

Frank Wilsenham Hyde (1909–1984): Radio astronomer extraordinaire!

Martin Mobberley

Frank Wilsenham Hyde was a popular character in the BAA from 1957 to 1966, receiving the Association's Merlin Medal in 1963 and serving briefly as the Editor of the *Journal* from 1963 November to 1965 December. His extraordinary Radio Astronomy Observatory was the most advanced amateur facility in the UK during the 1960s, and the media even described it as 'a miniature Jodrell Bank'. However, increasing financial problems led to his dramatic exit from the Association and the dismantling of his observatory in 1967.

Frank Wilsenham Hyde (Figure 1) was born in Rochford, near Southend-on-Sea, on 1909 March 10. As a young man he became interested in electronics and in his twenties he began to dabble with radio astronomy from his back garden, even before the start of World War II. His early interest was inspired by hearing about the pioneering work of Karl Jansky in 1932, and also that of Grote Reber.

After the war ended, in 1945, Hyde's interest in the subject resumed. At that time he worked for the electronics company Crompton–Parkinson at their Writtle Road site in Chelmsford. With the technological advances in electronics made during the war years, there was a growing interest in carrying out radio astronomy after the conflict had ended and Hyde was at the forefront of the amateur effort, while the names of Bernard Lovell, Martin Ryle, Anthony Hewish and a few others spearheaded the professional approach.

In the first ten or so years after World War II Hyde carried out radio astronomy from the back garden of his Clacton home at 27 Carlton Road (Figure 2). However, he had much bigger plans, and wanted to set up a large interferometer (superposing waves from multiple aerials) working at 27MHz as well as using his smaller 240MHz aerials. The lower frequency meant a longer wavelength and far more space than a back garden could provide, especially

when an interferometer was planned. He also wanted to move further away from the sources of interference experienced in a normal street of houses. So, in the late 1950s Hyde started laying his antennae out on deserted marshland at nearby St Osyth, using his caravan as a control room and achieving baselines (aerial separation) of 1,000 feet (305m).

By this time Hyde had long since parted company with his day job in Chelmsford and planned to use his expertise to set up a radio and television dealership in Clacton. In post-war Britain, renting, selling and maintaining televisions and radios was a booming business and Hyde understood the tech-



Figure 1. Frank Hyde in the 1960s, from a *Look at Life* cinema newsreel.

► Di Giovanni: Lunar eclipse brightness and the terrestrial atmosphere (continued)

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nology as well as anyone. Hyde's TV & radio dealership was located at 30 Penfold Road, a long street just off the Clacton seafront and pier area, and in the 1950s it was clearly thriving. As part of his business Hyde maintained three TV projection systems, using Schmidt optics, at the nearby Butlin's holiday camp.¹

Prior to 1957 Frank Hyde was not a BAA member, but rapid developments during 1956 attracted his attention towards the Association.

The Radio & Electronics Section

On 1956 April 25 the BAA held its annual Exhibition Meeting at the Royal Institution in London.² One of the more interesting exhibits was a display, by Ken Stevens of Derby, showing block models of typical aerials for work in connection with radio astronomy, along with photographs of his 20-foot (6.1m) parabolic array. This exhibit was well timed, because just one month later on 1956 May 30, Martin Ryle (1918–1984), addressed the BAA at Burlington House.³

Ryle was later knighted (1966), became the Astronomer Royal (1972–1982) and won the Nobel Prize for Physics (1974). The BAA President at that time (1956) was Reggie Waterfield (1900–1986), who introduced Ryle as: 'One of the pioneers in radio astronomy, especially in radio-interference methods.'

Waterfield continued: '[Ryle] recently constructed the large radio interferometer at Cambridge and already in his preliminary surveys with it has achieved highly remarkable results, which may well prove of revolutionary significance. He has kindly consented to come here this evening to talk about possible openings in radio astronomy for the amateur.' In fact, the idea that Martin Ryle might speak to the BAA had arisen a year earlier, at the Dublin IAU meeting, where radio astronomy for smaller professional observatories was discussed. After that meeting Reggie Waterfield had raised the question with Martin Ryle of how amateurs might participate in this kind of research.⁴

So, in his BAA talk of the following year Ryle suggested several investigations which did not require the use of large radio telescopes, in particular, the study of sunspot emissions and the scintillation of so-called 'radio stars'. After Ryle's talk a number of members made comments and asked questions, with the aforementioned Ken Stevens mentioning his Derby equipment and Harold Ridley (1919–1995) asking about meteor detection.

Waterfield suggested to those present that any members who were interested in the practical aspects of radio astronomy should send their names to the Assistant Secretary, Miss Lydia Brown (1903–1971). Any such members could then be put in touch with one another and later a small panel might be formed, possibly in cooperation with the Radio Society of Great Britain, to give technical advice and organise the observations.

At the 1956 October AGM Waterfield passed the BAA Presidency to Dr Alan Hunter, who chaired the subsequent Ordinary Meeting. Just before that meeting concluded Mr Don Campbell announced that Jim Codling (1921–1982) of St Albans had offered to handle all the BAA correspondence about radio astronomy, and Codling's contact address duly appeared in the December *Journal*.⁵

Another significant event occurred at the BAA meeting of 1957 January 2. Dr Hunter announced that following Martin Ryle's talk on radio astronomy a small group at the Norwood Technical College had been working along the lines suggested by Ryle,

under the guidance of John Heywood, who had come to Burlington House that day to explain what the Norwood group were doing with relatively modest equipment.⁶ Later in that meeting Don Campbell showed slides sent to him by a young BAA member, Colin Barrow, who was a student at Florida University. In the years to come Barrow would play a crucial role at Florida in collaborating with Frank Hyde.⁷

Just 8 weeks after that January meeting, on February 27 the BAA Council agreed to the formation of a Radio & Electronics Section with the Norwood College Technical Director, Heywood, serving as Director, with his two assistants, Codling and Fermin.^{8,9}

At this point it is worth seeing the picture through the eyes of John Heywood himself, who recounted his recollections of this period some years ago:¹⁰ 'In September 1954 I took up the position of assistant lecturer in radio in the Department of Telecommunications Engineering at Norwood Technical College in south-west London near the Crystal Palace. At Norwood I joined the team that taught students who wanted to become merchant navy radio officers. But within two years I was asked to take responsibility for new day-release courses in radio, television and electronic servicing. The students were released by their employers for one day per week of study at college. Their ages ranged from fifteen to fifty. The whole course took five years with certificate examinations at the end of the third and fifth years.

'Sometime, I think in 1955, Patrick Moore, who was a famous amateur astronomer and journalist, asked me if I would consider starting a radio section for the British Astronomical Association (BAA), the representative association of amateurs. At that time interest was being generated in radio astronomy by the building of the 'giant' (then) steerable radio telescope at Jodrell Bank in the UK. Even though it meant a lot of work over and above my teaching, I agreed. It necessitated me becoming a Council Member of the BAA.

'The BAA Sections had considerable reputations for doing research. One member of the Section, Dr Theo Sickloss, who was the principal of Crawley Technical College, thought it would be possible for a technical college to build a large dish. He had sketched a design and we spent many hours discussing this with a member of his staff, Mr W. H. Barnes, who undertook very detailed designs and built a scale model, a photograph of which makes up the back piece of BAA *Memoir* No 40. Unfortunately the model was broken in my care, a matter about which I have considerable regrets.

The main focus of the Section would in my view have to be educational, and that became my first activity in scientific and technological literacy. Notwithstanding, some research was done, in particular by Frank Hyde, who had a very large site at Clacton-on-Sea where he built an interferometer operating at 27mc/s. (MHz)

Hyde joins the BAA

In fact, as soon as Heywood's new Section had been created by the BAA, Frank Hyde applied for BAA membership. He was proposed by John Sparrow and elected on a suitably important day in astronomical history, namely 1957 April 24, the date of the first transmission of *The Sky at Night* on BBC 1, with the naked eye comet Arend–Roland visible in British skies. On that very day, at the Royal Institution, following the BAA Exhibition meeting, John Heywood addressed the meeting regarding his plans for the Radio & Electronics Section. He announced that amateurs in Liverpool, Derby and Clacton (Frank Hyde) were already in operation, in ad-

dition to his own team at Norwood College.¹¹ Heywood's new team planned to construct a number of interferometers working at 240MHz. Martin Ryle at the Cavendish Labs had offered his help and Dr J. S. Hey, of the Royal Radar Establishment at Malvern, had written to the BAA with encouragement.

Later, in the *Journal*, Heywood repeated¹² that as well as his own Norwood group two other main amateur sites were currently being supported by the BAA, under Lt Cmdr Leonard M. Dougherty (Liverpool) and Frank Hyde. These groups were receiving the support respectively of the Liverpool Astronomical Society, the Liverpool University Astronomical Society, and the Technical College at Colchester. Jim Codling was appointed as Heywood's Assistant Director at this time and the Section even had a few members outside the UK, such as D. S. Gibson (Trinidad) and J. G. Fraser (New Zealand). Heywood also noted that Colin Barrow, a student at the University of Florida, had joined the Section.

Sputnik

On 1957 October 4 space research was changed forever with the launch of the first artificial earth satellite *Sputnik 1* by the Soviet Union. The 58cm diameter polished sphere was visible to everyone on Earth and its four external radio antennae broadcast radio pulses which were easy to pick up if you had the right equipment. At a stroke the newly formed Radio & Electronics Section had a topical purpose, to follow the new object as it moved rapidly across the sky. At the 1957 October 30 BAA meeting at Burlington House the finish time of the OM was extended by 15 minutes to allow discussion of this dramatic new event, and Frank Hyde made his first presentation to the BAA. Arthur C. Clarke also made a short contribution at that same meeting, regarding the problems connected with launching satellites. It would be the first of many lectures that Frank Hyde would give to BAA audiences over the next decade and Hyde seems to have attended most BAA meetings from that point on, until the late 1960s.¹³

At that meeting, Heywood announced that the Radio & Electronics Section and the Radio Society of Great Britain were collaborating, and had twelve stations carrying out Doppler measurements on *Sputnik*. In addition, a further 50 members of the RSGB were making field strength and telemetry measurements. He then introduced Frank Hyde and stressed 'It is through Mr Hyde's persistence and the fact that his station was ready that the Section has come to play its part in these activities. The results that he has obtained have been most valuable.'

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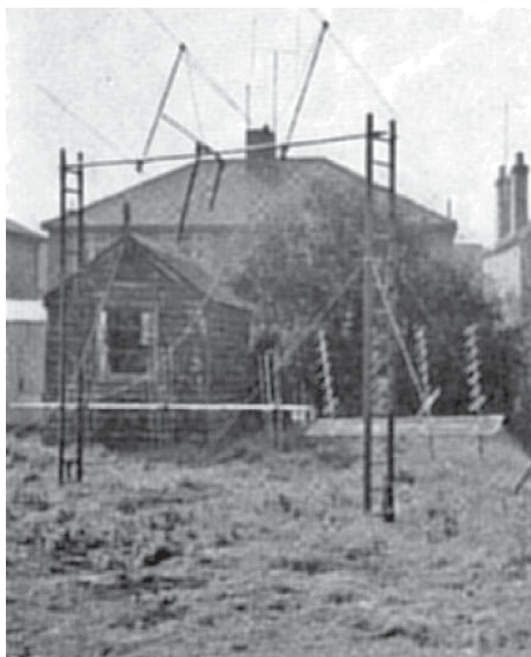


Figure 2. Radio astronomy aerials in the back garden of Frank Hyde's Clacton home during the 1950s. From *Radio Astronomy for Amateurs*.

In addressing his first BAA audience, Frank Hyde explained that his setup looked rather different from the Jodrell Bank or Cambridge radio telescopes. He showed slides of his three aerials mounted on small towers, working at 40MHz, and explained how he used a tape recorder and beat oscillator to produce the highly publicised *Sputnik* bleeps. His equipment had to be modified quickly as it had previously been operating at 108MHz. He said that when the satellite transited between midnight and 7 a.m. a great deal of information was recorded, at least until his batteries faded out on October 23. Hyde thanked the Clacton postmaster for arranging a very fast connection to be made from his observatory to the Ipswich speaking clock, whenever he declared that 'an emergency' existed.

In a subsequent paper about the first two *Sputniks*,¹⁴ Heywood said that all the Section's chief field-strength measurements were made by Hyde and were of considerable value, since continuous recordings were made during the lifetime of *Sputnik 1*. Hyde's plots were lent to the Cavendish Laboratory at Cambridge for comparison and analysis. Hyde was able to show the

polarisation of the transmission, simultaneous recordings being obtained from both vertical and horizontal dipoles, the latter being rotatable. These results revealed the Faraday fading and the toppling of the satellite.

Discussions about satellite launches continued at the November 27 BAA meeting¹⁵ with Hyde asking if the visual methods of the American 'Moonwatch' programme should be adopted by BAA members. Harold Ridley thought this would be a good idea. Frank Hyde pointed out that despite some people casting doubt on the Section's observers being able to receive signals from the new US satellites he was of the opinion that he would be able to receive them, based on the transmission data agreed at a recent conference in Barcelona.

Hyde dominates the Section

Of course, Frank Hyde's radio astronomy work had started long before the launching of artificial satellites, and the bulk of his routine work had been monitoring the Sun on a daily basis. Now working closely with John Heywood, the two men were keen to design affordable and portable equipment that could be used by all BAA members with an interest in radio astronomy.

At the BAA meeting of 1958 April 30 Hyde jokingly described his own role in the Radio Astronomy Section as 'the wire and wallpaper department',¹⁶ and he showed charts recorded at his Clacton observatory using his new 240MHz interferometer, which he was using as 'a simple drift instrument'. He said that his new equipment was fixed on an east-to-west base line 18 wavelengths apart and with John Heywood's help he held out the long pen recording charts (the 'wallpaper') he had produced as the Sun passed through the beam. Hyde said that his aerials had cost about £40 but the cables and other equipment pushed the cost much higher.

John Heywood then paid tribute to Frank Hyde's hard work for the Section, saying that Hyde had been 'pushed very hard' to get

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the project going. Heywood thought that Hyde's work had proved the results were providing valuable data about the ionosphere and the Sun, and that the results from Clacton showed that a drift interferometer with the minimum spacing of 40 feet (12.2m) at this frequency could be used to obtain satisfactory results, not only from the Sun, but also from targets in Virgo and Andromeda.

Heywood went on to describe the technical challenges that had been solved at Norwood and Clacton in designing systems that could reduce the problems of interference generated by local noise. Following the presentations by Hyde and Heywood the President, Dr Alan Hunter, enthused: 'We are privileged to have been present at the birth of so lusty an infant as the Radio & Electronics Section is turning out to be.'

Throughout 1958 Hyde & Heywood continued to work on developing equipment suitable for construction by members of the Radio & Electronics Section, with Hyde continuing his own measurements with antennae now operated on wasteland near the coast a few miles from his home. Hyde operated his 240MHz drift interferometer, modifying it between periods of use to introduce techniques which would allow improved performance and duplication by other Section members. He also constructed a second 240MHz receiver to the Section's specification, which was made reasonably portable so that it could be loaned to schools and colleges for lecture purposes. This second instrument was shown to the Queen and the Duke of Edinburgh on a visit to Crawley Technical College in 1958.

As well as solar work Hyde monitored the radio source Cassiopeia A and derived information on the state of the ionosphere from these measurements. Following the resignation of Jim Codling in 1958 Heywood installed Frank Hyde as his new Assistant Director, as well as appointing Lt Cmdr Leonard M. Dougherty as a second Assistant. The work of the Section and Frank Hyde had clearly impressed the Carnegie Trust as they awarded two grants of £100 to the BAA during 1958 to help purchase equipment for the Section.¹⁷

Two young members, whose names would become very familiar to amateur astronomers in the coming years, were quickly appointed as secretaries; these were no less than Paul Murdin and James Muirden. Hyde stood as one of the 'Other Members of the Council' in the 1958 BAA Ballot and was elected for the 1958/'59 session.

In the *Journal* Heywood reported that the main centres of the Radio & Electronics Section's activities had shifted to Clacton-on-Sea, where a large site was operated by the Assistant Director, Frank Hyde, and also to the Astronomical Society of Crawley Technical College, under Mr R. Barnes. In addition to this, Radley College Science Society, under the direction of Colin Barrow, had been active and three interferometers operating at 33, 27.5 and 50MHz had been built.¹⁸

Regarding Crawley Technical College and its Astronomical Society, in that era Patrick Moore (referred to simply as 'Patrick' from this point on) and Frank Hyde occasionally gave joint talks at the Society and some are still remembered on internet forums today. In 2012 a Sussex History Forum member called Dave recalled 'As a young boy I was fascinated by Astronomy, and I was delighted when my Dad took me to Crawley College for a talk by Patrick – this was probably the early sixties. Patrick arrived with his tie somewhere under his right ear and looking as though he'd sat on his shirt for about five days to achieve his characteristic dishevelled look. He shared the platform with Frank Hyde, a British radio astronomer, and there was a slide show. It was a very informative and amusing evening –

Patrick got quite animated when someone in the audience confused astronomy with astrology. Apparently Frank Hyde had been accused by the locals of turning their milk sour with his radio telescope – this caused Patrick to become animated again!¹⁹

The Crab and the corona

By early 1959 talks on radio astronomy were becoming increasingly popular at the monthly BAA meetings and at the May 27 meeting, for the third month in a row, the subject was covered yet again. This time Frank Hyde delivered a talk about radio telescopes using models made from cake trays.²⁰ At the same meeting John Heywood described the Section's plans for observing the occultation of a 'radio star' by the solar corona on June 12, using equipment at Crawley, Clacton and Abingdon (Radley College). When asked for clarification by Miss Cicely M. Botley, Heywood confirmed her educated guess that the 'radio star' was, in fact, the supernova remnant in the Crab Nebula.

One month later, at the meeting on June 24, as John Heywood had been unsure of whether he could attend he had asked Patrick to mention the arrangements made by the Radio & Electronics Section to observe the occultation.²¹ When it came to the technical aspects of the observations Patrick, not surprisingly, handed over to Frank Hyde, who showed slides of his two aerials at Clacton mounted 1,000 feet (305m) apart. His aerials were mounted on wooden frames 75 feet (22.9m) long with 26 feet (7.9m) uprights. Hyde explained that the date of the mid-occultation of the Crab Nebula by the solar corona had been June 14 and signals from the Crab were entirely blotted out on the morning of June 18. He showed a tracing indicating that on June 20 the nebula had reached a part of the corona where the radio obscuration was less, but on the day before the meeting there had been a new reduction in signal strength indicating that the corona was 'discontinuous electrically'.

Hyde said that local interference at Clacton had been insignificant, but 'small boys had been a minor hazard'. He added that from November to January the Sun would pass over the Sagittarius radio source region of the Milky Way, and so he would have an opportunity to check the corona on the opposite side of the Sun. John Heywood added that Patrick had organised a solar team within the Junior Astronomical Society who had been most helpful.

By 1960 February, some six months after George Alcock had discovered two comets in the space of a week and 28 months after the launch of *Sputnik I*, Frank Hyde lamented the lack of observations of the first artificial satellites by BAA members. He said that



Figure 3. A diagram showing the location and size of Frank Hyde's Martello Tower Observatory site at Beacon Heights, Point Clear, St Osyth, some 6 miles west of Clacton.

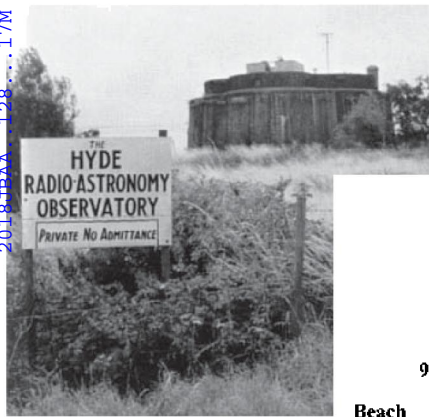


Figure 4a. Hyde's Observatory sign at St Osyth and the Martello Tower in the distance. From *Radio Astronomy for Amateurs*.

'to our everlasting shame, no observations are being made by members with the exception of those concerned professionally' adding 'the result is that the BAA is contributing nothing on a subject in which, of all bodies in this country, it should have the major interest'.²²

Hyde designed a simple satellite visual tracking device which consisted of a cross of 1-inch by 1/2-inch (25mm×13mm) prepared timber, mounted on an altazimuth stand. The cross was so arranged that the short arm contained a number of panel pins at 1-inch spacing which were viewed through a 'screw eye' at the end of the long arm. Each of the spacings represented 2°. Hyde's device was crude, but made it possible to locate the satellite in the grid formed by the pins, while noting the precise time.

Carnegie funding

By late 1960 the list of BAA Instruments, which had previously consisted primarily of optical equipment, was increasing rapidly due to the addition of radio telescope hardware, much of it purchased using Carnegie Grants inspired by Hyde's and Heywood's results. A quick look at the instruments list for that period reveals an ever increasing number of items loaned to Frank Hyde at Clacton, as well as three items donated by him to the BAA. For example, BAA instruments 214, 218, 220, 222 (pen recorders and radio interferometer apparatus) were on loan to Hyde while instruments 225–227 (old power supplies and a signal generator) were loaned out by Hyde to Salesian College, Cdr Dougherty and J. Ponsonby. Instrument 230, a 50/36 MHz receiver, was listed as donated to



Figure 5. Hyde could only enter his Martello Tower via a drawbridge. *University of East Anglia/East Anglian Film Archive*.

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Hyde, but currently on loan to himself!²³

At the 1960 October AGM the President, Dr Henry King, thanked Hyde for his equipment donations and explained that the Carnegie United Kingdom Trust had, since 1958 June, placed £950 at the BAA's disposal. Of this, £350 was for the purchase of four pen recorders with accessories for use by members of the Radio & Electronics Section. Only £80 of this money was now remaining.²⁴ The pen recorders were invaluable because, prior to their acquisition, even Hyde had mainly been using

a reel-to-reel tape recorder to capture most of his signals.²⁵ In the *Journal* Heywood reported that, as usual, a number of outside lectures have been given by members of the Section. These included two talks by one of the BAA's younger members, Paul Murdin. He also reported that Frank Hyde had been responsible for the development of one of the Workers Educational Association (WEA) courses on astronomy.

For the last few years Hyde had been coping with the difficulties of using a caravan as a control room for all of his long baseline apparatus strung out along the Essex coastline, not far from his Clacton home, but it was a less than ideal arrangement. Decades later a few BAA members of that era related numerous anecdotes about other activities taking place in Hyde's caravan, but these are not appropriate to detail here!

In 1960 Hyde appears to have made the decision to purchase a stretch of local coastline, together with a building far better suited as a control room, where he could spend all of his evenings.

Martello Tower 'B'

Between 1804 and 1812 the British Government instructed the building of a chain of forts, called Martello Towers, to defend the south



Figure 6. Hyde's Martello Tower radio telescope control room, which he called 'the eyepiece'. Note the pen recorders and charts, funded via Carnegie grants to the BAA. From *Radio Astronomy for Amateurs*.

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Figure 7. Another view of Hyde's control room, from a 1960s *Look at Life* cinema newsreel.

and east coasts of England, as well as coastal regions of Ireland, Jersey and Guernsey, to guard against a possible French invasion by Napoleon. A total of 103 Martello towers were built along the coast from Sussex to Suffolk.²⁶ The coastal region near to Clacton, where Hyde lived, had an unusually high number of Martello towers, a few of which survive to this day, and are now listed buildings.

Hyde recognised that Martello Tower 'B' at Beacon Hill, Point Clear, St Osyth, six miles west of Clacton, was perfect for a radio astronomy observatory. Not only was it well away from any local sources of radio interference, it also came with a significant stretch of beach, heathland and marshland. He was already stringing his antennae along the nearby coastline, but using his caravan as the control room was hardly ideal, or safe, for hundreds of pounds worth of sensitive electronic apparatus. The Martello Tower, with its existing power line, telephone line and solid construction was far more secure and had been used as a domestic holiday home for decades.

Tower 'B' and its surrounding land had originally been sold by the War Office in 1908 and purchased by a local family, named Cole. William Cole, along with two brothers and two sisters, moved into the Tower and lived there until they all eventually died, the last succumbing in 1924. William Cole was a well-known wildlife expert in the Clacton area. On the demise of the final Cole the property passed to their niece, a Dr Barnes, who kept the property as a holiday home for the Barnes family, so it was mainly used only in the summer months.²⁷ Frank Hyde purchased the land and the Martello Tower in 1960. He slowly began transforming it and the surrounding sea-front into the most advanced amateur radio astronomy observatory in the UK (Figure 3).

Hyde's site covered six and a half acres (26,306 sq metres) at high tide and ten acres (40,470 sq m) at low tide, with 500 feet (152m) of private foreshore. The Martello tower was 32 feet (9.8m) high and 140 feet (42.7m) in circumference with walls 8 to 12 feet thick (2.44m–3.66m) (Figures 4a & 4b). It even had a flimsy draw-bridge to gain access from the car park, which Hyde walked across every day (Figure 5).

Hyde used the first floor as a workshop and store. The top floor had three rooms, one large and two small. One of the small rooms housed the instruments (Figures 6 and 7), the second small room served as a library and a study, while the large room contained the long paper charts which could be laid out for comparison with each other. A whole array of antennae was assembled on the beach nearby which Hyde adjusted regularly (Figure 8).²⁸

Hardly had Hyde purchased the land when the media began to pay great interest in his work and he appeared on the local *About*



Figure 8. Frank Hyde adjusting one of the antennae on the beach outside his Martello Tower. Image from a 1960s *Look at Life* cinema newsreel.

Anglia television news in 1960 at his new facility.²⁹ By late 1960 even prestigious scientific journals were reporting Hyde's work alongside that of the BAA Radio & Electronics Section.³⁰

Heywood & Hyde make progress

Early in 1961 Heywood announced Hyde's new observing site and the new distribution of equipment within the Section.³¹ Hyde was appointed as Deputy Director, John Smith as Assistant Director, James Muirden as senior Section secretary and the assistant secretaries were to be Paul Murdin and J. Sabbagh. Mr Tomkin had kindly completed construction of new Section apparatus, at cost price, and as well as Hyde's facility stations were in operation at the Salesian College at Beckford, under Fr Lawrence Castelvechi, Crawley Astronomical Society and at Southampton.

Hyde's devotion to his new radio astronomy observatory resulted in his telling BAA colleagues that up to 6 p.m. he could be reached at his Carlton Road home phone number (Clacton 594) but from 6 p.m. to 9 a.m. every night he would be in the Martello Tower (Clacton 871). During World War II a thick concrete top had been added to the Tower. This meant that Hyde could erect his two 12-inch (305mm) Newtonian reflectors in the small buildings built onto the roof (Figure 9).

During the late 1950s Hyde had become concerned that the current model of the ionosphere was far from correct and this view was reinforced by his measurements of radiation which he had originally thought was emanating either from the solar corona, the Crab Nebula

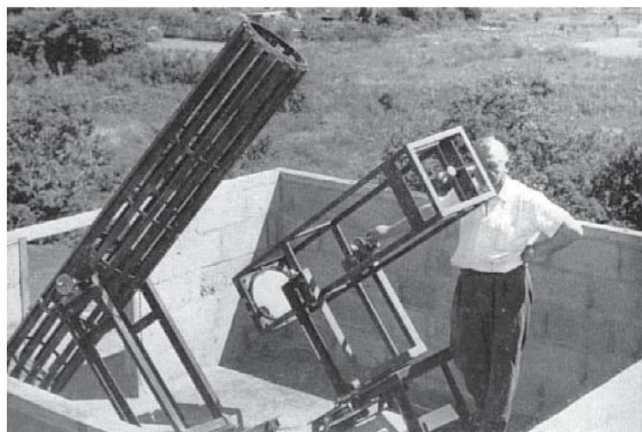


Figure 9. Long focus and short focus 12-inch (30cm) reflectors on the top of Hyde's Martello Tower. From *Radio Astronomy for Amateurs*.

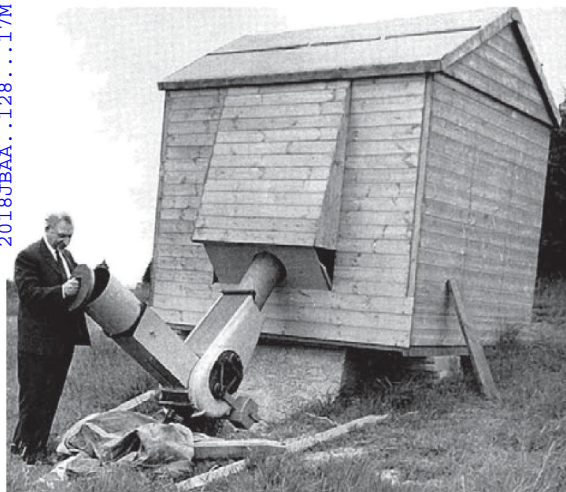


Figure 10a. BAA Instrument No. 96, William Strachan's giant 9-inch Cooke-Coudé, incorporated into a wooden building erected by Hyde on the beach in front of the Martello Tower. From *Radio Astronomy for Amateurs*.

or Jupiter. However, it was becoming clear from early space probe results that the Sun affected the region of space even as far out as the Earth, and he felt this could explain the anomalies he had noticed when making measurements at frequencies of 33MHz and lower. Most striking was a two-day period of monitoring the Sun at 27MHz, during 1959, when it seemed to be totally inactive and he suspected his equipment might be faulty.

He was now convinced that at these frequencies the ionosphere could occasionally block the real time solar emissions, because of the effect of the state of local solar system magnetic fields on the ionosphere. By collaborating with Fr Castelvechi at the Salesian College at Beckford he had noted ionospheric differences that could even be detected across the width of the British Isles. Hyde & Heywood proposed that the effect of particle accretion in the Earth/Sun field gave rise to reservoirs which spilled over to blot out or blanket the extra-terrestrial radiations.³²

On 1961 February 15 a total solar eclipse occurred across Europe and was famously televised live on the *Sky at Night*, with Patrick in the former Yugoslavia. The event was visible as a deep partial eclipse across the UK and Frank Hyde's antennae were monitoring the Sun during the event. Hyde reported that his charts showed the usual galactic background, and normal sunrise, and the eclipse period. There was a drop at the start of totality which continued until 8.41 when Hyde's equipment recorded normal conditions. He also recorded a reduction in level after totality, due to the eclipse affecting the ionosphere, but by noon everything was completely normal again. Hyde commented that the effects of totality were so marked that at first he suspected the instruments were faulty, but later on he found that they were functioning perfectly after all.³³

Such was the prominence of Hyde & Heywood's work at the time that during 1961 they were invited to Jodrell Bank by Bernard Lovell, and along with John Smith they visited Cambridge University three times during the year.³⁴ Meanwhile, Hyde & Fr Castelvechi continued their joint observations at 27MHz, and Hyde returned to making observations at 200MHz. He planned to operate at various other frequencies too, including 19, 38, 60, 81 and 240MHz.³⁵

Strachan's Coudé at St Osyth

No sooner had Hyde got all of his own equipment up and running inside and outside the Martello Tower he applied to borrow the

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Figure 10b. The eyepiece end of the 9-inch Coudé inside Hyde's wooden building. The spectroscope Hyde is using is BAA Instrument No. 8. From *Radio Astronomy for Amateurs*.

BAA's largest instrument, no. 96, the huge 9-inch (228.6mm) Cooke Coudé described in detail by this author in a previous recent paper.³⁶ The instrument had originally been built in 1923 for the disabled observer William Strachan, then briefly passed to the Hon. Lionel Guest, then to A. M. Newbegin, who loaned it to Bernard Pitcher; then he gave it to the BAA, where it was loaned out to J. G. Miller in the 1950s. The BAA Curator of Instruments since 1951 had been Henry Wildey, and he was no doubt happy to see the huge Coudé back in action, although lending instru-

ments to Hyde would later become something he deeply regretted.

Hyde mounted the Coudé inside a massive wooden shed on a south facing beachfront slope at his large St Osyth site (Figure 10a). In 1961 Hyde also borrowed instrument no. 8, a grating spectroscope, listed as 'weighing about 8lb and unsuitable for a light telescope', which he attached to the Coudé (Figure 10b). Along with electronic apparatus, he now had numerous BAA instruments out on loan at the Martello Tower.³⁷

Frank Hyde on BBC I

On 1961 June 5, at 22:25 BST on a Monday evening, Frank Hyde made his first appearance on Patrick's *Sky at Night* programme, broadcast live on BBC 1 and then only 15 minutes in length (followed only by the weather forecast and the BBC closedown). The programme was a mere four years into its life at that stage. The highlight of that evening's monochrome BBC entertainment, for most viewers, would have been the popular American *Wells Fargo* show, but no doubt Frank Hyde talking to Patrick was the real highlight for BAA members. This was a rare outside broadcast edition of the programme, using a BBC mobile television unit at the St Osyth Martello Tower, which showed how highly Patrick regarded Hyde's status. The programme was broadcast within

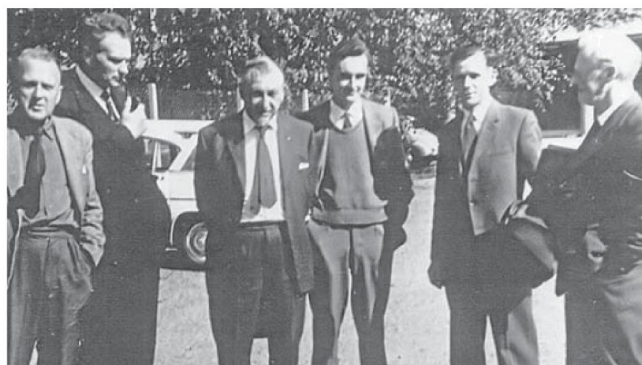


Figure 11a. Speakers at the BAA's first Out-of-London meeting on 1961 September 9, in the car park of the Herbert Art Gallery & Museum, Coventry. From left to right: Bill Baxter, Patrick Moore, Frank Hyde, K. Fea, Howard Miles (Organiser) and Bill Fox. Photograph by Alan Heath.

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months of Hyde's managing to get all of his main equipment up and running inside the fortress.^{38,39}

A few weeks after his *Sky at Night* appearance Hyde was back at Burlington House, giving a short talk to the BAA on June 28 about monitoring the solar corona using the Crab Nebula.⁴⁰ Hyde explained that it was Martin Ryle, during the mid-1950s, who had suggested that the solar corona could be studied by monitoring the Crab emissions while it passed behind the corona each year. Hyde had been carrying out these observations for some time, but the results were complicated by the fact that activity on the Sun itself could swamp the signal coming from the Crab through the corona. It was the corona Hyde was trying to study, not the daily changes in solar activity, but obviously there was a link between the Sun and its corona anyway.

Hyde had been monitoring the solar corona, using the Crab emissions, at 240MHz and 27MHz, with the signals at 27MHz being seriously affected by solar activity on a number of occasions. He had also been monitoring solar activity separately, at 24MHz, to appreciate what the Sun was doing. He recommended that amateurs without access to a huge area of land could easily build a 240MHz aerial. His own system had been built on a small 8 foot (2.44m) square (a quarter the size of his original 240MHz system) but worked well and could easily be used by anyone with even a small back garden.

During the 1960s the Carnegie Trust continued to donate generously to the BAA, especially towards the cost of equipment and part-funding educational courses. One of the agreed projects was a tutorial in radio astronomy at Frank Hyde's radio observatory, costing a mere 5 shillings (25p), on the weekend of 1961 August 26/27. However, only 6 BAA members took part, which drew criticism from the Carnegie committee and a minimum attendance of 20 was recommended following that event.^{41,42}

Coventry, Hyde, Patrick and Brinton

Just two weeks later, on 1961 September 9, a historic event in BAA history occurred, namely the first time that the Association held an Ordinary Meeting outside London. It was held at the Herbert Art Gallery & Museum at Coventry in co-operation with the Coventry Astronomical Association (Figures 11a and 11b). In the evening Patrick delivered a public lecture at the local Coventry technical college, 'Exploring the Moon by Telescope and Rocket'.

The very first speaker at that historic BAA event was Frank Hyde, who described how radio astronomy had developed and how his efforts had progressed in recent years. Hyde explained that it was practicable to work in a back garden at frequencies ranging from 60 to 300MHz. Within this band alone there were several interesting avenues to be explored. If there are a large



Figure 11b. Patrick talking to Frank Hyde at a BAA meeting around 1960 or so, possibly at the same Coventry Out-of-London meeting. On the full picture J. Hedley Robinson can just be seen on the extreme right edge. *Photographer unknown.*

number of these small telescopes in operation, though each may be of low resolution, the comparison and collation of the total observations could reveal statistically valuable material.⁴³

Bill Fox (Jupiter Section Director) pointed out that a radio astronomer called Kraus had claimed he had detected strong radio emissions from Jupiter, possibly due to the South Tropical Disturbance in the Jovian atmosphere. However, Frank Hyde was not convinced. He firmly believed that the emissions detected came from the Sun, but were somehow modified by Jupiter. Hyde had monitored Jupiter himself but never detected any emissions.

Hyde said that the frequencies used by those who claimed Jovian emissions ranged from 18 to 26MHz. John Smith backed Hyde's view, saying he once got results he thought might be from Jupiter but found out that he had been receiving Radio Moscow due to an ionospheric effect! Smith also recommended monitoring Cassiopeia A for a gradual decline in emissions. During the discussion Hyde made a very rare mention of his young Essex daughter, stating she had observed Jupiter with the 9-inch Coudé, commenting 'Look at that pink spot!'

As well as presenting *The Sky at Night*, during 1961 Patrick hosted a semi-regular children's astronomy programme entitled *Seeing Stars*, at a time (typically 17:45) when children were home from school but not yet in bed (as they invariably were during *The Sky at Night* broadcasts in that era). The programme was a simpler version of *The Sky at Night*, but, at 15 minutes, the same duration as his main show. On 1961 October 9, a Monday, *Seeing Stars* covered radio astronomy, but this time for children. Once again, Frank Hyde's observatory was the main subject, but Patrick also visited his friend Henry Brinton (at Patrick's future home of Selsey) who, with Hyde's help, was erecting a radio telescope in his garden at The Old Mill House.⁴⁴ Brinton's house was just as close to the beach as Hyde's Martello Tower observatory, so was also well away from major sources of radio interference (Figures 12a and 12b).

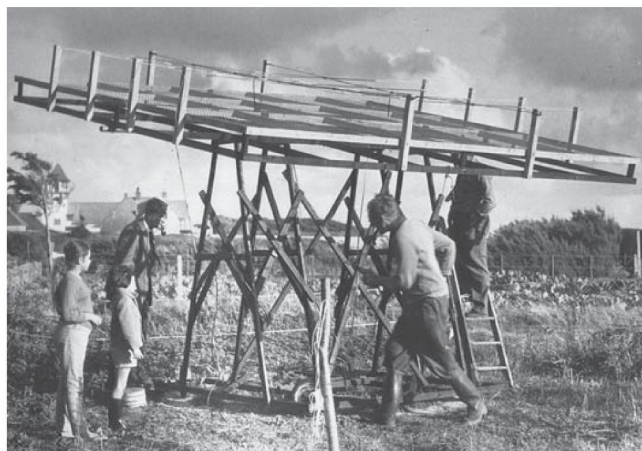


Figure 12a. Patrick and Frank Hyde assembling a radio antenna at Henry Brinton's Selsey home 'The Old Mill House' in 1961. Patrick (with pipe) is on the left, next to Brinton's daughters. Frank is up the ladder. Henry is nearest the camera. *Photograph courtesy of Alicia Brinton.*

In the 1961 November edition of the children's magazine *Look & Learn* Patrick commented: 'I was at Selsey when the building was completed, and it took the united efforts of Mr Hyde, Mr Brinton and myself, together with various other people who had come to help, to lift the instrument onto its mount. At one point I found myself taking nearly all of the weight, and it was as much as I could do to hold up the frame and stop it crashing to the ground.'

The 'Great Filter Battle'

As 1961 ended and 1962 began Frank Hyde became one of the main combatants in what became known in future years of the BAA as 'The Great Filter Battle'.^{45,46} It is by no means clear why a popular amateur radio astronomer should suddenly take such a strong stance against several of his colleagues within the BAA, all of whom had far more experience in visual observing of the planets than Hyde. One can only assume that Hyde looked at the subject of optical filters purely from the viewpoint of a radio astronomer, where filtering out unwanted wavelengths and noise is desirable, but only when you have sufficient signal strength to play with and where physiological effects (as with the human eye and brain) are not involved. The main trigger for his criticism appears to have been a talk given at the BAA meeting of 1961 April 26 by Messrs J. Hedley Robinson, V. Axel Firsoff, Alan Heath and F. C. Wykes, entitled 'Filter observations of Venus 1959'.⁴⁷

Hyde seems to have decided early on that the benefits obtained by using filters for observing Venus were illusory and physiological, and for the next year one of his main interests within the BAA seems not to have been the subject in which he was an acknowledged expert, namely radio astronomy, but one in which he had almost zero experience! Admittedly, one of the most vocal supporters of using filters for planetary work, V. Axel Firsoff, was a controversial character, known to support the idea that water had flowed on the Moon. According to Patrick, Firsoff (1910–1982) always slept with a loaded revolver under his pillow to prevent his assassination by the 'Scottish Communists'!

The subject of the BAA's 'Great Filter Battle' has been mentioned on numerous occasions by other writers, such as Richard McKim, J. Hedley Robinson and Richard Baum, but a brief summary of Hyde's involvement is relevant to this paper. Some nine months after the 1961 April talk the President, Dr Robert D'Escourt Atkinson, addressing BAA members at the 1962 January 31 meet-



Figure 12b. Another photo of Patrick and Frank Hyde assembling a radio antenna at Henry Brinton's Selsey home in 1961. Patrick is still on the left, and Frank is still up the ladder. From Patrick's personal photo archive.

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ing, primed the audience with the words 'It should also be mentioned that at our meeting on February 28, Mr Hyde will be speaking about the use of filters in visual work. As I gather that he is in strong disagreement with some other previous speakers on this matter, we should be ready for a lively discussion!'⁴⁸

As Atkinson stated, at the February 28 meeting Hyde presented his case in a paper entitled 'An investigation into visual filter observations'.⁴⁹ His collaborator was Dr Richard Fulford-Jones and Hyde told the audience that Fulford-Jones would deal with any clinical questions which might arise. Hyde was convinced that planetary observers, seeing details when using filters, were merely seeing subjective or psychological effects and that those seeing cloud details on Venus proved this was the case. Hyde argued that the reduction of illumination by the filter was playing tricks with the foveal area of the retina and that changes in illumination when the observer's head moved caused illusory details. He argued that only preventing the head from moving would eliminate such illusory cloud markings from being seen. Hyde's view was that any filtering would reduce visible detail and that for Venus the only point of reducing the illumination was reducing glare, which would be better achieved by stopping down the aperture. Needless to say, Hyde's views put him at complete odds with most of the experienced visual planetary observers in the Association and the 'battle' raged on for many months.⁵⁰

At the 1962 February 21 Mercury & Venus Section meeting held at Burlington House, which saw the Director, Patrick, in the chair, and an attendance of 23 members, Colin Pither undertook to provide interested members with suitable filters for experimentation to 'settle the vexed question of whether filters have any effect' when used on Venus. However, none of the main parties on either side of the filter battle actually attended the meeting, so no heated arguments took place!

The next war zone became the correspondence pages of the *Journal*, in which three lengthy letters appeared arguing against Hyde's and Fulford-Jones' views, written by V. Axel Firsoff, J. Hedley Robinson and Alan Heath.⁵¹ These experienced visual observers were not impressed by the criticism of their filtered work and had a plethora of arguments lined up. Perhaps the most poignant comment was by Alan Heath who stated at the end of his letter: 'I would heartily recommend sceptical observers to obtain some filters for themselves and 'have a go' before condemning what is in my opinion a valuable aid to astronomers.'

Some months later Colin Pither reported that Alan had taken some very good photographs of Venus using filters, basically proving Hyde wrong: the terminator and cusp details were real, not illusions. He also questioned the ability of the people who took part in Hyde's tests, as clearly Jovian markings were not illusions.⁵²

Emissions from Jupiter

Back in the world of radio astronomy, where Hyde was on far firmer ground, a BAA symposium on the subject was held at Burlington House on May 16 and marked 5 years of the Section's work.⁵³ Forty-three persons attended. It was reported that it became clear that a conflict existed between Heywood and Hyde as to the amount of work 'of use' that could be achieved by the amateur, with Heywood clearly viewing the Section's role as mainly educational. It was, however, generally

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agreed that where there was the money and skill and the site, such as in Hyde's case, amateurs could do useful work.

Heywood pointed out that while the Section had mastered the problems of apparatus design, it had not proved itself outstandingly successful at observational radio astronomy. This must be the task for the next five years. A young Paul Murdin presented a paper on 'The units of radio astronomy' at the same symposium.⁵⁴ During 1962 a further grant was received from the Carnegie Trust for pen recorder rolls. The BAA/Carnegie pen recorders were operated at that time by Fr Castelvocchi, John Heywood, John Smith, J. Tatum and Frank Hyde himself.⁵⁵

Throughout 1961 and into 1962 the debate about whether radio emissions could be detected from Jupiter, and identified with actual visible features, had not gone away. Hyde, as we have seen, had been highly sceptical, but his scepticism resulted in a major piece of luck coming his way. The aforementioned Colin Barrow, a young BAA member, former student, and now a researcher at Florida State University, suggested a NASA collaboration with Frank Hyde's observatory at St Osyth. Hyde was, by profession, a television and radio dealer, but he was an amateur radio astronomer, so clinching a joint research grant from NASA, via a US University, was a major achievement that even a British university would be proud of, even if a young BAA member had clinched the deal. Barrow visited the UK in June 1962 and described his own planned research programme, describing the 85° difference in longitude between Florida and St Osyth as 'so valuable'. Barrow's equipment at Florida had been switched on in mid-June and was following Jupiter and making measurements at 18, 22, 26, 34 and 38MHz. Some of the 18MHz Florida equipment would be installed in Hyde's observatory.

Books, lectures and more TV

A US University funding (via NASA) a facility operated by a British amateur was a major success story and Patrick was quick to report the news, inviting Hyde to take part with him on another *Sky at Night* programme broadcast on 1962 July 16 at the very convenient time of 18:35 BST. Once again the programme was broadcast live from the Martello Tower control room at St Osyth.

Hyde wrote two books on radio astronomy, both of which were edited by Patrick, had very similar content, yet were published via completely different competing publishers in that same year of 1962. The best known of these was *Radio Astronomy for Amateurs*, Volume II in Patrick's Lutterworth series entitled *The Amateur Astronomer's Library* (co-published a year later in the US by W. W. Norton). The other book was simply called *Radio Astronomy*, published by Weidenfeld & Nicolson, part of their *Young Enthusiast Library/Young Scientist Series*. Patrick's role in the second book was not advertised, but inside the book he was listed as the 'General Editor'.

The following year Hyde would write the radio astronomy chapter in Volume IV of Patrick's Lutterworth series, *Practical Amateur Astronomy*. In addition to these books, during the 1960s Hyde also wrote for the British magazine known as *The Radio Constructor*. Between 1962 December and 1963 March he penned four highly detailed articles covering the construction and assembly of a complete radio telescope installation. The magazine referred to Hyde as 'The foremost amateur authority on radio astronomy in this country'.

After a second appearance on the *Sky at Night*, the publication of his two books, sponsorship by NASA, and collaboration with a Florida university, Frank Hyde was now a major attraction within the BAA and as the world did survive the Cuban missile crisis of 1962 October, his research could continue. Early in 1963, when a residential observational course on astronomy was arranged for the weekend of September 27 to 29, the lecturers booked well in advance were Horace Dall, Frank Hyde, Dr Francis Jackson, Gordon Taylor and Don Campbell.⁵⁶

Filters again and the Merlin Medal

However, despite Hyde's popularity it was clear that his negative views on the use of filters for visual astronomy, along with those of his collaborator, Dr Fulford-Jones, still created disagreement with experienced visual observers. On 1963 January 15 a meeting of the Mercury & Venus Section was held at Burlington House with the Director, Patrick, in the chair.⁵⁷ Clearly, this would have been a good time for all the points of view to be aired but the British weather at that time was truly appalling. Britain was buried under snow and the average monthly temperature in January (-2.1C) had not been that low since 1814! Remarkably, 21 hardy Mercury & Venus observers did actually make it to Burlington House.

The following month, on 1963 February 27, just two days before George Alcock would discover his third comet, Patrick finally opened a discussion on the value of colour filters. This was also held at Burlington House, but some of the main combatants were now present, including Hyde himself, J. Hedley-Robinson and V. A. Firsoff.⁵⁸ Hyde now seemed to backtrack considerably from his previous opinions that filters were of little value. On this occasion he accepted that, as far as Mars and Jupiter were concerned, the BAA's planetary observers had carried out valuable work and filters were clearly effective. However, he stuck to his guns regarding Venus, despite Firsoff showing photographs which proved that the features seen by visual observers, when using filters, were not illusory.

In a move to possibly appease the BAA's many planetary observers Hyde funded a 6-inch (152.4mm) mirror-making kit (blanks, abrasives, polish etc.) as a prize for the best essay by a BAA member on the subject of 'How I would mount and use a 6-inch mirror'.⁵⁹ The adjudicators were to be Henry King and Horace Dall. Entries were limited to between 2500 and 3000 words in length and had to be sent to the Assistant Secretary, Miss Lydia Brown, on or before 1963 October 31. Just over 10 months later Hyde's essay prize was awarded to Mr C. D. Jones, by the President Ernest Beet, at the meeting of 1964 January 1.⁶⁰

On 1963 April 17 Hyde's observatory and the Martello Tower at St Osyth were filmed by Reuters for ITN with special emphasis on the grant he had received from NASA.⁶¹ Around the same time Hyde also appeared in a cinema newsreel about the 1960s called 'Look at Life'.⁶²

If anyone had been offended by Hyde's views on the use of planetary filters it was clear by April that the Council did not hold any grudge against him. At the 1963 April 24 meeting it was announced that Frank Hyde and John Smith had been awarded the Association's Merlin Medal for their notable contributions to the establishment of the Radio & Electronics Section.⁶³ Frank Hyde thanked the Association and explained that as an amateur, he had carried out this work because something

compelled him to do it. John Smith added that it was a great encouragement for those amateurs having limited means. In October, the Director of the Artificial Satellites Section, Howard Miles, recorded his appreciation for the help and encouragement he had been given by his assistants Frank Hyde and Stan Milbourn.⁶⁴

Hyde's prominence in the BAA during 1963 was, perhaps, only matched by the number of BAA instruments he still had out on loan! The 18 instruments in the BAA collection from nos. 213 to 230 were all very recent and highly valuable acquisitions by the Radio & Electronics Section.⁶⁵ Many of these had been acquired from substantial Carnegie grants, some were direct purchases, and three aforementioned items (225 to 227) were actually old pieces of equipment donated by Hyde to the BAA. At least six of the new instruments were listed as being on loan to Hyde in 1963 and there may have been more where the borrower was listed vaguely as 'Radio & Electronics Section'.

In addition, Hyde also had the aforementioned 9-inch Cooke Coudé and the heavy grating spectroscope out on loan. As if this was not enough Hyde had also persuaded Henry Wildey to loan him F. J. Sellers' old and massive spectroheliograph (instrument 210) together with a new BAA acquisition, an equatorial mounting (suitable for a 3 to 4 inch (76–102mm) refractor) on a mahogany tripod (instrument 236). All of these pieces of equipment were stored at Hyde's St Osyth observatory.

Patrick joins the Jupiter study

A month after Hyde & Smith received their Merlin awards Hyde's Florida University collaborator, Colin Barrow, came to London once more, on 1963 May 29, to give a talk to the BAA at the Royal Commonwealth Society rooms, where he described the plan to link radio emissions from Jupiter with solar activity during their two year collaboration.⁶⁶ Barrow explained that while it was now generally agreed that there seemed to be a link between radio activity from Jupiter and solar activity, there was no agreement about the delay time involved. The need to establish this link and the delay had been emphasised at a 1962 NASA conference and Hyde's funding for his collaboration with the University of Florida at Tallahassee had therefore come via NASA itself.

Barrow said that the main study would be concentrating on 18 and 22MHz emissions and that the major analysis would be statistical, using the Florida State University IBM 709 computer. The correlation analysis required as much data as possible, over as long a time span as possible, so collaborating with Hyde over a 2-year period, 85° of longitude further east, was invaluable. Just one month later, on 1963 June 26, Hyde mentioned that following the appearance of a large and active sunspot, observed optically by Bill Baxter and with radio emissions detected by John Smith and himself, he had received news from Barrow, at Florida, that apparent radio activity from Jupiter had occurred 2 days later, which was potentially encouraging evidence for their project.⁶⁷

Patrick was very interested in the possible radio emissions from Jupiter, even if Frank Hyde thought they were not from Jupiter at all, but from the Sun. What interested Patrick was the possibility that maybe the emissions really did come from Jupiter after all, and their generation might tie up with major Jovian

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features transiting the disk, as viewed from the Earth. Patrick was, quite obviously, not a radio astronomer, but he could easily observe Jupiter through his telescopes, especially if there was any suspected radio activity.

So as well as Patrick's usual planetary observations made from his mother's home at *Glencathara*, Worsted Lane, East Grinstead, he made a special effort to observe Jupiter at times of radio activity and to collaborate with Frank Hyde and Colin Barrow on this project. This did not require Patrick to be observing simultaneously with the radio astronomers. The method used was that if a radio burst was observed, the time would be noted, the Jovian System I and II longitudes calculated, and Patrick would check to see if he had observed any unusual features at those longitudes around that period (cloud permitting). From 1963 July 25 to October 23⁶⁸ 18 radio events were logged and Patrick attempted to tie them up with features he could see on the disk. He mainly used his 12½-inch (318mm) reflector for his observations but sometimes used his 8½-inch (216mm) reflector when the trees at *Glencathara* got in the way.

For the 18 events Patrick decided that 10 radio bursts could not be correlated with any features on the disk at all. For the remainder he found any correlation to be highly dubious. Of those 8 events, 4 coincided with relatively insignificant white spots transiting, three with transits of the Great Red Spot (two of these were bursts only 7 minutes apart) and one with a bright area in the Equatorial Zone. Patrick concluded from this set of observations that, as expected by Hyde, there was no correlation.⁶⁹

Despite the failure to link visual Jovian features observed by Patrick with the radio observations his attempt was mentioned in other scientific journals and one article reported that more radio observatories, in Nigeria, Spain and northern Norway were being involved.⁷⁰

Hyde becomes the *Journal* Editor

In 1963 the *Journal* Editor, David Hinds, had been in his post for three years, since taking over from Neville Goodman. However, Hinds had become seriously ill during the year and wished to be relieved from the post due to 'pressure of business'. During Hinds' illness Frank Hyde had kindly stepped into the breach to assist with editing the *Journal* and although the President, Ernest Beet, said a successor had not yet been appointed as of 1963 October 30, Hyde was the most likely candidate.

Yet another talk on radio astronomy was given by Hyde at the OM following the AGM that day.⁷¹ Just one month later, on Nov 27, five days after the assassination of US President John F. Kennedy, Hyde was officially appointed as the new Editor of the *Journal*.⁷² In the same *Journal* that this was announced there was a favourable review by Howard Miles of Hyde's book *Radio Astronomy*.⁷³

Hyde had barely taken control of the *Journal* when he published a 'Colour Filter Report', edited by Patrick, underneath some 'Mercury & Venus Section Notes' in which the main combatants in the 'Great Filter Battle' had their say, including J. Hedley-Robinson, V. A. Firsoff and Hyde himself. Francis Jackson was now the Section Director and little more was gained by the publication of this 'Colour Filter Report'. Indeed, it started as a report by Patrick, but soon became a meeting report, presumably of the Section meeting held in 1964 January, although this was not actually stated.⁷⁴ Essentially, Hyde had removed his objections to the use of filters,

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except where Venus was concerned, and there now seemed some doubt about the density of the filters Hyde had been using for his own investigations. Regardless of this, the publication of this 'report' pretty much ended Hyde's arguments against the filter users, especially as J. Hedley Robinson, Alan Heath and Firsoff had produced so much evidence to quash Hyde's arguments.

Coincidentally, around this time, Frank Hyde was asked to review a book written by Firsoff, entitled *Life beyond the Earth*.⁷⁵ Hyde could easily have given the book a bad review as it contained some highly controversial theories and quite a few errors. However, Hyde was generous in his treatment of the book, despite his ongoing disagreement with Firsoff regarding filters. Hyde's review began: 'In every age, there arise thinkers whose attitude to the normal, accepted beliefs sets them apart. A survey of Firsoff's many works puts him, I think, into this category; he is not afraid to move in any sphere, and when he does, he comes armed with facts and figures which he has vetted to his own satisfaction. He is at once stimulating and provocative.' However, two other book reviews by Hyde in this era were glowing with praise; these books were written by his BAA colleague John Heywood (*Radio Astronomy Simplified*) and by no less a person than Bernard Lovell (*Discovering the Universe*).^{76,77}

Emissions from Io?

With Frank Hyde now deeply engrossed in the Jupiter emissions study and Patrick an unofficial member of the project, Patrick invited Hyde back on the *Sky at Night* for his third appearance. The programme was broadcast on 1964 February 7, at 22:50 on BBC1. It had been intended to devote the whole programme to Jupiter, but two recent developments in space research (the *Ranger VI* lunar camera failure and *Echo II*) altered the emphasis slightly. As things turned out Hyde's Jupiter research was discussed, but Patrick and Frank were joined in the BBC studio by Howard Miles and Peter Stewart. Around this time Patrick invited Hyde to write an article for the next *Yearbook of Astronomy* entitled 'The Radio Sun'.⁷⁸ From mid-1964 the Radio & Electronics Section, which Hyde dominated, was renamed the Radio Astronomy Section.

Following Hyde's third *Sky at Night* appearance the situation regarding the Jovian radio emissions became even more complicated, due to a possible correlation between the radio bursts and the orbit of Jupiter's satellite Io. At the 1964 September 26 BAA meeting, held in the Physics Department at the University of Leeds, Frank Hyde spoke about this new theory but said that although Io was intimately connected with the radio emission from Jupiter, there was no indication of the nature of the cause of the radiation.⁸¹

Around this time John Heywood resigned from the Directorship of the Radio Astronomy Section as he found it too difficult to cope with running the Section since changing employer and moving from the college at Norwood to Birmingham. John Smith became the new Director and Frank Hyde also invited members to contact him if they wanted advice.⁸²

By the time of the 1964 AGM Frank Hyde had been the *Journal* editor for almost a year (the year of 'Beatlemania' in the UK) and two main changes had

been noted by the membership. Firstly, the *Journal* had been distributed with greater regularity, which had been welcomed. Secondly, in both content and appearance, the *Journal* had become more 'popular'. While some applauded this second development, it was regarded with 'horror' by others, according to BAA President Ernest Beet.

There had been another negative development too, not specifically linked to Hyde by Mr Beet in his summary of the year, but revealed in a splendid recent paper about W. M. Lindley, written by Jeremy Shears. This concerned the 1964 resignation of the Variable Star Section Director Reginald Andrews, due to the apparent refusal of Frank Hyde to publish all of Andrews' VSS reports in the *Journal*.⁸³ The resignation of a very hardworking Section Director due to a dispute with the new Editor must have been a matter of great concern to Council. Mr Beet commented about Andrews that 'his industry must be almost unparalleled in the BAA and makes him a difficult man to replace'.

Far removed from his editorial chores, Hyde gave more details about the possible Io radio emissions during the BAA meeting at Burlington House on 1965 Feb 24.⁸⁴ In reply to a question from Mr Vince (regarding Hyde's theory involving the 'reflection' of solar activity being responsible for Jovian emissions) Hyde replied that he was still convinced that the initiating effect was solar but that the mechanism was not as straightforward as was at once thought.

A Memoir and mounting debts

As well as Hyde's editorship of the *Journal* there was also another development regarding BAA publications. In the early 1960s Dr J. G. (Guy) Porter, the former Computing Section Director, had revised two important BAA documents concerning the phenomena of the satellites of Jupiter and Saturn, for the incumbent Director, Cameron Dinwoodie.⁸⁵ During Hyde's first session as Editor the BAA Council decided to proceed with the reprinting of these publications as part of the revised Computing Section *Memoir* (Vol. 30, part 3), the original versions of which were then long out of print.⁸⁶ Hyde was asked to obtain an estimate from the reliable and trusted *Journal* printer, Arrowsmith of Bristol. In due course Hyde produced a competitive estimate from a previously unknown Clacton agency, close to his home, which he claimed was reputable and the more favourable with respect to pricing. The Council took Hyde's advice and gave the contract to the Clacton agency.

What the Council did not appreciate at that time was that the Clacton duplicating and printing agency was owned by the woman who was Hyde's partner, and that his own Clacton TV and radio dealership was in serious financial trouble. While the 1950s had been a boom time for mono-

There's a model to suit every budget

5 NEW Pam PRINTED CIRCUIT MODELS

- Model 1 Price \$39.95 - 10" screen
- Model 2 Price \$49.95 - 12" screen
- Model 3 Price \$59.95 - 14" screen
- Model 4 Price \$69.95 - 16" screen
- Model 5 Price \$79.95 - 18" screen

GREATER RELIABILITY
MEANS BIGGER PROFITS

PAM (RADIOS & TELEVISIONS) LTD., 222, BROADWAY, NEW YORK, N.Y.

Figure 13. PAM appears to have been the major creditor for Frank Hyde's TV & radio business. This is one of their TV-set adverts from *Wireless & Electrical Trader* magazine in 1957.

chrome TV sales the 1960s saw increased competition from Japan, which threatened the very existence of British radio and TV manufacturers and those who sold, or rented, their equipment. One of the big companies most seriously affected was Pye, who invested in a number of smaller companies with more exciting brand names to entice customers to use their equipment. From 1955 Pye owned 100% of Pamphonic Reproducers, a successful British Hi-fi manufacturer, and Pye started marketing their TV and radio equipment under the Pamphonic brandname, later shortened to PAM (Radio & Television). It appears that this company supplied much of the TV & radio equipment rented or sold by Frank Hyde (Figure 13). By 1965 Pye, and their subsidiary PAM, were struggling to compete against foreign imports and had serious cash flow issues.

In 1965 May the cash flow crisis within Hyde's own TV & radio business at 30 Penfold Road, Clacton reached crisis point, with his main creditor deciding enough was enough. PAM (Radio & Television Ltd) of 295 Regent Street, London W1, who were owed money by Hyde, filed a legal petition for the winding-up of F. W. Hyde Ltd, in order to get their money back. Their solicitors, J. E. Baring & Co., of 22 Theobalds Road, London WC1, presented the petition to the High Court of Justice (Chancery Division) at Companies Court on May 24. It was listed as case no 697 of 1965. The Court decreed that anyone wishing to appear at the subsequent hearing must file their details with the Court prior to 4 p.m. on 1965 June 18, with a hearing date scheduled for June 21 at the Royal Courts of Justice in The Strand, London.⁸⁷

From the BAA point of view Hyde proceeded as normal at this worrying time for his business. Just two days after the winding-up petition was filed against him Hyde delivered a talk at the 1965 BAA Exhibition meeting at the Royal Commonwealth Society Rooms, where he spoke about recent progress in studies of the radio emissions from Jupiter.⁸⁸ New equipment had, Hyde said, been developed since the previous annual report; installations had been erected in Spain, Nigeria and Norway, and there were already stations in South Africa and America. It had sometimes happened that radio noise from Jupiter had been received at one station and not another. Hyde guessed that the ionosphere was involved in some way. Matters had been complicated by the recent discovery that Io was associated with the occurrence of radio emissions, and the whole situation was anything but clear.

Just seven weeks after Hyde's Exhibition Meeting talk the High Court of Justice scheduled two meetings, of creditors and contributors, to be held on the morning of 1965 July 16 at Room 1, Nos. 3/5, Northgate Street, Ipswich, so that the fate of F. W. Hyde Ltd could be determined. If Hyde could not convince the Court that he could find the funds to pay off his debts, his company would face liquidation.⁸⁹

A new Editor, and more about Io

But despite his worsening financial situation, to the BAA it still seemed that nothing unusual was happening in Frank Hyde's life. In the annual summary of the progress of the Radio Astronomy Section, in late 1965, John Smith enthused about Hyde's continued collaboration with Florida State University and the planned work from 1965 August onwards. Smith commented that the new information regarding the satellite Io was being taken into account and a computer program had been set up for the analysis.⁹⁰

From 1965 September 17 to 19, one week before George Alcock's

Mobberley: Frank Wilsenham Hyde: Radio astronomer extraordinaire!

fourth comet discovery, Hyde was one of the four main speakers at the BAA residential weekend course held at Moor Park College in Farnham. The other lecturers were Henry Brinton (Lunar Photography), Ben Burrell (Mars) and W. E. Fox (Jupiter). Hyde lectured on what the amateur could achieve in radio astronomy.⁹¹ During this period Hyde and Smith were also thanked for their help with constructing the Clare School Radio Telescope which was displayed at the British Association Exhibition at Cambridge in September.⁹²

At the end of 1965 Hyde resigned, very suddenly, as Editor of the *Journal*. The last *Journal* he edited was that for 1965 December (Vol. 76 no. 1) but that edition left the contact address for the Editor completely blank, as Hyde's successor had not yet been decided. By 1966 February Colin Ronan had been appointed by the BAA Council as Hyde's successor, and he would serve as Editor until 1985. During his second year as Editor (Vol. 75) Hyde (with Council's permission) had controversially reduced the number of *Journals* per year from 8 to 6. From the *Journal's* earliest days there had usually been 10 *Journals* per year, although each of the World Wars caused this to be reduced to 9 in the hardest times. Since the late 1940s the number had stabilised at 8, but Hyde made the *Journal* bi-monthly, which undoubtedly made his life much easier and is possibly the only major lasting legacy of Hyde's period in the BAA. While still the Editor Hyde had been entered into the Council ballot (under 'Other Members of the Council') for the 1965/'66 session and was duly elected.

Barely had Hyde cleared his desk of *Journal* correspondence when he appeared for his fourth and final time on *The Sky at Night*. The programme, broadcast on BBC1 at 22:55 on 1966 January 14, saw Patrick and Frank Hyde discussing the latest results from his Jupiter collaboration with the University of Florida and the idea that the moons of Jupiter, especially Io, might be the cause of the emissions.⁹³ [Author's note: I can't help wondering if this topic influenced Arthur C. Clarke when he wrote *2001!*]

On May 25 Hyde summarised the latest conclusions regarding his Jupiter emissions work at the BAA Exhibition Meeting, held at the Royal Commonwealth Society, where he displayed new charts he had produced.^{94,95} Hyde explained that as well as NASA funding his own research they were also now funding radio telescopes across the globe. Hyde said that in 1964, a suggestion by È. E. Bigg had led to the discovery that the amount of radiation received from Jupiter was affected by the orbital position of Io. Hyde had constructed a 13.5MHz polarimeter to help in the work, and a complete new site had been added at Talahassee, Florida.

The new predictions for Jovian emission were accurate for some stations, but not for all and Hyde believed the cause of the error was, in fact, the inner satellite V (Amalthea) which was very close to the planet and very quick-moving, so that it would in fact be moving inside the Jovian magnetosphere. In every way it seemed to Hyde that the research was now being carried out along the right lines. He lamented the fact that NASA had reduced the grant given for the research, but he hoped that a further grant would be made available to him next year.

Finally, Hyde spoke briefly about a new programme in which he was collaborating with the Mullard observatory at Cambridge. This concerned quasars. Earlier, the occultation of the Crab Nebula by the solar corona had been measured, and Hewish had noted scintillations of the radio source. This method was now being used in a search for quasars. Quasars would be markedly affected by scintillations in the same way as the Crab Nebula. It seemed as though three new quasars had already been found in this way.⁹⁶

Mobberley: Frank Wilsenham Hyde: Radio astronomer extraordinaire!

Once again, Hyde was booked as a main speaker at the Association's annual course at Moor Park College, Farnham, from Friday evening 1966 Sept 16 to Sunday evening Sept 18. This time around, seven weeks after England won the World Cup at Wembley, the other speakers were Bill Granger (Setting up a telescope and the amateur astronomer at work), Mike Candy (Comets) and Harold Ridley (Meteor observing and astronomical spectroscopy). In his annual report as the Radio Astronomy Section Director, in the autumn of 1966, John Smith reported that the major work of the Section had again been carried out by Hyde, and he summarised the Jupiter study results, quoting from Hyde's own report.⁹⁷

Hyde exits the BAA

For the eighth time (including his period as Editor) Hyde stood in the BAA Council elections for the 1966/'67 session. He was elected to the new Council at the 1966 October AGM, together with messrs. Appleton, Curtis, Granger, Hunt, Hysom, Maddison, Milbourn and Ringsdore. At that time Hyde was still Smith's assistant in the Radio Astronomy Section and a committee member of the Artificial Satellites Section under Howard Miles.

Council did not know at the time, but F. W. Hyde Ltd was then on the verge of liquidation. In addition the Computing Section *Memoir* (Vol. 30 part 3) requested by Cameron Dinwoodie, being printed by Hyde's recommended 'Clacton agency', had still not appeared at the BAA office (Lydia Brown's home address at 303 Bath Road, Hounslow) despite two years having elapsed. Council were very concerned about this as they had, unusually, not awarded the contract to the *Journal's* normal printers. It appears that Hyde, who clearly was in desperate need of any funds he could acquire, assured the Council that arrival of the *Memoir* (being printed by his partner) was imminent.

At the 1966 October AGM Don Campbell handed the Presidency over to Bill Fox at the critical time in the saga of the *Memoir* reprint. As the incumbent Jupiter Section Director, Bill Fox was, of course, well known to Frank Hyde. Just after that AGM the *Memoir* reprints from the mysterious Clacton agency arrived for inspection, but the quality of the work produced by Hyde's partner was poor and the cost considered to be excessive. While Hyde had many friends on the Council, Neville Goodman (the business secretary) took a principled stance against him and his demand that the bill must be paid. Largely because of this, Council declined to pay the £150 bill in 1966 November, not least because Hyde's partner's agency refused to justify its charges with an itemised account. At this point Frank Hyde, teetering on the financial brink, literally detonated at the Council table, according to various accounts.⁹⁸ He resigned his BAA membership and his partner's agency instructed her solicitor to issue a writ.

This was delivered by hand to the new President's doorstep (40 Windsor Road, Newark) just weeks after Bill Fox's term of office started. Eventually, in 1968, the matter ended up in court, with Hyde actually winning the case, and his partner's Clacton duplicating and printing agency being paid £194, but far too late for it to solve his financial problems.⁹⁹

It is possible that the refusal of the Council to pay Hyde's printing bill at the end of 1966 was the very final straw in his crumbling financial situation, although it is more than likely that he was doomed long before that date and the *Memoir* fee would have made no difference. Even so, his reaction indicates that this may

have been the last straw psychologically. Wherever he looked in 1965 and 1966 there must have been debts, but never enough credit, not even from his BAA colleagues.

The TV and radio business F. W. Hyde Ltd was dissolved soon after by the appointed liquidator and receiver, namely one Christopher Albert Taylor of Inveresk House, 346 The Strand, London, WC2. Hyde sold the beach, marshland and Martello Tower to property developers and his beachfront radio astronomy fortress was being demolished by the end of the summer of 1967. A private housing development, called Beacon Heights, was erected in the early 1970s on the land immediately behind Hyde's former observatory, but a small remnant of Hyde's Martello Tower still exists even today, very close to the house at no. 6, Beacon Heights. The remains of the Martello forward gun battery also partially survives, in the garden of no 6, to a height of nearly 1 metre in places and is preserved to some extent over approximately two thirds of its original length.¹⁰⁰

Some 8 months after Hyde's Council explosion the liquidator completed his winding up of F. W. Hyde Ltd and was officially released from the task on 1967 July 24.¹⁰¹ However, even if Hyde had continued as a BAA radio astronomer, by late 1966 the now famous Kettering Grammar School pupils, led by Geoffrey Perry, were grabbing all the newspaper and TV radio astronomy headlines as they analysed the radio transmissions from Soviet space-craft launches.

Instruments vanish

Unfortunately this sorry tale of BAA fallout does not end there, as Hyde had quite a few items of BAA equipment on loan to his observatory at the time he detonated over the *Memoir* payment and left the Association. The aforementioned Instrument No. 8, a grating spectroscope, was still in the possession of Hyde in 1968 when, according to the 2015 Curator of Instruments, Bob Marriott, Henry Wildey wrote in his instrument records 'Hyde says it was stolen'. Prior to this, since its donation by Miss Elizabeth Brown in 1899, Bob reports it had been safely loaned to 14 members over almost 70 years.

Instrument No. 22, a transit theodolite with 6-inch circles, by Negretti & Zambra, did eventually return from Hyde to the BAA, as did Sellers' massive spectrohelioscope (Instrument 210), but incredibly, the giant 9-inch Coudé (Instrument 96) did not survive Hyde's custody. Again, Bob Marriott kindly provided the following information to the author:¹⁰²

'The 9-inch Coudé Cooke refractor remained intact only until 1965. Henry Wildey has inscribed in his book, in large capital letters: 'HYDE BROKE IT UP AND LOST ALL THE PARTS' – and obviously with anger, as the pen has pierced and torn the paper. All that was recovered was one element of the object-glass, which was afterwards sold but was smashed in transit. Wildey's book also records that in 1960 this instrument was valued at £1,500'.

In addition, another seven expensive electronic instruments loaned to Hyde for several years of his Martello Tower operation were eventually written off, namely BAA instruments 217 and 219–224, generally listed as 'Radio Interferometer Ancillary Apparatus', either purchased by the BAA Radio Astronomy Section or by using Carnegie Grants.

The final instrument that was eventually written off after being loaned to Hyde was the last one he acquired, instrument 236, the

equatorial mount and tripod 'suitable for a 3 to 4 inch refractor'. All in all several thousand pounds worth of equipment (at 1966 prices) seems to have been destroyed, stolen or simply became unaccounted for, following Hyde's explosive departure.

F. W. Hyde in the post-BAA years

Sometime later, after his 30 Penfold Road business and St Osyth observatory disappeared from his life, Hyde acquired another contact address at 2 Jackson Chambers, Jackson Road, Clacton-on-Sea. This was just a hundred yards from his old Penfold Road TV dealership. His company's liquidation was certainly not the end of Frank Wilsenham Hyde. Despite having no more to do with the BAA he was still interested in and writing about space travel, astronomy and electronics. A few months after his TV & radio business disappeared he was writing a semi-regular column called *Spacewatch* for the magazine *Practical Electronics*; the first article appeared in 1967 October. This, of course, was perfect timing, because the planned *Apollo* Moon missions were only a year or two away. But despite continuing to write articles Hyde refused to rewrite his radio astronomy chapter in Patrick's book *Practical Amateur Astronomy*, which had to be revised during 1969. John Smith completely rewrote Hyde's chapter.¹⁰³

On 1969 October 27, Hyde, at that time listed as having a facility called 'The Radio Physics Laboratory at Little Clacton, Essex' of which he was the 'Principal', formed 'The Society of Professional Engineers', an organisation whose stated objective was 'to enhance the status of trained and experienced professional engineers in the absence in the UK of any legal protection for the title "Engineer"'. Hyde and nine other engineers created the organisation which claimed to be able to trace its origins to the original 'Society of Engineers', founded in 1854. The SPE still exists and is a registered company, with a respectable Journal, whose members are entitled to use the designation P. Eng.

[As well as frequently putting F.R.A.S. and F.R.S.A. after his name, Hyde often added M.S.E. and P. Eng. as well]. By 2006, long after Hyde's death, the original Society of Engineers had become part of the Institution of Electrical Engineers (IEE).^{104,105}

Hyde had always been interested in airships and also in paranormal activity. In 1971 he was one of the founders of The Airship Association and became the enrolment member for the new organisation. The committee, of which he was a member, contained two members of parliament, several engineers, an economist, and the managing director of a brand new airship company.¹⁰⁶ As well as being the enrolment organiser Hyde also gave talks about the most promising airship designs for the 1970s to organisations such as the aforementioned Society of Engineers.¹⁰⁷ He was still giving

Mobberley: Frank Wilsenham Hyde: Radio astronomer extraordinaire!

these talks in the mid-1970s. For example, on 1975 January 23 he delivered a lecture at 4 Hamilton Place, London, entitled 'The Economics of Current Airship Designs and Their Impact on the Environment'.¹⁰⁸

In 1971 *Practical Electronics* published a major monthly series of articles on radio astronomy and asked Hyde to be its author. His first article appeared in the June edition on page 462, and the series ended with article no. 10 in 1972 March. From late 1972, until Hyde's death in 1984, his *Spacewatch* column in *Practical Electronics* would be a popular monthly feature in every issue of the magazine, rather than the semi-regular article it had been for the previous five years (Figure 14).

The articles he wrote were mainly based around space travel and technical advances in astronomy, but the subjects were many and varied. For example, in 1973 alone he wrote about India's space programme, alien communication, Soviet meteorite research, *Lunokhod* and *Skylab*, Saturn's rings, orange lunar soil, asteroids, gravity, probes to Venus and Mars, Black Holes, Comet Kohoutek, radio stars and a Siberian meteorite.

Without doubt the greatest response Hyde's *Spacewatch* column provoked was when, in 1980, he used it to launch an attack on the eccentric theories of Immanuel Velikovsky (1895–1979) who

had died a few months earlier. Hyde specifically criticised the theory that 'around 1500 BC a comet erupted from Jupiter and formed the planet Venus'.¹⁰⁹ An outraged magazine reader, W. G. C. Austin, in the 'Readout' correspondence section,¹¹⁰ demanded that Hyde should treat Velikovsky with more respect, claiming Hyde actually believed the solar system was only 4,000 years old and that he had distorted what Velikovsky said at the 1974 AAAS symposium. Another reader, D. G. W. Birch,¹¹¹ rallied to Hyde's aid, also slamming Velikovsky, but then two more readers, J. Abery and P. Warlow, weighed into Hyde and Birch's views, alleging the misuse of secondhand quotes from Isaac Asimov and Carl Sagan.¹¹² After 8 months of this 'Velikovsky War' Hyde closed the correspondence at the end of the year.¹¹³

Following the Velikovsky exchanges Hyde lived for fewer than another four years. He died on 1984 March 22, aged 75. His final *Spacewatch* columns (now sub-titled 'Extra-terrestrial activities chronicled') were published in the first months of that year, with his February subject entitled 'SERC scientists 'weigh' a black hole'.

Patrick, in the *Journal*, wrote the briefest of obituaries about his former friend who had resigned almost 18 years earlier, saying 'Older members will remember his talks and his pleasant personality'.¹¹⁴

So there ends the tale of Frank Hyde's decade (but for a few months) within the BAA. Undoubtedly Hyde was an intelligent man, a highly knowledgeable engineer and a man driven by an obsession (one might even say a dangerous *addiction*) regarding his passion for radio astronomy. He helped many budding BAA radio astronomers in the late 1950s and 1960s and made a huge number of useful solar observations, along with his Jupiter emissions research. If not for the decline of his radio & TV business and his 'doggy' *Memoir* escapade, who knows what he would have gone on to achieve within the BAA?

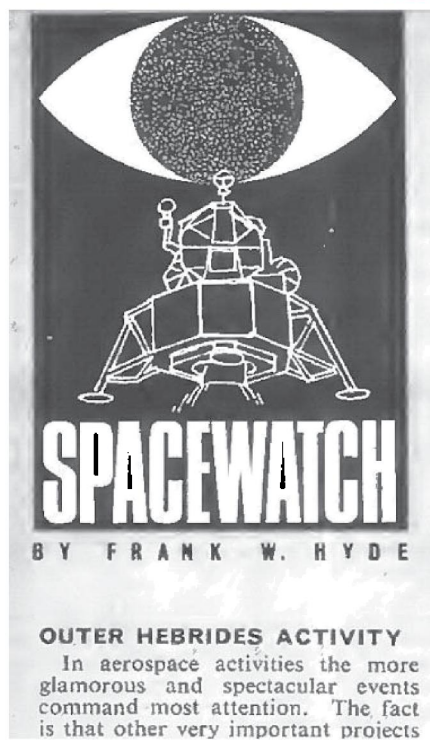


Figure 14. The logo for Frank Hyde's *Spacewatch* column in *Practical Electronics* from the July 1973 edition.

Index to Volume 127 (2017)

Prepared by H. W. McGee

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Abbreviations: ill. = illustration news = in 'Notes and News', 'BAA Update' or 'Observers' Forum'
ltr. = letter to the Editor obit. = obituary
mtg. = meeting contribution rvw. = publication review

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