

Highlights from Elsie Widdowson's Personal Diary of Her Meetings With Early US Nutrition Pioneers in 1936

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During 3 months in 1936, a young Dr Elsie Widdowson undertook a trip to the United States to discuss mutual research interests with colleagues there. This article picks out highlights from Elsie's personal diary, focusing on the contributions her US colleagues were making to the study and practice of dietetics and to nutrition research. Virtually all her meetings were with women who were pioneers in the new science of nutrition 80 years ago. Elsie was just a beginner, but they treated her with great kindness, and they made a deep impression on her. In this way, they helped Elsie on her way to becoming one of the greatest woman scientists in the 20th century. *Nutr Today*. 2016;51(2):93–101

In the early 20th century, research in nutrition expanded enormously. In 1912, Casimir Funk described the “anti-beriberi factor” and suggested that pellagra,

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scurvy, and rickets were caused by deficiencies of unidentified factors called “vitamines” that were vital to life. In 1912, E. V. McCollum and Harry Steinbock at the University of Wisconsin developed an approach working with farm animals that led to the widespread discovery of nutrients such as vitamins A and D. By the 1930s, W. C. Rose at the University of Illinois had discovered the essential amino acids, the building blocks of protein. Many female scientists were also active, including Dr Elsie Widdowson. A companion article¹ explains how Elsie Widdowson detoured into dietetics before she became a full-time research scientist. Elsie applied for a grant from the United Kingdom's Medical Research Council to travel to the United States so she could learn more about dietetics. When one of us (M.A.) was researching Widdowson's incredible life for her biography,² among Elsie's papers was a typewritten copy of the diary that she kept during her US trip in 1936. This paper is a blow-by-blow account of her observations on the science and scientists she encountered at the institutions she visited. Elsie's contributions to dietetics were the focus of the companion article,¹ and so we have picked out entries that relate to the same themes, namely, the composition of foods, energy, and nutrient balance and determination of nutrient requirements. We also made inquiries to find out what scientists at these institutions are doing today, and we have included that update here as well (Table).

NEW YORK

After Elsie arrived in New York on the Royal Mail Ship *Aquitania* (which she described as quite an adventure!), she stayed there from April 15 to April 27, visiting several departments in Columbia University, the Rockefeller Institute, the New York Hospital, Montefiore Hospital, and Bellevue Hospital. In the New York Hospital, she was amazed at the number of dietitians employed in only one hospital:

Tuesday, April 21

Visited Miss Gillam. She showed me through all the kitchens, storerooms, bake house, and then to see some of the ward kitchens and how the special diets are prepared, staff dining rooms, etc, etc.

The hospital employs 17 dietitians. (In the whole of London there are only three.) Dietitians are responsible for the feeding of the whole hospital, patients, and staff and for seeing outpatients. They are divided into 2 groups, and each group meets once a fortnight to discuss various problems that have arisen.

In the Medical Center of New York hospital, she met Dr Clarke and his assistant Miss Goettsch:

Dr Hans Clarke in charge. Very nice, and a first-class worker I should think. Trained in England at U.C. and worked there with Professor Drummond. About 30 people working in the department. Miss Goettsche, his assistant, ...is working on muscle dystrophy in rabbits and cerebral disorders in chickens. Both are caused by a deficiency of something which is present in vegetable oil (soya bean oil), and both are cured if not too far advanced by the administration of this. Maybe different factors involved for each, or maybe the same. The chicken factor is present in the unsaponifiable fraction of the oil. Apparently (it could be) 1 or 2 new vitamins, but Miss Goettsche will not publish it until she has determined the chemical nature of the factor or factors. Experiment been going on for about 4 years now.

Of course, this factor must have been vitamin E, which was only written about in nutrition and dietetic text books after 1936. In fact, Elsie Widdowson and Margery Abrahams wrote a book together, *Modern Dietary Treatment*, first published in 1937.³ Subsequent editions were published in 1940 and 1951, but this first edition does not mention vitamin E. A handwritten addition to the 1937 edition shows that Elsie ensured the “new” vitamin took its rightful place in the second edition.

PHILADELPHIA

When she left New York, Elsie travelled to Pennsylvania Hospital in Philadelphia, which she was told was the oldest hospital in the United States, having been founded in 1753. She stayed here a couple of days, and on April 30, she went with Miss Alderman to her Food Clinic:

The room where the patients are seen is made to look as “homelike” as possible—pictures round the walls and ornaments suitable for Germans, Jews, Dutch, Italian, colored people, etc. Posters dealing with nutrition round the walls, and Miss Alderman has literature, which she distributes. She also has an excellent set of food models (wax), which unfortunately are very expensive. Miss Alderman was trained by Miss Stern and speaks very highly of her. For about 40 minutes each morning, she gives a lecture talk to prospective mothers in the antenatal department. The colored and whites are kept separate in the maternity block in O.P.’s (outpatient departments) and in the wards. This was a colored day. There were 5 women. Miss Alderman talked to them very nicely and simply about the building up of a baby’s body and what it needs, how the food reaches it, etc. She tries to make the women enter into the conversation. Then she went on to talk about lactation and the importance of breast-feeding. One or 2 of the women seemed fairly intelligent—the others were rather dull.

Not only does this tell us how good the nutrition education was in antenatal care, but it shows the massive

difference in the way clinics had to be run before racial equality came onto the scene!

BALTIMORE

On May 1, Elsie moved on to John Hopkins University in Baltimore, and here she met Dr E. V. McCollum, famous for his work on vitamin D, whose company she obviously enjoyed:

Dr McCollum, a charming man, unassuming, quiet, and very friendly. I was with him for about ½ hour and greatly enjoyed it. We discussed the League of Nations report, our dietary studies on children, iron (Fe) etc. I gave him a copy of our Fe paper (Fe in diets and hemoglobin [Hb]). Then I went to see Miss Becker, his assistant, who teaches nurses and student dietitians and who also works on rats, feeding them with various mixtures of inorganic salts. They use mixed breeds of rat—not only albinos, and they breed all their own. Miss Becker has been feeding them on different Ca:P ratios and finds that if the Ca is very low, they do better if the P is correspondingly low. Results are not published yet. Then I had lunch with Dr McCollum, Miss Becker, Miss Orent, and Dr McCollum’s secretary. Sandwiches, and coffee and milk to drink, then pears and grapes. Paper hand towels were used as table mats. Very nice and unofficial. We discussed different treatments of milk. Afterward, I told Dr McCollum about my work with Audrey Richards on African diets. Miss Orent has been working on manganese and sterility and also on magnesium deficiency in animals.

Little did Elsie realize at the time that, many years later, she would be asked to deliver the prestigious McCollum lecture. The American Society of Nutrition established the EV McCollum International Lectureship in Nutrition to encourage sound advancements in nutritional science and their application for improving the health and well-being of people worldwide and to recognize the life and contributions of McCollum who died in 1967. Elsie’s lecture in 1985 was entitled “Animals in the Service of Human Nutrition,” but she started the lecture by recalling how kindly she had been treated by McCollum in 1936 when “he was a great man, and she was a nobody”.⁴ She never forgot his lesson and example. Those who are lucky enough to have known Elsie could say exactly the same about the way she treated us. Much of Elsie’s lecture was about McCollum’s own work with rats (which he had to buy from a pet shop with his own money!) and his contributions to the discovery of vitamins A and B. His work with his student, Miss Orent, on manganese and magnesium deficiency on sterility was also featured in Elsie’s lecture, so it is easy to see how important that day in Baltimore was to her. Johns Hopkins has a nutrition fellowship in Orent’s name even today.

WASHINGTON, DC

Elsie once commented, “I sometimes think that of all the various aspects of nutrition I have dabbled in, my first

venture on the composition of foods will be the longest lasting.” Well her 3 days spent in the Bureau of Home Economics in the Department of Agriculture in Washington, DC, must have been a momentous time for her. Here she met the group who were responsible for the tables of food composition then in use in the United States and also in Britain. Elsie particularly remembered Miss Chatfield (Figure 1). They discussed whether it was better for compilers like Chatfield to prepare tables from the published work of others, in this case that of Atwater,⁵ dating from 1900, or for people like Widdowson, who had analyzed the foods, to make the tables.

Wednesday, May 6

I arrived at the Bureau at about 10 AM. First went to see Miss Chatfield and Dr Adams (Charlotte and Georgian). Spent all the morning with them, discussing the composition of foods, available Fe, etc. I had not got our figures with me as my trunk had not arrived. They seem very keen and widely read and also very critical. They are quite aware that they are open to the criticism that they are not doing any practical work on food analysis, but they feel that their collection of data is a full-time job, and if they were working in a laboratory, they wouldn't be doing it. I found that our opinion of various pieces of previous work, whether good or bad, was in agreement with theirs. They are firmly of the opinion that the Latin names should be given, because foods are called by different names in different countries; for example, our chicory is endive in America and vice versa. They are constantly writing to authors for further data that they assume are available, for example, where percentage losses on cooking are given they want the percentage composition of the original material. They think we ought to give the composition of the raw vegetables in our cooking experiments. They try to read every paper dealing with the composition of food, and when they have read the



FIGURE 1. Ms Charlotte Chatfield of the US Department of Agriculture.

paper critically, they decide whether or not they will enter the results in their records. Sometimes they enter the results tentatively. I am satisfied that the results they publish are reliable.

Thursday, May 7

I took our MRC (Medical Research Council) report on The Chemical Composition of Foods, and we started going through the figures and the text. Miss Chatfield had many useful suggestions to make. If we do not publish the values for the composition of the raw vegetables used for the cooking experiments, I have promised to send her the values.

Friday, May 8

Spent the whole day in the Food Composition Section, mostly discussing our MRC report and comparing our results with others they have queried. I have decided to leave it all with them—they seem so keen to have it. I had lunch with Miss Chatfield and Dr Adams.

Two things strike us from these diary entries: first, how long Elsie had existed without her trunk containing all her data and, presumably, all her personal belongings! Second, how happy she was to leave all her results to her US colleagues. No wonder they were pleased to have them! Elsie was in her late 20s at the time and very much Miss Chatfield's junior. Elsie commented later that Chatfield was a rather forceful person and thought she had won the argument about compiling tables from the data of others. But she did not convince Elsie. The British tables were eventually published in 1940.⁶ The main difference between these and the US tables⁵ was that the compilers of the tables, McCance and Widdowson, had analyzed all the foods themselves and not just compiled the data from other sources. Other innovations in the British tables included the values for cooked foods as well as raw foods, the values for ionizable iron to provide some estimate of the bioavailability of iron in foods, and the inclusion of phytate values as it was becoming increasingly apparent that phytate was an inhibitor of calcium and iron absorption. Many years later, Elsie wrote a paper about the UK food tables and included the story of her meeting with Miss Chatfield in 1936.⁷ On publication of *The Chemical Composition of Foods* in 1940, Elsie sent Miss Chatfield a copy, but she was very worried about her reaction to it. There was no need. Charlotte Chatfield wrote back: “Dear Elsie: Your book arrived some weeks ago, and I am certainly proud to know you. I can appreciate the amount of work this represented, probably better than people who have worked in other fields. I am especially impressed with the fact that there is nothing wrong with it, so far as I can tell. You know from past experience that I am always finding fault with publications in this field.” At last, Elsie had received Miss Chatfield's approval and with such high praise!

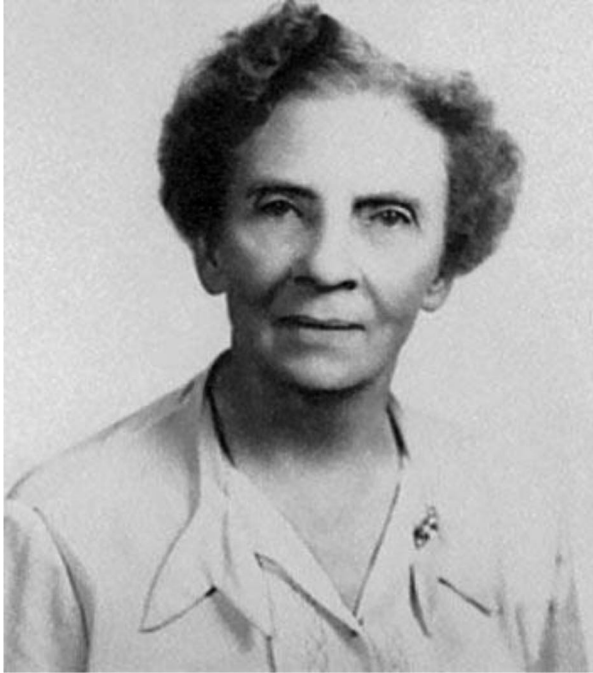


FIGURE 2. Lydia Roberts.

The UK tables are now in their seventh edition, and in deference to their instigators, they still carry the names of McCance and Widdowson.⁸

Other important people Elsie met in Washington included Dr Hazel Stiebeling and Ms Sybil Smith. In fact, it appears it was the latter who helped Elsie plan many of her other US visits. She was particularly keen for her to meet the groups in Chicago and in Iowa because she could see parallels with what they and Elsie were doing in measuring individual dietary intakes.

CHICAGO

Tuesday, May 12

I went straight to see Dr Lydia Roberts on my arrival. I reached her department about 12, and she and Mrs Brooks took me to lunch. I stayed with Dr Roberts all the afternoon, and I very much enjoyed the time with her. She planned a schedule for me in Chicago, and we discussed Fe and also her nutrition work with children. She told me about the individual dietary studies that have been made under her direction, mainly by her students, during the past few years. She reckons that she has about 500 records altogether. A great many of these, however, are collected in institutions. Her object is to determine requirements of calories and nitrogen (N). Mixed samples of food are combusted and also N estimated by Kjeldahl, so that she does not rely on tables at all. She is only interested in N and calories. For institutions, they have a neat way of collecting the weights of the foods eaten. Each child has an envelope. In each pat of butter, portion of bread, potatoes, etc, etc, is stuck a little tag with its weight, previously weighed by the person in charge. The boy collects these (tags) in his envelope, and if he has a second helping, he just adds to them. Then, in each institution, each individual foodstuff would be analyzed. In families where individual children are studied, the composite diet is ana-

lyzed. Physical measurements taken as a routine are height and weight, teeth, and, for signs of vitamin deficiencies, x-rays of ribs for vitamin D, capillary strength for vitamin C (she recommends us to try this). Also photographs taken with an ordinary snapshot camera. I think we might do this.

So Elsie picked up 2 very simple tips from her visit to Lydia Roberts (Figure 2) in Chicago, which were to be featured in her own studies back in the United Kingdom. Before she left Chicago, Elsie gave a talk on what she and McCance were doing at Kings College Hospital in London:

I told them about our food analysis, cooking experiments, available carbohydrate, and iron studies. They seemed most interested, because most of them were working on one or other of the subjects.

IOWA

Elsie then took the night train from Chicago to Iowa City and visited the Iowa State College at Ames. Her first port of call was to meet Precious Mabel Nelson, Margaret Ohlson, and Pearl Swanson (Figure 3).

They were studying mineral metabolism in rats and making dietary surveys on groups of women in the local population:



FIGURE 3. Precious Mabel Nelson, Margaret Ohlson, and Pearl Swanson (from left to right).

Friday, May 15

Drs Nelson and Swanson have been doing a rat feeding experiment lasting over about 4 years, on various proteins in the diet. They find that, if the diet is otherwise adequate, but if the sole source of protein is pork, or even beef, the rats are all right for the first generation, but in later generations, they are poor things. The addition of a small amount of liver, so small it cannot make any difference to the protein intake, will put them right again. Therefore, it must be some other factor in the liver. It has never been noticed before because experiments have only followed 1 or 2 generations.

We wonder what this factor was. Maybe one of the yet undiscovered B vitamins? In 1936, only vitamin B₁—thiamine—was in the text books.

Elsie next went to the Iowa State Hospital to see Dr Kate Daum (Figure 4):

Monday, May 18

Dr Kate Daum is in charge of the nutrition department at Iowa State Hospital. She is a most keen and interesting person. She is a scientist primarily, but also has charge of all the feeding in the hospital, 900 patients, as well as staff and all special diets. I don't think she spends much time in the kitchen. She has about 6 assistants and 8 students. Her students, besides doing their ordinary hospital work, are doing research work on various problems for their master's degree. One is working on vitamin A, another on vitamin C. They have a laboratory in which to work.



FIGURE 4. Dr Kate Daum.



FIGURE 5. Dr Genevieve Stearns.

This is the first time I have seen scientific dietitians. Mrs Marble, Miss Karlake, and Miss Wells were trained here. The whole department works in close touch with the doctors, goes on ward rounds, and is consulted about treatment. This is the only place I have seen where the doctors really consult the dietitians about the cases. There is no outpatient clinic because the patients all come from long distances, and therefore, it is the teaching of the patient before he/she goes home that is important.

Elsie's comment about seeing scientific dietitians for the first time who were actually consulted by the doctors is quite revealing!

Another woman who impressed Elsie in Iowa was Dr Genevieve Stearns in the Department of Pediatrics (Figure 5) who had ingenious ways of making balance studies on babies:

She has a squad of 14 babies: 7 on and 7 off balance. They have cute little contraptions for collecting urine and feces. The babies lie on beds made of canvas hung between the ends of the bedstead, and there is a hole leading to an evaporating basin for the feces. The boys have the finger of a rubber glove attached to the penis with adhesive tape, leading to a glass and rubber tube, passing through another hole in the canvas to a flask below. The girls have little oilskin aprons, and urine and feces are collected together. The children are strapped down, with their legs wide apart, but they don't seem to mind. Dr Stearns is testing out various kinds of evaporated milk, some irradiated, some not,

TABLE Current Nutrition Interests of Places Visited by Elsie Widdowson in 1936

Institutions Visited	Current Status if Known
Columbia University and Columbia Medical, New York	Maintains a strong nutrition program, and a research remains a fundamental component of all graduated programs in nutrition
Rockefeller Institute, New York	The Rockefeller Institute, now known as the Rockefeller University, focuses on research and graduate education in the biomedical sciences, chemistry, bioinformatics, and physics. There is no current nutrition program
Presbyterian Hospital, New York	Has a dietetic internship program with a focus on clinical nutrition and offers outpatients services for a variety of conditions
Montefiore Hospital, New York	The nutrition department remains but is not focused on research
Bellevue Hospital, New York	Offers inpatient and outpatient nutrition services, but there are no graduate degrees or nutrition department that focused on research
Dubois Clinic, New York	No information is available
The University of Pennsylvania Hospital, Philadelphia	The University of Pennsylvania School of Nursing and College of Arts and Sciences jointly offer nutrition minor, and the hospital has inpatient and outpatient services with nutrition research
Cox Research Institute, University of Pennsylvania, Philadelphia	The institute focused on nutrition research, including glucose tolerance and obesity. Research on endocrine and cardiovascular topics continues at the Hospital of the University of Pennsylvania
Child Health Society, Philadelphia, Pennsylvania	No information is available on the Child Health Society, but the Children's Hospital of Philadelphia, which is affiliated with the University of Pennsylvania, has an active clinical nutrition program in its Division of Gastroenterology, Hepatology, and Nutrition
National Dairy Council, Philadelphia, Pennsylvania	The National Dairy Council, now located in Rosemont, Illinois, funds nutrition research related to dairy products and produces nutrition education materials about the nutritional value of dairy products. It also informs the public about the research that supports dairy health benefits
Temple College, Philadelphia, Pennsylvania	Now a university, Temple has a School of Medicine and School of Public Health with a graduate nutrition science program focusing on obesity research and education, and a hospital offering offers inpatient and outpatient nutrition services
Johns Hopkins University School of Hygiene and Biochemistry, Baltimore, Maryland	The university has a nutrition research program and dietetic internship program focused on nutrition research. It offers doctor of philosophy (PhD) and master of science (MS) degrees of public health, a fellowship in nutrition, and a major lecture, American Society for Nutrition annual meeting in honor of Dr E. V. McCollum. The School of Public Health is well known for its international work on vitamin A and xerophthalmia and other public health nutrition problems

(continues)

TABLE Current Nutrition Interests of Places Visited by Elsie Widdowson in 1936, Continued

Institutions Visited	Current Status if Known
Bureau of Home Economics, US Department of Agriculture (USDA), Washington, Washington, DC	Much of the former Bureau of Home Economics' work on food composition is now in the Agricultural Research Service's Beltsville MD Human Nutrition Research Center. The USDA Agricultural Research Service now has 6 Human Nutrition Research Centers (Beltsville, Maryland; Houston Texas; Little Rock, Arkansas; Davis, California; Grand Forks, North Dakota; Tufts University, Boston, Massachusetts). In addition, USDA has an active Center for Nutrition Policy and Promotion; it cosponsors the ongoing dietary portion of the National Health and Nutrition Examination Survey and sponsors an active competitive grants program and Cooperative Research, Education, and Experiment Stations. It continues to have an active program in food composition and analysis as well as compiling analytical findings from other laboratories in the Standard Reference Food Composition Tables. The USDA's Bureau of Home Economics no longer exists, but components of it continue, with some of education programs in the Center for Nutrition Policy and Promotion in the Food and Nutrition Service. There is also a competitive grants program called the National Institute of Food and Agriculture that awards grants to investigators on various food and nutrition topics
University of Chicago Department of Home Economics, Illinois	The University of Chicago had an active program in clinical nutrition for most of the 1930s and 1940s both in the enrichment of flour and also activities collaborating with the American Medical Association, with offices in Chicago. After a long series of investigations by Dr Lydia Roberts of the Department on Child Nutrition, Roberts retired to Puerto Rico to study the nutritional status of the island in the 1940s, where she collaborated with investigators and educators to improve the nutrition of rural families. The Norushen Home Economics Department was closed, and graduate program in nutrition discontinued. The Division of Biological Sciences in the Pritzker School of Medicine of the University of Chicago now has a Committee on Molecular Metabolism and Nutrition, a research unit of the University of Chicago offering interdisciplinary doctoral training in the molecular basis of biological processes as they relate to nutrition and human disease. It has a PhD degree in molecular metabolism and nutrition. The University of Chicago Medical Center has an active program in gastroenterology and bariatric surgery
University of Iowa, Iowa City	The university has a nutrition department in the School of Public Health. The University of Iowa Hospitals and Clinics have a strong research focus on medical nutrition therapy and food composition. The Department of Pediatrics has been a leader in study of the nutrition, growth, and development of children for many years. The university focuses on research on prevention, community health, and chronic disease management and offers a dietetic internship program and degree in public health
Iowa State University, Ames	It offers MS and PhD degrees in nutritional sciences with focus on animal nutrition, human nutrition, and molecular/biomedical nutrition. Interdisciplinary research foci include the nutritional relationships between diet and cancer, diabetes, obesity, soy nutrition, and the development and production of new food products that promote health and prevent disease. It also has an excellent food economics department
Institute of Child Welfare	No information is available

(continues)

TABLE Current Nutrition Interests of Places Visited by Elsie Widdowson in 1936, Continued

Institutions Visited	Current Status if Known
Mayo Clinic, Minnesota	It offers a dietetic internship program and continues to provide clinical care to its patients at the hospital, which now has a medical school
Children's Research Laboratory Fund, Detroit, Michigan	No information is available
University of Michigan, Ann Arbor	It offers MS and PhD degrees in nutritional sciences in its School of Public Health and a dietetic internship in the University of Michigan Hospital
University of Rochester, New York	Offers a dietetic internship and master's degree in cooperation with Cornell University and its hospital, Strong Memorial, and continues to do nutrition research
University of Toronto, Ontario, Canada	It continues to be active in nutrition research and teaching offering MS and PhD in nutritional sciences, and its affiliated hospitals have active nutrition research programs. There is also a combined dietetic internship-master's program
McGill University, Montreal, Quebec, Canada	It offers graduate degrees including MS and PhD degrees in human nutrition, and a dietetic internship
Boston, Massachusetts	There are numerous institutes and hospitals that offer dietetic internship programs and graduate programs in nutritional sciences, including Tufts University, Boston University, Harvard University School of Public Health, and the University of Massachusetts and their associated hospitals
Yale University, New Haven, Connecticut	It offers a dietetic internship program at its teaching hospitals and some nutrition courses in its School of Public Health and medical school
University of Wisconsin Madison	It continues to offer graduate MS and PhD programs in biochemistry and nutritional sciences and a dietetic internship in the University of Wisconsin Hospital. The long tradition of research on human nutrition requirements and food science continues

some with added vitamin D in various forms, and they are measuring Ca and P balances.

Elsie's final meeting in Iowa was with Dr Amy Daniels:

Monday, May 18

Dr Amy Daniels is in charge. She is mainly concerned with research—balance experiments on children, but she is also an advisor on nutrition for the Institute of Child Welfare, and she is "at home" to telephone calls for a certain time each day, to give advice on infant nutrition etc. Her research consists of long-term balance studies on preschool children. She has worked on N, Ca, P, Fe, Mg, and now vitamin C. She has 2 nurses, whose only duty is to look after the 3 children. She will now have had these 3 children continuously on balance for a year. She tries to get all she can out of 1 balance study, as it is all so expensive. Her vitamin C work is in press. She has come to the conclusion that one citrus fruit a day is not sufficient for a child, and they need larger amounts of vitamin C than this. The more that is given, the more they retain, up to a certain point. Exactly the same is true of Mg (magnesium). She is following creatinine as well. The chemical work is done in a laboratory across the road, a con-

certed house where 4 or 5 girls work, and they are the girls who appear on her publications.

Elsie also noted how the students funded themselves at the university—not very different to what they do today!

Students at the University of Iowa, both men and women, work to help keep themselves. By working for 3 hours, for example, at typing, dishwashing in the kitchen, cleaning schools, etc, they earn their 3 meals. Other students are waitresses in restaurants in the town. One student was studying medicine and working 7 hours a day besides.

Elsie left Iowa and travelled via Rochester, Minnesota, and Madison, Wisconsin, to get to Detroit. Dr Icie Macy was someone who made a lasting impression on Elsie and of whom she spoke about many years later. Her work on nutritional requirements of children and of pregnant and lactating women and on the composition of breast milk were to inspire Elsie's own studies in these areas.⁹

Detroit, Children's Research Laboratory Fund Monday, May 25

Dr Icie Macy is director of the Fund. It was a fund set up for studies on children, and a great deal of the money is spent on curative work—dentists, etc—in Michigan, but this institute is just for research. The work that is going on is most interesting. There are 2 main experiments in progress. The first deals with babies. It is financed by “Gerbers,” the canned-food manufacturer, and their nutritionist, Dr Lillian Storms, was at the Fund while I was there. The subjects of the experiment are 100 babies. These babies are divided into 3 groups. Some are given milk only; others, milk + strained vegetables; and a third group, milk + vitamin B. The babies live at home, but they are brought every month, and anthropometric measurements are made, length, chest, head, etc, etc. X-rays are also taken, and hemoglobins, blood counts, etc, etc, and, of course, weight. By these means, they are hoping to find whether the addition of vegetables to infants' diet at about the second month is beneficial or not. So far, there appear to be no differences between the experimental group and the controls. The second experiment, which is now completed, has consisted in a complete balance study on 10 children for 8 months. The children, 6 boys and 4 girls, are 4 to 8 years old. They live in a home with a foster mother, 17 miles out of Detroit. This home is part of a Methodist orphanage. Weighed and prescribed amounts of food have been given throughout the period, and duplicate portions are always analyzed. Collections of urine and feces have been made in 5-day periods. The experiment has just been terminated, and a great deal of statistical work remains to be done. Determinations of protein, calories, and all the inorganic salts, including sulfur, have been made. The results that have so far been tabulated show tremendous fluctuations from period to period in 1 child and from 1 child to another. A 5-day period appears to be of no use whatever, for you may get any result from a strongly positive to a strongly negative balance on the same diet and under exactly the same conditions. Dr Macy thinks that periods of growth may have something to do with this. I went to see the children, and they certainly seem exceptionally happy and healthy.

We find it interesting that baby food companies were sponsoring studies on nutrient requirements of infants even in 1936, and we wonder if the “purists” were as critical as they are today of industry bias in results. It is also fascinating to see how day-to-day variation in requirements was recognized and how they realized even then that balance studies must be long term to be meaningful.

After Detroit, Elsie's travels took her on to Ann Arbor and then to Toronto and Montreal in Canada before she returned back to New York in June 1936 to get the ship back to the United Kingdom.

CONCLUSION

Apart from being surprised at how many places she visited and people she saw in her US trip, we have been amazed at the meticulous notes Elsie made in her 1936 diary and how many of the studies inspired her to follow research along similar lines throughout the rest of her career. She makes it very clear in the diary just how inexperienced she felt in her visits to these great women pioneers of the subject and how honored she felt that they spared the time to tell her about their work. Knowing Elsie from the 1970s onward, as 2 of the authors (M.A. and J.D.) have done, when she was the age we are now, we can well believe that they were happy to give up their time to someone who was always so appreciative and who was so keen to learn. If anyone from any of these institutions, or any distant relative of any of the people named in this diary, happens to be reading this, they can feel rewarded that the help their predecessors gave to this young British lady was partly responsible for turning someone who considered herself a “nobody” into one of the world's most famous research scientists of the 20th century.

REFERENCES

1. Fialkoff L, Berdanier C, Ashwell MA, Dwyer J. Elsie Widdowson: the remarkable life of a pioneering nutrition research scientist, but an unsung dietitian. *Nutr Today*. 2015;51(2):86–92.
2. Ashwell MA 1993. *McCance and Widdowson—A Scientific Partnership of 60 Years*. London, UK: British Nutrition Foundation; 1993.
3. Abrahams M, Widdowson EM. *Modern Dietary Treatment*. London, UK: Balliere, Tindall and Cox; 1937.
4. Widdowson EM. 1985 E. V. McCollum International Lectureship in Nutrition. Animals in the service of human nutrition. *Nutr Rev*. 1986;44(7):221–227.
5. Atwater WO, Bryant AP. *The Chemical Composition of American Food Materials*. Storrs, CT: USDA Office of Experiment Stations Government Printing Office; 1906.
6. McCance RA, Widdowson EM. *The Chemical Composition of Foods*. London, UK: HMSO; 1940.
7. Widdowson EM. Development of British food composition tables. *J Am Diet Assoc*. 1967;50(5):363–367.
8. Public Health England. *McCance and Widdowson's the Composition of Foods, Seventh Summary Edition*. London, UK: Royal Society of Chemistry; 2014.
9. Nichols BL. Icie Macy and Elsie Widdowson: pioneers of child nutrition and growth. *J Nutr*. 2003;133:3690–3692.