

## The Stars Belong to Everyone: Astronomer and Science Writer Helen Sawyer Hogg (1905–1993)

**Maria J. Cahill**

*Edison State College, Humanities Building, L122D, 8099 College Parkway, Ft. Myers, FL 33919; mjcahill@edison.edu*

*Presented at the 100th Spring Meeting of the AAVSO, May 22, 2011; received January 31, 2012; revised March 1, 2012; accepted March 7, 2012*

**Abstract** As a scientist and science educator, Helen Sawyer Hogg served astronomy, and especially variable star astronomy, in diverse ways while raising a family. Her long interest in and support of the AAVSO over many years took place in the context of not only that busy scientific and writing career, but also one of personal struggle to achieve parity as a female in a largely male profession. This biographical sketch demonstrates that her path to eventual status as “the Canadian face of astronomy” was both difficult and filled with uncertainty.

### 1. Introduction

University of Toronto astronomer Helen Sawyer Hogg (AAVSO President 1939–1941; Figure 1) served her field through research, teaching, and administrative leadership. Additionally, she reached out to students and the public through her *Toronto Star* newspaper column entitled “With the Stars” for thirty years; she wrote *The Stars Belong to Everyone* (Hogg 1976), a book that speaks to a lay audience; she hosted a successful television series entitled *Ideas*; and she delivered numerous speeches at scientific conferences, professional women’s associations, school programs, libraries, and other venues. Eventually, she became known as the “Canadian face of astronomy” (Faught 2002). This article will illuminate her life and the personal and professional forces that influenced her work.

### 2. Early educational influences

In a speech given to the American Association of Physics Teachers and the American Physical Society, Helen spoke of childhood years with a family that was

keenly interested in all aspects of nature. My father took me for walks along the Lowell waterways; my mother collected many things, including minerals; my aunt pressed wild flowers, and they all took me as a small child out at night to see the stars, especially the magnificent constellation of Orion, the only constellation visible

from these latitudes with two first magnitude stars, and Halley's comet. (Hogg 1985)

Unfortunately, when Helen was only twelve years old, her father passed away; however, he was an astute banker who left his family in comfort. Helen's mother did not have to work and was able to send her daughter to college. Education was a priority (MacDonald 2004b). And when Helen began her college studies at Mount Holyoke, she took her family's love of nature and the stars with her and, briefly, became a chemistry major (Clement and Broughton 1993). However, at Mount Holyoke, the library was adjacent to Williston Observatory, and Helen found herself reading many books on astronomy (Gingerich 1987). Then Helen's professor, Dr. Anne S. Young, took her astronomy students on a special train from Massachusetts to Connecticut to view the total eclipse of the sun. On January 24, 1925, the students stood with "horribly cold feet...almost knee deep in the snow [and] view[ed] the eclipse from the path of totality." Many years later, Helen exclaimed that "the glory of the spectacle seems to have tied me to astronomy for life" (Clement and Broughton 1993). So, Helen's interest in and love of astronomy grew over time but cemented itself on that auspicious day in 1925.

Paving the way for Helen's success in her new-found field was a meeting with noted Harvard astronomer, Annie Jump Cannon, just one year after the eclipse. Shortly after their meeting, Cannon arranged for Helen to continue graduate studies under the Harvard College Observatory director, Dr. Harlow Shapley (Clement and Broughton 1993). Her graduate appointment changed her life. Of her years at the HCO, Helen said:

My office was next to [Miss Annie J. Cannon's] and for many hours I heard the sound of her voice as she called out the spectral classifications of stars to her assistant, sometimes for many thousands of stars on one 8 by 10 inch plate. I really did not realize at the time that I was myself participating in the start of the major graduate school in astronomy at Harvard or Radcliffe, ...sparked by the dynamic personalities of Cecilia Payne and Harlow Shapley, each of whom was worthy of the term genius in various ways.... Cecilia's astronomical genius was really ahead of her time and it left her with years of frustration that, because she was a woman, she was not receiving fair treatment. Also in September 1926 Frank Scott Hogg arrived at the observatory to begin doctorate studies.... He was able to complete his doctoral work under Cecilia Payne as supervisor in three years and in 1929 he received the first Ph.D. [in] astronomy awarded by Harvard University. My own doctoral degree was in 1931, the third awarded by Radcliffe in astronomy. It was certainly one of the happy circumstances of my life that Frank and

I were attracted to each other and were married in September, 1930, with many common interests to share. (Hogg 1985)

At Harvard, Helen established her scholarly voice and first collaborated on scholarly work with Shapley, who became her foremost professional confidante until his death in 1971. Helen's other mentor was her beloved husband and colleague, Frank Hogg. By the time she completed her Ph.D., she had already published a dozen or so papers with Dr. Harlow Shapley (Clement and Broughton 1993).

### **3. Early professional years as scientist, wife, and mother**

In 1931, shortly after their marriage, Frank Hogg was hired at the Dominion Astrophysical Observatory (DAO) in Victoria, British Columbia (Clement and Broughton 1993). According to Helen Hogg,

In 1924 J. S. Plaskett wrote to Henry Norris Russell asking for a recommendation for an open position at the DAO. Russell noted that "quite the best of the young folks" in astrophysics was Cecilia Payne. J. S. Plaskett responded that "there would be difficulty about the observing end of it with a woman in this isolated place and I think we can hardly consider her." Not till I read this statement did I realize that my superb observing privileges with the 72-inch reflector had been made possible by the automatic presence of a built-in chaperone, my husband. (Hogg 1988)

It is not clear, other than J. S. Plaskett's simple statement, why Cecilia Payne did not receive a job offer. However, Owen Gingerich interviewed Helen in 1987, and she reflected on this critical period in her and Frank's life. According to Helen, Frank, although Cecilia Payne's student, also worked directly with J.S. Plaskett's son, H. H. Plaskett, at Harvard. Frank and H. H. Plaskett had become close. Helen did not indicate that she suspected this relationship was the reason for her husband's employment; however, it seems logical. When the DAO position opened, J. S. Plaskett had more than one qualified candidate; he picked the male astronomer who was qualified, would meet social conventions, was friends with his astronomer son, and would, indeed, bring with him another highly qualified astronomer for free: Frank's wife, Helen.

However, Helen's participation was still limited because, during the Depression, the Canadian Government considered it unconscionable to employ two individuals from one family. Therefore, Helen worked as an unpaid volunteer from 1931 to 1936. She utilized the "72-inch...telescope to search for and study variable stars in globular clusters as a 'volunteer astronomer'" (Clement and Broughton 1993). According to Helen, "I took my first globular

cluster plates on September 22, 1931” (Hogg 1988). Globular cluster variable stars, the subject of her graduate research, remained the focus of her interest throughout her astronomical career (Clement and Broughton 1993).

During her years at the DAO, Helen gave birth to the Hoggs’ first child, Sally, on June 20, 1932; Helen halted work for five weeks, and resumed observing on July 27th:

As I was nursing her, it meant that she had to come to the dome with us for the night. This resulted in some world-wide publicity because the Astronomer Royal of England, Sir Frank Dyson paid a visit to the Dome. A jovial individual and traveler and a great story teller, he loved to tell how as he mounted the stairs to the observing floor of the dome he heard a whimpering and exclaimed “What’s that!” and [J. S.] Plaskett calmly replied, “Oh, that’s the Hoggs’ baby in its basket on the platform by the pier.” The story has come back to me in various forms, including one in which I was said to let the baby in her basket down on a rope from the Newtonian platform. (Hogg 1988)

In reality, Sally stayed below while her mother stood at the top of the dome in the Newtonian cage and worked. Although Helen remained a volunteer, in 1932, J. S. Plaskett helped her with a grant (Hogg 1988). In the end, Helen’s work at the DAO put her in a position to eventually be hired by Dr. C. A. Chant of the David Dunlap Observatory (DDO) and the University of Toronto (UT) (Clement and Broughton 1993).

#### **4. The University of Toronto years**

For a year following Frank’s employment at the DDO, while she was establishing their new home, she worked as an unpaid volunteer. However, she did not complain and continued publishing all along; and in 1936, Helen was offered a paid position as a research assistant (Clement and Broughton 1993).

Then once the depression passed and Helen was finally employed, few opportunities escaped her. In Toronto, she had a growing family of three children, and she worked hard both as a scientist and as a mother. Although employed by the University of Toronto, Helen worked as acting chair at Mount Holyoke during the 1940–1941 academic year. More than likely, she was chosen because she was a successful and collegial alumna with strong family ties to the area, yet the circumstances regarding that position are unclear. When she returned to the University of Toronto in 1941, she was promoted to a teaching position. It was the onset of WWII. Four researchers from the DDO joined the Canadian armed forces, as Helen described it, leaving only “Dr. R. K. Young, Dr. Frank Hogg, with a heart ailment, myself and Ruth Northcott,

who ran the 74-inch telescope nights and taught classes at the St. George campus of the University of Toronto by day.” In 1946, Frank became director of the DDO and a full professor (Clement and Broughton 1993). During the war, many women assumed positions they had not been allowed previously. However, after the war, many women gave them up because they wanted to return to their former lives. It is possible that Helen may have advanced given those historic times, but she was already a trained and experienced scientist. Leaving was not an option for her, and she only received support from Dr. Chant and her husband, Frank.

### **5. Harlow Shapley and Frank Hogg**

In spite of Helen’s professional advancement, through the years, she became exhausted and frustrated with her combined role of astronomer and parent. Helen was a private person, however, who did not openly share her fears or frustrations. But she shared them with the two men she trusted—Frank Hogg and Harlow Shapley. The letters that follow allow us to see Helen as few knew her. In the late 1940s, Helen experienced a strong desire to leave the university and her research at the DDO, work that she loved. In a letter to Shapley on July 25, 1949, she wrote:

All Spring I have felt very doleful.... I left the Ottawa meetings more depressed than when I went; and the night observing which I have been tackling systematically since my return has served only to convince me once more that I cannot fit in night work with my heavy family responsibilities. In other words, I seem to have reached the end of my tether. I have asked Frank to get me an indefinite leave of absence from my university position here, but he is very much upset at the thought.... Shortly after my return from Ottawa I had a letter from the secretary of the A.A.S. informing me of the Annie J. Cannon award, which of course you know about. In my opinion, this award carries with it a certain amount of responsibility, when made to a person my age, that is. In other words, it does not look so good to take the award and quit! Therefore I have not replied to Dr. Huffer’s letter, but am turning the matter over in my mind. It has probably not crossed his mind that circumstances might make it advisable for me to refuse the award. (Hogg 1949)

This letter points to depression and a sense of overwhelming responsibilities to work and family. When she wrote this letter, she had already consulted her husband who strongly opposed her resignation. So, she turned to Shapley who, in his July 29, 1949 letter, said,

There is little doubt but what you are undertaking too much in running a family at this critical stage...and doing everything else. A leave of absence from the University work is obviously a good idea; but a study, with astronomical literature in it, and some photographs of clusters and the computing machine—that should not be given up, even if it must be established in one corner of some room at home. And also probably there is some interesting and not too laborious writing about old books that should be done, just to keep the finger in the game until strength and time are less expensive. About that award—don't be silly, even if the weather is hot. The award is made for past accomplishments, and carries with it no responsibility for future activities. Suppose I should commence turning in medals because I have degenerated into being just a blank, blank director, personality smoother, instigator of labors by others. Let's both cheer up. One particular reason for such a resolve is that after fifteen or twenty lectures on cosmogony in the Harvard Summer School I have convinced myself that this is unquestionably the best universe I know of. (Shapley 1949)

Shapley is light-hearted and amusing, coaxing Helen out of her doldrums, while also suggesting a practical, though temporary, solution to her troubles. Shapley and Frank helped Helen persevere through this difficult time, and her work did not suffer. Over the next year and a half or so, Helen continued on, unaware of how much worse her life would become, and in such a short time.

## 6. A time of loss

When Frank and Helen married, they knew that he didn't have a normal life expectancy; in fact, he couldn't even get life insurance. As a boy, Frank had rheumatic fever, but it had gone undiagnosed for some time and had damaged his heart. In 1941, Frank developed a two-star sextant; quickly, radar superseded it. However, he took the sextant in a small plane to test. As a result, he caught pneumonia, and it damaged his heart even more (MacDonald 2004a).

On January 1, 1951, ten years following his bout with pneumonia, Frank Hogg went into the bedroom to take an afternoon nap. He appeared to be fine that day. But he fell asleep and did not awaken. Helen and all three children were with him at the time. Frank's death was a deep emotional loss for Helen, Sally, David, and James. Fortunately, Helen had prepared. She had an astute business sense, and she had purchased stock, one share at a time, so that when her husband died, she had a nest-egg and knew how to manage her finances. Her and her children's financial future was relatively secure (MacDonald 2004a).

Helen had always been a hard worker, but following Frank's death on January 1, 1951, she threw herself into her work. She was fearful that *The*

*Toronto Star* would drop Frank's column, which he had written for ten years. Even though the column was established, the agreement Frank had had with *The Star* remained week-to-week. Helen wanted to write the column because she loved writing, particularly for a lay audience, and because she also wanted the income. But it is possible, although it cannot be verified, that Helen longed to continue her beloved husband's column simply because they had been close as husband and wife as well as colleagues, and she hoped to continue the column in his tradition. Therefore, on her behalf, friends appealed to *The Star's* management, and she was allowed to assume Frank's column at a compensation of \$5.00 per week. In her grief and bereavement, Helen remained focused. Fortunately, her children were teenagers and had already achieved some degree of independence (MacDonald 2004a).

Nonetheless, Helen wrote a letter to Shapley on February 7, 1951, just five weeks after Frank's death, expressing her exhaustion between personal obligations and work:

The past month has seemed impossibly heavy for me with the work that had to be done, but eventually I shall get some of the backlog caught up, and not feel that I am behind with everything. Dr. Heard is the acting head of the observatory. It is my understanding that the new permanent head will be appointed as of July 1 [replacing Frank Hogg]. My own promotion as Assistant Professor has come through simultaneously with a good boost in the salary scale here.... At present I am teaching two courses, which takes me virtually all of two full days in the city. I have the weekly article in *The Star*, which takes me several hours, but I consider quite vital. Do you know how many astronomical articles have a circulation of 400,000? I think I am making out quite well with the column. I enclose a copy of my first one, which I wrote about Frank. Then I have "[Out of] Old Books" (essays on the history of astronomy, published in *JRASC*), and all fall I had been working hard on a series about Le Gentil from the volumes I got at H.C.O. in November. This particular job ran into a hundred or more hours, and I am struggling for time to get it in final shape for three installments in the *Journal*. Then there are the usual meetings, long distance visitors...which cut in to time, not to mention household activities. I am well along with the settlement of Frank's estate, and have written about 200 acknowledgements so far. The time that is left from the above activities I can spend on globular cluster research. The past month there has been none left. But I think this state of affairs will alter markedly the first of April when lectures stop. I hope so. I am wondering if there is any chance that I can get over to Michigan to hear you, as I would certainly enjoy a chat with you. (Hogg 1951a)



In spite of her dedication, Helen found herself caught up in personal and professional obligations that kept her from her research. At first glance, her letter appears matter of fact, yet it is dotted with phrases like “impossibly heavy” when describing her work; “struggling for time” in reference to her writing for “Out of Old Books”; and “200 acknowledgements” when referring to correspondence resulting from her husband’s death. Of course, with three teenage children, there’s much not said in this letter. Noticeably, Helen speaks positively of her writing for *The Star*, “which takes me several hours, but I feel is quite vital.... I think I am making out quite well with the column.”

Then, after twenty years of work in the field and fifteen years with DDO and UT, she received a promotion to assistant professor, and she mentions this to Shapley without complaint. Frank received full professorship in 1941; however, he had worked only a few years longer than she and was not known for his research. Helen wrote to Shapley on April 14, 1951, and then, again, on May 17th: But she still felt overwhelmed, expressing both gratitude with those who had proved their friendship and frustration with those who had not (Hogg 1951b, c).

This was a season of loss for Helen. Although generally healthy and vital, along the way, she had her own health problems. In 1946, she had a hysterectomy. In 1952, following Frank’s death, she became very ill with serious bowel obstructions. However, while in the hospital, her daughter, Sally, stated that in a hushed, croaked voice, her mother said, “I have to write the column” [for *The Star*]. Helen was terrified if she missed a week of her column, *The Star* would drop her. So, she wrote that week’s column from her hospital bed (MacDonald 2004b). Although it has been impossible to legitimize Helen’s fear of being dropped, her concern was clearly confirmed by her daughter, Sally, who served as her mother’s typist for several years.

From 1949 to 1953, her frustration with her work-related life and responsibilities only increased, as read in her March 3, 1953, letter to Shapley:

This has been one of the dreariest winters I ever lived through. I think I have never in my life hated my work as I have this year. (This of course is confidential, as I am not yet willing to go on public record as an astronomy-hater.) This has been due to an unfortunate combination of a variety of circumstances. No one person is to blame for the sum total. But the past several months I have been driven more and more toward what appears to me now as an inescapable conclusion, namely that I never will be in control of my life here. I am battling too many separate things that I do not like, and I will never be able here to feel that the game is worth the struggle. It is still my hope to remain in Canada two more years, until James finishes Grade XIII at Richmond Hill high school.... I have started a separate bank account into which I am pouring a substantial sum of cash reserves. All this is preparation for the fact that I propose to



work through one more academic year here, which I agreed to do some time back, and then for the following year, beginning July 1 1954 I intend to be as free as the proverbial birds of the air. I intend to keep on with my Star column as long as the editors will take it, because that is still pure enjoyment for me, and provides a small bit of income as well. I have felt better in my mind since I embarked on a definite course of action. I am going to the bank this noon to make my March deposit on my F. F. (Freedom Fund). All the above is super-confidential as I have discussed this matter with no one here. As you are probably aware I am not given to discussing my problems with a dozen or more friends. I do not intend to announce my plan here until next fall, which I consider fair notice. (Hogg 1953a)

Just two years following her husband's death, she was ready to leave her work at UT and DDO—leave astronomy altogether—except for her column. In the numerous interviews, no one expressed knowledge of Helen's despair. A lack of control over one's destiny can, indeed, prove the most frustrating of all. She does not, however, elaborate over the situation(s) and indicates that the problems come from a number of directions.

Shapley returned Helen's letter with a lengthy one of his own, and he did so within the week, thus dated March 9, 1953:

Since you write me with confidence I can reply in an equally confidential manner from your old school. Things are not going well here. It has been the unhappiest of the thirty-two years I have spent in this institution.... All was sweet and rosy until I walked out of the administrative picture with the resolve and expectation of having nothing more to do with the administration here. The past should not govern the future. I have stuck with my resolution, of course.... I shall send you a copy, if I can find one, of my last report as Director. It will remind you that this was, and has been, up to now, a nice place! And now here comes the most important paragraph of this confidential communication. Almost certainly within two or three months a new director will be chosen. Mr. Conant has left the University permanently. There will be a new president.... I am hopeful not only that Harvard's eye-hold in the southern hemisphere may be in part retained, but also that the Harvard Observatory friendly spirit of past years can be rescued. Instead of those foregoing paragraphs I should have written you my regret and also my astonishment at the general tenor of your letter, I sympathize with you. (Shapley 1953)

Within this letter Shapley responds with his own departmental "woes," reflecting fondly on a time when the H.C.O. was a respected and congenial

unit, and he provides his former student with words of understanding and consolation.

## 7. The tide turns

Just days following Shapley's response on March 24, 1953, the tide turned for Helen, and she writes that Dr. Baade offered her a summer vacation job in 1955: "especially since Frank's death, I have become a globular cluster on a desert island. I need more company with other globular clusters.... Dr. Baade does not know me personally very well, and of course he did not realize he was giving my dejected spirits a real lift!" (Hogg 1953b). Helen was twirling many plates in the air when Frank Hogg died, and it finally caught up with her. Dr. Baade's offer gave her something concrete to hold onto.

Just two years later, she was offered a year-long position at the National Science Foundation (NSF) (Hogg 1955). From September 1955 to June 1956, Helen was Program Director of the National Science Foundation in Washington, D.C. Even though UT had been unhappy with her departure, when she returned from Washington, she was offered a better appointment; her daughter, Sally MacDonald, speculated that her mother took the NSF position not only out of interest, but to hedge against struggles at UT (MacDonald 2004b). Yet, this isn't evident in her letters to Harlow Shapley. In the past, Helen had struggled with the university enough to consider leaving. From this point on, however, she remained entrenched in the University of Toronto and in her teaching and research.

## 8. Influence

Over the years, Helen wrote a variety of articles (for professional and lay readers) for the *Journal of the Royal Astronomical Society of Canada (JRASC)*. In addition to her teaching at the University of Toronto, Helen's column in *The Star*, her book, and her television series exemplify her commitment to education. At the time of Helen's death in 1993, the president of the RASC, Peter Broughton, said, "But perhaps her greatest memorial is the appreciation of a larger universe which her popular writing instilled in thousands of ordinary Canadians" (Pipher 1993). Because of Helen's public writings, she became a well-known name in Canada. According to Helen's former graduate student, Christine Clement (2004), Helen said, "We women need to stick together," and she demonstrated this belief by mentoring her students and modeling the relationship that she and Shapley held.

In January 1993, Helen, Dr. Robert Garrison, and other scientists from UT (primarily female), created a film, *Discovering Science*, geared toward late elementary and middle school girls. One of the movie's final scenes is of young, middle-school-aged girls sitting around Helen and listening to her talk about the

pursuit of knowledge, in general, and science, in particular. Helen looks at the girls, smiling, and says, “Not to know what’s beyond is like spending your life in the cellar, being completely oblivious of all the wonderful things around us” (Garrison 2004).

On the morning of January 25, 1993, Helen had a two hour taping session at the DDO. The evening of that last taping, Helen felt that she had made a small error, and she called the director to ask him to correct it. She became ill early the next morning, and she passed away two days later, January 28, 1993 (MacDonald 2004b; Garrison 2004).

## 9. Conclusion

Dr. Helen Sawyer Hogg’s dedication was evident to all. She took more than 2,000 photographs, discovered hundreds of variables, and published more than 200 papers. Her knowledge of the night sky was phenomenal. Her series of catalogues, *Variable Stars in Globular Clusters*, are valuable reference sources that are frequently cited in the literature. She published three editions: in 1939, 1955, and 1973, and was working on the fourth at the time of her death. Even in her final days, she remained involved in attracting women to the sciences, as in her participation in a video, *Discovering Science* (Clement and Broughton 1993; Univ. Toronto Women’s Assoc. 1993). A significant reason for her success, no matter her gender and the attitudes surrounding her, was persistence.

If Helen had protested and objected too strenuously to the annoying everyday inequities, they would have consumed her personal and professional life. Instead, she focused on her own goals and accomplishments because, as a child, her family taught her to appreciate the science they could see along a wooded road or in the stars of a dark night’s sky. Then, as a young college student, teachers and female scientists such as Anne S. Young and Annie Jump Cannon provided inspiration and direction. Once an astronomer, Helen’s husband, Frank, refused to let her quit, and her mentor and friend, Harlow Shapley, provided an enduring and supportive friendship. Within this framework of education, friendship, and family, Dr. Helen Sawyer Hogg succeeded in her beloved field of astronomy.

## 10. Acknowledgements

The archival materials researched for this article include Helen Sawyer Hogg’s personal correspondence, diaries, and notes; drafts of her articles, public addresses, and drawings; four complete drafts of her book, *The Stars Belong to Everyone*; thirty years of her weekly column in *The Toronto Star*; transcripts from her eight-week television series, *Ideas*, as well as interviews with various friends, family members, former colleagues, and students. Because of its personal nature, this article is based largely on personal letters and interviews.

I am indebted to Christine Clement, Robert Garrison, and John Percy from

the University of Toronto Department of Astronomy and Astrophysics, and to Harold Averill, University of Toronto Archives, as well as Helen Sawyer Hogg's children, Sally MacDonald and David Hogg. All of these individuals have been more than generous with their time and consideration during this project and others regarding Helen Sawyer Hogg; their first-hand knowledge has proven invaluable. Finally, to Helen Sawyer Hogg, herself, I share much and will be forever grateful.

## References

- Clement, C. 2004, private communication (June 17).
- Clement, C., and Broughton, P. 1993, *J. Roy. Astron. Soc. Canada*, **87**, 351.
- Faught, B. 2002, *Univ. Toronto Mag.*, Spring (<http://www.magazine.utoronto.ca/category/spring-2002/>).
- Garrison, R. 2004, private communication (July 6).
- Gingerich, O. 1987, interview of Helen Sawyer Hogg by Owen Gingerich on August 18, 1987, Niels Bohr Library and Archives, American Institute of Physics, College Park, Maryland.
- Hogg, H. S. 1949, letter to Harlow Shapley (July 25), B 1994-0002/067 (13), Univ. Toronto Archives, Toronto.
- Hogg, H. S. 1951a, letter to Harlow Shapley (February 7), B 1994-0002/004 (16), Univ. Toronto Archives, Toronto.
- Hogg, H. S. 1951b, letter to Harlow Shapley (April 14), B 1994-0002/004 (16), Univ. Toronto Archives, Toronto.
- Hogg, H. S. 1951c, letter to Harlow Shapley (May 17), B 1994-0002/004 (16), Univ. Toronto Archives, Toronto.
- Hogg, H. S. 1953a, letter to Harlow Shapley (March 3), B 1994-0002/004 (16), Univ. Toronto Archives, Toronto.
- Hogg, H. S. 1953b, letter to Harlow Shapley (March 24), B 1994-0002/004 (16), Univ. Toronto Archives, Toronto.
- Hogg, H. S. 1955, letter to Harlow Shapley (May 31), B 1994-0002/004 (16), Univ. Toronto Archives, Toronto.
- Hogg, H. S. 1976, *The Stars Belong to Everyone*, Doubleday Canada, Toronto.
- Hogg, H. S. 1985, address to American Association of Physics Teachers and the American Physical Society, Toronto, B 1994-0002/020 (08), Univ. Toronto Archives, Toronto.
- Hogg, H. S. 1988, *J. Roy. Astron. Soc. Canada*, **82**, 328 (B 1994-0002/020 (15), Univ. Toronto Archives, Toronto).
- MacDonald, S. 2004a, private communication (June 17).
- MacDonald, S. 2004b, private communication (June 20).
- Pipher, J. L. 1993, *Publ. Astron. Soc. Pacific*, **105**, 1369.
- Shapley, H. 1949, letter to Helen S. Hogg (July 29), B 1994-0002/004 (16), Univ. Toronto Archives, Toronto.

Shapley, H. 1953, letter to Helen S. Hogg (March 9), B 1994-0002/004 (16), Univ. Toronto Archives, Toronto

Univ. Toronto Women's Assoc. 1993, *Discovering Science: Encouraging Women in Science and Engineering* (video recording), Univ. Toronto, Toronto..



Figure 1. Helen Sawyer Hogg is second from left in this photo from the June 1940 meeting of the AAVSO held in Toronto. Pictured from left: Eugene Jones (AAVSO member/observer), HSH, Margaret Mayall (HCO/AAVSO), Martha and Harlow Shapley (HCO), R. Newton Mayall (AAVSO), Frank Hogg (DDO) and son David, Clinton B. Ford (AAVSO), and Leon Campbell (HCO, AAVSO Recorder).