

Remembering Jeanette Snyder Brown (1925–2014)

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Received: 4 July 2015 / Accepted: 15 August 2015
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Abstract Jeanette Snyder Brown (universally called Jan) was associated with the Department of Plant Biology, Carnegie Institution for Science (until recently Carnegie Institution of Washington) over a period of 37 years. Jan has left a scientific legacy of extensive publications concerned with photosynthetic pigments and their organization, and a historic collection of portraits of scientists who were prominent during her long tenure in the Department of Plant Biology. This legacy will stand for many years to come.

Keywords Photographs of scientists · Photosynthetic pigments · Spectral forms of Chlorophyll a · Stacy French

Jeanette Snyder Brown was born in Rochester, New York (NY), USA, on March 6, 1925; she was the only daughter of James and Lottie Snyder. She received a bachelor's degree from Cornell University (Ithaca, NY) in 1945 (with bacteriology as her major). After a brief stint at the University of Wisconsin as a graduate student and a research assistant, she returned to Cornell for a master's degree in 1947. Thanks to a Cornell professor (Otto Rahn), she obtained a position with a firm exploring the biological

effects of low-level radiation. That venture failed, but she had already started working for a PhD at Stanford with Professor Arthur Giese. There she completed her PhD on the effects of visible light in reversing the deleterious effects of ultraviolet-induced cell damage in 1952. Her first association with Carnegie Institution for Science was as a research assistant for a few months in 1954. She became a full member of the research staff in 1960, and she worked for almost 30 years before she officially retired. Figure 1 shows 4 portraits of Jan Brown at different times of her life.

Married to Walter Brown in 1950, she waited until the youngest of their three children was three and, in 1958, returned full time to the Carnegie Department of Plant Biology. She worked once again as a research assistant with C. Stacy French for 2 years before he appointed her as a regular staff member—the Carnegie equivalent of a faculty member. For a biography of Stacy French, see Govindjee and Fork (2006).

Jan's research centered on the physiology of algae, with a sharp focus on their photosynthetic pigments. She has published about 50 research papers. When her husband made frequent trips to the Philippines to collaborate with a herpetology colleague there, she joined him and collected a variety of tropical algae with unusual photosynthetic pigment systems. In the process, she pioneered techniques and developed a facility at Carnegie for the culture of unusual algal species. She also collaborated with the then director C. Stacy French in carrying out spectroscopic investigations of photosynthetic pigments using a remarkable set of home-made spectrophotometers that Stacy had built. One of these would measure the first derivative of an absorption spectrum mechanically by means of a vibrating slit arrangement, enabling them to detect subtle features of these spectra that would be missed by conventional spectroscopy (preceding by many years the ability to do derivatives of spectra by computer).

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Fig. 1 A panel of four photographs of Jan Brown. (a, *Top left*) a portrait of young Jan Brown. (b, *Top right*) a portrait of Jan Brown, used at a web site (<https://dpb.carnegiescience.edu/article/jan-brown-passes-away-august-16th>). (c, *Bottom left*) Jan holding a birthday cake

decorated with absorption spectra of algae. (d, *Bottom right*) a portrait in 2014. a, b and c are from the archives of the Department of Plant Biology, Carnegie Institution for Science; and d was taken by one of the authors, Govindjee

Indeed, besides Stacy, she was the only person at Carnegie who could operate this instrument! It was with this very special instrumentation that they were able to demonstrate that living photosynthetic cells contain several spectrally distinguishable forms of chlorophyll—a discovery made long before molecular and biochemical techniques started to characterize the basis for the different forms. We refer the readers to, as examples of her research, three of her early papers: Brown and French (1959, 1961) and French et al. (1972). In addition, she has published extensively on spectroscopy (both absorption and fluorescence) of photosynthetic systems (see e.g., Brown 1967,

1969, 1972, 1973, 1977a, b, 1980, 1983a, b, 1987, 1988; Brown and Schoch 1981, 1982, and Bialekbylka and Brown 1986).

Gijs van Ginkel, of The Netherlands, wrote

“It is about 40 years ago that I first met Jan Brown. I do not remember when and where exactly it was: either when she visited the Utrecht Biophysics group, or during a photosynthesis conference in Stresa, Italy (1971) or at the Weizmann Institute in Israel (1974). It was then that Jan

asked me if I was interested to work with her as a postdoc at the Plant Biology Department of the Carnegie Institution of Washington in Stanford (now Carnegie Institution for Science). In view of the enthusiastic stories from my Utrecht colleagues about the institute, the long lasting exchange relation between the Utrecht Biophysics group and the Carnegie Institution group, and Jan's scientific reputation and charming personality, it was a very welcome invitation which materialized during 1977–1979. The research time at Carnegie and the contact with Jan and all her colleagues at Carnegie have left sweet memories both for myself as well as for my family. Upon arrival in Stanford, we started experiments on reconstitution of isolated Photosystem I particles in lipid vesicles, using different methods. Initially the data looked promising, but chlorophyll played its own game with us, and started to make oxygen radicals, which spoiled our expectations, but nevertheless these experiments yielded interesting data about the radicals formed during interaction of light with chlorophyll in a lipid (or detergent) environment and about the mechanism how the photosynthetic system coped with it. This led to a report in the Carnegie Yearbook (Brown and van Ginkel 1978) and two papers (van Ginkel and Brown 1978; van Ginkel 1979); this research was continued on a different track: the phase behavior of photosynthetic membranes and model membranes, consisting of lipids from different plants and algae.

During my time in Stanford, I had, of course, a lot of contact with Jan either about work or about personal matters. One thing we remember well was her invitation to join the folkdance classes she and her husband Walter followed. When I think about Jan, I see her sitting behind her desk, walking through the corridor of the Carnegie building, standing behind her lab table, drinking hot water in the coffee room (Jan did not drink tea or coffee, but only hot water), at ease when eating lunch in the small open place between shrubs next to the Carnegie building (the first place where I saw a California quail strolling around), going together to Plant Physiology meetings like the one in 1978 in Washington, and joining her on a visit to one of her friends. When I look back on the contact and cooperation with Jan, I cherish the sweet memories she has given us, and the wonderful time she gave us when we worked together."

Figure 2 shows a photograph of Jan Brown, during those early days, 1970s–1980s, with two members of the Carnegie staff.

Jan Anderson, of Australia, wrote

"While Jan B.'s research was mainly concerned with algae [and spectral forms of Chl *a*], she also undertook significant plant research. She was a wonderful friend in 1966 on my



Fig. 2 Left to right Frank Nicholson, Jan Brown and Dick (Richard) Hart. Photo taken in 1978. Source Gijs van Ginkel

Carnegie Fellowship; I was the first Australian/New Zealand scientist. In 1982, Jan B. came to Canberra on a US National Science Foundation (NSF) grant and continued her research on the chlorophyll *b*-less barley mutant that she had introduced to Carnegie in 1966 (Brown et al. 1982). In 1983, on my short sabbatical to visit Dick (Richard) Malkin, at the University of California at Berkeley, I returned to Carnegie to collaborate with Jan B. We showed that chlorophyll *b* was indeed an integral component of Photosystem I (Anderson et al. 1983). Jan B. also collaborated with Tasso Melis at Carnegie and demonstrated for the first time that the photosystem II/photosystem I stoichiometry was not unity, as had been assumed before (Melis and Brown 1980)."

Figure 3 shows photographs of Jan Anderson, Olle Björkman (a distinguished scientist at Carnegie), and Winslow Briggs (one of the authors).

Following Stacy French's retirement in 1973, Jan continued her studies of photosynthetic pigments and maintained a number of algal species in culture and made them available to the photosynthesis world until her retirement in 1987. She couldn't stay away from the science, however, and volunteered at Carnegie's new Department of Global Ecology from 2002 to 2011.

Jan also traveled widely, visiting and carrying out research in photosynthesis laboratories all over the world—England, Denmark, The Netherlands, Germany, France, Israel, and Japan. She also regularly participated in and contributed to photosynthesis conferences and symposia all over the world. In the course of these travels, she took on a special research project of her very own: to photograph as many of the prominent (and not so prominent) researchers—largely in photosynthesis but in other plant fields as well. Figure 4 shows a panel of several distinguished, and departed, photosynthesis scientists from the past. It includes: Martin Kamen (1913–2002); C. Stacy French

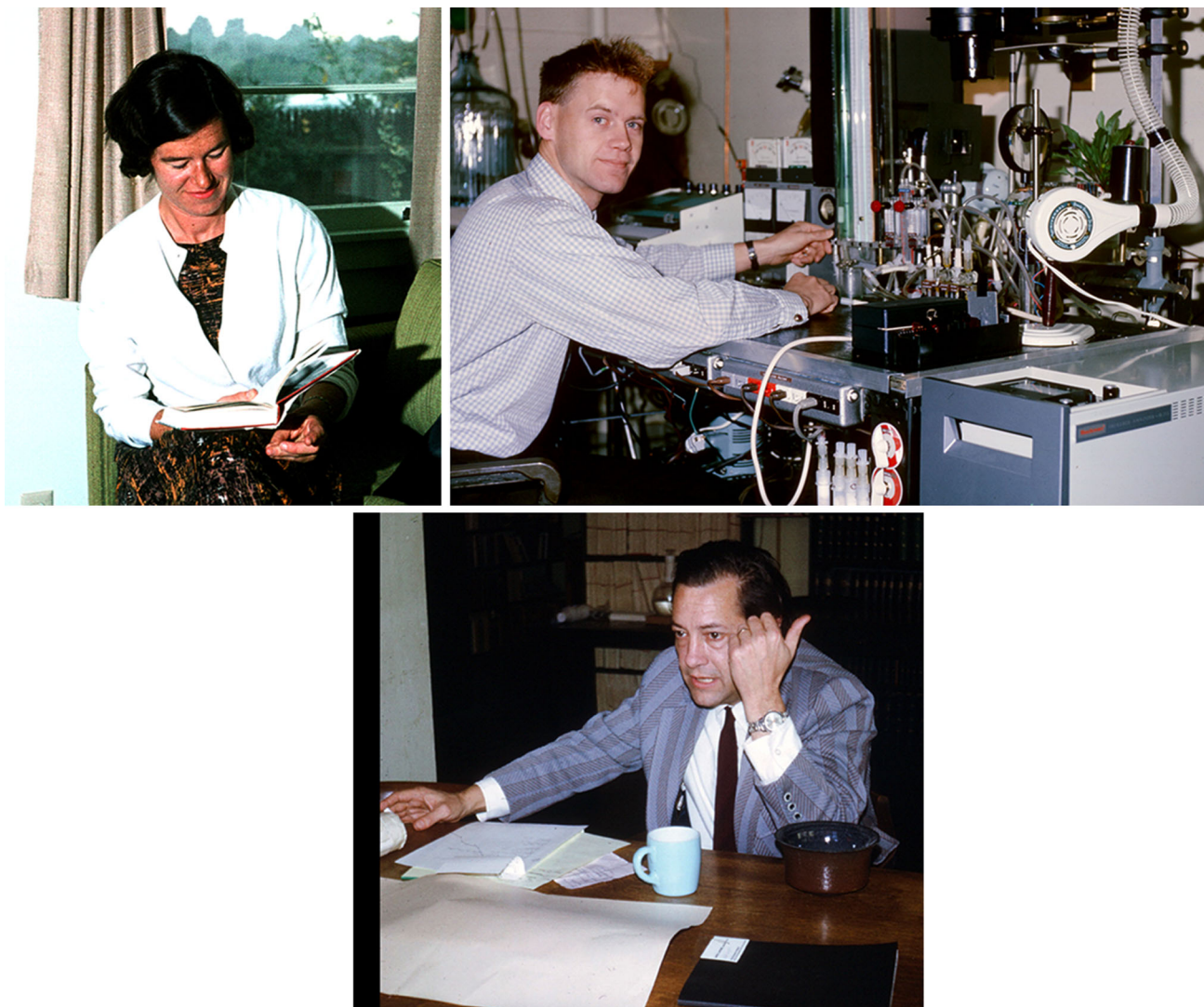


Fig. 3 A panel of three photographs from the collection of Jan Brown, at Carnegie Institution of Science. *Top Left* Jan Anderson; *top right* Olle Björkman in the laboratory; and *bottom* Winslow Briggs

(1907–1995) and Francis Haxo (1921–2010); Bessel Kok (1918–1979) and Larry Blinks (1900–1989); and Jan Amesz (1934–2001).

During her stay with Global Ecology, she culled her vast collection of photographs and put together a remarkable set of portraits, largely informal, of almost every major scientist studying photosynthesis. With support from the department she had the images digitized and this resource, on a CD, is now available without charge to anyone who needs a picture of a particular historic figure.

Jan is survived by her 3 children, Pamela Brown Lanigan, James C. Brown, and Julie Creighton; four grandchildren; one great-grand child; and a brother, Ted Snyder.

Concluding remarks

We note that Jan never really retired, coming into the lab frequently. In the last several years she helped with the newsletter and interacted most closely with researchers and staff at the Department of Global Ecology, often coming to seminars and asking insightful questions. She was a pioneer in photosynthesis research, working on the arrangement of chlorophyll and other pigments in the chloroplast membranes of plants and algae. She used the unique derivative spectrophotometers developed by Stacy French to examine the spectral properties of pigment-protein complexes associated with Photosystems I and II and with the help of the famous French Press (that still exists in the



Fig. 4 Four photographs from the Janet Brown Collection at the Carnegie Institution of Science. *Top left* Bessel Kok and Larry Blinks; *top right* Stacy French and Francis Haxo; *bottom left* Martin D. Kamen; *bottom right* Jan Amesz, doing experiments in the Carnegie laboratory

Lab), she was able to purify and characterize some of these pigment-protein complexes. This work was fundamental for the development of our current understanding of light harvesting by photosynthetic organisms. The photosynthesis community at large misses her greatly.

We remember the wonderful person Jan was with a photograph (Fig. 5) with Glen Ford, David Fork (both long time colleagues), and Rajni Govindjee, who had worked at Carnegie in 1963 (see Govindjee and Govindjee 1965).

Govindjee remembers vividly that it was Brown and French (1959) paper on different spectral forms of chlorophyll *a* that played a very important part in his discovery (Govindjee and Rabinowitch 1960) that a short wave-length absorbing form of chlorophyll *a* (Chl *a* 670) was in the same system as chlorophyll *b* (currently, Photosystem II). Further, it was the same paper of Jan (Brown and French 1959) that had played a crucial part in his work that led to direct observation of different spectral forms of chlorophyll *a* (Cederstrand et al. 1966).



Fig. 5 A photograph of Jan Brown, taken by Govindjee, in her apartment in Palo Alto (June, 2014). From left to right Rajni Govindjee, Janet Brown, Glen Ford, and David Fork



Fig. 6 A 1976 photograph of the authors of this Tribute to Jan Brown: Winslow Briggs (left) and Govindjee (right)

In the spirit of Janet's interest in photography, we end this tribute by showing our own picture (Fig. 6), taken in August, 1976, in Rome, Italy, at the 7th International Congress, on Photobiology.

Additional material on Jan Brown may be found at the following web sites: <https://dpb.carnegiescience.edu/article/jan-brown-passes-away-august-16th> and http://globalecology.stanford.edu/people/In_Memoriam_Jeanette_Brown.html.

Acknowledgments We are grateful to Jan Anderson and Gijs van Ginkel for their contribution to this paper. We thank all the members of the Carnegie Institution of Science in Stanford, especially Chris Field (Global Ecology), Olle Björkman, and Martin Jonikas (Plant

Biology) for their support in finalizing this Tribute. We thank Rajni Govindjee for reading this manuscript before its publication.

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