## J.P.M.PRENTICE

With the death of John Philip Manning Prentice at his home in Suffolk on 1981 October 6 the astronomical community lost an amateur astronomer of great distinction. Although Prentice will be remembered primarily for his discovery of the great meteor shower associated with the Giacobini–Zinner comet and of Nova DQ Herculis he exerted a great influence on the development of astronomy in the UK through his association with the early research work at Jodrell Bank.

Manning Prentice was born on 1903 March 14. He was educated at Gresham's School, Holt, and, destined for a legal career, he was articled to Gudgeons, Peecock & Prentice of Stowmarket, Suffolk in 1921. In 1926 he obtained a first class in the honours examination of the Law Society and was awarded the Clements Inn Prize. Throughout his life he remained by profession, a lawyer, becoming the senior partner in the Stowmarket firm to which he was articled. His interest in astronomy developed whilst still a schoolboy when he began to make records of meteor observations. In 1919 he became a member of the British Astronomical Association and in 1923 at the age of 20 he was appointed Director of the Meteor Section – a post he occupied for the next 31 years.

Prentice's first major success in astronomy was associated with the Giacobinid (Draconid) meteor shower. The comet in question, Comet 1900 (III), was discovered by Giacobini in 1900. Recovered by Zinner in 1913 November the comet became known as the Giacobini–Zinner comet. In 1915 the Rev Dr M.Davidson published the results of his investigation in which he estimated which comets observed between 1893–1914 would pass close enough to the Earth's orbit so that an associated meteor shower might be observed (1). There were two only, one of which was Comet 1900 (III). Davidson estimated that this comet might give rise to a meteor shower at descending node about October 10 the radiant being at RA 267°, Dec +50° – a position subsequently modified as more accurate elements for the cometary orbit became available to RA 261°, Dec +53·5°. Until 1926 no evidence was available that a shower was associated with this comet, but in that year Crommelin calculated that on October 10 the orbits of the Earth and the comet would intersect. From his home near Stowmarket, Prentice commenced a routine watch at $20^h\ 20^m$ on October 9. In his account published eight years later (2) he wrote that 'within forty minutes five slow meteors were seen which indicated a radiant in the NW sky; and turning to watch in that direction I soon realised that an exceptional stream was in activity'. He estimated the hourly rate to be '17 for one observer' and the observed position of the radiant agreed so closely with the calculated value for Comet 1900 (III) that 'the connection of the meteor stream with the comet was thus virtually beyond dispute'. A similar conclusion had been reached by Denning in a note published shortly after the occurrence of this shower (3).

These observations during the night of 1926 October 9–10 placed the association of the meteor shower and the comet beyond reasonable doubt. They are also historic in recording one of the greatest fireballs ever observed.

This fireball came from the radiant area at $22^h\ 16^m$ UT on October 9. It was of zenithal magnitude $-7$ and left a long enduring train persisting for more than 30 minutes. A description of the observations of this great fireball was published by Porter & Prentice in 1939 (4).

The period of the Giacobini–Zinner comet was 6·5 years. It was computed that whereas in 1926 the Earth crossed the cometary orbit 70 days ahead of the comet, the passage would be 80 days behind the comet in 1933. Since only negative results had been obtained in the intervening years, Prentice and his BAA section awaited the 1933 return with considerable interest. In the event England was cloud-covered during the night of October 9–10 but at Armagh the Rev W.F.A.Ellison observed a great meteor storm:

> 'Between 7 and 7.35 p.m. I counted 300 meteors . . . and occasionally there were brilliant flashing fireballs which lighted up the landscape like sheet lightning . . . called indoors for an evening meal at 7.35, I was out again at 7.58. Then it was apparent that a really great meteoric storm was in progress. I counted 200 meteors in two minutes and then counting became impossible. The firestars became as thick as the flakes of a snowstorm . . . ' (5).

Apart from a brief glimpse of the shower, during a break in the clouds, by W.B.Housman at Seaton, Prentice (6) could refer only to the observations made elsewhere in Europe which showed 'that the stream returned in very great abundance, giving a meteor storm comparable to the classic meteor storms of the last century'. Indeed the summary by King (5) revealed that the total duration of the shower was only 4 to 4·5 hours but that the visual rate at maximum was 4000 to 6000 per hour.

The relation of the meteor stream to the comet was now placed beyond doubt and the next returns were expected in 1939 and 1940. The Earth crossed the cometary orbit 136 days ahead of the comet in 1939 October but neither on that occasion nor in 1940 was Prentice able to find any associated meteors (7). (Since the predicted time of maximum fell after dawn in 1939 and during the afternoon in 1940, these negative observations are not surprising in view of the short duration of the shower.) The next return in 1946 October was predicted to occur as the Earth crossed the cometary orbit only 15 days behind the comet and the expectations of another short-lived intense meteoric storm were fulfilled. Prentice gave an account of his own observations at Stowmarket and in summarizing the work of his meteor section he concluded that at maximum the equivalent visual zenithal rate was 2250 per hour (8). But by that time Prentice had undertaken his vital collaboration with us at Jodrell Bank and that event of 1946 October 10 finally established the validity of the radio echo observations of meteors (9).

The reports in the *Journal of the British Astronomical Association* reveal that Prentice was a tireless observer of the heavens on clear nights during the dark of the Moon. A spectacular bonus of this devotion to astronomical observation was his discovery of the Nova DQ Herculis whilst he was observing the Geminid meteor shower during the early morning of 1934 December 13. At the meeting of the British Astronomical Association on 1935 January 2 the President, who was then H.Spencer Jones, invited Prentice to give an account of his discovery. With characteristic modesty Prentice said that he had 'come to hear about the behaviour of the new star rather than to speak

of it'. Nevertheless the account of his discovery (**10**) is evocative of the man who, after a day in the office, would settle down to his night's observations.

> 'On the evening of the 12th he [Prentice] started work at about $5^h\ 30^m$ GMAT ($17^h\ 30^m$ UT) and continued till $7^h\ 30^m$ and again from about $9^h\ 10^m$ till $11^h\ 30^m$, when clouds stopped observation. About $13^h\ 30^m$ ($01^h\ 30^m$ UT) he was again able to see the sky and observed many Geminids. His observing station was on a farm, about four miles from Stowmarket. After observing for some three hours or so, he found himself missing meteors, a sign of fatigue, and therefore decided to rest awhile by taking a stroll and looking at other parts of the sky. He had not walked three paces before he noticed that there was something wrong with the head of Draco. The strange appearance proved to be due to a conspicuous nova. He estimated the brightness at $3^m{\cdot}4$. Knowing that the spectrum of the star should be photographed at the earliest possible moment, he got the car going and proceeded to Stowmarket and telephoned Greenwich Observatory at 17 hours (05 UT). Since then he had watched the career of the nova and hoped it would prove a very interesting one. . . .'

The President then reported that 'Mr. Martin, who was on morning parallax duty at the time of the reception of the message, had very promptly secured before dawn two spectra of the nova with the Yapp reflector'.

This discovery of Nova Herculis and the prompt action of Prentice which enabled the spectra of the early stages of the outburst to be obtained was a major astronomical event. *The Times* carried a detailed description of the discovery on 1934 December 14 and on December 17 the leader writer paid tribute to Prentice.

> 'Astronomers are already paying their homage and countless observatory telescopes now point to Nova Herculis . . . but let it not be forgotten that it was a Stowmarket solicitor, Mr. J. P. M. Prentice who first observed that a star in Herculis had run amok . . . the honours of astronomy not infrequently go to the amateur. . . .'

The issue of December 29 reported the progress of the observations and on 1935 January 3 the Astronomical Correspondent wrote that 'A circumstance unusual to such observations is that no one has claimed to have seen the Nova before December 13 and Mr. Prentice remains in undisputed possession of the honour of being the first observer.' At the AGM of the BAA on 1935 October 30, Spencer Jones gave his presidential address on 'Novae' and presented to Prentice the Walter Goodacre Medal and Gift which had been awarded to him by the Council for this discovery. A few months earlier, in June, his discovery had already been recognized by the American Association of Variable Star Observers through the award of the D.B.Pickering Gold Medal. In 1937 Prentice was awarded a Leverhulme Research Fellowship which enabled him to take a brief respite from his professional duties as a lawyer. In 1938 April and May he visited Madeira in order to study the radiant of the $\eta$-Aquarid shower.

My own contact with Prentice did not occur until after World War II, when in 1946 I had two ex-army trailers of radar equipment at Jodrell Bank. My intention had been to develop a radar technique for the observation of transient echoes from high energy extensive cosmic ray air showers – a subject which I had been investigating with spaced cloud chambers when war broke out in 1939. It had proved impossible to operate this equipment in the University precincts in Manchester because of electrical interference and

I had permission to site the trailers in the grounds of the Botany Department at Jodrell Bank, south of the city. Transient echoes were immediately evident but their rate of occurrence was such that they could not be from the cosmic ray ionization. At this point J.S.Hey of the Army Operational Research Group referred me to the work on the radar detection of V2 rockets. On many occasions the occurrence of transient echoes had led to warnings of V2 attacks when it transpired from Intelligence sources that no rockets had been launched. Hey concluded that the reflections might be from the ionized trails of meteors.

Although the pre-war ionospheric literature contained many references to this possibility, there was no secure proof of the specific relationship of the transient echoes to meteors, neither did the limited astronomical literature to which we had access contain much information about meteors. Fortunately at that time a young Norwegian scientist, Nicolai Herlofson was working in Blackett's laboratory in Manchester. He had been a meteorologist during the war and knew that the authorities on meteors were the amateur astronomers. In this way we were introduced to Prentice in the early months of 1946. When he was acquainted with our problem he immediately offered to visit Jodrell Bank during the next reliable meteor shower which he advised us would be the Perseids in late July and early August. His idea was simple in the extreme – namely that he would transfer the observations which he would normally be making at Stowmarket to Jodrell Bank so that we could assess whether our radar echoes coincided with his visually observed meteors.

Thus in the summer of 1946 we were introduced to the remarkable manner in which Prentice and his team made their observations. He arrived with his equipment consisting of celestial globes, star atlases, a flying suit, deck chair and other paraphernalia piled on the back seat of an open Morris car. Shortly after sunset he would erect the deck chair as near horizontal as possible and settle himself with a piece of string, a dimmed torch, and a writing board. When a meteor streaked across the sky he would raise the stretched string at arms length along the line of the transient meteor and read off with comparative leisure the stars which defined the beginning and end point of the meteor's track. He would also shout when a meteor appeared so that, in the adjacent trailer, we established the extent of the correlation between the transient echoes and the visible meteor trails. The results of this early collaboration with Prentice, published (11) in 1947, established our scientific viability in this new astronomical technique and was the foundation of all later developments at Jodrell Bank.

The demonstration in this manner of the possibilities of the radio echo technique for observation under any sky conditions and in daylight was part only of the fundamental influence which Prentice exerted on our affairs. There was an understandable caution in the Establishment regarding the possibility that those of us who had been diverted for six years to the prosecution of the war could return to effective academic research. It was our good fortune that we were able to receive our education in the fundamentals of astronomy from a superb practitioner of the art of observing the heavens, for Prentice's knowledge of the sky was as great as that of any professional astronomer I encountered subsequently. His cardinal influence in the develop-

ment of Jodrell Bank was acknowledged by the University of Manchester in 1953 July when Prentice was awarded the honorary degree of Master of Science.

Prentice exerted an important influence on the techniques for the visual observation of meteors. Until the late nineteenth century the method was to observe the path of the meteor and then plot it on a star map. In 1890 W.F. Denning (**12**) had recommended the use of a wand or extended string which the observer aligned along the meteor path and read the coordinates of the beginning and end of the path in terms of the star background. This was the technique inherited by Prentice who introduced a great improvement in the accuracy by using cross-bearings and quotation of actual distances between known stars instead of estimates of angular distance. Thus, star maps were rarely used at the moment of observation – but this demanded a most thorough knowledge of the sky. In 1938 Porter (**13**) gave an analysis of the accuracy of the data from the observation of 102 meteor paths observed simultaneously, but independently, by Prentice and Alcock, between 1932 and 1935. The probable error was $\pm 3{\cdot}26°$ for the beginning of the trail and $\pm 2{\cdot}43°$ for the end. Later, Porter (**14**) analysed the data for 1253 meteor paths, 725 of which were observed simultaneously by Prentice and other members of his team between 1932 and 1940 using this modern technique. He found the standard deviation in the direction of motion to be $3{\cdot}19°$ for the beginning of the path and, for the end, $3{\cdot}16°$; whereas the offset errors perpendicular to the path were $0{\cdot}96°$ and $1{\cdot}13°$ for the beginning and end respectively. The timing errors were the most serious, leading to mean errors of 20–30 per cent in the speed derived by different observers (**15**). The difficulties in the reduction of the data when different observers rarely observe the same meteor path with precise simultaneity were treated by Porter (**14**) and the excellence of the results obtained by the British observers under the direction of Prentice reflects the skill and determination which he brought to the task.

Prentice was well acquainted with the literature on meteors and had acquired a professional understanding of the subject as was evident in the lecture he delivered as part of the Physical Society Conference in Manchester in 1947 March (**16**). He was aware of the development of the rotating shutter photographic techniques in America for the measurement of velocities. He remained deeply suspicious of the interpretation of the velocity results of Öpik (**17**) using the rocking mirror apparatus during the Arizona meteor expedition of 1931–33, and of the interpretation of the von Niessl-Hoffmeister fireball catalogue (**18**). Both interpretations were in favour of hyperbolic velocities (and hence interstellar origin) for the sporadic meteors and fireballs. The view which Prentice took of this work was fully justified when the new radio echo methods of velocity measurement failed to reveal the existence of such hyperbolic velocities. Before he became acquainted with the radio echo techniques, Prentice had undertaken a private venture with EMI for the development of an electron image intensifier behind a large lens with which he hoped to increase the magnitude limit to which meteors could be observed.

If Prentice had one abiding frustration as an observer it was that cloud or Moon so often coincided with major events. He had been deeply disappointed that cloud had obscured from his view the great Giacobinid

meteor storm in 1933 October and the realization that the new radio echo techniques could record meteors independently of cloud, Moon or daylight filled him with enthusiasm. He felt, quite erroneously, that the new technique would make the visual observers redundant and devised plans for installing radar equipment at his home near Stowmarket. However, other matters began to make serious inroads on his spare time. He resigned the directorship of the meteor section of the British Astronomical Association in the autumn of 1954 (**19**) because he believed the pressure of these other duties would interfere with his control of the work of the section. He remained a member of the section and continued to contribute to its work for the rest of his life.

These other matters which began to monopolize the spare time energies of Prentice concerned the church. The family of Prentice had been deeply involved with the Stowmarket Congregational Church for six generations – an association which could be traced back to 1799 when a Manning Prentice of Bungay came to live in Stowmarket, became the first deacon of the church and founded the Sunday School. The Manning Prentice of the twentieth century had been closely involved with this church throughout his life, finding a particular expression in the organization of the Boys' Brigade. In 1933 he became Captain of the 1st mid-Suffolk Stowmarket Company of the Boys' Brigade and remained so until 1942. His abiding interest in this activity was evidenced again in the post-war era when, from 1967 to 1975 he was Captain of the 2nd mid-Suffolk Needham Market Company. However, this involvement with the affairs of the Boys' Brigade, although occupying much time and energy was not the issue which ultimately caused so much distraction to Prentice.

His marriage to Elizabeth Mason Harwood in 1937 June strengthened the involvement with the Stowmarket Congregational Church and when the building was destroyed by bombs in 1941 Prentice was a deacon of the church. For 14 years the task of rebuilding this church fell heavily on the shoulders of Prentice – years in which he fought with the planning authorities and commissioners and rallied the people to sustain their faith and interest – years which he later described as like 'the ticking of the death watch beetle'. At last this task was nearing completion and in 1954 a few months before the official opening, Prentice was officially appointed Church Secretary. Until 1971–72 he served with immense care and devotion but then by a majority vote it was decided that the Stowmarket Congregational Church should become part of the new United Reformed Church. The decision caused Prentice acute pain. He believed fervently in the freedom which belonged to the local church and was very strongly opposed to the union which he regarded as the first casualty of the drive towards the central direction of the affairs of the church. He could not believe that the primary tasks of the church could be performed 'in assemblies or in synods or by passing pious resolutions. It is in the local church that the real work of the church is carried on'. The intensity of Prentice's belief led him to transfer his allegiance elsewhere. He was deeply wounded by this development that caused him to leave the church which he and his ancestors had served for six generations, and which he himself had sustained and recreated after its destruction in 1941. The thanksgiving service for Prentice on 1981 October 26 was, never-

theless, fittingly held in this church. He had served the local community for over 50 years as a lay preacher and even after the union he occasionally returned to speak from the pulpit of what had become the Stowmarket United Reformed Church.

In the last years of his life when he was already suffering from his mortal illness Prentice wrote three books. The first two of these were published together in 1980 as *Occasional Notes for my friends and other papers* (**20**). The third, under the same title was completed on his death bed and has only been circulated privately (**21**). In the form of a series of letters to his daughter-in-law, Elizabeth, this third book tells the story of the agonizing conflict which he suffered over the question of church unity. In the second book he describes in some considerable scientific detail the modern views on the evolution of life and his own resolution of the problems raised by the Christian and scientific attitudes to existence. The first book contains the essence of the development of his interests throughout life and his personal account of the night he discovered Nova Herculis will be of especial interest to astronomers.

Prentice was a remarkable man. He was trained and lived his life as a lawyer. For over 50 years he was a lay preacher deeply versed in the theological literature. He served the church and the Boys Brigade organization with a deep passion. But if his environment had been different he could well have been an outstanding professional astronomer. As a boy of 15 whilst reading in the school library the wonder of the Universe '. . . like a great wind sweeping in from the sea . . . took possession of him and filled his mind with infinite delight' (**20**). In later years he likened this moment 'to a Conversion, and so it was . . .'. He proceeded as a schoolboy to draw sunspots, the craters on the Moon, and with the aid of a 3-inch telescope he observed Saturn and Jupiter. Within a few years, before he was qualified professionally, he became director of the meteor section of the BAA and one of the most skilful amateur observers in history.

Late in life he wrote that he had found the same delight in his association with us at Jodrell Bank, but, ironically, it was this which, within a decade, was to lead him to abandon his astronomical work. He wrote:

> 'The war, which halted my work just as it was beginning to prosper, also accelerated the new techniques which were to replace it. But these new techniques meant that if I wished to continue seriously my research into meteors I must become a true scientist and devote my whole time to it. The opportunity, a fleeting one, did indeed occur. But I knew that my life had other purposes as well, which I could not forego, and in 1953 I gave up all my astronomical work, to my great and lasting sorrow.' (**20**)

Although Prentice may have intended to abandon his astronomical work when he resigned the directorship of the Meteor Section of the BAA, he did not, in fact, do so. He continued to make observations and I am indebted to the present (1982) director Mr G.H.Spalding for the information that Prentice observed the Perseid and Geminid showers in 1980, and the 1981 Perseid shower only two months before his death. He remained a Fellow of the Royal Astronomical Society, to which he had been elected in 1935, until 1975. Council of the Society acknowledged his work by the award of the Hannah Jackson Gwilt Gift and Medal in 1953.

Prentice is survived by his wife and the four children of the marriage. I am deeply indebted to Betty Prentice for helping me with many of the facts of her husband's career which could not be deduced from his published researches, particularly for the gift of his last writings – the *Occasional Notes* – and for the copy of the address delivered by L.James on the occasion of the thanksgiving service.

BERNARD LOVELL

## NOTES AND REFERENCES


(1) Davidson, M., 1915. *J. Br. astr. Ass.*, **25**, 292.
(2) Prentice, J.P.M., 1934. *J. Br. astr. Ass.*, **44**, 108.
(3) Denning, W.F., 1926. *Mon. Not. R. astr. Soc.*, **87**, 104.
(4) Porter, J.G. & Prentice, J.P.M., 1939. *J. Br. astr. Ass.*, **49**, 337.
(5) This extract from the *Belfast Telegraph* of 1933 October 11 is quoted by A.King who collected and summarized many reports from Europe (*J. Br. astr. Ass.*, **44**, 111, 1934).
(6) Prentice, J.P.M., 1934. *J. Br. astr. Ass.*, **44**, 110.
(7) Prentice, J.P.M., 1939. *J. Br. astr. Ass.*, **50**, 27; **51**, 18, 1940.
(8) Prentice, J.P.M., 1947. *Observatory*, **67**, 3; *J. Br. astr. Ass.*, **57**, 86, 1947.
(9) See Lovell, A.C.B., Banwell, C.J. & Clegg, J.A., 1947. *Mon. Not. R. astr. Soc.*, **107**, 164. Similar radio-echo results of this Giacobinid shower were also obtained at Slough by Appleton, E.V. & Naismith, R., 1947. *Proc. Phys. Soc.*, **59**, 461, and at Byfleet by Hey, J.S., Parsons, S.J. & Stewart, G.S., 1947. *Mon. Not. R. astr. Soc.*, **107**, 176.
(10) *Observatory*, **58**, 41, 1935.
(11) Prentice, J.P.M., Lovell, A.C.B. & Banwell, C.J., 1947. *Mon. Not. R. astr. Soc.*, **107**, 155.
(12) Denning, W.F., 1891. *Mem. Br. astr. Ass.*, **1**, 20.
(13) Porter, J.G., 1938. *J. Br. astr. Ass.*, **48**, 337.
(14) Porter, J.G., 1943. *Mon. Not. R. astr. Soc.*, **103**, 134; **104**, 257, 1944.
(15) For an account of this work and of the influence of the timing errors on the problem of the velocity of sporadic meteors see Lovell, A.C.B., 1954. *Meteor Astronomy*, chapter X, Oxford University Press.
(16) Prentice, J.P.M., 1948. *Rep. Prog. Phys.*, **11**, 415.
(17) Shapley, H., Öpik, E.J. & Boothroyd, S.L., 1932. *Proc. nat. Acad. Sci. U.S.A.*, **18**, 16. Öpik, E.J., 1934. *Circ. Harv. Coll. Obs. No. 389*, and many subsequent circulars. A short account was given by Öpik, E.J., 1940. *Mon. Not. R. astr. Soc.*, **100**, 315, and a full account of this work and its interpretation in chapter IX of (15).
(18) von Niessl, G. & Hoffmeister, C., 1925. *Denkschr. Akad. Wiss., Wien*, 100.
(19) See *J. Br. astr. Ass.*, **65**, 3, 1954–55 for the report of the AGM (1954 October 27) at which his resignation was accepted. He was succeeded as director of the meteor section by H.B.Ridley.
(20) *Occasional Notes for my friends and other papers*, Books 1 and 2, Stowprint, 1980.
(21) *Occasional Notes for my friends and other papers*, Book 3. 'The Elizabeth Letters', 1981, unpublished.


## CHRONOLOGICAL LIST OF PUBLICATIONS

The following is believed to be a complete list of publications by J.P.M.Prentice (see also (20) and (21):

Observations of the meteors of the Epsilon Arietid radiant in 1921 (with Miss A.G.Cook), *Mon. Not. R. astr. Soc.*, **82**, 309, 1922.
14th Report of the British Astronomical Association, Meteor Section 1922, *Mem. Br. astr. Ass.*, **24**, 49, 1923.
Meteor radiants, *Handbk Br. astr. Ass.*, 1924, p. 22.
The photography of meteors (with E.H.Collinson), *J. Br. astr. Ass.*, **37**, 266, 1927.
The radiants of the Orionid meteor shower, *J. Br. astr. Ass.*, **43**, 376, 1933.