Stuart H. Perry’s contributions to meteorite collection and research, 1927–1957

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Abstract—Stuart H. Perry (1874–1957), an influential Michigan newspaper editor and publisher and a vice president of the Associated Press, developed a passionate interest in collecting and studying meteorites in the 1920s and 1930s. Firmly believing that meteorites belong in great museums where they can be properly investigated, he generously donated his meteorites to various museums after he finished his own study of them. He had a sincere interest in the National Collection of Meteorites, and donated 192 specimens—mostly irons—to the U.S. National Museum; these constituted some of the most important meteorites in its collection, and moved iron meteorites to center stage, a position still occupied. By applying current metallographic methods to the study of iron meteorites, Perry directed scientists to a powerful new research tool, which led to major advances in our understanding of meteoritic irons and helped give rise to a new field within planetary sciences. His groundbreaking monograph The metallography of meteoric iron served as a standard reference collection of metallographic photomicrographs of iron meteorites for more than 30 years. It remained an insightful and useful work on the structure of meteoritic iron until improved binary and ternary phase diagrams in the Fe-Ni(-P) system allowed a more detailed treatment of the formation of iron meteorites. Perry received many honors for his work, and held office in the Meteoritical Society, serving as a councilor from 1941–1950, and as a vice president from 1950–1957.

BACKGROUND

Stuart H. Perry (1874–1957) was born in Pontiac, Michigan, on October 13, 1874, and developed a keen interest in natural history early in his teens. At age 14, his father bought him a piece of the Toluca, Mexico, meteorite. This became his “Specimen No. 1,” which he treasured throughout his entire life (Perry 1955b). He also had a keen interest in fossils, and at age 15 precociously presented a paper on rhizopods before the American Microscopical Society (Henderson and Perry 1958).

Perry attended the University of Michigan, where he studied geology, chemistry, and zoology, graduating in 1894. He married Maude Caldwell, a fellow student, in October, 1895. Maude Caldwell Perry went on to become an accomplished poet, whose poems were characterized by their “obliqueness and classical restraint, their delicate and unobtrusive rhythms, and their enigmatic identification of image with meaning.” Some of them are significant representations of their genre, and are still found in recent poetry anthologies (Bennett 1998).

Following his undergraduate studies, Perry graduated from the University of Michigan Law School in 1896, and practiced law in Detroit for five years. Then in 1901 he decided to enter the newspaper field. After working at various newspapers in Michigan for a half-dozen years, he purchased an interest in The Adrian Daily Telegram in 1907, taking on the positions of editor and publisher. A few years later he purchased an interest in The Monroe Evening News, becoming its vice president. Perry’s work on these two well-known Michigan newspapers was successful and highly regarded, and he was elected vice president of the Associated Press in 1921. He and his wife led comfortable lives, spending winters in Tucson, Arizona, and summers in Newagen, Maine. (Fig. 1)

RELATIONSHIP WITH THE U.S. NATIONAL MUSEUM

In the 1920s and 1930s, Perry developed a passionate interest in collecting meteorites. Within a short time, his interest led him to initiate contact with the U.S. National Museum (now the Smithsonian Institution’s National Museum of Natural History) in Washington, D.C. Perry’s first
contact with the museum was in 1927, when he sent a recently obtained meteorite (Seneca Township, Michigan) to George P. Merrill (1854–1929), the head curator of geology, for analysis. By that time, Merrill was a major figure in Smithsonian administration, and one of the nation’s most highly regarded scientists. Meteorites were one of his earliest and deepest interests—he published the first three of his approximately 80 papers on meteorites in 1888 (the same year Perry received his Toluca specimen)—and carried out detailed field work at what is now known as Meteor Crater, Arizona, in the early 1900s that helped establish its meteoritic origin.

Merrill took a keen interest in building up the Smithsonian’s meteorite collection, and under his aegis it grew steadily both in terms of number and quality. When Perry sent Merrill his Seneca Township, Michigan, meteorite for analysis, Merrill informed Perry that the museum was restricted to only work on specimens represented in its collections, and therefore asked him if he would allow the museum to cut off and keep a small piece. Perry (1927) readily agreed: “By the way, what did you say to me about cutting it in two and giving me half, or something like that? . . . A Solomon’s judgment of that sort might make everybody happy.” Perry also informed Merrill that he was thinking of eventually donating the entire meteorite to either the University of Michigan (his alma mater) or the U.S. National Museum.

The prospect of adding the entire specimen to the National Collection obviously pleased Merrill. Only five months earlier, he had been in Europe to attend the 14th International Geological Congress at Madrid “and study . . . the collections, particularly of meteorites and minerals in sundry foreign museums” (Merrill 1926). He was strongly impressed with the collections at the natural history museums in Paris, Vienna, and London, and realized that their meteorite collections were far superior to that of U.S. National Museum. Merrill felt this was due to the fact that “foreign governments take a more active interest in their museums than does our [sic] and money is furnished with which to purchase.” With perhaps just a tinge of self-interest, he encouraged Perry to pursue his meteorite-collecting hobby and wished him luck.

Perry and Merrill carried on a small but steady correspondence over the following three years. Perry usually initiated the exchange, sending Merrill a suspected meteorite for analysis; discussing various technical matters, often relating to the structure of iron meteorites; and enquiring about reasonable purchase prices for meteorites he had a lead on and was considering buying. In one exchange, Merrill (1928) noted with a smile that Perry’s aggressive attitude towards meteorite acquisition reminded him of his “friend [Harvey H.] Nininger of Kansas,” and that he admired his “pertinacity.” In reading this correspondence, one gets the impression that they enjoyed their interactions; these were two men of maturity, intelligence, and wit who were comfortable in the upper reaches of professional and administrative society in general and with each other in particular. Had Merrill been twenty years younger, it is quite likely that a close personal bond would have developed between them.

In a letter of May 1928, Perry (1928) clearly explained to Merrill exactly what he was trying to accomplish with his meteorite collecting program. He made it clear that he was not collecting meteorites merely as curios, or from any commercial motive. Rather, he felt strongly that since they were objects of great scientific value, they belonged in museums where they could be studied by trained scientists. It was his intention now to donate his meteorites to the University of Michigan: “Having got two degrees and found a wife there, after which they were good enough to give me an honorary degree, I naturally have a very strong affection for the institution, and on learning how very meagre their collection of meteorites is I thought they ought to have something worth while.” As he explained elsewhere (Perry...
decades. His aim was “to get fine representative specimens of the various classes of meteorites, so as to make the collection of the greatest possible educational value for one of its size.”

A year later, Perry (1929) informed Merrill of the welcome news that since the University of Michigan “has made no special effort in the study and collection” of meteorites, he had decided to donate some of his collection to the National Museum: “I think that any specimens of outstanding importance—more particularly undescribed meteorites—would better go to Washington. The same might be true of falls not represented at all in the Museum collection.” Merrill was obviously pleased with the prospect of adding specimens to the National Collection, and he certainly would have been delighted by the extent of Perry’s munificence that extended over a period of nearly three decades.

But Merrill died in August, 1929, only three months after learning of Perry’s plans. The job of looking after the U.S. National Museum’s mineral collection and collection of meteorites (about 840 specimens) fell to William F. Foshag (1894–1956), curator of the Division of Mineralogy and Petrology. Foshag was knowledgeable about meteorites, and was involved—as time permitted—in their scientific study, publishing the first of a half-dozen papers on meteorites in 1935. He also organized the Shepard and recently acquired Canfield and Roebling mineral collections, each containing a suite of meteorites; oversaw at that time the endowment from the Roebling Fund, which was used to purchase minerals and meteorites; handled all the meteorite-related correspondence (the lion’s share of which was with collector/dealer Harvey H. Nininger); and prepared the official meteorite accession records and catalog entries.

Foshag also took a keen interest in growing the meteorite collection. As he explained (Foshag 1935) to an individual with whom he was negotiating a meteorite purchase: “We are trying here to build up our collection to where it will be the best in the world. At the present time we are fourth in the number of falls, being exceeded only by Field Museum, the British Museum, and the Vienna Museum. In quality of material, however, I think we could easily rank third as we do not go in for those small fragments that are worthless for scientific or display purposes and apparently are only added to collections so that the name can be entered into the catalogue.” It is therefore obvious that he would want to continue the friendly relationship that had been established with Perry.

PARAGOULD METEORITE

Perry’s first written exchange with Foshag took place in February 1935, when he wrote (Perry 1935) to say he wanted to put into place the program that he had earlier suggested to Merrill: “In our conversation last month you will recall that I expressed my intention of presenting a number of meteorites of outstanding importance to the Museum.” To inaugurate that program, Perry informed Foshag he wished to now donate Specimen No. 22 of his collection, his Paragould meteorite.

The Paragould, Arkansas, meteorite fell on February 17, 1930 and an 80 lb (36.3 kg) individual was recovered within hours. After it was exhibited at the local high school for a short time, Perry purchased it for his collection. A second, much larger (370 kg) individual of the same meteorite was recovered four weeks after the first, and was purchased by Nininger. The subsequent sale of this at a handsome profit to Stanley Field—who then donated it to the Field Museum of Natural History in Chicago—played a crucial role in helping Nininger launch his new career. Perry (1930) felt that the value of his specimen had been reduced by the discovery of the larger mass, but he strongly believed it nevertheless was “still . . . of considerable scientific interest and it ought to be in a museum.” Foshag (1937) fully agreed: “[It] promises to be of more than usual interest and we expect it to prove one of the most important single meteorites that has been added to our collection for quite some time.”

Foshag also realized that this gift marked the beginning of Perry’s serious relationship with the Smithsonian. In a Memorandum (Foshag 1937) to Alexander Wetmore (1854–1929), the director of the museum who was also assistant secretary of the Smithsonian Institution at that time, he observed: “You may recall that some time back I transferred to the official files a letter from Mr. Perry in which he indicates a number of complete falls which he controls and which he intends eventually to come to this Museum. I believe there is a good possibility that Mr. Perry will become an important contributor to our collections.”

In this regard, Foshag was following in the footsteps of other scientists at the Smithsonian in his day and before who, due to the limited funds at the museum’s disposal, frequently looked to outside sources as a possible means of enhancing their holdings (a practice which continues today, and is expected to become increasingly important in the future). The federal government itself was one source the Smithsonian turned to, receiving from it objects that had been collected on various surveys and expeditions, such as the Coast and Interior Survey, Lieutenant Charles Wilkes’ United States Exploring Expedition (1838–1842), and the U.S. Geological Survey. As well, the Smithsonian had relied since its beginning upon a cadre of careful and disciplined amateur collectors (Rivinus and Youssef 1992). For its part, the Smithsonian could offer these collectors free authentication and identification services, a measure of recognition, and either an exchange of objects or a small amount of compensation. These initiatives worked well, and continued throughout the 1930s, 1940s, and even early 1950s, a time when there was considerable retrenchment at the Smithsonian. The museum’s holdings of natural history objects—especially fossils—grew dramatically through such measures. But this was not the case with meteorites, which were much rarer than fossils. Perry’s offer to donate
meteorites to the National Collection was therefore timely as well as generous.

In the transaction correspondence accompanying Perry’s donation, he clearly made known two of his major desiderata: 1) that the meteorite be appraised so he could claim a legitimate tax deduction, and 2) that it be adequately described scientifically. As a graduate of the University of Michigan Law School and one who had practiced law for five years before entering the newspaper business, Perry (1936) had a clear understanding of the legal implications of his gifts. Fearing that “An uninformed revenue agent would be very likely to question my figures if I claim to have made such a large gift, and the gift consists of a single stone whose value he has not the remotest idea,” he requested the museum provide him with an official appraisal of the meteorite’s value.

Foshag acceded to this request, and placed Paragould’s value at $2500. Here, and in his appraisals of Perry’s subsequent donations, Foshag (1939) based his figures on the per gram price of similar meteorites offered to the museum by mineral dealers, such as Ward’s Natural Science Establishment. If that was not possible, Wülfing values, in which a meteorite’s exchange value was determined by the amount of preserved material of the meteorite, the total weight of the petrographic group in which the meteorite was classified, and the number of owners of that particular meteorite, were utilized (Foshag 1940). The appraisals that Foshag provided were fair (usually even conservative), and were approved and transmitted to Perry in letters from Wetmore. They therefore reflected Foshag’s knowledgeable opinion and sound institutional judgment. This method of appraisal continued for nearly two decades, till 1953, when the Smithsonian’s counsel advised museum directors that appraisals of the value of gifts to the institution should no longer be made by Smithsonian staff (Foshag 1953).

Perry’s second desideratum (Perry 1937) was that a scientific examination of the Paragould meteorite be undertaken: “That remarkable fall should be fully described by somebody, but I don’t know who will do it. Neininger [sic] probably knows more about the fall than anyone else but I do not think he would undertake the petrographic description . . . Now that the museum has the second mass, perhaps it might undertake the task.” Wetmore (1937) assured Perry this would be done: “Later on when Mr. E.P. Henderson, Assistant Curator of Physical Geology, returns from Russia where he was attending the Seventeenth International Geological Congress as Representative of the United States and the Smithsonian Institution, he will take up the study of the meteorite.”

Edward P. Henderson (1898–1992) joined the Museum staff in 1929, shortly after Merrill’s death. Originally placed in charge of the economic geology collections, his interest soon turned to meteorites. In 1934—the year preceding the museum’s acquisition of the Paragould meteorite—he
became a charter member of the Society for Research on Meteorites (the precursor of the Meteoritical Society), and published his first article on meteorites (Henderson 1934). As well, he had been observing from the sidelines how Foshag and Wetmore were handling the museum’s meteoritical dealings, and had helped out in the curation of meteorites under Foshag’s direction. As Foshag became more deeply involved with mineralogical and geological concerns and related field work in the mid-1930s, Henderson became more deeply involved with the meteorite collection (Fig. 2).

Henderson did not undertake a scientific examination of the Paragould meteorite, however, because he had not yet developed sufficient technical competence to do so. Nevertheless, he was soon drawn into working with Perry. Over the next few years, as Perry donated several more meteorites to the museum, Foshag handled the curatorial aspects and accessioned them into the collection, and Henderson provided the cutting and polishing services and did chemical analyses of them. As Perry began corresponding with Henderson about the meteorites he was donating, a friendly if somewhat formal working relationship developed between them. But as they worked more and more closely together on building up their respective meteorite collections and on various research projects, their relationship blossomed over the next two decades into a genuinely warm and very productive one.

**LAFAYETTE METEORITE**

A good example of the kind of donation that Perry later made to the museum is the Lafayette, Indiana, meteorite, an exquisite ~800 g oriented specimen that was shaped into a dome during its atmospheric passage, with streamers of fusion crust descending from its apex (Fig. 3). It had first been recognized as a meteorite by Oliver C. Farrington (1864–1933), the curator of the meteorite collection at the Field Museum in Chicago, while classifying some rocks and minerals for the Department of Geology at Purdue University in Lafayette, Indiana, sometime around 1929. Prior to that, the meteorite had been regarded as a glacial boulder or pebble, and its surface markings were thought to have been scratched on it due to its glacial origin.

Farrington died in 1933, before he could publish a description of the meteorite, and no notes on the specimen were found amongst his surviving papers. The first published description of the meteorite was given by Nininger in a *Popular Astronomy* article published in 1935. Here, Nininger (1935, p. 404) related that a Purdue student “reported that a number of years ago while fishing at the edge of a little lake he was frightened by the falling of a stone at a distance of only a few feet from him. This stone he later dug from the soft mud and found it to be ‘shaped just like a corn pone’ and of about the same size.” For a time he kept the stone, but then brought it to the university. But he could not be found later, and so neither Nininger nor anyone else could ever corroborate the story.

On the surface, this discovery story sounds very unlikely. Lafayette closely resembles Nakhla, a shower of individual stones that fell near Alexandria, Egypt, on June 28, 1911 (one of the falling stones reportedly striking and killing a dog). The close resemblance between them led some meteoriticists, e.g., the Smithsonian’s Brian Mason (1966) and Purdue’s Mike Lipschutz, to suspect that Lafayette might really be a fragment from the Nakhla shower. Lipschutz suggested that perhaps a Purdue faculty member had acquired the stone in Egypt and brought it back to Lafayette, where it somehow found its way into the university’s museum (Filipic 1982). But the finding of another nakhlite in Brazil in 1958 and others afterwards made it easier to believe that they were distinct. Today, most meteoriticists consider the Lafayette individual and the Nakhla individuals to represent separate falls. They are members of the SNC group which serve as prototypes of this subgroup of achondrites, generally believed to be from Mars.

Henderson heard about the meteorite, and in 1948 asked Perry if he would be willing to acquire it, and donate it to the U.S. National Museum. Perry (1948) agreed to do so, but his efforts were unsuccessful, and he sadly informed Henderson “I wrote . . . the best letter I knew how to write. I can’t do any more. Guess we shall have to forget it.” But then in 1951, Henderson heard from Prof. Paul Guttormsen at Purdue that the university would now be willing to part with the meteorite. Henderson (1951a) immediately wrote Perry that “This is our chance.” Henderson wrote Guttormsen, asking him if he would rather arrange for a meteorite exchange or an outright purchase.

Guttormsen replied that since the university had all the
specimens needed for the teaching of its geology courses and had a storage problem, it didn’t want any more meteorites. But he suggested that perhaps the Smithsonian could purchase some needed equipment in exchange for the meteorite, and asked Henderson for an estimated value for the specimen. Henderson suggested a figure of around $500, and an agreement was eventually struck. In June, Henderson (1951b) wrote Perry: “Have you got the letter I wrote about the Lafayette meteorite? . . . That will be a wonderful prize, and for it you should get a darn good value for tax purposes.”

Henderson (1951d) claimed that the average value for six chondrites which Perry had recently donated to the museum was $0.69/g. But the Lafayette was a much rarer achondrite, “and this fact alone makes it worth ten times as much.” And “Since this specimen also shows flight markings, has an unusual crust, and we have the most important specimen, it is worth a bonus of at least 25% above its basic value.” He therefore set a figure of $5,500 for the meteorite’s value. One can only wonder what kind of valuation would be put on the Lafayette meteorite today!

Henderson’s reluctance to cut the Lafayette meteorite is misleading if not seen in its proper context. In the first place, it should be noted that the Smithsonian did not acquire the complete ~800 gram meteorite, but rather the main mass, which had by then been reduced to 637 grams. Although the history of this meteorite is somewhat sketchy, the available evidence suggests that at least three pieces had already been removed from it by the time it was accessioned by the Smithsonian. Field Museum of Natural History records indicate that a slice of 123 grams had been presented to it as a gift from Purdue University in 1929; and according to Nininger (1935, p. 408), a “complete section” was in his personal collection, and a small sample had been sent to a scientist at the Colorado School of Mines for examination.

Secondly, Henderson was a firm believer in the necessity of cutting meteorites in order to properly study them. On one occasion, for example, when a professor of English at the University of Arkansas balked at the idea of having a meteorite he had donated to the university cut, Henderson (1984, p. 73) explained to him that a meteorite was like a valuable rare book, but one that remained useless unless it was opened up and “read.”

Finally, Henderson (1963) realized that the analysis of meteorites had progressed to a point where a great deal of valuable information could be gotten by employing much smaller samples than required earlier, and by means of nondestructive testing: “. . . by being a little reluctant to pass out pieces [of very rare meteorites such as the Lafayette], I have now reached the point where we can get a lot more information out of a lot less material than we could several years ago. Therefore, I reason that by dragging my feet science has not been hindered after all.” In this light, he felt his reluctance to further cut the Lafayette specimen was both prudent and justified.

**SYLACAUGA METEORITE**

The Sylacauga, Alabama, meteorite is another specimen which was purchased by Perry for the Smithsonian collection. On November 30, 1954, at 12:50 P.M. an 8.5 lb (3.86 kg) meteorite crashed through the roof of a house in Sylacauga, Alabama, bounced off a radio, and hit Mrs. Hewlett Hodges, who was taking an afternoon nap on her couch. This was the first definitive case of a meteorite striking a person, and it received a great deal of attention in the popular press (Fig. 4).

Henderson (1954a) wanted to obtain the meteorite for the National Collection, and wrote Foshag, who was now the head curator of the Department of Geology: “This naturally is an important sample for any collection of meteorites and probably we will only have one chance to bid so what amount will you approve . . .” Foshag (1954a) answered “Depends upon the kind. Say up to $100/lb?” This did not at all please Henderson, who thought it was far too low to be successful. Ensuing events made matters worse, and seriously strained relations between the two men.

Henderson had made arrangements with the Air Force, which had taken the meteorite for examination, to turn it over to a congressman from Alabama, who in turn was going to turn it over to him for examination and appraisal. As Henderson (1954b) explained to Perry, “This has taken a lot of fancy foot work to get possession of the meteorite . . . It was my idea of getting a politician interested and he liked the idea of getting his name in the papers and doing something for the people in his district. Strange how such things work.” But such an arrangement angered Foshag (1954b), who wrote a sharp letter to Henderson informing him that only the secretary of the Smithsonian could deal with Congress, and that “This regulation is strictly insisted upon by the Director [of the museum] and the Secretary.” When Foshag later heard that Henderson had nevertheless received the meteorite from the congressman, he was furious and demanded an official report be sent both to him and the director.

On his part, Henderson (1954c) was furious that Foshag had made statements to the press that the Smithsonian would not pay more than $100/lb for the meteorite. He pointed out to him that it was, in his opinion, extremely poor policy to make
Stuart H. Perry’s contributions to meteorite collection and research, 1927–1957

public statements about the value of meteorite specimens as they might prove embarrassing to persons considering making donations to the Smithsonian: “I hope your public statement does not backfire on a good friend of mine and of the Institution [Perry]. There is a good chance that it could, and if it does, will you be man enough to eat your words? . . . I am inclined to consider your statement of values of meteorites as the outstanding blunder of the affair.”

While this heated dispute was taking place, a spirited bidding war for the meteorite began when Mrs. Hodges, speaking through her attorney, announced she would sell the meteorite to the highest bidder. In less than a week, she received more than seventy-five offers, with one reportedly in excess of $5000. But since meteorites legally belong to the person on whose land they fall, not to those who find them, a problem arose when the person who owned the house that Mrs. Hodges rented claimed ownership of the meteorite for herself (Schmitt 2002). Although it is not clear whether or not this case ever went to court, or who finally obtained title, the 8.5 lb meteorite eventually ended up at the Alabama Museum of Natural History.

A week after the fall, on December 7, news broke (Washington Star 1955) that a second specimen of the Sylacauga meteorite, weighing 3.75 lbs, had been found by a farmer and his stubborn mule, who apparently shied when it saw the new object on the ground. As the farmer explained: “That mule just stopped and wouldn’t go on till I climbed out of the wagon and threw that black rock in the ditch. I didn’t know what I threw away until the next day when I read about Mrs. Hodges getting hit. I went back and took it out of the ditch. Now, I’m going to buy that there mule the biggest dinner it will eat.”

Fig. 4. The Sylacauga, Alabama, meteorite crashed through the roof of a house, bounced off a radio, and forcefully struck Mrs. Hewlett Hodges, who was napping on her couch at the time. This is the only definitive case of a meteorite striking a person, and it received a great deal of publicity. Henderson very much wanted to obtain this meteorite for the National Collection. Although this could not be arranged, a second specimen of this meteorite was obtained, once again through Perry’s generosity. This photograph, showing a physician examining the bruise on Mrs. Hodges, appeared in Life magazine on November 30, 1954.
When Henderson learned through the finder’s attorney that this specimen was being put up for sale, and that a clear title to it could be obtained, he turned his efforts towards acquiring it for the museum. Once again he asked Foshag if he would approve its purchase, and if so, what amount was he willing to offer. Foshag (1955a) guardedly replied: “Funds from Roebling fund [the chief Smithsonian fund for meteorite acquisitions at the time] are available. You suggest the price.” Apparently he did not, for a week later Henderson wrote back that the owner of this specimen was thinking in terms of $1000–$1250. Although that was higher than he thought it could be gotten for, once again he asked Foshag how much money he would approve for its purchase. When Foshag (1955b) replied “Since this is another chondrite, and not the famous stone [i.e., the one that hit Mrs. Hodges], I would suggest $100/lb.,” Henderson decided to turn elsewhere.

Henderson (1955a) quickly wrote Perry, and explained to him the scientific value of the specimen: “This is a chondrite, and is fresh and unlike 99.999999% of the meteorites it has so far not been contaminated with terrestrial materials. It is large enough to be important, fresh as can be asked and should be important for many delicate investigations that are not possible on most meteorites.” He further explained that the owner was thinking in terms of $1000 for the specimen, but suggested that if Perry were willing to purchase it for the Smithsonian, he should make an offer of $750 (i.e., two times what Foshag was willing to offer). Perry did so.

When this offer was accepted and the deal closed, Henderson (1955b) explained to Perry how happy he was to have this meteorite for the national collection, and that there were reasons other than strictly scientific ones behind this: “There was so much publicity about the Alabama fall, more than any meteorite I ever heard about, and in most of these news releases the National Museum was mentioned [as wanting a sample]. If we failed to get the specimen, it would have been bad for us, so this became not only an important specimen, but one which we had [to have] to prevent backfiring on us.”

THE METALLOGRAPHY OF METEORIC IRON

As discussed above, Perry became known as a meteorite collector in the late 1920s, when he was in his mid-fifties. His first meteorite publication followed promptly (Perry and Wylie 1930), a note in *Popular Astronomy* on the Paragould chondrite he had recently obtained. Then in 1933 he produced three additional notes about two meteorites in which he was also personally involved, the Cherokee Springs, South Carolina, and Athens, Alabama, chondrites (Perry 1933b, 1933c; Wylie and Perry 1933). In the following year, he published his first substantive meteorite paper, a description of Cherokee Springs (Perry 1934a).

Throughout these activities of the early 1930s, Perry augmented his stature as a meteorite collector by additionally establishing himself as an independent iron meteorite researcher. Although he lacked graduate-level training in science and had never worked as a scientist, he had received a good technical education at the University of Michigan, which helped him to develop considerable skill in his investigations. Graduate students in metallurgy at the university, probably less than 50 miles from his home in Adrian, Michigan, served as his research assistants, preparing sections for examination and taking photomicrographs.

In 1934, Perry published a highly original paper on the San Francisco Mountains, Arizona, iron meteorite (Perry 1934b). This was his first description of an iron meteorite, and it was published in the *American Journal of Science*, then the leading U.S. journal for meteorite research. In this study, Perry took the novel approach of applying modern metallographic methods to the investigation of iron meteorites. In a later work (Perry 1944a, p. iii), he explained how he was led to this approach:

"A systematic treatment of the metallography of meteoric iron was prompted by the author’s experience in describing an iron meteorite [San Francisco Mountains] by metallographic methods somewhat more than a decade ago. He was then unable to find that any new meteorite had been so described, and the literature bearing upon the subject was scanty. It consisted chiefly of the writings of iron and steel technicians in the books and periodicals of that trade and a few contributions in the proceedings of scientific bodies. The work done by such investigators upon meteoric iron being incidental to their studies of artificial iron and other metals, they naturally passed over many matters of interest to students of meteorites as such. Also, in their investigation of meteoric iron they did not utilize fully the methods of research that were in common use in the study of artificial metals.

This led him to supplement his iron meteorite studies with an intensive study of the microstructure and transformations of artificial nickel-iron alloys. As a result, Perry described San Francisco Mountains in the manner of the metallographers.

Perry’s paper (Perry 1934b) was an excellent description for its day of an iron meteorite. It clearly showed his technical mastery of the pertinent current and historical European and American meteorite and related metallurgical literature. His research demonstrated he was the preeminent student of meteoritic metal of his decade, if not his generation, and that he had a vision for the future direction of iron meteorite studies. By utilizing metallographic methods which had been in constant use by iron and steel technicians for more than a quarter of a century, but which had been largely ignored by meteorite scientists, he moved an important branch of meteoritics in a new and in time highly fruitful direction.

The San Francisco Mountains meteorite paper was much more lavishly illustrated than the typical meteorite papers of its day; the text of the paper broke with the past practice of meteorite descriptions by introducing a number of photomicrographs taken by a vertically illuminated microscope of sections prepared by contemporary metallographic methods. Perry’s Figs. 1 and 2 of the paper..."
capture superbly the bulk specimen with its dramatic aerodynamic sculpturing. The source of these photographs is not mentioned in the paper, but an identical photograph in the Smithsonian’s Division of Meteorites files credits the “Chicago Architectural Photographing Co., 75 E. Wacker Drive, Chicago.” Perry had gone to considerable effort and expense to get the type of photographs he wanted.

Perry’s Figs. 3 and 4 may also have been made in Chicago at the same time. No. 3 is of the cut surface on the end of the large mass that had undergone ordinary macro etching (5% nitric acid in water). Figure 4 is of a thin slice that had been micro-polished and etched (3% nitric acid in alcohol). It dramatically illustrates the unusual depth to which the atmospherically produced heat altered zone penetrated this meteorite. Figures 3 and 4 are the basis of a detailed discussion of the Widmanstätten pattern. A chemical analysis by F.A. Gonyer of Harvard University is also provided.

Perry’s Figs. 5 through 16 are all photomicrographs at 100 or 1000 times magnification. All surfaces have been etched, and the etchant and the time the surface was exposed to it are noted. Perry makes much use of 5% picric acid, although other reagents were also employed. These illustrations were the basis of discussion of detailed metallographic features.

Over the next few years, Perry amassed a large collection of photomicrographs of iron meteorites, and assembled them into an album. One of us (Clarke 1991, p. 10) has elsewhere described how this work was carried out: “Meteorites were sent here [to the museum] or selected from our collection, photographed, cut, macroetched sections prepared and photographed, and material sent to the [Engineering Department of the] University of Michigan where Perry had made arrangements for talented graduate students to prepare high quality metallographic sections and good photomicrographs” (a metallographic microscope capable of producing high quality photomicrographs was not present at the museum until around 1960).

The meteorite sections were etched with various reagents, with selective etching to identify phosphide, carbide, etc., and photographed at magnifications ranging from 50× to 3000× (Perry 1952). The photomicrographs were mounted on large (29 cm × 35 cm) heavy ledger linen sheets on the right-hand pages of the album (Fig. 5b); the left-hand pages facing them carried typed material interpreting the various details of the microstructures shown (Fig. 5a). As well, there was a descriptive page at the beginning of the series of photographs of each iron, with specific analyses and references for that particular meteorite. The quality of Perry’s photomicrographs in his albums compares well with what we routinely consider to be high quality photographs today.

Perry sent his album of microphotographs, along with accompanying descriptions and interpretations for each meteorite, to Foshag in February 1939. Foshag (1939) was very impressed, and pointed out “It is obvious from even a casual examination that much still remains to be explained and even discovered in iron meteorites. I think we ought to do more of this sort of work here but we do not have the adequate set up.” He also encouraged Perry to pursue his idea of expanding this work into a monograph: “I hope you will find time to prepare this, for I know of no one more fully qualified to do the job. I am sure such a monograph would be of great importance to students of meteorites and the details of structure will be a revelation to many others as it has been to Henderson and myself.”

By this time, Henderson had come to play a much more important role in the museum’s meteorite program. By the beginning of 1938, he had taken over the management of the official meteorite correspondence from Foshag, and had developed his laboratory skills to the point where he was beginning to produce publications on meteorites on a regular basis. Perry and Henderson initiated a frequent and lengthy exchange of letters on various meteorites from that time on, leading to a series of joint publications beginning in 1942. They also became much closer in their relationship, and in the later stages of their research Henderson on occasion joined Perry at his home in Adrian, Michigan, his summer retreat in Newagen, Maine, or his winter retreat in Tucson, Arizona, to discuss their work.

When Perry completed a draft manuscript of his monograph, he submitted it to Foshag for review. Foshag assured him that after he and Henderson had finished reading it, he would submit it to Alexander Wetmore, the director of the museum, with the recommendation that it be published by the Smithsonian. With Foshag’s support, Perry was appointed an honorary associate in mineralogy at the museum in April, 1940, a position he held until his death. By the time the manuscript was finally ready for publication, however, World War II had broken out, and there was considerable soul-searching at the Smithsonian about the advisability of publishing such a work at that time. But with the help of Henderson, who played a major role in getting the manuscript over numerous Smithsonian hurdles, Perry’s monograph, The metallography of meteoric iron, was published as Bulletin 184 of the U.S. National Museum in 1944 (Perry 1944a). Bulletin 184 is also available online in the Biodiversity Heritage Library at http://www.biodiversitylibrary.org/bibliography/7548.

The book contains 115 pages of discursive text pages and 81 plates, each, as in the albums, with a facing page of technical notations. All but a few of the plates contain four photomicrographs of meteorite structures, for a total of over 300 illustrations and descriptions of 98 meteorites, of which four were unknowingly duplicates. As Perry explains (p. 114): “All the original photographs, and many others, of the iron here illustrated are in a collection of about 1,300 photomicrographs of meteoric irons bound in [what now had expanded to] five volumes . . . . deposited in the United States National Museum where they may be conveniently studied.” While the photos in the book were excellent for their time,
they were limited by the dot matrix printing system, and not susceptible to significant enlargement.

In order to appreciate the extent of Perry’s achievement, it will be constructive to put it into the context of earlier studies of the structure of meteoritic irons. At the dawn of the 19th century, Alois von Widmanstätten (1753–1848) developed a new printing technique in 1808 to reproduce the pattern produced on highly polished, etched surfaces of iron meteorites, which has justly carried the name Widmanstätten pattern ever since. The first reproduction of the Widmanstätten patterns was not published until twelve years later by Carl von Schreibers (1755–1909), an early date in the scientific study of meteorites (von Schreibers 1820). The Widmanstätten pattern soon became a window into the internal crystallographic structure of meteorite metal. Differences in types of Widmanstätten pattern became the basis for systematic classification that retains usefulness still.

At the beginning of the 20th century, Emil Cohen (1842–1905) published Meteoritenkunde (The science of meteorites) (Cohen 1894–1905) in three volumes over an eleven year period, but it was left incomplete due to his early death. This work became the standard reference on iron meteorites, although it had an important shortcoming: it was devoid of photographs, and used line drawings and diagrams sparingly. Even the most carefully written verbal descriptions of iron meteorite structures cannot lead to a level of comprehension that similar descriptions with good illustrative material afford.

The Meteoritenkunde photographic deficiency was partially compensated for by Aristides Brezina’s (1848–1909) and Cohen’s Die Struktur und Zusammensetzung der Meteoreisen erläutert durch photographische Abbildungen

Fig. 5a. The introductory left-hand page for the San Francisco Mountains meteorite in Perry’s Album IV. The top half of the page is descriptive text giving basic information about the meteorite. The bottom four entries are legends for the numbered photographs on the facing right-hand page.
Fig. 5b. The corresponding right-hand page for the San Francisco Mountains meteorite. No. 1 is a 2.4× macro etched photograph of a section through the specimen. No. 2 is a 2.5× micro etched section showing the zone of alteration. No. 3 is a 50× micrograph showing characteristic structure. No. 4 is part of No. 3 at 100× with a lighter etch.

geätzter Schnitflächen (The structure and components of meteoritic irons illustrated by photographs of flat etched surfaces) (Brezina and Cohen 1886–1906). Issued in sections over a twenty year period, it contained unbound descriptive pages interleaved with photographic prints on heavy mounting boards. The meteorite sections photographed varied in quality of preparation, and magnifications varied from actual size to ten times. The lighting was oblique and the magnifications were normal photographic rather than reflected light microscopic enlargement. It was a large publication, with 40 plates each containing multiple photographs. It presented a good introduction to the variety of iron meteorite structures, and was undoubtedly far ahead of anything else the field had to offer at the time. But Die
Struktur und Zusammensetzung der Meteoreisen suffered from the fact that it was awkward to use and undoubtedly of very limited availability. It was produced in small numbers, and mainly found in museums with major meteorite collections. Merrill had a copy at the museum, probably from an early date.

The metallography of meteoric iron served to remove the shortcomings inherent in these earlier studies. Perry’s approach to the study of external surfaces of iron meteorites was the traditional one of presenting good photographs of the specimens accompanied by a descriptive text. His major innovation to descriptive studies lay in the utilization of the contemporary reflected light microscope to obtain high quality photomicrographs. As he explained in the Introduction of his monograph (Perry 1944a, p. 1):

Before metallographic methods were applied to the study of meteoric iron an extensive literature had been built up by the work of a number of able scientists, dealing with their classification, their chemical composition, and such structural features as could be observed at moderate magnification in oblique light . . . Their researches, however, were limited by the imperfect methods then available; for the ordinary microscope at best could reveal only the coarser contrasts in structure. The invention of vertical illumination opened a field of research that not only laid a new foundation for metallurgy but also greatly extended our knowledge of meteoric iron . . . Even so, until in quite recent years, scientists continued to describe and discuss iron meteorites in the language of the older writers.

Perry broke new ground with The metallography of meteoric iron. He was not the first to use the modern metallographic microscope to observe meteorite structures, or to discuss structures observed in terms of the Fe-Ni phase diagram. These earlier papers, however, were few in number and the issues dealt with were generally remote from the standard meteorite literature of the day. The metallographic detail was generally peripheral to the study of meteorites from a descriptive point of view. Those who described iron meteorites, mainly museum curators, generally ignored or downplayed these papers. Perry saw this lack of interest as an oversight and a missed opportunity for the meteorite research community. The metallography of meteoric iron contains an abundance of previously unavailable high-quality photomicrographs to entice interest. The text of the monograph is a detailed tutorial on the background needed to enter this area of research effectively. As a demonstration of its utility, Perry connected the phase diagram and the classically derived classification system. His work interested the small meteoritic community of the day, but it would be a number of years before later significant progress would be made in this area.

Perry correctly realized that “Although the structures of meteoric irons show variations due to the presence of other substances (especially phosphorus), the iron-nickel [phase] diagram is the basis for their study and interpretation” (1944a, p. 45). There were just two phases in the low-temperature equilibrium diagram in Perry’s day, known to meteorite workers
by their mineral names as kamacite and taenite. Over time, improvements in the phase diagram led to better interpretations of Widmanstätten pattern formation. But early versions of the diagram were inaccurate, and there was also confusion between true Widmanstätten pattern formation in meteorites and so-called Widmanstätten structures claimed to have been produced artificially in the laboratory on quick cooling of nickel-iron alloys. The phase diagram that Perry used was more accurate than that of earlier investigators, and led him to correctly conclude (Perry 1944a, p. 43) that “Meteoritic structures generally were produced by extremely slow cooling” (Fig. 6). This was a very fruitful insight, and in time helped scientists to surmise the sizes of meteorite parent bodies.

The publication of The metallography of meteoric iron beautifully shows the extent and value of Perry’s and Henderson’s collaboration. It is clear that Perry was an accomplished meteorite metallurgist by the time of the publication of his paper on the San Francisco Mountains meteorite in 1934, long before Henderson had developed his laboratory skills analyzing meteorites and long before the two had developed a close personal relationship. Although Perry was the conceptualizer and driving force behind the monograph, the one with the vision and ability to bring it to fruition, Henderson’s role should not be minimized. He encouraged Perry to undertake the preparation of such a monograph, and offered encouragement and help at every stage of the project. Specifically, he provided him with cut, polished, and macroetched sections of meteorites from the National Collection for his investigation; he performed chemical analyses on these specimens; he discussed aspects of the chemical and metallographical studies with him at great length, either through correspondence or at personal meetings; and he helped arrange for the book’s Smithsonian publication (Mason and Clarke 1994).

In addition to their joint work on The metallography of iron meteorites, Perry and Henderson published a total of 16 collaborative papers on meteoritic irons: 13 were on specific meteorites, one was a more general study of 7 siderites, one was on the metallic constituents of meteorites, and one was on the densities of iron meteorites (see Appendix). In 1945, Perry was awarded the J. Lawrence Smith Medal for meteoritic research by the National Academy of Sciences. Following Smith’s death in 1883, his widow had given the proceeds of the sale of his meteorite collection to the National Academy to establish an endowment for the funding of meteorite research. This was only the third time that the medal had been awarded, and it was the first award to someone who was not a professional scientist. Years later, in 1970, Henderson was also awarded the J. Lawrence Smith Medal.

TRADE WITH THE BRITISH MUSEUM (NATURAL HISTORY)

By 1946, Perry had compiled volumes 6 and 7 of his albums of microphotographs. Due to the excessive cost of production, only six sets of the albums were produced. The American Museum of Natural History, the Field Museum, the University of Michigan, and Harvard University were each provided with a set, and the National Museum with two (the negative plates of the photographs were also deposited in the museum). Perry (1951a) strongly felt that the British Museum (Natural History) should have a set: “The British Museum is doing the most and the best work of any museum except our own . . . The Albums contain an immense, and unique, store of photomicrographs and I feel earnestly that the Albums should be there for reference. I can think of no other place so appropriate, or where they would do so much good.”

Henderson agreed, and saw an opportunity here. He realized that the Smithsonian had a number of meteorites in its collection that the British Museum did not, and vice versa, and was keen to institute an exchange. He thought that a possible way to initiate this might be to arrange an exchange of Perry’s album set for some meteorites not represented in the National Collection. If such an exchange could be worked out, he felt that it could be used as an opening wedge for future meteorite exchanges between the two museums, to their mutual benefit.

Henderson (1952) wrote to Max Hey (1905–1984), the keeper of minerals at the British Museum, sounding him out on the idea. He (1953) then further explained that “This is the most unusual exchange I have ever had the pleasure of offering,” and as such he was not looking for any specific monetary figure to be attached to the meteorites in return: “If this was an exchange between [a] commercial dealer and our Museum I would try to balance the monetary value. But exchanges between the two Museums should be made on a different basis. We should be interested in each other’s collection of meteorites and making frequent exchanges. I feel there should be a friendly and understanding exchange going on all the time.”

When Hey expressed an interest in arranging such an exchange, Henderson booked passage for a trip to Europe. When he visited the British Museum in August, 1954 he came armed with a complete set of the albums, which by then had expanded to a final size of 9 volumes, containing 2,308 photomicrographs of 160 meteorites, and weighed a hefty 37.5 kg (Perry also updated the collections of the institutions that had earlier received his seven volume set by sending them volumes 8 and 9). Henderson placed a value of about $40,000 on the set, and obtained 33 meteorite specimens and filings of six of them in exchange (Hey 1954). These meteorites were subsequently donated by Perry to the Smithsonian. During his visit to the British Museum, Henderson also succeeded in his larger goal of laying the groundwork for future meteorite exchanges.

CONCLUSION

Once Perry developed an interest in meteorites, he became a keen student and vigorous collector of them.
Throughout his life, he bought or arranged for the sale of hundreds of meteorites, and became the nation’s leading private collector. He never regarded meteorites simply as mineralogical curios, however, but rather as objects of great scientific value deserving serious study. For this reason, he strongly felt (Perry 1944b) they should not be held by individuals, “. . . but should be in a great museum having an important collection of meteorites, such as the U.S. National Museum, where [they] can be compared and studied by those interested in that line of research.”

Perry therefore generously donated all of his meteorites to various museums after he was through investigating them. In this way, he enriched not only the holdings of the U.S. National Museum, but also the University of Michigan, the Field Museum of Natural History, the American Museum of Natural History, Harvard University, Michigan State University, and the Cranbrook Institute of Science in Bloomfield Hills, Michigan (Perry 1955a).

Because the Smithsonian housed the National Collection of Meteorites, Perry was likely predisposed to think well of the institution from the beginning. His friendly and productive relationships with Merrill and Foshag on curatorial matters and Henderson on analytical matters served to greatly strengthen this feeling, and he donated what he considered to be his most important meteorites—totaling 192 specimens—to it. These specimens represent 163 different meteorites; many of them have more than routine importance, and represent the only mass or the major mass of the meteorites now in the museum’s collection (Perry 1955a; Grady 2000).

Iron meteorites were Perry’s main interest, both in terms of collection and research. They constituted the majority of his donations to the National Museum (roughly 60%), including Dayton, Edmonton (Kentucky), Linwood, Loreto, Pitts, and San Francisco Mountains. With his help, irons thus moved to a position of center stage at the Smithsonian, and are still at the heart of its meteorite collection. Of his 31 published papers on meteorites, only six dealt with stony meteorites, the last being published in 1935; after that, all 24 of his subsequent publications concerned iron meteorites or meteorite metal (see Appendix).

As a collection of metallographic photomicrographs of iron meteorites, *The metallography of iron meteorites* was unsurpassed at the time. The photomicrographs in it (more so than in his albums, due to their limited availability) provided the leading iron meteorite scientists of the day with valuable background to their work. To get a feel for how directly Perry’s monograph influenced pioneers in the modern study of metallic meteorites, we asked individuals to comment. Ed Scott, for example, recently remarked: “I think for pictures of diverse kinds of plessite and different types of inclusions—Perry’s book was the best. Pearlitic plessite for example was in Perry but not anywhere else as I recall” (pers. comm. August 1, 2008). Vagn Buchwald recalls “I acquired his monograph in Copenhagen sometimes in the early sixties, and I appreciated it so much that I had it bound in a beautiful leather case in 1966” (pers. comm. August 28, 2008). John Wasson also found Perry’s monograph invaluable: “For about 20 years, I had Perry’s book together with other cosmochemistry books that I could reach from the chair in my office. I looked at it many times as I constructed the compositional-structure classification of iron meteorites. It was my main source of meteorite images until Buchwald’s handbook was published” (pers. comm. August 4, 2008). Indeed, Perry’s monograph remained a standard reference mainly for meteorite images for more than 30 years, until the publication of Vagn Buchwald’s *Handbook of iron meteorites* (Buchwald 1975).

The late historian of science John G. Burke (1986, p. 250) has cogently summed up some of Perry’s main contributions to the study of meteoritic metallography: “Although some of his interpretations were incorrect, they represented a systematic study that was of considerable value to later scientists. After 1950, the major areas of investigation were those stressed by Perry: the nickel content at low-temperature transformation; the role of phosphorus; and the rate of cooling necessary to produce the true Widmanstätten structure of meteoric irons.” Perry’s groundbreaking metallographic studies of iron meteorites led to a major advance in our understanding of the structure of meteoritic irons. His conclusion about the extremely slow cooling of meteorites proved to be a very significant idea to the meteorite community. When it was reintroduced by workers 20 years later and combined with metallographically derived cooling rates, it led to lively discussions on the size and nature of iron meteorite parent bodies. New insights gained in this manner dramatically enlarged the horizons of meteoritics, and helped give birth to a new field within planetary sciences. *The metallography of meteoric iron* continued to remain an insightful and useful work in the area of meteoritic metallography until improved binary and ternary phase diagrams in the Fe-Ni-(P) system allowed a more detailed treatment of the formation of iron meteorites.

Perry received many honors for his work. In addition to his appointment as honorary associate in mineralogy at the U.S. National Museum in 1940 and his award of the J. Lawrence Smith Medal for meteoritic research by the National Academy of Sciences in 1945, he was also elected a Fellow of several scientific societies, including the Meteoritical Society, the American Association for the Advancement of Science, the American Museum of Natural History, the American Geographical Society, and the Cranbrook Institute of Science (Perry 1953). Perry held office in the Meteoritical Society, serving as councilor from 1941–1950, and as vice president from 1950 till his death on February 15, 1957.

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**REFERENCES**


Foshag W. F. 1937. Memorandum to A. Wetmore, September 25, Smithsonian Institution Archives, Washington, D.C., Accession Number 133428.

Foshag W. F. 1939. Letter to S. H. Perry, February 8, Bentley Historical Library, University of Michigan Historical Collections, Ann Arbor, Michigan, Stuart H. Perry Papers.

Foshag W. F. 1940. Letter to S. H. Perry, February 6, Bentley Historical Library, University of Michigan Historical Collections, Ann Arbor, Michigan, Stuart H. Perry Papers.


Foshag W. F. 1954a. Memorandum to E. P. Henderson, December 6, Smithsonian Institution Archives, Washington, D.C., Record Unit 268, Box 3.

Foshag W. F. 1954b. Memorandum to E. P. Henderson, December 8, Smithsonian Institution Archives, Washington, D.C., Record Unit 268, Box 3.

Foshag W. F. 1955a. Memorandum to E. P. Henderson, January 19, Smithsonian Institution Archives, Washington, D.C., Record Unit 268, Box 3.

Foshag W. F. 1955b. Memorandum to E. P. Henderson, January 27, Smithsonian Institution Archives, Washington, D.C., Record Unit 268, Box 3.


Henderson E. P. 1952. Letter to M. H. Hey, November 17, Smithsonian Institution Archives, Washington, D.C., Record Unit 268, Box 4.


Henderson E. P. 1954a. Memorandum to W. F. Foshag, December 6, Smithsonian Institution Archives, Washington, D.C., Record Unit 268, Box 3.


Henderson E. P. 1954c. Memorandum to W. F. Foshag, December 16, Smithsonian Institution Archives, Washington, D.C., Record Unit 268, Box 3.


Foshag W. F. 1936. Letter to M. W. Rowe, February 9, Smithsonian Institution Archives, Washington, D.C., Record Unit 269, Box 8.


Merrill G. P. 1926. Letter to A. Wetmore, October 5, Smithsonian Institution Archives, Washington, D.C., Record Unit 7177, Box 19.

Merrill G. P. 1928. Letter to S. H. Perry, April 16, Smithsonian Institution Archives, Washington, D.C., Record Unit 7177, Box 20.


APPENDIX

Bibliography of Perry’s Meteorite Papers

Perry S. H. 1944b. Letter to H. W. July 6, Smithsonian Institution Archives, Washington, D.C., Record Unit 7284, Box 1.

Perry S. H. 1950. Meteorite collection of Stuart H. Perry, Adrian,
Henderson E. P. and Perry S. H. 1956. The Loreto, Baja California, meteorite (CN = 1113,260), and its similarity to the Morito, Chihuahua, Mexico, meteorite. Meteoritics 1:477–488.