# FAMOUS VISITORS TO HELIOPOLIS

3185 Alpine Road, Menlo Pak, CA

AND THEIR HAMMER AND CHISEL SIGNATURES

R.N. Bracewell

**ART ('Dick' Thompson.** Yorkshireman Dick Thompson, with a Ph.D from Lovell's group in Manchester, was recruited to Stanford from Marfa, spent many years with our Radio Astronomy Institute, coauthored papers with RNB on imaging theory, moved to the Very Large Array in Socorro, New Mexico, represented the United States at meetings of the International Telecommunications Union, where frequency allocations are apportioned. Strange as it may seem, the Federal Communications Commission, being legally bound by international treaty, does not have the final say in allocation of frequency bands and RF power limits where interference with foreign services, by land or sea, could result. Seen from a ship's bridge, international jurisdiction obviously must rule. It was when the NSF determined that radio astronomy grants to universities must be phased out in favor of National Centers (National Radio Astronomy Observatory at Charlottesville, West Virginia, and National Ionospheric Observatory in Puerto Rico), that NRAO inherted Thompson, who is now at the Charlottesville headquarters after a stint of several years in Socorro. Thompson is the principal author of the current text on radio astronomy techniques.

**J.B. = ?**

**(E.K.) Bigg.** Radiophysics collaborator on VLF waves and freezing nuclei.

**(B.J. 'Bart') Bok.** Famous Leyden astronomer. Initiated observational radio astronomy at Harvard. Commonwealth Astronomer at Canberra. Conducted site survey that led to siting of the Anglo-Australian telescope at Siding Spring. Resiled to Department of Astronomy, University of Texas, Arizona.

**J.G. Bolton.** Radiophysics Laboratory, Sydney. Discovered the first four radio stars. Built the big interferometer for Cal Tech in the Owens Valley. Returned to Radiophysics Laboratory as director of the 210-foot dish at Parkes. NASA copied its own three 210-foot dishes, equally spaced in longitude around the world, from the Parkes design and used the dish for communcating with early satellites. RNB was the first visiting astronomer and first to discover strong polarization in extragalactic sources (see Journal of Astronomical History and Heritage). The SETI Institute spent months at Parkes studying hundreds of stars thought to be possible sites of intelligent life.

**(E.G.) 'Taffy' Bowen.** Long-time Director of Radiophysics Laboratory. Famous for carrying the first magnetron to the United States, on his lap by plane during wartime. Responsable for acquiring the 210-foot dish. Participant in guidance of the Anglo-Australian telescope project.

**(Robert) Hanbury (Brown).** Manchester, U. Sydney. First to apply the intensity interferometer to measurement of stellar diameters.

**M.J. Buckingham 'Mike'.** One of the first four Professors of Physics appointed by Harry Messel. Ph.D. from Carolina, went home to Australia with his American wife who is famous for having been 'denationalized' when she applied for renewal of her U.S. passport at the U.S. Consulate in Sydney, despite her unmistakable Carolina accent. Reason given was that she voted in a municipal election (not state or federal). Not an unreasonable thing to do where homeowners were fined for failing to vote in the town council election. (In Australia voting in state and federal elections is also compulsory.

**M. Chodorow 'Marvin'.** Famous Stanford Professor of Physics, director of the Ginzton Laboratory and microwave pioneer.

**(W.N.) Christiansen 'Chris'.** Radiophysics Laboratory radar wizard, later Professor of Electrical Engineering at Sydney, and builder of the 'Chris Cross.'

**(Donald I.) Cone.** A courtly ancient Stanford EE alumnus. Older than, but attached to Hugh Skilling, (they met weekly at the Ancient Order of Elks). He attended the EE weekly seminars for years.

**(A.E. 'Art') Covington.** Radio astronomer in Ottawa. Did not accept an offer of a professorship at Stanford. Made daily scans of the microwave sun and established an international standard for daily solar flux level.

**BMO(liver) 'Barney'.** Director of Research at Hewlett Packard. Developed the HP35, the first handheld all-function calculator. Member of Dean of Engineering's advisory council and listed in Courses and Degrees as lecturer. Got BART to work and helped straighten out the Palo Alto School District.

**H. (N. 'Harry') Edwardes.** Radiophysics oldtimer, a practising left-leaner. For five years or more after WWII, the United States refused entry to visitors who had been members of the Melbourne University

Labor Club. Three of them are in this list. Eventually all were allowed to attend international scientific meetings in the United States.

**W.C. 'Bill' Erickson.** University of Maryland radio astronomer. Built the first big meter-wave radio-telescope on Clarke Lake in the Southern California desert. What a commute! Afraid of early incapacitation due to heredity, he and his wife researched the world atlas for the best place to live where you could go sailing all the time. Answer: an island off the South coast of Tasmania! There have been other astronomical defectors to Tasmania, most notably Grote Reber who built the first paraboloidal radio telescope in his backyard in Illinois.

**H.T. 'Harald' Friis.** Research director at Bell labs when, in 1932, Karl Jansky discovered radio emission from the Galaxy. Jansky was mapping the azimuth of arrival of radio interference with a view to better planning of wavelengths for transatlantic communication. He very astutely noticed a 23 hour 54 minute periodicity and was thus able to pin its origin on the Milky Way. Harald Friis retired to Hewlett Packard Research Labs.

**(R.M. 'Roger') Gallet.** French physicist working in Boulder, Colorado.

**(E.L. 'Ed') Ginzton.** Stanford Professor of Physics who collaborated with the Varian brothers when the klystron was developed and later became director of Varian, Inc. Kept a tame skunk at home in the living room.

**T. Gold 'Tommy'.** Cambridge Ph.D. whose first job was as assistant in the Royal Observatory, Greenwich. Meanwhile he experimented with human hearing and showed that, contrary to belief at the time, the ear is sensitive to phase. Years later (around 2000) the Acoustical Society celebrated this discovery and regretted that this work of a nonacoustician had been dismissed. Gold also published the explanation for the sonic boom in *Nature*. Coauthor with Fred Hoyle and Hermann Bondi of the big bang hypothesis. Being a Viennese he was interned in Canada (with Bondi) by the British, but by the end of the war was wearing an army lieutenant's uniform as he traveled around Germany debriefing scientists. Possessor of a named chair in Astronomy at Harvard, he caused consternation when he left for Cornell. (Apparently this

**(Donald I.) Cone.** A courtly ancient Stanford EE alumnus. Older than, but attached to Hugh Skilling, (they met weekly at the Ancient Order of Elks). He attended the EE weekly seminars for years.

**(A.E.) Covington.** Radio astronomer in Ottawa. Did not accept an offer of a professorship at Stanford. Made daily scans of the microwave sun and established an international standard for daily solar flux level.

**H. (N.) Edwardes.** Radiophysics oldtimer, a practising left-leaner. For five years or more after WWII, the United States refused entry to visitors who had been members of the Melbourne University Labor Club. Three of them are in this list. Eventually all were allowed to attend international scientific meetings in the United States.

**W.C. Erickson.** University of Maryland radio astronomer. Built the first big meter-wave radiotelescope on Clarke Lake in the Southern California desert. What a commute! Afraid of early incapacitation due to heredity, he and his wife researched the world atlas for the best place to live where you could go sailing all the time. Answer: an island off the South coast of Tasmania! There have been other astronomical defectors to Tasmania, most notably Grote Reber who built the first paraboloidal radio telescope in his backyard in Illinois.

**H.T. Friis.** Research director at Bell labs when, in 1932, Karl Jansky discovered the radiofrequency radiation from the Galaxy. He was mapping the azimuth of arrival of radio interference with a view to better planning of wavelengths for transatlantic communication. He very astutely noticed a 23 hour 54 minute periodicity and was thus able to pin its origin on the Milky Way. Harald Friis retired to Hewlett Packard Research Labs.

**(R.M.) Gallet.** French physicist working in Boulder, Colorado..

**(E.L.) Ginzton.** Stanford Professor of Physics who collaborated with the Varian brothers when the klystron was developed and later became director of Varian, Inc. Kept a tame skunk at home in the living room.

**T. Gold.** Cambridge Ph.D. whose first job was as assistant in the Royal Observatory, Greenwich. Meanwhile he experimented with human hearing and showed that, contrary to belief at the time, the ear is sensitive to phase. Years later (around 2000) the Acoustical Society celebrated this discovery and regretted that this work of a nonacoustician had been dismissed. Gold also published the explanation for the sonic boom in *Nature*. Coauthor with Fred Hoyle and Hermann Bondi of the big bang hypothesis. Being a Viennese he was interned in Canada (with Bondi) by the British, but by the end of the war was wearing an army lieutenant's uniform as he traveled around Germany debriefing scientists. Possessor of a named chair in Astronomy at Harvard, he caused consternation

(Robert) Hanbury (Brown), Manchester, USyd. First to apply the intensity interferometer to stellar diameter measurement.

when he left for Cornell. (Apparently this had never happened to a Harvard named chair before, Gold told me.) (EL)

**(F.T.) Haddock.** At Naval Research Laboratory during the war and started observational radioastronomy at Michigan under Leo Goldberg. In 1956 I was considered for this job and submitted a list of publications. I wondered how I would cope with a place where neither hill nor dale nor sea was within reach. Fortunately I did not have to cope with this dilemma, because I did not receive an offer. Haddock built one of the early 84-foot dishes.

**(J.V.) Jelley.** English astronomer who worked in Canada developing the parametric amplifier. Returned later to Greenwich.

**Joan (Freeman) (Jelley)** Australian physicist at Radiophysics Laboratory, Cambridge Ph.D. Wrote a biography with emphasis on what it had meant to spend a woman's life in physics ~~as a woman.~~

**R.S. Joseph.** From Radiophysics Laboratory.

**F.J. Kerr.** Senior Research Officer at Radiophysics Laboratory. Early observer of the hydrogen line radiation received from galactic space. Professor of Astronomy at Universityof Maryland.

**B.D. Laroia.** Distinguished visitor from India.

**M. Lebenbaum.** Designer of up-to-the-minute circuitry, such as correlators, random noise generators and receivers.

**(A.E.) Lilley.** Pne of Bart Bok's early radioastronomers at Harvard.

**A. (G.) Little.** Originally a technician at Radiophysics Laboratory. Visited Stanford Radio Astronomy Institute where he was a great help with the parametric amplifier. Received a Stanford M.S. and returned to Harry Messel's School of Physics as a faculty physicist working on observations with the Mills Cross.

**(E.F.) McClain.** Leader of the Naval Research Laboratory group in Washington, D.C. working with the precision 60-foot dish built by J.P. Hagen. When the Soviets, using German rockets, were able to launch Sputnik 1, Hagen was charged with launching an American satellite. It was always referred to as being the size of a grape fruit. The first two attempts were failures; the job was then handed to Werner von Braun, who knew from dozens of spectacular failures of his own, how to do it right. As you might expect from such a clever fellow, he foresaw the Yankee debacle and had kept a Redstone rocket in a shed. When he trundled it out and lit the wick it went into orbit on the first try.

**L.L. McCready.** Older member of the Radiophysics Laboratoryradar group and coauthor (with Pawsey and Ruby Payne-Scott) of the first measurement of of the diameter

of radion emission from the Sun, associated with, but above the photosphere, where sunspots live.

**(A.) Maxwell.** A New Zealand appointee to Harvard's solar spectrograph at Marfa, West Texas. Yorkshireman Dick Thompson, with a Ph.D from Lovell's group in Manchester, was recruited to Stanford from Marfa, spent many years with our Radio Astronomy Institute, co-authored papers with RNB on imaging theory, moved to the Very Large Array in Socorro, New Mexico, represented the United States at meetings of the International Telecommunications Union, where frequency allocations are apportioned, Strange as it may seem, the Federal Communications Commission, being legally bound by international treaty, does not have the final say in allocation of frequency bands and RF power limits where interference with foreign services, by land or sea, could result. Seen from ~~the~~ ship's bridge, international jurisdiction obviously must rule. It was when the NSF determined that radio astronomy grants to universities must be phased out in favor of National Centers (National Radio Astronomy Observatory at Charlottesville, West Virgina, and National Ionospheric Observatory in Puerto Rico), that NRAO inherted Thompson, who is now at the Charlottesville headquarters after a stint of several years in Socorro. Thompson is the principal author of the sole current text on radio astronomy techniques.

**H. Messel.** Canadian mathematical physicist, WWII parachute trooper, Dublin Ph.D., physicist at Adelaide University, and after visits to Alaska hunting polar bears (dangerous in snow ridges if you are on foot) he soon became head of the School of Physics at Sydney University. The job had failed to attract potential successors to Oscar Ulrich Vonwiller because of the magnitude of the job description. In those days, as in England, the department head was the only professor. Messel negotiated five tenured professorial slots. These positions lured Blatt from the United Stares, Hanbury Brown from Manchester, J.M. Bennett from Universityof Queensland, and Bernard Mills from Radiophysics Laboratory. Soon these recuits became Fellows of the Royal Society, of the Australian National Academy, and officers to the Order of Australia (which replaced the Order of the British Empire thanks to the Labor Party, which successfully adopted abolition of knighthoods as an election plank). Harry Messel is a world phenomenon. He turned to tagging crocodiles and produced several monographs on little-known crocodile-infested tropical coast. His students developed a position finder for urban vehicles based on the crocodile-tracking technology. Messel started the Summer Science Schools and published the contributions of the participating lecturers such as Hermann Bondi, Werner von Braun, Tommy Gold, Robert May (now Lord May, President of the Royal Society), George Mueller, Peef Panofsky, Ed Salpeter, Glenn Seaborg, and Jimmy Watson. Each

year the five best high school students in the U.S. (don't ask me how they were selected) were farewelled from Washington by President Lyndon Johnson, who hosted a gathering to meet the five best from the U.K., who had just been farewelled by the Duke of Edinburgh. On arrival in Sydney they met Japan's best, and local bright students from New Zealand and New South Wales. This extraordinary series of meetings, the brain child of Professor Harry Messel, has been going for more than fifty years, and has produced a world-wide group of now largely mature international alumni, who cherish their unique experience.

**B.Y. Mills.** My contemporary on radar design at Radiophysics Laboratorywhen several of us were snatched from our posts as acting sergeants in the Autralian Army Ordnance Corps in 1942. Mills was the chess champion of Australian Universities (the contests were conducted by long-distance telephone). After he had developed a 3 HHz particle accelerator (not unlike the SLAC unit), downsizing of the radar establishment ranised a problem. He moved to Messel's School, obtained from the Natioal Science Foundation a substantial grant which, I am happy to say, I supported. and built the famous Mills Cross near Canberra.

**(R.M.) Minkowski.** Well known astronomer of CalTech and Berkeley. One of the first to try associating radio sources with telescopic objects seen in the 200-inch telescope at Mount Palomar. Unexpectedly, dozens of the new radio 'stars' proved to have no detectable light-emitting counterparts.

**H. Minnett.** Radiophysics Laboratoryradar specialist who detected microwave emission from the Moon and measured the depth from which the subsurface emission came. Later he was in charge of engineering for the 210-foot dish at Parkes and later still Chief of the Radiophysics Laboratory.

M.T.

**~~A.P.~~ Mitra.** Ionospheric physcist from India.

**J.D. Murray.** Radiophysics Laboratory

**B.M. O(liver).** Director of Research at Hewlett Packard. Developed the HP35, the first handheld all-function calculator. Member of Dean of Engineering's advisory council and listed in Courses and Degrees as lecturer. Got BART to work and helped straighten out the Palo Alto School District.

**J.H. Oort.** Distinguished leader of the Netherlands school of world-famous astronomers such as Bart Bok (→ Harvard), Mathewson (→ Canberra), Jan Hgbom (→ Manchester), Wim Brouw (→ Sydney), G. Westerhout (→ Maryland). Seth Shostak returned to the United States to assume a leading position in the SETI Institute, Mountain View. Known for the Oort cloud, where comets come from, for starting the great radio astronomical observatory at Dwingeloo, and running the International Astronomical Union.

**J.L. Pawsey.** Melbourne physicist, Cambridge Ph.D. and employee of E.M.I. Limited where he worked on the design of antennas, especially those used for transmitting and receiving the first scheduled television programs originating in London before WWII. EMI is best known now for inventing the x-ray machine for computed tomography. Second in command at Radiophysics Laboratoryunder Taffy Bowen. Principal author (with RNB) of the first textbook of radio astronomy (Oxford, 1954). First observer (with McCready and Payne-Scott) to associate solar radio emission with sunspots and to determine the diameters of the emitting regions. This remarkable angular resolution was achieved with a sea interferometer, consisting of a single antenna on a cliff overlooking the sea plus its virtual image well below sea level. The technique was developed for finding the altitude of enemy aircraft whose range was already known. This was very important when fighter planes were scrambled and needed to know the altitude of their distant targets, as much as a hundred miles away. Equipment using this technique was installed on South Pacific islands where delivery was made through the surf and fungus grew on electronics that was imported from temperate factories into the damp, hot tropics. Pawsey was later appointed Director of the National Radio Astronomy Observatory at Charlottesville but died shortly afterwards. The position was taken by one of Bok's students.

**J.H. Piddington.** A senior research physicist at Radiophysics Laboratoryand one-time aspirant to an Oxford D. Phil. One of his external oral examinmers was J.A. Ratcliffe who directed my Ph.D. work after the war (1946-1950). Ratcliffe asked him what was the value of Planck's constant. Piddington said he could easily look it up. Ratcliffe did not consider this appropriate and failed him. He did obtain a Ph.D. elsewhere. With Minnett he designed and built apparatus for detecting lunar thermal emission, and from the observations deduced that microwave full Moon comes 3 $\frac{1}{2}$ days later than human full Moon. If humans had evolved with vision dependent on microwaves instead of on eyes (and after all we all emit microwaves, even in the dark) then Easter, and other monthly happenings, would be diffferent.

**J.A. Roberts.** Coauthor of a fundamental 1954 paper that showed that scanning with a radiotelescope beam was analogous to the operation of an electrical filter.

**(Nancy) Roman.** One of the earliest ~~female~~ women in radio astronomers (with Ruby Payne-Scott and Joan Freeman Jelley.

**C.L. Seeger.** Early Cornell radio astronomer (brother of Pete Seeger). Moved via the Netherlands, Stanford, and Berkeley to the SETI Institute, Mountain View, where his wide experience was greatly respected.

**John Shakeshaft.** One of Martin Ryle's first Ph.Ds. in the postwar resumption of research in Ratcliffe's group at Cambridge. He remained steadily at work at the Cavendish Laboratory in the company of Ryle, Hewish, and other luminaries.

**(S.F.) Singer.** Polymath from Vienna who occupied positions in Washington, at the University of Virginia, Hoover Institution, and now issues newsletters from the Science and Environmental Policy Project. He writes, and publishes, scathing denunciations of fanatical enviros as well as of more respected scientists when they are seen to be grinding a political ax, behavior of which he himself is a master.

**Graham Smith.** Another of Martin Ryle's earliest postwar students. He defected to Manchester and rose to be Astronomer Royal (as did Ryle before him). The plaque in the ante-chapel at Trinity College, Cambridge, where Ryle lives on in the elevated company of Isaac Newton and other notable Trinitarians, says he was 'astrologus regius.' Sounds like a mistake, but is correct L:atin

**W. Stromgren.** A highly respected Scandanavian astronomer who largely lived in the United States ~~At one time~~ we served together on the council of the American Astronomical Society.

**H. Urey.** A Chicago chemist, discoverer of deuterium. and well known in astronomical circles for predictions about interstellar chemistry. Later moved to San Diego.

**G. Westerhout.** A product of Oort's school who settled at the University of Maryland.

**H. Whale.** New Zealand physicist who gained a Ph.D. under Ratcliffe doing research on the ionosphere.

**A.E. Whitford.** A CalTech astronomer, author of the Whitford Report on the future of astronomical research and its funding. I served on his committee and met interesting senior members of the astronomical hierarchy. I had a previous experience with preparation of the (J.R.) Pierce Report that focused on the future of radio astronomy. Years later I was privileged to supply John with a copy of his report, which he wished to refer to.

**O.L. Wirsu.** A Radiophysics Laboratoryoriginal who was a member of the Sydney University Film Society. From this experience he already knew much more about electric circuitry than I did when we taking classes in electricity at the same time.