

# Fred Lawrence Whipple (1906-2004)

Fred L. Whipple, legendary 20th-century cometary astronomer, died on 2004 August 30 in a hospital in Cambridge, Massachusetts, at age 97. He had been in declining health for some years but still had remarkable mental capacity. Just a few months ago, for example, he gave an extensive oral history of his career to Ursula Marvin of the Smithsonian Astrophysical Observatory (which has been published in *Meteoritics & Planet. Sci.* **39**, Suppl., A199). Earlier taped, transcribed-but-unpublished career Smithsonian interviews of Whipple were made by Owen Gingerich some 15 years ago, by David DeVorkin in the 1970s, and by Pam Henson.

While my personal knowledge of Fred Whipple only encompasses the last quarter of his long, illustrious life, I realize that I did get to know Fred fairly well. I initially requested Marsden to write an *ICQ* obituary for Fred, because he had known Fred for twice as long as I had. But he observed that I worked with Fred quite closely, too, inferring that I should be able to put down some useful remembrances that would be unique to me. Thus, I humbly jot down some notes here, adding that some fill-in-the-blanks information comes from Marsden and others at the CfA who knew Fred; I thank DeVorkin for sending a transcript of his April 1977 interview with Whipple, from which some information about Fred's early life were gleaned.

Only in the last couple of months of Whipple's life — due to his inability to walk easily to his large corner top-floor former-Director's office, on the southeast corner of B building here at the Harvard College Observatory (a 1950s-era building that has no elevator) — were his files, books, and papers boxed up in preparation for passing the office on to another astronomer. For decades into his 80s, Whipple rode his bicycle every day the 3-or-so miles from his home in Belmont to the Observatory. His daily routine in the 1980s typically included a 1-block lunch-time walk to nearby Armando's pizzeria, where he was well liked, to get a hot sandwich.

I had the pleasure of knowing Fred for more than two decades in my tenure here at the Harvard-Smithsonian Center for Astrophysics (CfA). For a young cometary astronomer, it was a real treat for me to work alongside what are arguably the three most preeminent cometary scientists of the 20th century: Whipple, Zdenek Sekanina, and Brian Marsden (Sekanina moved to California in 1980, two years after my first arrival in Cambridge). Though I spoke with him occasionally in the years after my first visit to Cambridge in 1978, my first real dealings with Fred occurred in 1982 in connection with the *ICQ*'s first American Workshop on Cometary Astronomy, which was held at Harvard College Observatory (see the report of that AWCA by C. S. Morris 1982, *ICQ* **4**, 39). I had talked with Fred to get him to be one of the speakers, which he kindly agreed to, but late on that Saturday afternoon, I ran into Fred in a hallway in A building, and he commented on what "a great job Dan Green has done" to pull the meeting together. He was then 75, and I thought that his memory was really going, to have not recognized me there. But I assumed later that this was probably just the typical short-term memory loss that we all face as we enter our senior years, for Fred was certainly full of wonderful memory to his final days.

Not long after that first AWCA in 1982, Fred asked me to work with him on a book that the Smithsonian Institution Press (SIP) was soliciting from him as part of their series entitled "Smithsonian Library of the Solar System": a popular account of comets, in preparation for the widely heralded forthcoming 1985-1986 apparition of Halley's comet. Being some fifty years younger than Fred, I agreed to help him when he pleaded that he could not do such a book at his age without a knowledgeable assistant. My main task was to do research for various aspects of the book, including especially illustrations, but I ended up editing the entire book and writing part of it (including much of the chapter on comet discovery).<sup>1</sup> One illustration that we got for the book, that of Minoru Honda, was the topic of a short story in itself. It was well-known that Honda, who had served in the Japanese military in World War II, was not favorable to Americans, even decades after the war, and it was hard to get photographs of him. A *National Geographic* (*N.G.*) photographer had somehow managed to do so, and I found a *N.G.* article that had contained a nice photograph of Honda. So I approached *N.G.* to get the photograph and permission to republish it in our book, and they pointed me to the free-lance San Francisco photographer, saying that it was his photograph and therefore his decision. But the free-lance *N.G.* photographer wanted a huge sum of money to re-use the photograph of Honda (and we had only a tiny budget for such matters); even when I argued that an SIP book would give more favorable exposure to him as a photographer, and that we had little money for this sort of thing, he refused to lower his high fee. So I ended up getting a helpful Japanese amateur astronomer to take the photograph that we ended up using in our book, at no charge! (It's bizarre how silly people can be sometimes, isn't it? I still can't figure out the thinking of that free-lance *N.G.* photographer.)

My wife, Lina, contributed by creating the book's index. In fact, Lina's connection to Fred goes back to late 1981, before she and I even met: she was working for RAI (Italian television) out of Manhattan then as a translator and producer for a weekly science "news magazine" Italian TV show entitled "Quark", and she telephoned to arrange interviews of both Marsden and Whipple for a piece on Halley's comet that they were planning. She ended up getting both interviews, and it was during that visit to the Boston area in which she and I met.

<sup>1</sup> Fred kindly told me in the later stages of writing the book that he could not have done it without my help, and he generously requested to SIP that my name be added to his as a co-author. I was honored, but SIP balked and said that they wanted only Fred's name; the compromise was to put the words "Assisted by Daniel W. E. Green" on the title page and cover, though the cover action was somehow not accomplished.



I spent much time with Fred working on that book, which was titled *The Mystery of Comets* and published in 1985 (first in hardcover and later in paperback). As intelligent as he was, Fred never liked working with the then-new interactive computers and relied on others to help him. He wrote his manuscript out in long hand and had secretaries type it into a computer for him. He told me that he was just too old to learn this new technology. One of my memories of working with Fred in his office over a couple of years on creating *The Mystery of Comets* was his heavy smoking. Fred smoked cigarettes like a chimney — coming from that by-gone era when it seemed that most people smoked. His office always smelled of smoke even if he wasn't actually smoking. I remember marvelling on how healthy he seemed for a man in his late 70s, considering that he had smoked heavily for most of his adult life. For many years dating back to his college years, Fred had also been an active tennis player. But Fred's health started to become a problem soon after we finished that book, including a bout with pneumonia, and his physician 'forced' Fred to stop smoking. Fred continued to ride his bicycle into the Observatory until one day, evidently forgetting to take his medications, he blacked out on Huron Avenue enroute to the Observatory. Though Huron Ave. is a busy street, Fred was fortunate in that nobody hit him while on the ground.

Though he continued riding for a bit after this, a bothersome sciatica condition made Fred realize that he could no longer ride his bicycle, but he would still drive his Volvo (with the personalized Massachusetts license plate reading "COMETS")<sup>2</sup> into Cambridge. Fred remained actively engaged in research on comets until just the last few years, working especially on the light curves of comets (trying to develop an "activity index"), and he continued to consult with Marsden, me, and others in discussing his results during the last decade. The Observatory put on a big birthday bash in November 1996 at the Harvard Faculty Club to commemorate Fred's 90th birthday. Among the people who sat with Lina and me at our table at that memorable event were Gene and Carolyn Shoemaker, Brian and Nancy Marsden, and Zdenek Sekanina (Gene was killed only a few months later).

Among my strongest memories of that birthday party were Richard McCrosky's very humorous remarks about his memories of Fred. McCrosky, who at various times directed the Observatory's Prairie meteor network and its Agassiz/Oak Ridge and Mount Hopkins observatory stations, was one of the many people that Whipple brought to the CfA. In fact, by bringing the Smithsonian Astrophysical Observatory (SAO) to Harvard in 1955, Whipple transformed the HCO and the SAO into what would soon become the world's largest astronomical center, now employing some 300 scientists.<sup>3</sup> By exploiting the availability of government funds for establishing a satellite tracking system in the late 1950s, Whipple brought many new employees to the Observatory in Cambridge. In his remarks to the invited guests at his 90th-birthday party, Fred said that his philosophy in expanding the Observatory staff was to bring a lot of good minds into the fold and then to let them have complete independence to pursue astronomical problems as each scientist saw fit — with a minimum of "meddling" from any administrative people. This fostered a creative atmosphere at the Observatory and encouraged more than a few astronomers to come and stay for many years.

Whipple enticed a young Brian Marsden to come and work at SAO in 1965, upon completion of his Ph.D. thesis at Yale, rather than take a job with Kuiper (who also courted him) in Tucson. Marsden notes that many things would be very different in planetary science and astronomy if it weren't for Whipple, including the career paths of many scientists (including Marsden, and thus, myself!). When it was announced in 1964, at a Commission 6 meeting at the International Astronomical Union's General Assembly in Hamburg, that K. A. Thernöe was retiring and the Central Bureau for Astronomical Telegrams would have to leave its original home in Copenhagen, Whipple got up to say that the SAO could take on the production of the *IAU Circulars*. For four decades, the Observatory had been publishing the *Harvard Announcement Cards* as the North American version of the *IAUCs*, so there was already a staff in place for this work. And so it happened that Owen Gingerich became the first CBAT Director in Cambridge at the beginning of 1965, succeeded only three years later by Marsden. Whipple continued to build the center at Cambridge, serving as Director of the SAO during 1955-1973 and helping to fuse the HCO and SAO into the CfA in 1973.

Whipple himself started out concentrating at Harvard on meteors for the first 15-20 years of his post-graduate career. The study of meteors as atmospheric probes proved to be very important to the impending (and then fledgling) spacecraft program. Some 750 pages of Whipple's two-volume collected works (published in 1972) contain his many published papers on meteors. Though he was computing orbits of comets as a student in the late 1920s and scrutinized the Harvard plates for comets in the 1930s, Whipple really came to embrace comet research in the late 1940s, culminating in his well-known papers on his icy-conglomerate model of a cometary nucleus, in which he showed that jetting effects were causing the nongravitational effects seen in the orbit of comet 2P/Encke, and expanding this to discuss the effects of solar radiation on small interplanetary objects (Whipple 1950, *Ap.J.* 111, 375; 1951, *Ap.J.* 113, 464; 1955, *Ap.J.* 121, 750).

In the 1950s and 1960s, Whipple built up an eastern-U.S. powerhouse for planetary science — particularly for meteor and cometary astronomy — which was complementary to the Lunar and Planetary Laboratory created by Whipple's good friend Gerard Kuiper at the University of Arizona.<sup>4</sup> To take nothing away from Kuiper's work — as I have stated in

<sup>2</sup> a photograph of which (though on an earlier car) appears on page 88 of Nigel Calder's 1981 book *The Comet is Coming!* (New York: Viking Press).

<sup>3</sup> The bringing of SAO to Cambridge from Washington, DC, is discussed in numerous sources, including *Lighthouse of the Skies — The Smithsonian Astrophysical Observatory: Background and History 1846-1955* by B. Z. Jones (1965, Washington, DC: Smithsonian Institution), pp. 290ff. and *Solar System Astronomy in America: Communities, Patronage, and Interdisciplinary Research, 1920-1960* by R. E. Doel (1996, Cambridge University Press), pp. 202ff.

<sup>4</sup> See Doel (*op.cit.*). I remember once talking with Fred about Kuiper, and he told me the powerful story of how the two of them were together in Mexico City when Kuiper died in Whipple's arms of a heart attack in Kuiper's hotel room on Christmas Eve 1973. That incident had a strong effect on Fred, as shown by how touched he still was when relating the story to me many years later. Whipple had the highest regard for Kuiper.



these pages (see *ICQ* 21, 45) — the many transneptunian objects found since 1992 (giving meaning to the discovery of Pluto in 1930) were predicted to be there by Whipple and *not* by Kuiper. Whipple<sup>5</sup> and Al Cameron<sup>6</sup> (a leading planetary cosmogonist who joined Whipple and company at the CfA) conjectured separately in the 1960s that even today “there must be a tremendous mass of small solid material” between  $r = 40$  and 50 AU, and Whipple illustrated his hypothesis by showing some members of the “comet ring” as close as  $r = 30$ –35 AU and out to 50 AU (see accompanying figure). Whipple stated clearly in a 1972 paper<sup>7</sup> that his thinking on this was spawned independent of the work by Cameron and by Kuiper, and Whipple pleaded with astronomers not to forget that there might be now a detectable belt of objects beyond Neptune. Whipple’s concept may have germinated as early as the 1930s, when his undergraduate mentor at UCLA proposed just such a group of object beyond Neptune (though Whipple said no to this when asked this recently): Frederick C. Leonard (1930, *Leaflet Astron. Soc. Pacific* No. 30, pp. 121–124) questioned, “Is it not likely that in Pluto there has come to light the *first* of a *series* of ultra-Neptunian bodies, the remaining members of which still await discovery but which are destined eventually to be detected?” I have argued that the TNOs, if named after any person, should be named for Whipple and not Kuiper, because, Kuiper said that TNOs may have existed early in the solar system’s history but probably not now — and Fred kept urging astronomers in print and at meetings to not forget to look for the elusive objects.

Whipple never considered Kuiper to have stated that there was currently a region of TNOs waiting to be discovered.<sup>8</sup> It is very strange, indeed, that Whipple would omit mention of something so significant (were it true!) as the Fernández/Duncan-purported claim that Kuiper should be credited for coming up with the idea that TNOs exist. After all, Kuiper was a close friend of Whipple’s, and friends in a small field such as planetary astronomy not only know what each other is doing and has done, but they would take care to credit each other where appropriate. Fred never credited Kuiper with what Fernández, Duncan, and their successors credited to Kuiper — for good reason!<sup>9</sup> Fred also told me that he always thought it to have been ridiculous that the astronomical community called Pluto a major planet.<sup>10</sup> Of course, he had intimate dealings with it — having been among the first to compute orbits for it upon its discovery in 1930, while he was an astronomy graduate student at Berkeley, and this showed that Pluto’s orbit was more like that of a minor planet or a comet than a major planet (and which, combined with its brightness at such a large distance, suggested a very small size for Pluto).

Whipple was also instrumental in establishing a group to support early astronomical satellites at Cambridge, and he was involved heavily in the observation program at HCO’s Agassiz Station (later SAO’s Oak Ridge Observatory) and was key in creating SAO’s observatory at Mount Hopkins (in southern Arizona), now named the Fred Lawrence Whipple Observatory. In the process of looking at survey plates taken at Agassiz Station (located some 40 km west of Cambridge, where light pollution decades ago was minimal), Whipple found the six comets named for him, including 36P/Whipple. Comet C/1942 X1 (Whipple-Fedtko-Tevzadze) became the brightest of his comets, reaching total visual mag  $\approx 3.5$  in February 1943. Also, minor planet (1940), discovered in 1975 at Agassiz, was named for Whipple. He received numerous other honors, including medals awarded by the National Academy of Sciences, the Royal Astronomical Society, the U.S. Air Force (for his contribution to radar countermeasures during and after World War II), Presidents Harry Truman and John F. Kennedy, and the Smithsonian Institution.

Whipple was born, evidently on his parents’ farm near the small town of Red Oak, Iowa, some 50 miles southeast of Omaha, on 1906 Nov. 5. His early schooling in Iowa occurred in a one-room schoolhouse that had generally fewer

<sup>5</sup> 1964, *Proc. National Acad. Sci.* 51, 711; 1964, *A.J.* 69, 563.

<sup>6</sup> A. G. W. Cameron 1962, *Icarus* 1, 13; 1978, in *The Origin of the Solar System* (ed. by S. F. Dermott; Chichester: John Wiley and Sons), pp. 61ff.

<sup>7</sup> in *The Motion, Evolution of Orbits, and Origin of Comets* (ed. by G. A. Chebotarev *et al.*), p. 401.

<sup>8</sup> The current-day myth that Kuiper predicted the TNO belt observed today was apparently begun erroneously with a much-cited 1980 paper by Julio Fernández (*MNRAS* 192, 481), in which Fernández unfortunately appears not to have done very extensive searching of the literature on the matter (though he did more than most others that followed him). The flood gates apparently opened in earnest due to the paper by Duncan *et al.* in 1987 (*A.J.* 94, 1330); prior to that, authors actually looked at the earlier papers, with proper credit on theorizing about TNOs going to Cameron and Whipple [*e.g.*, Hamid *et al.* (1968, *A.J.* 73, 727), Marsden (1974, *Ann. Rev. Astron. Astrophys.* 12, 1), Eneev (1980, *Sov. Astron. Lett.* 6, 163), Bailey (1983, *MNRAS* 205, 47P)]. The real problem was that Fernández (and, thus, the authors following Fernández’s lead without checking to see what Kuiper actually wrote) did not look beyond this one early paper that Kuiper had written on the speculations about the origins of the solar system for a general book, in which Kuiper said precious little about the topic at all! That Kuiper’s thoughts on a region of small bodies beyond Neptune were very minor parts of Kuiper’s work is reflected in the powerful lack of citing Kuiper on this topic by most other pre-1987 authors, such as Cameron, Whipple, and T. Yamamoto (1984, *A.A.* 142, 31). When Kuiper was cited on this topic prior to 1987 (*e.g.*, Biermann and Michel 1978, *Moon and Planets* 18, 447), it was in reference to his placing comets as having formed originally at or beyond Neptune, without comment on Kuiper’s stance on the evolution of the placement of those original comets. Furthermore, none of his obituary writers — mostly contemporary planetary scientists who should have known the situation well — made any mention to Kuiper speculating on objects in a region just beyond Neptune, despite including lengthy lists of notable accomplishments by Kuiper in his planetary-science career [see Cruikshank 1974, *Sky Telesc.* 47, 159; Owen and Sagan 1974, *Mercury* 3(2-3), 16; Whitaker 1974, *Physics Today* 27(3), 85; Sagan 1974, *Icarus* 22, 117; Anonymous 1974, *Nature* 248, 539]; indeed, though numerous of Kuiper’s significant publications were cited in the obituaries, there is no mention of Kuiper’s chapter in Hynek’s book that is so highly cited by “Kuiper-belt” proponents today.

<sup>9</sup> See Whipple’s discussion on theorizing about comets beyond Neptune in his papers and in his books *Orbiting the Sun* (1981, Harvard University Press, pp. 298ff) and *The Mystery of Comets*.

<sup>10</sup> His views were put into print, as in *Orbiting the Sun*, p. 298, where he surmised that Pluto and Triton are “effectively large comets”.



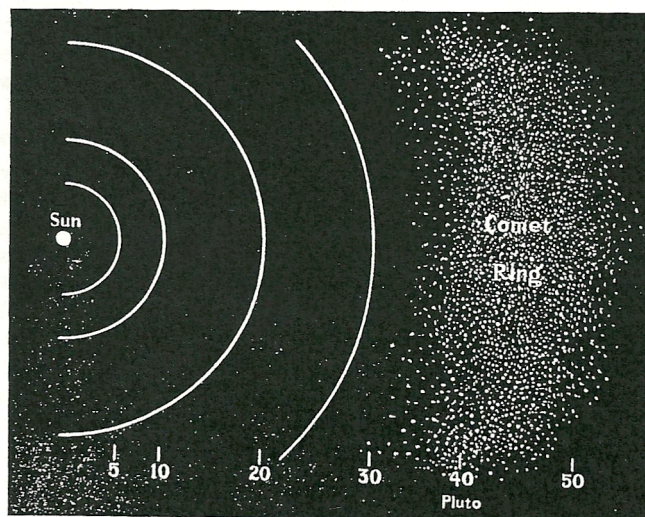
than eight students for grades 1-8 at any one time. After 3.5 years at Emerson High School, Fred's family moved to Long Beach, California, when he was 15, where his father became a grocer. Fred started college at Occidental College near Pasadena, before transferring to the University of California, Los Angeles, from which he graduated with a major in mathematics. His astronomy professor at UCLA, Leonard, encouraged Fred to do graduate work in astronomy. After obtaining his Ph.D. at the University of California at Berkeley, Fred's parents were not very happy with his choices of leaving the Presbyterian school (Occidental) and going into astronomy; as he told Devorkin that he "was the type of youngster . . . in those days" such that his parents "knew it was futile to argue with" him: "When I'd made up my mind to do something, I went ahead and did it, and there wasn't any argument about it." Whipple recalled then that his teaching fellowship at Berkeley paid him \$600 for nine months, which he said was plenty for him to live on in 1930.

Fred Whipple accepted an offer in 1931 to serve as head of the observing program at HCO. Upon choosing to work at Harvard over Lick Observatory (where he also had a job offer), Whipple told DeVorkin: "I made a decision then that I would rather be . . . a small frog in the big puddle than a big frog in the little puddle", saying in 1977 that he was happy at Harvard. In the 1930s, the Harvard astronomy teaching load fell mostly to Whipple, Bart Bok, Donald Menzel, and Cecilia Payne. He held teaching posts on the Harvard faculty for some 45 years, eventually being made Phillips Professor of Astronomy at Harvard University for some years until his formal retirement in 1977. Whipple never really wrote an autobiography, as many elder astronomers do for publications such as *Annual Reviews of Astronomy and Astrophysics*. *The Mystery of Comets* is possibly the closest thing to an autobiography of him, in which he discusses the development of cometary science in the 20th century from his perspective (and including much of his own input into the field); a more technical assessment of the same concept was given as the Henry Norris Russell prize lecture to the American Astronomical Society in January 1988 (published as Whipple 1989, *Ap.J.* **341**, 1). In my hours spent with Fred over the last 20 years, there were three names in cometary science that he mentioned over and over as astronomers whose work and friendships he greatly admired and respected — Ernst Öpik, Sekanina, and Marsden.

Whipple occasionally wrote for the *ICQ*, as with his review of the January 1984 meeting on "Ices in the Solar System" in Nice, France (*ICQ* 6, 35). I was pleased that Fred wrote the Foreword to the *ICQ*'s 1997 *Guide to Observing Comets*. He continued to be rather active in research, though at a much slower pace, in the 1990s. He continued to read over the *ICQ* and extract magnitude data for his work on a comet-activity index based on comet brightness, and he maintained a large handwritten card file in his office of orbital and photometric data on comets. Fred regularly commented to me that it was such a pain getting older; he regretted that his body was giving out on him while his mind was still pretty strong. The physical ailments of the last decade or two clearly (which were mainly problems associated with old age) made him very unhappy. But Fred was always eager to see the ongoing developments in cometary astronomy — especially those wonderful images and results from the spacecraft that have flown by comets in recent years. We had all hoped that Fred would live to be 100 and that he could enjoy another big birthday bash. But his ailments are now at an end, and we are fortunate to have had him in our midst for so long. Cometary astronomy will always owe a large debt to Fred Whipple.

Daniel W. E. Green

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Fred Whipple's "Comet Ring" figure, depicting his vision of a belt of comets orbiting beyond Neptune (whose orbit is drawn as the outermost arc, closest to the "Comet Ring"). Note that Pluto's orbit is not depicted, in line with Whipple's consideration of Pluto as a member of the transneptunian belt of comets. This figure was published by Whipple in at least two places: in 1964, in *Proc. [U.S.A.] National Acad. Sci.* **52**, 585; and in 1972, in *The Motion, Evolution of Orbits, and Origin of Comets* (ed. by G. A. Chebotarev et al.), p. 401.