

## LONG-PUBLISHING ASTRONOMERS, OR THE PROBLEM OF CLASSIFICATION

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**Abstract:** In response to several discussions among astronomers and historians of astronomy, I started out to prepare a paper on long-publishing astronomers—those who published for 70, 75, or even 80 years. However, I soon ran into a number of questions of classification, and that turned out to be at least as interesting. How do we decide on classifications? Every time we choose classes, such as asteroids, planets and stars, we run into objects that seem to be in between. In the present case a number of questions arise: Who is an astronomer? Several of those with the longest publication runs started out as physicists, published for years in that subject only, and later took up astrophysics, eventually publishing a few papers in astronomy journals. What is a publication? Should we count publications in physics, chemistry, or mathematics? What about philosophy of science or history of science? What about the elderly retired astronomer presenting a memoir of his or her own work? Abstracts of oral presentations? Monographs? Textbooks? Book reviews? Obituaries? Then there is the problem of posthumous publications. Probably most would include papers in the pipeline when the astronomer dies, but what about the case where the coauthor finally publishes the paper as much as twenty-two years after the death of the person of interest? I eventually decided to make two lists, one which would include most of the above, and one restricted to papers that make contributions to physical science. Note that I do not say 'refereed', as that presents its own problems, especially when applied to periods before the twentieth century.

I present a list of astronomers who have published for periods of 68 to 80 years and discuss the problems of defining such terms as astronomer and publication.

**Keywords:** Astronomers, long-publishing.

### 1 INTRODUCTION

On several occasions historians of astronomy have discussed the question of the longest-publishing astronomers. For example, an obituary (Boeshaar, 2000) claimed that Philip Keenan's 71-year publishing record was "... the longest publishing career in modern astronomy." Helmut Abt (1995) tabulated the longest-publishing astronomers at that time, but his list was confined to publications in the *Astrophysical Journal*, and his longest run, 64 years for Joel Stebbins (1878–1966), does not come close to those described here.

An attempt to compile a list led to a number of interesting questions regarding classification. Whenever we try to classify something and put every member of a population into a bin, Nature confounds us by presenting objects that do not fit. When I took my last biology class (in the 1950s) I was taught that there are two kingdoms, plant and animal, and a few things, e.g., fungi, that don't quite fit. Today American students are taught that there are six kingdoms, while those in some countries are told there are five. And several newer systems have been proposed, some with far more than six kingdoms classified into three domains. Astronomers are more familiar with the question of how to define a planet. There are difficulties at both ends, as shown by the controversies over dwarf planets and brown dwarfs.

The present endeavor leads immediately to two questions: (1) Who is an astronomer? (2) What is a publication? In order to proceed, I had to make a number of quite arbitrary decisions. Readers may well disagree with some of them.

### 2 CLASSIFICATIONS

Regarding the first question, I decided to include anyone who has contributed to astronomy, interpreted broadly. This includes many physicists and quite a few

mathematicians, chemists, geologists, and planetary scientists. Some of them published very few papers in astronomical journals.

The second question proved so difficult that I decided to make two lists, one confined to publications that make original contributions to scientific knowledge, and one of essentially all publications that contribute to astronomy or the community of astronomers. The first list is almost, but not quite, synonymous with "refereed" publications today, but refereeing is a fairly recent development, and journals have changed. Table 1 lists a number of types of publications and whether they are included in the "original contribution" list and the total list.

The two lists have different objectives. The first list ("original") is simple in principle: any publication which makes an original contribution to scientific knowledge. This includes papers in journals and monographs. Posthumous publications are included only if the author actually worked on them. Thus papers published by coauthors long after the death of the person of interest but with his name on them because his data were used are not counted. Also omitted are the cases where an observation or two contributed to a line in a table of observations published by another. If these were counted, the New Zealand amateurs Frank Bateson (see Table 3) and Albert Jones (b. 1920) would rank higher, as they contributed observations to organizations of variable star observers several years before they began publishing in their own names.

The second ('total') list is to show which astronomers were intellectually active, to the point of publishing, for the longest times. Elderly scientists are frequently called upon to write reminiscences of their own work and obituaries of departed colleagues. Many write book reviews and popular articles on science, while a few update their textbooks. Some

Table 1: Decisions on which publications to count.

Type of publication	Count for "original" list?	Count for "total" list?
Journal articles with new science	yes	yes
Monographs	yes	yes
Publications in other physical sciences and mathematics	yes	yes
History of science (not personal)	no	yes
Personal history, reminiscences	no	yes
Abstracts of papers presented at meetings	no	yes
Textbooks	no	yes
Popular books and articles on scientific topics	no	yes
Obituaries	no	yes
Book reviews	no	yes
Ph.D. and master's theses	no	no
Publications on non-scientific topics	no	no

present at conferences. Not a few have turned to history of astronomy. While they may no longer be contributing to the advancement of scientific knowledge, they are still active. We will see that this can extend their publishing records to seven decades or more. The omission of dissertations and theses from the "total" list is a pragmatic choice: it is difficult to find their dates in most cases, and this gives an unfair advantage to those whose theses happen to be readily available. In most cases the thesis work appeared in a published paper within a year or two.

### 3 METHODOLOGY

Once the above—admittedly arbitrary—decisions had been made, there was still the problem of comparing publications of the distant past with those of today. Publication was quite different a few centuries ago, and much of the world's scientific work is difficult to find. Therefore I made another practical decision: This work is limited to authors born in 1800 or later, and it is based primarily, though not exclusively, on two sources, ADS (<http://www.adsabs.harvard.edu/>) and Google Scholar (<http://scholar.google.com/>).

The major omissions are probably those who published in non-European languages, although it is quite possible that some others have been missed. I hope that the list will still be of interest, and I welcome corrections and additions to the list.

### 4 THE LONGEST PUBLISHING ASTRONOMERS: ORIGINAL CONTRIBUTIONS TO PHYSICAL SCIENCE

Table 2 shows the twenty astronomers who made original contributions to physical science over periods of 68 to 80 years. Some are very prominent scientists—three were awarded Nobel prizes—while others are known only to specialists in their fields. Haas is an amateur astronomer. Cousins made the transition from amateur to professional in mid-career, while Baldwin went in the opposite direction. Let's take a closer look in inverse order.

#### 4.1 Sixty-eight years of Scientific Contributions

**Ralph B. Baldwin** (Figure 1) was a Ph.D. astrophysicist who helped develop the proximity fuse during World War II, taught at several universities, wrote a number of books, and then spent 37 years running his family's machinery business in Michigan. He is best known for convincingly demonstrating that lunar craters are due to impacts.



Figure 1: Ralph B. Baldwin (courtesy Archives, Grand Rapids Public Library, Grand Rapids, Michigan).

**Theodor S. Jacobsen** (Figure 2), the lone astronomer at the University of Washington for several decades, made spectroscopic studies of stars. He published a book on the history of planetary systems (with a lot of help from his friends) at age 98.

**Charles P. Olivier** (Figure 3) taught at the Universities of Virginia and Pennsylvania and founded the American Meteor Society. He measured parallaxes and orbits of binary stars.

**Jan Oort** (Figure 4), long-time director of the Leiden Observatory in the Netherlands, is justly famed for his theory of the rotation of the Galaxy, the advancement of radio astronomy, the founding of international organizations, and proposing today's accepted model for the source of long-period comets, the "Oort Cloud."

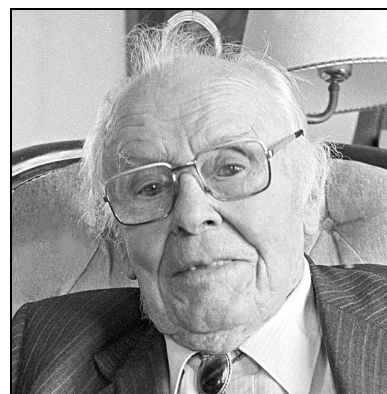


Figure 2: Theodor S. Jacobsen in 1999 (courtesy of University of Washington/Kathy Sauber).

Table 2: Longest-publishing astronomers: original contributions to physical science

Rank	years	Name (lived)	First Orig. Sci. Pub.	Last Orig. Sci. Pub.
1	80	Hans Bethe (1906–2005)	Bethe, 1927	Bethe, et al., 2007
2	77	Alan W.J. Cousins (1903–2001)	Cousins, 1924	Cousins and Caldwell, 2001
		Harold Jeffreys (1891–1989)	Jeffreys, 1910	Jeffreys and Shimshoni, 1987
4	74	Viktor A. Ambartsumian (1908–1996)	Kosirev and Ambarzumian, 1925	Ambartsumian and Gyulbudaghian, 1999
		Fred Whipple (1906–2004)	Berman and Whipple, 1928	Cochran, et al., 2002
6	73	Charles H. Townes (b. 1915)	Townes, 1938	Townes, et al., 2011
7	72	Charles G. Abbot (1872–1973)	Noyes and Abbot, 1897	Abbot and Hill, 1969
		George H. Herbig (b. 1920)	Herbig, 1940	Dahm, et al., 2012
		Dorrit Hoffleit (1907–2007)	Hoffleit, 1930	Webbink, et al., 2002
		George Van Biesbroeck (1880–1974)	Van Biesbroeck, 1904	Van Biesbroeck, et al., 1976
11	71	Philip C. Keenan (1908–2000)	Keenan, 1929	Barnbaum, et al., 2000
		Willem J. Luyten (1899–1994)	Luyten, 1918	Warren, et al., 1989
13	69	Lawrence H. Aller (1913–2003)	Aller, et al., 1935	Mooney, et al., 2004
		Walter H. Haas (b. 1917)	Haas, 1937	Haas, 2006
		Gerhard Herzberg (1904–1999)	Herzberg, 1927	Dabrowski and Herzberg, 1996
		John A. Wheeler (1911–2008)	Wheeler, 1933	Holtz and Wheeler, 2002
17	68	Ralph B. Baldwin (1912–2010)	Baldwin, 1938	Baldwin, 2006
		Theodor S. Jacobsen (1901–2003)	Jacobsen, 1924	Wallerstein, et al., 1992
		Charles Olivier (1884–1975)	Olivier, 1901	Olivier, 1969
		Jan H. Oort (1900–1992)	Oort, 1922	Oort, 1990



Figure 3: Charles P. Olivier in 1914 (Holsinger Studio Collection, Special Collections, University of Virginia Library).

#### 4.2 Sixty-nine Years of Scientific Contributions

**Lawrence H. Aller** (Figure 5), a theorist and observer at the Universities of Indiana and Michigan and, for most of his career, the University of California, Los Angeles, was a leading authority on planetary nebulae, stellar spectra, and chemical abundances of the Sun, stars, and nebulae.

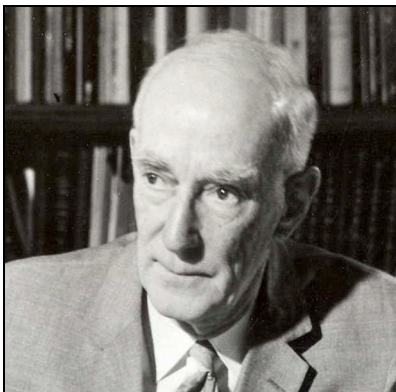


Figure 4: Jan H. Oort (This image is copyright by the Leiden Observatory).

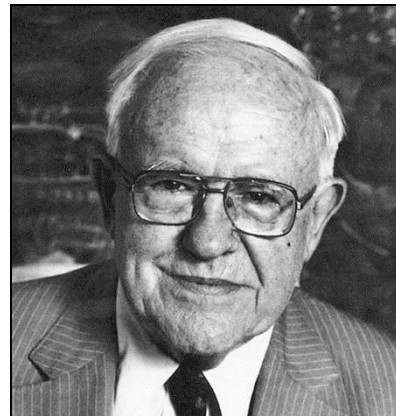


Figure 5: Lawrence H. Aller (courtesy National Academies Press).

**Walter H. Haas** (Figure 6) is an American mathematics instructor and applied mathematician who founded and for many years led the Association of Lunar and Planetary Observers (ALPO), a large organization of amateur astronomers. Most of his publications have been accounts of observations published in the *Journal of the Royal Astronomical Society of Canada*, *Popular Astronomy*, and the *Journal of the ALPO* (formerly called the *Strolling Astronomer*), which he founded.

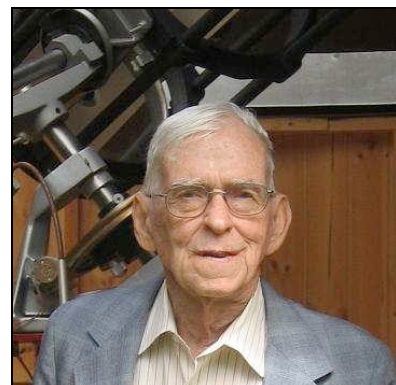


Figure 6: Walter Haas in 2004 (courtesy Richard McKim).

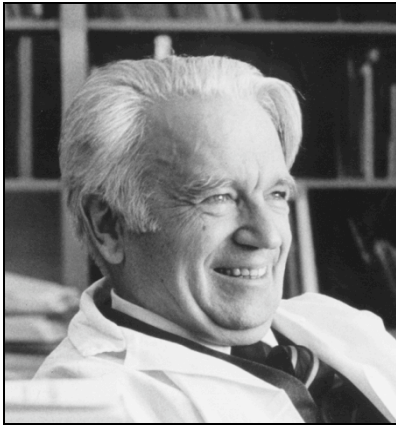


Figure 7: Gerhard Herzberg (courtesy National Research Council Canada).

**Gerhard Herzberg** (Figure 7) once described himself as “25 percent astronomer, 30 percent chemist, 40 percent physicist.” He is best known for theoretical and experimental work on atomic and molecular spectra and structure. He emigrated from Germany to Canada in 1935 and was awarded the Nobel prize in chemistry in 1971 “for his contributions to the knowledge of electronic structure and geometry of molecules, particularly free radicals.” Most of his research was done at the University of Saskatchewan and the National Research Council of Canada.

**John Archibald Wheeler** (Figure 8) was a theoretical physicist who worked at Princeton University and the University of Texas at Austin. He led one of the world’s leading research groups in general relativity and contributed to the theory of black holes (coining the term) and cosmology. He also developed the theory of nuclear fission with Niels Bohr. Nearly all of his publications were in physics journals, general science publications, and books.

#### 4.3 Seventy-one Years of Scientific Contributions

**Philip Keenan** (Figure 9), a spectroscopist who, with W.W. Morgan, developed the two-dimensional classification of stellar spectra, had a long and productive career studying cool stars at Ohio State University. His work included stellar abundances and evolution as well as spectral classification.

**Willem J. Luyten** (Figure 10) was born in the Dutch East Indies (now Indonesia) and educated in the Netherlands, but worked in the United States, especially the University of Minnesota, where he taught for 36 years, the first 26 as the university’s lone



Figure 8: John A. Wheeler (Courtesy University of Texas.)



Figure 9: Philip Keenan (courtesy Gerald Newsom).

astronomer. He observed, despite losing an eye in his youth, and he blinked and measured plates, using a machine he designed, to find proper motions of more than 500,000 stars and to discover a great many white dwarfs.

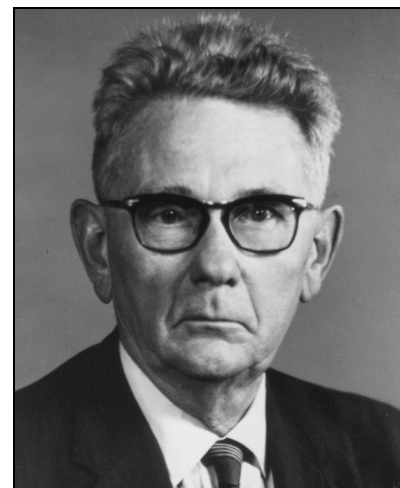


Figure 10: Willem J. Luyten (courtesy James Luyten).

#### 4.4 Seventy-two Years of Scientific Contributions

**Charles G. Abbot** (Figure 11) directed the Smithsonian Astrophysical Observatory and later the entire Smithsonian Institution, devoting most of his efforts to measuring the solar constant and attempting to show correlations between variations in the Sun’s output and terrestrial weather. He established solar monitoring stations around the world and invented improved bolometers.

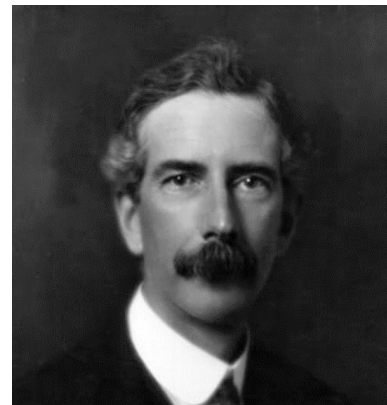


Figure 11: Charles G. Abbot (Photo by Bachrach).



Figure 12: George H. Herbig (courtesy Karen Teramura).

**George H. Herbig** (Figure 12) is a spectroscopist who had a full and productive career at the Lick Observatory and then moved to the University of Hawaii at age 68. Now, at 92, he is still publishing observations of stars and the interstellar medium. He is best known for his work on early stages of stellar evolution, including his independent discovery of the Herbig-Haro objects, and for studies of diffuse interstellar bands.

**Dorrit Hoffleit** (Figure 13) worked at Harvard and Yale Universities and directed the Maria Mitchell Observatory on Nantucket Island, where she and her students measured variable stars. Her best-known work consists of spectroscopic parallaxes, several editions of the *Bright Star Catalogue*, and a catalogue of stellar parallaxes, but she also wrote many popular articles, and in her later years she wrote books and articles on the history of astronomy.

**George Van Biesbroeck** (Figure 14), who was born in Belgium and educated at the University of Ghent, worked at Yerkes Observatory and the University of Arizona, observing until well into his nineties. His specialties included visual binary stars and discoveries and positions of comets, asteroids, and planetary satellites. He also made several eclipse expeditions.

#### 4.5 Seventy-three years of Years of Scientific Contributions

**Charles H. Townes** (Figure 15) is an experimental physicist who has worked at Bell Labs, Columbia University, the Massachusetts Institute of Technology, and, since 1967, the University of California at Berkeley. He worked on radar in World War II, he



Figure 13: Dorrit Hoffleit in 2007 at her 100th birthday party (courtesy Yale University).

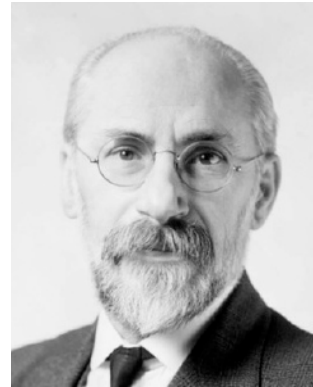


Figure 14: George Van Biesbroeck in 1939 (courtesy Archival Photographic Files, apf6-00174, Special Collections Research Center, University of Chicago Library).

shared the Nobel Prize in physics for co-inventing the maser, and he proposed the idea of extending stimulated emission into the visible range to make the laser. Masers led to radio astronomy, and he has spent his later years extending interferometry from the radio region into the infrared and using a three-element interferometer to measure such quantities as stellar diameters and the formation and conditions of molecular material in stellar atmospheres.

#### 4.6 Seventy-four Years of Scientific Contributions

**Viktor A. Ambartsumian** (Figure 16) worked at the Pulkovo Observatory, the Byurakan Astrophysical Observatory, which he founded and directed, Erevan University, and the Armenian Academy of Sciences, which he served as president from 1947 to 1993. He



Figure 15: Charles H. Townes in 1968 (courtesy Lawrence Berkeley National Laboratory).

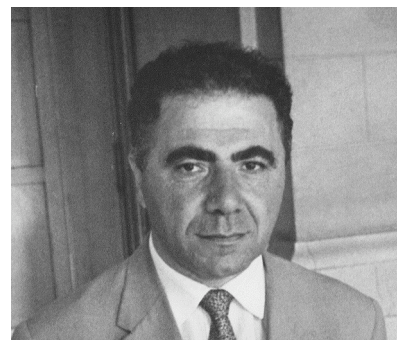


Figure 16: Viktor A. Ambartsumian (courtesy *Sky & Telescope*).



Figure 17: Fred Whipple (courtesy Smithsonian Astrophysical Observatory).

applied invariance principles to the theory of radiative transfer, dealt with inverse problems, and developed theories for the origin and evolution of stars and galaxies. He suggested that T Tauri stars are young, and he proposed that stellar associations are expanding.

**Fred L. Whipple** (Figure 17) conducted research on meteors and comets at Harvard University and the Smithsonian Astrophysical Observatory and led the merger of their astronomy programs into the Harvard-Smithsonian Center for Astrophysics. He showed that most visible meteors come from cometary material and proposed the “dirty snowball” model for comet nuclei. The inventor of a device for confusing radar and of the “Whipple shield” to protect spacecraft from micro-meteorites, he was on the science team for a NASA mission to a comet in his late nineties.

#### 4.7 Seventy-seven Years of Scientific Contributions

**Alan W.J. Cousins** (Figure 18) made variable star observations as an amateur astronomer while working as an engineer on power stations until the age of 44, when he obtained a professional position at what is now the South African Astronomical Observatory. He is known for his development of photographic and photoelectric photometry and especially for making the UBVR system the accepted standard.

**Harold Jeffreys** (Figure 19), primarily a mathematician, was a professor of geophysics and astronomy at the University of Cambridge. He modeled

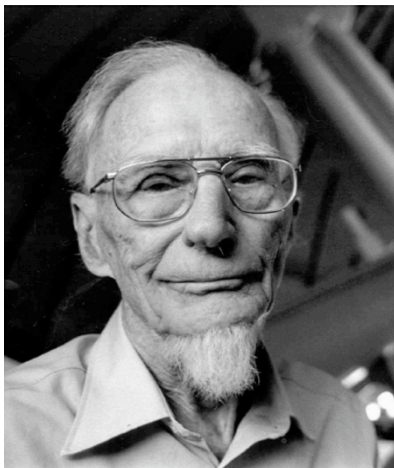


Figure 18: Alan W.J. Cousins (courtesy South African Astronomical Observatory).

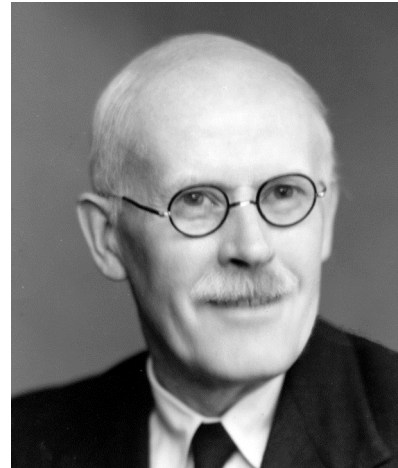


Figure 19: Harold Jeffreys in 1952 (photo by Walter Stoneman, American Geophysical Union, courtesy AIP Emilio Segrè Visual Archives).

the interior of the earth and outer planets, studied and wrote about earthquakes and worked in pure and applied mathematics as well.

#### 4.8 Eighty Years of Scientific Contributions

**Hans A. Bethe** (Figure 20) made major contributions to solid state physics, nuclear physics, and astrophysics and significant ones to atomic physics and quantum electrodynamics. Alsace-born and German-educated, he taught and conducted research at Cornell University from 1935 to 2005. His detailed models of the two hydrogen-burning reaction chains which power the stars, computed in the late 1930s, led eventually to a share of the 1967 Nobel prize in physics. He was a noted statesman of science and advised governments on arms control and energy policies.

#### 4.9 Honorable Mention

Those who published original scientific results for “only” 67 years, are Paul Baize, who will be discussed in the next section; Subrahmanyan Chandrasekhar, the Indian-born University of Chicago astrophysicist, whose discovery of the limiting mass of white dwarf stars was eventually recognized with a Nobel prize and who made theoretical discoveries in half a dozen branches of astrophysics; and Yngve Öhman, the Swedish solar astronomer.



Figure 20: Hans Bethe in 1967 (courtesy Cornell – LEPP Laboratory)

Table 3: Longest-publishing astronomers: All contributions related to physical science

Rank	years	Name (lived)	First Publication	Last Publication
1	80	Hans Bethe (1906–2005)	Bethe, 1927	Bethe, et al., 2007
2	79	Harold Jeffreys (1891–1989)	Jeffreys, 1910	Jeffreys, 1989
3	78	Willem J. Luyten (1899–1994)	Luyten, 1918	Hintzen, et al., 1996
4	77	Alan W.J. Cousins (1903–2001)	Cousins, 1924	Cousins and Caldwell, 2001
5	76	Dorrit Hoffleit (1907–2007)	Hoffleit, 1930	Hoffleit and Gay, 2006
		Theodor S. Jacobsen (1901–2003)	Jacobsen, 1923	Jacobsen, 1999
7	75	Giorgio Abetti (1882–1982)	Abetti, 1905	Abetti, 1980
8	74	Viktor A. Ambartsumian (1908–1996)	Kosirev and Ambarzumian, 1925	Ambartsumian and Gyulbudaghian, 1999
		George H. Herbig (b. 1920)	Herbig, 1938	Dahm, et al., 2012
		Fred Whipple (1906–2004)	Berman and Whipple, 1928	Cochran, et al., 2002
11	73	Ernst J. Öpik (1893–1985)	Öpik, 1912	Öpik, 1985
		Charles H. Townes (b. 1915)	Townes, 1938	Townes, et al., 2011
13	72	Charles G. Abbot (1872–1973)	Noyes and Abbot, 1897	Abbot and Hill, 1969
		Hermann A. Brück (1905–2000)	Brück, 1928	Brück and Brück, 2000.
		George Van Biesbroeck (1880–1974)	Van Biesbroeck, 1904	Van Biesbroeck, et al., 1976
16	71	Paul Baize (1901–1995)	Baize, 1923	Baize, 1994
		Philip C. Keenan (1908–2000)	Keenan, 1929	Barnbaum, et al., 2000
18	70	Frank M. Bateson (1909–2007)	Bateson, 1936	Bateson and Jones, 2006
		Jesse L. Greenstein (1909–2002)	Greenstein, 1930	Freeman, et al., 2000
		Jan H. Oort (1900–1992)	Oort, 1922	Oort, 1992
		John A. Wheeler (1911–2008)	Wheeler, 1933	Wheeler, 2003

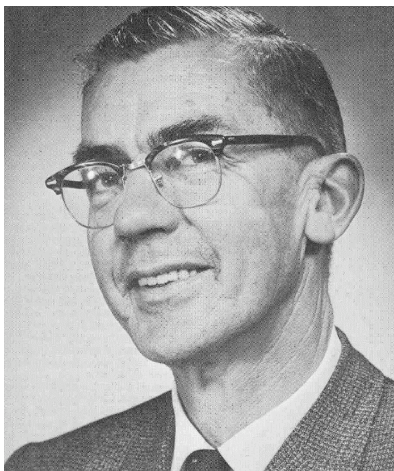


Figure 21: Frank M. Bateson (courtesy F.M. Bateson).

## 5 THE LONGEST PUBLISHING ASTRONOMERS: ALL CONTRIBUTIONS TO PHYSICAL SCIENCE

Table 3 shows the twenty-one astronomers who produced all kinds of publications relevant to astronomy or astronomers over periods of 70 to 80 years. There are six who were not on the previous list: Abetti, Baize, Bateson, Brück, Greenstein, and Öpik.

### 5.1 Seventy Years of Publications

**Jan H. Oort** and **John A. Wheeler** were discussed in Section 4.

**Frank M. Bateson** (Figure 21), like Cousins, started out as an amateur astronomer and became a professional relatively late in life. The founder of the Variable Star Section of the Royal Astronomical Society of New Zealand observed variable stars and coordinated the observations of others during a career as a businessman in the Cook Islands. He helped found the Mount John University Observatory in New Zealand and became its first director in 1963.

**Jesse L. Greenstein** (Figure 22) left the University of Chicago's Yerkes Observatory to start the astronomy graduate program at the California Institute of Technology in 1948. A spectroscopist with interests in theory and instrumentation, he explored the interstellar medium, the colors of nebulae, abundances of the elements and isotopes, and peculiar stars. He observed hundreds of white dwarf stars and determined their properties.

### 5.2 Seventy-one Years of Publications

**Philip C. Keenan** was discussed in Section 4.

**Paul Baize** (Figure 23) was a French pediatrician and hospital administrator by day and an amateur astronomer by night. There was nothing amateurish about his observations of double stars, however, and he was granted permission to use the telescopes of the Paris Observatory. Many of his later publications were short notices of orbits he computed, published in the *Information Circulars* of International Astronomical Union Commission 26 (Double Stars).



Figure 22: Jesse Greenstein in 1948 (courtesy Archival Photographic Files, apf6-04368, Special Collections Research Center, University of Chicago Library).



Figure 23: Paul Baize in 1993 (courtesy Jean-Claude Thorel).

### 5.3 Seventy-two Years of Publications

**Charles G. Abbot** and **George Van Biesbroeck** were discussed in Section 4.

**Hermann A. Brück** (Figure 24) was born and educated in Germany, where he changed fields from solid state physics to astronomical spectroscopy. After 1937 he worked at the University of Cambridge, the Dunsink Observatory in Ireland, and from 1957, the Royal Observatory Edinburgh and the University of Edinburgh, where he updated the equipment, designed and constructed scanning machines, and did precision mass spectroscopy of stars, using Schmidt telescopes. After retirement as Astronomer Royal for Scotland, he and his wife, Mary, wrote on the history of astronomy.

### 5.4 Seventy-three Years of Publications

**Charles H. Townes** was discussed in Section 4.

**Ernst J. Öpik** (Figure 25) was born in Estonia and educated in Moscow. He worked in Estonia and, for 33 years, at the Armagh Observatory in Northern Ireland. Often too far ahead of his time for his ideas to be accepted, he made early contributions to stellar structure and evolution theory, explained the structure of giant stars, and showed that spiral nebulae were extragalactic as early as 1922. He made statistical studies of meteors, comets, and asteroids and wrote a great many articles for the *Irish Astronomical Journal*, which he edited from 1950 to 1981.

### 5.5 Seventy-four Years of Publications

**Viktor A. Ambartsumian**, **George H. Herbig**, and **Fred Whipple** were discussed in Section 4.



Figure 24: Hermann A. Brück in 1965 (courtesy Royal Observatory Edinburgh).



Figure 25: Ernst Öpik (courtesy Armagh Observatory).

### 5.6 Seventy-five Years of Publications

**Giorgio Abetti** (Figure 26), who had worked in Rome and Florence, succeeded his father as director of the observatory in Arcetri, Italy in 1925. A leading researcher in solar physics, he constructed a solar tower and used it to study motions around sunspots. He wrote textbooks, monographs, and books on the history of astronomy. He held several national and international positions.

### 5.7 Seventy-six Years of Publications

**Dorrit Hoffleit** and **Theodor S. Jacobsen** were discussed in Section 4.

### 5.8 Seventy-seven Years of Publications

**Alan W.J. Cousins** was discussed in Section 4.

### 5.9 Seventy-eight Years of Publications

**Willem J. Luyten** was discussed in Section 4.

### 5.10 Seventy-nine Years of Publications

**Harold Jeffreys** was discussed in Section 4.

### 5.11 Eighty Years of Publications

**Hans Bethe** was discussed in Section 4.

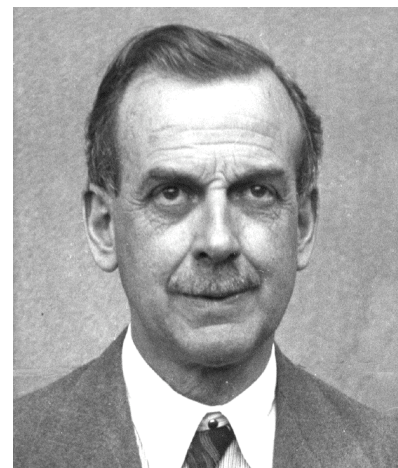


Figure 26: Giorgio Abetti (courtesy Archival Photographic Files, apf6-04366, Special Collections Research Center, University of Chicago Library).



## 5.12 Honorable Mention

Lawrence Aller, Frank K. Edmondson, Walter Haas, Gerhard Herzberg, William H. McCrea, and Antonie Pannekoek had total publication spans of sixty-nine years. Not mentioned previously are Edmondson, the Indiana University astronomer who discovered and tracked asteroids and was a leader in establishing the Association of Universities for Research in Astronomy; McCrea, the Irish/British mathematician, general relativist and cosmologist; and Pannekoek, the University of Amsterdam theoretical astrophysicist whose abundant writings on Marxist theory are not counted here.

## 6 CONCLUSIONS

Perhaps it is surprising that although all astronomers born in 1800 or later were investigated, none born before 1872 made the top lists. Of course there were fewer astronomers in the 19th century than the 20th, and life spans were generally shorter. Of those considered who were born before Abbot, the longest publishers (total list only) were John Evershed (1874–1956) with 68 years and William Thomson (Lord Kelvin, 1824–1907) with 66 years.

Those who are desirous of joining this elite group should follow three rules: (1) Start early. (2) Live long. (3) Stay active.

## 7 ACKNOWLEDGEMENTS

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