of C.C. Walker that there was a potential economy in speed, and hence a value in what he rather nicely called 'aerodynamic purity'. Next time you have a seemingly impossible deadline to meet, you might like to reflect that ten months before the race took place, not even a plan existed of this remarkable aeroplane. In the event, it had a range of nearly five thousand kilometres at an average speed of 350 km/hr; it took 71 hours to make the trip, about three times the transit time of a jumbo jet.

An elliptical connection with the Moon next and a non-astronomical star: Tom Hanks made the commemorative series *From the Earth to the Moon* in 1998, a dramatic reconstruction of various aspects of the manned space programme that saw twelve men walk on the surface of the Moon. In the previous year, Steven Spielberg and Tom Hanks came to Hatfield to shoot sequences of *Saving Private Ryan*, just a short walk from the present de Havilland campus. Production designers apparently cleaned out clothing stock from the town's charity shops and aeroplanes and smoke filled the sky during an unusually noisy summer vacation. University students worked on some of the models for these productions, as they have on many others in the thriving

local film industry. The replica of Galileo's telescope that you will see on stage during the European Week of Astronomy and Space Science meeting was made by an undergraduate, Tina Jane Moore, as part of her final year project on the Model Design programme.

Hatfield was sometimes referred to as 'Space City' nearly fifty years ago because of the investment in rocketry that occurred here. De Havilland was involved in developing missiles designed as part of the national nuclear deterrent. The test facilities became a distinctive local landmark as no effort was made to disguise the site which was clearly visible (and audible) from Manor Road. Fortunately, the Blue Streak missile discovered a happier role as the lowest stage in the European Space Launcher Programme, Europa, where it proved extremely reliable and, with its twin RZ.2 Rolls Royce engines, immensely powerful.

The University is a natural descendant of the de Havilland Aeronautical Technical College where the trademark first assignment for new trainees was to make their own tool box. Some of the early courses in the Technical College (and later Polytechnic) were designed for satellite groups working for the firm. In 1960, de Havilland was bought by Hawker Siddeley in a major restructuring of the British aircraft industry, and this in turn became part of nationalised British Aerospace in 1977. Although this closed in 1992, there is still local expertise e.g. in mathematics, where one of Hatfield's specialisms in the nineteen sixties was the optimisation of spacecraft trajectories. There are also close links, including a

European postdoctoral training network, with EADS Astrium, based in nearby Stevenage and one of the generous sponsors of this meeting. A prototype Mars rover designed there will be stationed close to the conference on the closest surface we could find to a Martian dune which, rather fittingly, comes from Sandy!

Astronomy was established as a subject in its own right at the University in 1969. From the outset, a centrepiece of the course was the University Observatory located at Bayfordbury, in a country estate about half an hour's drive from the main campus offering some respite from insidious town lighting. The Observatory was opened by Alan Hunter, then Deputy Head of the Royal Greenwich Observatory. Bayfordbury is one of the UK's finest teaching observatories hosting eight domed telescopes with apertures up to 0.5 m. Nik Szymanek teaches the undergraduates observing and image-processing techniques. Nik was awarded the Amateur Achievement Award of the Astronomical Society of the Pacific in 2004 and is the author of *Infinity Rising*, a beautifully illustrated guide to photographing the night sky. He also has many professional links and has worked with the the Isaac Newton Group of Telescopes in La Palma, the UK telescopes on Mauna Kea, and the Faulkes Telescope on Haleakala, both taking and processing heritage images. The image of the Moon here was taken with a 10" Maksutov telescope using a narrowband OIII filter, a technique that gives images of the surface a pleasing range of subtle tones.



NIK SZYMANEK *A six-pane mosaic of the waxing Moon at half phase captured in 0.1s exposures using an Astronomik O III filter with a 10" sub-aperture Vixen VMC-260 Maksutov telescope equipped with an Astro Physics 0.67 x focal reducer and a Quantum Scientific Imaging CCD*

Hatfield's early research reputation rests on the detection and modelling of polarised radiation in active galactic nuclei, star forming regions and planetary nebulae. Polarimeters were designed and constructed in-house, a programme initiated and driven by a then University physics lecturer, Jim Hough, who is now Director of Astronomy Research (in the now much expanded research centre) nearly forty years later. One of the most provocative discoveries of the group was the serendipitous discovery of high degrees of circular polarization in the Orion star forming complex and the speculation that this could be linked to the molecular homochirality essential for life.

Nowadays the research interests of the Centre for Astrophysics Research also embrace high and low frequency radio, x-ray and gamma ray astronomy. The Centre currently has about sixty researchers working in wide-ranging galactic and extragalactic programmes. Astronomer and musician Brian May has endowed a studentship awarded each year to a student of outstanding promise studying toward a Research Masters degree within the Centre. Perhaps one of these students will take the next step in adding to Hatfield's lunar heritage.

James L Collett

April 2009

Bibliography

A distillation of a vast amount of his personal research on Richard of Wallingford's life and science is contained in John North's *God's Clockmaker – Richard Wallingford and the Invention of Time* (Hambledon Continuum 2005). Contemporary reaction to Richard's clock can be found in G.H. Baillie's *Watches – Their History, Decoration and Mechanism* (reprinted by N.A.G. in 1979). Details of C.C. Walker's life were kindly passed on to me by Betty Ewens BEM who worked for de Havilland and also organised the donation of Walker's surviving photographs from the estate of Mrs Riks. There is a nice centenary appreciation of 'C.C.' written by D.R. Newman and published in *The Aeronautical Journal of the Royal Aeronautical Society* in October 1978. The early trials and excitement of experimental powered flight are captured in Sir Geoffrey de Havilland's autobiography *Sky Fever* (reprinted by the Crowood Press Limited in 1999). A comprehensive and accessible review of what can be achieved with polarimetry is Jim Hough's "New opportunities for astronomical polarimetry" (*Journal of Quantitative Spectroscopy & Radiative Transfer* 106 (2007) 122). Further details of the Rainbow Portrait and indeed other art treasures in Hatfield House are contained in Auerbach and Adams' *Painting and Sculpture at Hatfield House* (Constable & Co. Limited 1971).

BACK COVER

JAMES COLLETT *Copernicus and its environs captured using the afocal imaging technique with an Olympus 350mm f/2.8 and a Canon 40D SLR 05/10/07*

