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BART J. BOK

1906—1983

A Biographical Memoir by

J. A. GRAHAM, C. M. WADE AND R. M. PRICE

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Biographical Memoir

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Bart Bohl

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April 28, 1906–August 5, 1983

BY J. A. GRAHAM, C. M. WADE, AND R. M. PRICE

BART J. BOK WAS one of the movers and shakers in mid-twentieth century astronomy. He was a dreamer of dreams, but at the same time, a forceful and vital man who directly and indirectly influenced the lives of many people at all levels of society. A memoir writer has an abundance of material with which to work and it is a hard task to select those parts which are the most significant. An essential component in his life and work was the enduring love and devotion between himself and his wife Priscilla. Much of the story we tell took place between their first meeting in Leiden in 1928 and her death in 1975. They functioned as the most effective of collaborators through which their final bequest to the world was much greater than either could have accomplished alone.

In writing of Bart Bok's movements on the astronomical stage, it is appropriate that this chronicle divides rather naturally into three acts, each set in a place where he made a major mark on the development of astronomy. A prologue concerns his early years up until the time he met Priscilla Fairfield and set off to make his career in the United States. We end with an epilogue describing those concluding eight years when his life in no way slowed down but went off in new creative directions. His influence, particu-

larly on young people, continues to be strong. He was, to make use of one of his own favorite words, “a phenomenon,” a personality who combined great human warmth with a single-minded devotion to his chosen science. It was not possible to distinguish between Bok the man and Bok the astronomer. They were the same.

PROLOGUE: THE FORMATIVE YEARS (1906–29)

Bartholomeus Jan Bok was born on April 28, 1906, in Hoorn, Holland, the son of Sergeant Major Jan Bok and his wife Gesina Annetta van der Lee Bok. We are not sure what first turned Bart’s interest to astronomy—he told conflicting stories about this. On several occasions he attributed it to a period in the Boy Scouts when the family had moved to The Hague shortly after 1918. By the time he was thirteen, it is clear that he knew he would be an astronomer. He attended high school at The Hague and was strongly influenced by a young physics teacher fresh out of the university. He graduated with high marks in 1924. In high school, he was an active amateur astronomer and it was during this time that he became an admirer of Harlow Shapley, certainly the second strongest influence on his life. He read widely, and he wrote about astronomy for one of The Hague’s newspapers. It seems that much of Bart’s style took form early: his fascination with the sky, his need to share and communicate, and his tendency to see people as heroes to be esteemed or as villains to be abhorred.

In 1924 Bart entered the Sterrewacht at Leiden with two other young Dutchmen who became outstanding astronomers, Gerard P. Kuiper and Pieter Th. Oosterhoff. His teachers at Leiden included several of the great figures of twentieth century physics and astronomy: W. de Sitter, E. J. Hertzsprung, J. J. Woltjer, and J. H. Oort; P. Ehrenfest and W. J. de Haas were especially influential. It must have been

a heady atmosphere for a young scientist in those days. People like Schrödinger, Heisenberg, Dirac, and Madame Curie came to visit. Leiden gave Bart a thorough grounding in classical astronomy and a first-hand view of the excitement and frustration of research. In 1927 he went to Groningen to pursue his doctorate under P. J. van Rhijn, who probably influenced Bart more than any of his other teachers.

In the summer of 1928 the Third General Assembly of the International Astronomical Union was held in Leiden. Two events at this meeting profoundly affected Bart's life and career. First, he met Harlow Shapley, director of the Harvard College Observatory, whom he had long admired. Shapley was impressed with the young man, and Bart was duly invited to come to Harvard the following year. Second, he met an American astronomer, Priscilla Fairfield, with whom he promptly fell in love, even though she was ten years his senior. She did not immediately reciprocate, but Bart pursued her with characteristic vigor and ultimately was successful. They were married in Troy, New York, on September 9, 1929, two days after Bart's arrival in the United States from Holland.

Bart's marriage to Priscilla was without doubt the most important event of his life. They achieved a symbiosis that few couples approach, and, from the time of their marriage, the story of Bart is also the story of Priscilla. He was boisterous, unrestrained, easily swayed by the feelings of the moment. She was quiet, introspective, sensitive to others, inclined to take the long view. Her mind was clear and analytical, and she could reduce complex issues to simple terms. Bart rightly valued Priscilla's judgment and he never made an important decision without first consulting her.

With his marriage, Bart's foundations were in place. His formal training was finished, although he still had to com-

plete his doctoral thesis. The Milky Way was now his main research interest. He had joined the Harvard College Observatory where he would stay for over a quarter of a century. Most importantly, he had a wife whose love and wisdom would be a strong anchor through the rest of his life.

I. THE HARVARD YEARS (1929–57)

In 1929, Harvard was an exciting place to be a young astronomer. This can be sensed from the many memoirs of the time. Bok started as the R. W. Willson Fellow. Harlow Shapley, the director of the observatory, was an energetic and enthusiastic man in his early forties who was a natural leader, and at this time was arguably at the peak of his long and distinguished career. He was one of the great communicators of his time and his skills were closely observed by the younger man. Bart admired Shapley enormously and from then on modeled his own career and administrative style on that of his hero. West Coast astronomy at the time tended to emphasize large telescopes and the pushing of observational techniques to their limits. At Harvard, the research style was more people-intensive, more oriented toward large-scale surveys in the tradition of the Henry Draper Catalog, more directed toward explorations from distant field stations, set up in an expeditionary style to collect data to be sent back home for detailed analysis.

Yet they were not easy years for a newly married couple. It was a time of turmoil and change. The crash of 1929 occurred shortly after Bok's arrival and the Roaring Twenties gave way to the Great Depression. The uncertainty of the times must have affected the atmosphere about him. However, life appears to have been happy and successful for the Boks. Their son, John Fairfield, was born in August 1930. Bart completed his dissertation and successfully defended it in Groningen on July 6, 1932. He became assis-

tant professor in 1933, and daughter Joyce Annetta joined the family late that year.

Bart's doctoral thesis, "A Study of the Eta Carinae Region," is short and unusually lucid. The careful statement of the problem, the precise description of methods and results, and the clear enunciation of conclusions and their limitations are all vintage Bok. The final fifteen pages, which deal with the physics of emission nebulae, anticipate the classic work which Bengt Strömngren independently did some years later.

Bart's research during his first fifteen years at Harvard dealt mainly with the structure and kinematics of the Milky Way system. The observational basis consisted of massive star counts and large numbers of proper motions, radial velocities, and spectral classifications. The aim was to deduce the spatial distribution of the stars in the solar neighborhood and, as far as possible, throughout the galaxy. The analysis was complicated by uncertainties in the stellar luminosity function, by systematic errors in proper motions, by errors on photometry, and more than anything else by uncertainties of the interstellar absorption. His creative activity in stellar statistics culminated in the 1937 monograph, *The Distribution of the Stars in Space*. The labor involved in such studies is enormous; for sheer tedium, star counting remains unsurpassed. Bart organized a "star counting network" at a number of eastern colleges to increase the rate of data acquisition. It was a large project for its time; yet, looking back, it was not a great success, despite the huge effort by Bart and others.

Bart was actively interested in galactic dynamics. His 1934 paper on the stability of moving clusters in a rotating galaxy remains a classic ("The Apparent Clustering of External Galaxies," *Nature*, vol. 133, p. 578). It is probably the most mathematical of his papers. It includes the first dem-

onstrations that there is a critical density that a cluster must have in order to be stable against disruption. He concluded that twenty billion years was a reasonable upper limit to the age of the Milky Way system because observed stellar aggregations could not have survived much longer.

One of Bart's early papers provides an interesting footnote to the history of cosmology. Edwin P. Hubble had claimed that there is no great tendency to clustering among faint galaxies and that there is an ultimate uniformity in their distribution. In separate but complementary papers, Shapley and Bok showed that there is widespread clustering. We believe this to be the first demonstration of the fundamental large-scale clumping of matter in the universe.

Bok became an American citizen in 1938. Academic tenure followed in 1939 with appointment as associate professor. These developments made him more secure and more willing to speak out. In the May 1941 issue of the *Harvard Progressive*, he described his philosophy as a citizen and as a scholar. It is an unusual article, revealing an inner uncertainty that was rarely seen in his later writings. He voiced concern about what he perceived to be "the war-like imperialist sentiment" at Harvard and in the country. At this point, he was one of the minority of the faculty who actively opposed American involvement in the war. It is indicative of his character that he stood openly on the unpopular side of a highly emotional dispute. Bart described his feelings about teaching in the same article. To him, the teaching of elementary courses was enjoyable and rewarding. He worked hard on his lectures and delivered them in a lively style that caught the interest of every student. Believing that one bad lecture could alienate a promising student, he never gave bad lectures. He saw the popularization of astronomy among the general public as a natural extension of university teaching. He carried this philosophy to the end of his life.

The Boks spent some months in Mexico during 1941 helping to set up the new National Observatory at Tonantzintla. Bart supervised the installation of the main instrument, a 26–31-inch Schmidt telescope that was patterned closely on a similar instrument at the Harvard Observatory's Oak Ridge (later Agassiz) Station. He was in his element in such pioneering situations, leading the troops with his irresistible enthusiasm expressed in the local language (but always with a heavy Dutch accent). He returned to Tonantzintla for the formal dedication of the observatory early in 1942. He went back again for three months in 1944–45, this time to use the telescope he had helped put into service.

Another notable event of 1941 was the publication of *The Milky Way*, one of the semi-popular series *Harvard Books on Astronomy*. Bart and Priscilla had started work on it in 1937, rewriting the whole text several times before they thought it ready for publication. The spirit of the book is conveyed on the first pages where we are asked to “start off with a quiet evening at home where we shall get out our maps and photographs of the territory we are about to explore” and goes on to express the wish that “when you return, you will not regret having taken the time for such a long trip, and that you will still be curious about what lies beyond. . . .” And in a concluding chapter, “It is essential for science that we realize the limitations of each special field of research, but it is also essential that we do not retreat as soon as there is some doubt about the foundations of our reasoning.” The book went through five editions, the last appearing in 1981. It has attracted over the years many young, curious minds into the study of astronomy.

Bart took no part in war-related research during World War II. He was not physically qualified for military service, since a mild case of polio in the late 1930s had left his right hand withered and permanently stiff. He states in the A.I.P.

oral history that he would not have been a conscientious objector but had a strong antipathy to any participation that would involve the killing of fellow human beings. Bart's participation was aimed at saving lives through the teaching of navigation as Frances Wright has described elsewhere (*Astronomical Quarterly*, vol 5, pp. 151–56).

Harlow Shapley appointed Bok associate director of the Harvard College Observatory in 1946, and Bart continued in this capacity until Shapley's retirement in 1952. The two men had very similar views on running the observatory. It perhaps would have been wiser to appoint some other staff member who thought less like the director. It was especially unfortunate that Bart shared Shapley's relaxed attitude about the poor quality of Harvard's optical instrumentation, with the feeling that the skillful and determined observer can always overcome the deficiencies of the equipment. Bart achieved full professorship when he became a Robert Wheeler Willson Professor of Astronomy in 1947. He was forty-one years old. During the following years, he worked actively for UNESCO's program in the natural sciences through writing, personal contact with scientists, and behind-the-scenes lobbying with officials and politicians. This experience served him well in the later years in Australia and Arizona when he was endeavoring to radically improve local observing facilities.

In further service to the Harvard Observatory, Bok and his family set sail for South Africa in February 1950 to put into operation the 32-inch Schmidt telescope at the Harvard Boyden Station. The job was completed quickly and successfully. Bok stayed until September 1951, collecting large amounts of data from the southern sky. He was awed by the grandeur of the southern Milky Way. Given his liberal philosophy, he was repelled by apartheid but saw no realistic alternative.

At this point Shapley was preparing to retire. He proposed Bok as his successor, but this was not to be. Other senior members of the Harvard Observatory faculty, notably Donald Menzel and Fred Whipple, also anticipated Shapley's retirement and were suggesting changes in the observatory, the scope of its research programs, and its sources of funding. These positions, developed in Bok's absence, were largely at variance with his views. In particular, he was unwilling to seek funding from the Defense Department and was utterly opposed to classified research at universities. He was a strong supporter of the then-proposed National Science Foundation, which many knowledgeable people at the time thought to have doubtful prospects of success.

With Shapley's influence waning, and lacking the support of the senior members of the observatory, Bok's candidacy for the directorship failed. Donald Menzel became acting director in 1952 and was confirmed as director a year later. Disillusion with the developing changes soon set in. At this time, Bart immersed himself in the then-new science of radio astronomy, administering the construction of a 24-foot antenna and a group of new graduate students. This led to an increasing involvement in the advocacy for radio astronomy at the Washington level, which eventually led to the establishment of the National Radio Astronomy Observatory.

Late in 1955, Bart and Priscilla decided to leave Harvard. The precipitating factor was the imminent transfer of the Smithsonian Astrophysical Observatory to the Harvard Observatory grounds. Bok was strongly opposed, believing the transfer a threat to the integrity of the graduate program. Bok was also angry that he had not been consulted about the matter and felt frustrated that it was no longer possible to do research in the way that he wished. His resignation was announced officially on May 10, 1956, although it was widely known as early as January.

Two months before his announcement, Bok had been offered the directorship of the Mount Stromlo Observatory and the Chair of Astronomy at the Australian National University. This was largely the result of lobbying on Bart's behalf by Joseph Pawsey, then assistant chief of the CSIRO Division of Radiophysics and a powerful figure in the Australian scientific establishment. Pawsey's influence was decisive, for another strong contender had the support of Richard Woolley, the outgoing director. Although Pawsey held Bart in high esteem, personally and professionally, the main reason for his forceful advocacy was the belief that Bart would be far more supportive of radio astronomy in Australia than the other candidate.

When Bart and Priscilla set out for Australia in January of 1957, they left behind more than a professorship and a home. At Harvard, Bart's life had been that of a typical academic, with thoughts and activities centered mainly on his research, his students, and his family. The children had now grown up and Bok himself had begun to branch out with his efforts on behalf of UNESCO and his participation in the establishment of the National Radio Astronomy Observatory, though such things were not yet central to his daily pattern. This was to change. In Australia, he was to play on a much larger stage, and his style would grow to fit it.

II. THE MOUNT STROMLO YEARS (1957-66)

With characteristic enthusiasm, Bok began his thinking about the work to be done in Australia well before the official start of his appointment. In September 1956 he visited the Mount Stromlo Observatory to review first-hand the instrumentation programs and to discuss them with staff members. He spoke at some length with the administrators of the Australian National University (ANU) about his plans

for the future of the department of astronomy and the equipment and programs of the observatory. Bok stressed the need to get the telescopes into first-rate operating condition, and then to outfit them with the most modern of operating instruments. In a detailed letter to the ANU he outlined details of new darkrooms to be built, dome repairs needed, refurbishment of staff quarters on the mountain, and a prompt paving of the mountain road to encourage visitors to Mount Stromlo. He further announced his plans to attract more graduate students and to tour the country widely, carrying the message of astronomy to young people at the schools and colleges. Finally, he pointed out the need to establish a field station at a better observing site in order to escape the prolonged spells of poor observing weather at Mount Stromlo. All this was done before he arrived! Bart and Priscilla took up residence at Mount Stromlo in February of 1957. For Bok this was a chance to further his galactic structure research, to work with the radio astronomers at CSIRO, and to build a major astronomy department for Australia. He was the right man, at the right place, at the right time.

Australia was still something of a scientific backwater in 1957 when the Boks arrived. An exception was the CSIRO Division of Radiophysics in which Pawsey had built one of the world's premier radio astronomy groups. The opportunity to work with these scientists was no doubt attractive, but it was the lure of the southern Milky Way and the opportunity to do galactic structure research in the way he wanted to do it that were irresistible. Under the direction of Woolley, the Mount Stromlo Observatory had become an active research center with a 74-inch telescope in competition only with an older telescope of similar size at the Radcliffe Observatory in South Africa. Woolley had brought the observatory into the recently formed Australian National Uni-

versity as part of the Research School of Physical Sciences. The school was headed by Mark Oliphant who had returned to Australia from a distinguished career at the Cavendish Laboratory and the University of Birmingham to help build a research department that would give Australia its own independent scientific capability and would keep talented Australian scientists at home. Oliphant and Bok worked well together and Bart received the support that enabled him to fulfill Woolley's plan to mould Mount Stromlo into an internationally respected institution.

Until jet air travel to Australia came into regular use, scientific visits to Australia still had somewhat of an expeditionary character. People did not come casually or easily. After 1958 one could reach Australia almost overnight from anywhere in the world and international contacts became much easier to establish. Bart came to Australia with his own extensive professional network and gave astronomy at Mount Stromlo stronger international links than it had enjoyed up until that time. Several well-known American astronomers, such as Gerry and Katherine Kron, Frank Bradshaw Wood, Paul Hodge, and Lawrence Aller came on leave; both Walter Baade and Harlow Shapley came on extended visits; others, like Th. Dunham, joined the staff. The Uppsala Schmidt telescope was set up and operated by a succession of Swedish observers, some of whom stayed to form long-term links with the country.

As Pawsey had anticipated, Bok's presence at Mount Stromlo was successful in fostering a strong relationship between Mount Stromlo and the CSIRO radiophysics group. Radio astronomy at this time was in the period of rapid growth and development that often follows the introduction of a new technique. Pawsey had brought together a group of young radio astronomers who were actively pushing both detection and resolution of radio sources to ever

finer limits. Christiansen, Kerr, McGee, and Mills come immediately to mind. Bolton was shortly to return from the United States. Techniques of both optical and radio observation were dependent on each other and this was emphasized in Bok's research direction. Joint visits, colloquia, and meetings were arranged.

From the start, Bart and Priscilla had a deep interest in the education of young Australian astronomers. Bart lectured extensively at the state universities, astronomical clubs, and church groups in his inimitable style, which unveiled the excitement and exhilaration of astronomical research to impressionable minds. Many were swept up by his enthusiasm. He initiated a summer vacation program that attracted promising undergraduate students to Mount Stromlo in order to experience first-hand the nature of scientific research, and in turn to be watched as possible future graduate students. Even those who did not take up astronomy as a profession carried Bok's message out to the community at large. Arrangements were made to allow some research students to work at the Australian National Radio Astronomy Observatory, especially after the 210-foot radio telescope had been commissioned in 1961. He took the whole graduate program very seriously, with required courses presented at Mount Stromlo by the observatory research staff. His own lectures combined the clarity of his exposition with the rigor of blackboards full of equations and diagrams supplemented by extensive outside reading. He showed an intense, individual interest in the scientific development of every one of the students and was always available for advice and wise counsel. When things were not going well, as happens often in scientific research, a visit to the professor was all that was needed to get one's batteries recharged and enthusiasm generated anew.

Visitors' nights on Mount Stromlo were always brilliant

and memorable occasions with the director acting as ringmaster for all the smaller shows going on around him. They were carefully planned with each staff member and student having specific duties to be carried out at specific times. Most importantly, they served to generate grass-roots support for astronomy in the community in general and among legislative leaders in particular. This activity proved to be exceedingly useful later on when new projects such as the development of a field station and the quest for the support of a major large telescope were initiated.

With the larger administrative load, Bok was less involved in large scientific projects than before. Priscilla remained an active collaborator and it is due to her that so much could be done. Her responsibility was the reduction of observations made at the telescope, often on the previous night. Priscilla had a critical eye for separating good from bad measurements and bears much of the credit for the enduring nature of their joint work. Galactic structure studies such as that of Selected Area 141 were accomplished with the aid of highly competent research assistants such as Jane Basinski. Other projects involved students. Then there was the occasional short paper such as the letter to *Observatory* entitled "The Spiral Structure of our Galaxy," which, in pointing out the existence of an extended spiral structure in the constellation of Carina, oriented the subject in a completely new direction. Following the Shapley tradition, the Magellanic Cloud always received good press from Bart. He and Priscilla did particularly valuable photometric work in a number of prominent clusters and associations, and in drawing people's attention to the unique place that the Magellanic Clouds occupy in galactic and extragalactic research.

Early in his directorship, Bart realized that the rapid growth of Canberra would soon threaten Mount Stromlo as a dark observatory site. Already a number of site surveys of the

Australian continent were under way and Bok supported these fully. The search was long and time consuming, partly because Australia had no obviously superior sites such as those that were quickly recognized in Chile and southern Africa. The Mount Stromlo participation in the project was placed in the charge of Arthur Hogg but Bok maintained an active interest in it, personally inspecting most of the sites that were proposed. The final selection resulted in the founding of Siding Spring Observatory. Bok's last major task was to oversee the construction of the first new telescope for the site, a 1-meter Ritchey-Chrétien reflector. Siding Spring has since become the location of the 3.9-meter Anglo-Australian telescope and is now Australia's major optical observing facility.

Bok dreamed of a 200-inch class telescope in Australia. He had worked toward this end, both in behind-the-scenes discussions in England and the United States, as well as with his exhortations to his scientific colleagues in Australia. He felt that he had made considerable progress, especially in convincing influential politicians in Australia. But his penchant for speaking out boldly and generating frank, open discussion was an unusual one in Australian scientific politics of the time, which was generally conducted very much behind closed doors by figures of the establishment. Today, it would hardly shock at all. He felt that in order to get things done, it was first necessary to get things moving. He was outspoken in his conviction and angry at what he considered unnecessary delays. It was unfortunate that the Anglo-Australian telescope never became a reality during his directorship. He did, however, do much of the preliminary work to make it possible and took great pride in later years when it was completed.

Bart and Priscilla's return to the United States in 1966 was no surprise. He had told his family that he would

return at about this time. Even before the move to Australia, Bart had been an adviser to the University of Arizona on all astronomical matters. A position at the university had been talked about for many years and had actually been offered in 1964. Bok, however, wished to remain in Australia for two more years to try to get the large telescope project under way. It was also common knowledge that the Boks had long before planned to retire to the southwestern United States. Yet, Bart felt considerable uneasiness at having been out of the mainstream of U.S. astronomical thinking and action and was uncertain as to whether he could recover an influential position. But he was one of the natural activists of this world and was temperamentally incapable of occupying a passive position. His fears were essentially groundless.

III. THE STEWARD OBSERVATORY YEARS (1966-70)

In 1966, the Department of Astronomy (Steward Observatory) at the University of Arizona was still relatively small and very much in the shadow of the generously funded Kitt Peak National Observatory, just across the street, where development of the 150-inch telescope was in progress. Astronomy at the University of Arizona has grown enormously since then and it is ironic that, in the present time of tight funding for national facilities, the shadow now crosses the street in the opposite direction. Tucson in the 1960s was an exciting place to do astronomy. With the growing facility on Kitt Peak, the presence of the Lunar and Planetary Laboratory under G. P. Kuiper, and then, the arrival of B. J. Bok, it became a center through which astronomers were always visiting, whether for observing, for committees, or for scientific meetings.

During the previous several years, both the National Science Foundation and the University of Arizona sensed that,

with the development of Kitt Peak, it would be advantageous to strengthen the department of astronomy at the university. Leland P. Hayworth, then director of the foundation and an old friend of Bok's, felt that the staff at the National Observatory should have access to young people who were part of a strong graduate student program. The University of Arizona administrators recognized that here was a chance to set up one of the major astronomy departments not just in the country but in the world. Bok's predecessor, Aden Meinel, had initiated a Science Development grant proposal to the NSF in which Bok was also closely involved. The grant came through shortly after Bok's arrival. Not only did this involve the construction of a major new instrument, a 90-inch telescope, for the observatory, but also a large increase in the size of the teaching staff. Bok was able to convince the university administration and the National Science Foundation that, for the department to develop as it should, the size of the staff should be doubled from six to twelve.

Bok always felt strongly that the bread and butter of an astronomy department, particularly in a state-funded university, lay in the teaching of young people outside astronomy. Beyond the training of graduate students, he believed it was one of the most important obligations and perhaps a one-time opportunity to make contact with people who would become leaders in the general community. He himself taught liberal arts Astronomy I courses until his retirement. Under his leadership, the graduate student program grew in size and prestige until, by 1970, it was ranked fifth in the nation.

Although not a practical instrumentalist, Bart showed repeatedly throughout his career an outstanding intuition of those techniques that were about to become important and was at his best in directing his energies into supporting

people who could and did make them available for general users like himself. Already mentioned was his role in the early history of radio astronomy. The completion of the 90-inch telescope in 1970 coincided with the development of image tube intensifier detectors, making possible programs that until then had been beyond the light grasp of the largest telescopes in the world. He recognized early the coming importance of infrared detectors in astronomy. Observing continued to be an important part of his life, and he was always available to try out the newest experimental emulsion from Kodak. Trips to Cerro Tololo Inter-American Observatory in Chile were a major part of the activity. He and Priscilla delighted on these occasions in being back observing together their beloved southern sky. He went so far as to write on one occasion that, "Our visits to Cerro Tololo marked about the best days in the lives of Priscilla and Bart Bok."

Bart quickly became active in national astronomical organizations. He was delighted, and somewhat surprised, to be elected to the National Academy of Sciences in 1968, shortly after his return from Australia. He was a trustee of Associated Universities, Inc. (1968–71), vice-president (1970–71) and then president (1972–74) of the American Astronomical Society, and a board member of the Astronomical Society of the Pacific (1977–80). Although active on several NSF committees and panels, he was uneasy in his relations with the Association of Universities for Research in Astronomy (AURA) which operated the national optical observatories. While he was one of the strongest supporters of the Kitt Peak and Cerro Tololo observatories, he felt that the overall management techniques were not as good at that time than they could have been. His involvement with the National Radio Astronomy Observatory was both deeper and more satisfying.

Bok's research during the Steward Observatory years remained strongly directed towards the mapping of spiral structure in the galaxy. He was a strong propagandist for the density wave theory of galactic spiral structure as formulated by C. C. Lin and Frank Shu and urged that it be employed in mapping the spiral structure in our own neighborhood. Toward the end of his life, he expressed increasing doubts as to whether this theory was adequate to supply unique solutions to the problem. At about this time, his interest in dust globules and their relation to star formation was being renewed by the discoveries of molecular line radiation in the dark obscuring clouds in the Milky Way.

His activity on the national and international scene markedly increased following his resignation as director of the Steward Observatory in 1970 while still remaining professor of astronomy. With these outside interests, he was free from the temptation to interfere with the policies of his successor while at the same time he could continue his research on the wider stage. As one of the most active presidents of the American Astronomical Society, he took his duties very seriously, feeling a special responsibility toward the younger members. Each year there was an address to the membership on the current state of the profession and this was subsequently printed and widely distributed. He did not hesitate to speak out about unpopular subjects such as the tightening employment situation and inadequate funding by government agencies, often to the distress and discomfort of fellow council members. He urged colleagues to take a firm stand in the community about such subjects as astrology and pseudo-science. There was nothing passive about this man.

International recognitions came often. He became a vice-president of the International Astronomical Union in 1970 for a six-year term but felt the need to resign from this

position in 1974 because of the declining health of Priscilla. It was touching to his friends to see the single-minded devotion to Priscilla in the last months of her life. When she died on November 19, 1975, he was desolate.

EPILOGUE: LAST YEARS

During the year following Priscilla's death, many of Bart's colleagues were seriously concerned about his health and well-being. Uncharacteristically, he withdrew into himself and was seen little outside of his home. The fact that he was so sadly missed at the many astronomy gatherings in the Tucson area was an indicator of the frequency and intensity of his participation in former years. It was at this time that he prepared a touching memoir of Priscilla that was distributed to their many friends. Towards the end of 1976, he began to involve himself again in the astronomy that he loved. Apparently, this was triggered by a peripheral involvement in the planning for the NASA Large Space Telescope. His interest was aroused and for the rest of his life he became a constant high-profile publicist for what is now the Hubble Space Telescope. Nobody was allowed to overlook that this was the instrument that was going to revolutionize astronomy. Not to participate meant to be left out of mainstream astronomy at the end of the twentieth century. Perhaps he somewhat underestimated the tremendous demands that this instrument will make on ground-based astronomy, but he made his point.

In his scientific interests, there was a strong break from his early interest in the overall spiral structure of the Milky Way. Realizing that observational errors smoothed out the mapping of its features at distances greater than several thousand light years, he believed that future progress in the area could best be made through high-resolution studies of external galaxies. His own work, prompted by Priscilla's

advice shortly before she died, turned to the study of low-mass star formation in the small dust globules that he had studied at Harvard many years before. He was aware that in these places, molecular gas and dust was able to accumulate, shielded from the disrupting ultraviolet radiation that fills interstellar space. He developed a strong interest in the techniques for detecting this material. He was excited at the development of infrared observation that enable the embedded, newly formed stars to be precisely located and studied.

Travel became a big theme of his last years, in part to escape the loneliness of being at home, in part because of his naturally gregarious nature. He lectured frequently and it was amazing to his friends that, even as his physical health declined, his talent for communicating the excitement of astronomy remained at an incomparably high level. He could still fill a room and hold its audience spellbound. He was always a good synthesizer and this showed clearly in his lectures, review articles, and semipopular contributions. During these travels, many young people were attracted to astronomy through his encouragement and enthusiasm.

Further awards came in acknowledgement of his lifelong service to astronomy. The Bruce Medal of the Astronomical Society of the Pacific was awarded to him in 1977 and he was the Russell Lecturer of the American Astronomical Society in 1982. The Russell lecture itself was delivered in 1983 and published posthumously in the *Astrophysical Journal* ("Some Current Trends in Milky Way Research," *Astrophysical Journal*, vol. 273, pp. 411-20). It was an exuberant survey of the exciting parts of present day astronomy (as he saw them), delivered in classic Bok style.

Observing trips to Chile continued. One produced the famous "St. Valentine's Night" picture of the Gum nebula globule, which contains a beautiful demonstration of the

isolated formation of a star of approximately solar mass. This widely circulated photograph of what is indeed a classic example, has had a strong influence in studies of star birth.

He continued to be active in National Academy affairs. Notably, he was an outspoken campaigner on human rights issues using to the full the international friendships developed over a lifetime to argue cases of less influential younger colleagues who were in difficulties.

On the morning of August 5, 1983, Bok passed away suddenly, still planning and enjoying life to the full. On the short term, a lively weekend with friends was on the agenda; on the longer term, an extensive European tour highlighted by a conference on the Magellanic Clouds. Up until the end, it was a full and generous life that led to the enrichment of many others. We owe him a tremendous debt, which, in gratitude, we can try to repay by following his example.

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