Doris Howes Calloway (1923–2001)

Janet C. King

U.S. Department of Agriculture/ARS Western Human Nutrition Research Center, University of California, Davis, CA 95616

Doris Howes Calloway died August 31, 2001, in Seattle, WA, after a long battle with Parkinson’s disease. She was born February 14, 1923, in Canton, OH. Her father, Earl Howes, was a lawyer, judge, and fingerprint and ballistics expert. He died when Doris was 3 years old. To support Doris and her older sister, June, Doris’s mother, Lillian Roberts, worked as a Pinkerton’s undercover agent, specializing in fraud. Doris commented once that with both parents being private investigators, she may have inherited her skills of observation and inquiry. Doris and her sister, June, both took ballet lessons and learned to tap dance. Doris maintained an interest in music, dance and the arts throughout her life, and she enjoyed the San Francisco Symphony and the Opera.

As a child, Doris attended public schools in East Canton, OH. Her academic excellence was evident early; she graduated as valedictorian of her high school class of 1300 students when she was only 16. Although Doris was interested in studying medicine, finances did not permit this. Instead, she won a scholarship to Ohio State University entering in the Fall of 1939. During her senior year at OSU, her mother died, leaving Doris an orphan at an early age. Doris received a B.S. in nutrition and dietetics in 1943 and was encouraged to stay at OSU to study for a Ph.D. in Physiological Chemistry. However, with World War II in progress, she wanted to do something more immediately useful, which led to her completing a dietetic internship at Johns Hopkins Hospital in Baltimore.

Doris then joined a Department of the Army research project at the University of Illinois Medical School in Chicago. The project was to study whether dietary protein and physical activity could shorten the time required for convalescence from surgery. This marked the beginning of Doris’s research career in human metabolic studies. She worked with a very talented group, including Professor H. H. Mitchell, a well-known nutritional scientist who was noted for his rigor in the design and conduct of nutrition research.

While engaged in this research, Doris entered the graduate program at the University of Chicago. She also met Nathaniel Ogelsby Calloway, an intern on the wards of the hospital, and they married in 1946 on her birthday, February 14th. Their first child, David, was born while she was still a graduate student. Nevertheless, she completed her Ph.D. in Nutrition in 1947, a mere three years after she began her studies—a testimony to her academic capability and her ability to maintain a high energy focus on her activities. Candice, her second child, was born shortly after Doris finished her doctoral degree.

In 1951 Doris was appointed as a nutritionist at the Armed Forces Food and Container Institute in Chicago and was made Chief of the Nutrition Branch. Nat, her husband, had just been drafted into the Korean conflict, and they could not make ends meet on his salary alone. It was here that she discovered that there were properties in food that helped protect against radiation. She found that broccoli reduced the carcinogenic effect of radiation. In 1959 the Institute named her “Man of the Year.” Doris loved the plaque and displayed it in her office throughout her career. After the war, Nat became very involved in Chicago politics. The demanding social obligations associated with the “Daly Machine” overwhelmed them, and in 1956, they were divorced.

In 1961 Dr. Calloway accepted a position as Chair of the Department of Food Science and Nutrition at the Stanford Research Institute (SRI) in Menlo Park, CA. She was actively recruited by SRI in October, 1960, but decided that she did not want to leave Chicago. In January, Chicago had a major snow storm; when SRI called to see if she wanted to reconsider, she did. While with SRI, she developed the special food
Doris: the Scientist

Doris's research contributions are extensive in terms of both quantity and subject matter. In this review, her research was grouped into nine different areas (Table 1). The diversity of her work demonstrates her exceptional mastery of a broad spectrum of human nutrition and food science. Often she was working on two or more topics at one time. Dr. Sheldon Margen was a key collaborator in her metabolic studies of human protein requirements. At the end of her career, Dr. George Beaton worked with her on the functional consequences of malnutrition among populations in developing countries.

Her first paper, published in 1947 when she was a young dietitian working at the University of Illinois with Professor H. H. Mitchell, was on the importance of ambulation in postoperative convalescence. A second paper was published by the same group in 1948, shortly after Doris attained her Ph.D. This research showed that encouraging surgical patients to eat earlier and to have some physical activity improved their rate of recovery. This is now common postoperative practice.

While working with the Armed Forces Food and Container Institute in Chicago, Doris and Dr. Harry Spector investigated the effect of restricted feeding on nitrogen balance. The Department of Defense was interested in this problem because of the limited feeding capability created by warfare. This work also progressed naturally from her earlier work with Professor Mitchell. Using experimental rats, Doris and Dr. Spector showed that nitrogen utilization during energy restriction was altered by dietary fat, variations in nitrogen intake and the previous diet of the individual. She continued to investigate

### Table 1

<table>
<thead>
<tr>
<th>Years of publication</th>
<th>Topic</th>
<th>Coauthors</th>
<th>Affiliation of Calloway at the time of the study</th>
<th>Number of papers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1968–70</td>
<td>Yeast, bacteria, and algae as food sources</td>
<td>S. Margen, C.I. Wasilen, J. Bowering, F. Costa</td>
<td>University of California, Berkeley</td>
<td>6</td>
</tr>
</tbody>
</table>
protein-energy interactions throughout most of her scientific career. Between 1957 and 1963, also while employed at the Institute for the Armed Forces in Chicago, Doris showed that irradiation did not alter the growth-promoting quality of turkey meat when it was fed to experimental animals. Irradiation decreased the thiamin content of the food, but only to the same extent as heat processing. The results of this work on the nutritional effects of irradiated food are still quoted when decisions are made to use this means of food preservation.

While at the Stanford Research Institute and during her early years at Berkeley, Doris conducted a series of studies on gut microflora and gas production. Her interest stemmed from a report that nitrogenous gases produced in the gastrointestinal track contribute to nitrogen loss in adults. She reported in Nature in 1966 that the intestine is not an important source of gaseous nitrogen loss, and that respiratory hydrogen, but not methane, was affected by consumption of gas-forming foods. NASA also conducted a comparative flatulence study among astronauts, and this led to a long series of collaborations with the space program. She investigated the effects of various types of foods and diets on intestinal gas production, i.e., legumes, wheat-containing foods, fruits and pineapple, as well as the space diet. The widespread incidence of lactose intolerance was of concern, and in 1969, Doris reported that this disorder could be diagnosed by breath analysis. Her techniques were adopted by gastroenterologists to assist in their diagnosis and treatment of this disorder.

It was thought at NASA that hydrogen-fixing bacterium, such as Hydrogenomonas eutropha, could form the basis of a bioregenerative system for atmospheric control during prolonged space flight if the harvested cells could serve as a food source for the crew. Doris, therefore, studied the use of single-cell proteins, such as yeast, bacteria, and algae, as food sources. However, because these cells are high in nucleic acid, ingestion of bacteria or algae led to large quantities of uric acid production which could put the astronauts at risk for renal stones and gout.

In 1967 Doris began a systematic investigation of human nitrogen and amino acid requirements that spanned 15 years and resulted in many peer-reviewed publications, technical reports and policy documents. Her research addressed the effects of reduced protein intakes on nitrogen loss from the integument, the amount of nitrogen lost in sweat and miscellaneous losses, the amino acid patterns supporting in nitrogen balance and the adequacy of soy protein in maintaining nitrogen balance. She also studied the nitrogen requirements of pregnant, menstruating and elderly women. Her research at UC Berkeley, and that of Dr. Nevin Scrimshaw and his coworkers at MIT, served as the basis of human protein requirements in global food plans. In a study for NASA, Doris demonstrated that excessive flatulence could be lowered if the food eaten by astronauts was a hydrogen-fixing bacterium, which could serve as a food source. This study was done while Doris was an investigator at UC Berkeley. The fact that she successfully completed the
study while being an effective administrator demonstrates her intensity, energy, commitment and integrity.

The findings from Doris’s research had a substantial effect on nutrition; her work led to new concepts, which in turn led to new programs and policies. Her early work on protein metabolism provided new solutions for convalescence and wound healing; her landmark studies on protein and energy requirements provided the foundation for past and current national and international dietary standards for those nutrients; and her later work on moderate malnutrition and physiologic function led to a more comprehensive view of dietary interventions, i.e., that the quality of the food eaten is just as important as the quantity. Consequently, she substantially improved the quality of life of persons all around the world.

For these scientific contributions, Doris received all of the most notable awards in Nutrition. She was elected a Fellow of the American Institute of Nutrition and was a recipient of its prestigious Conrad Elvehjem Award. She also was elected to the NAS Institute of Medicine. She received the Bristol-Myers Squibb/Mead Johnson Award for distinguished achievement in nutrition research. Upon her retirement in 1990, she was awarded the Berkeley Citation, and in 1992, she was selected to give the UC Berkeley Faculty Research Lecture.

Her research, accomplishments and awards clearly demonstrate her outstanding work as a nutrition scientist. However, those accomplishments are not her most important contribution. As George Beaton once said, “What Doris did during her scientific career is to create a model with which others may compare themselves.” It is a model of a scientist who values first truth in science and objectivity in interpretation, but who does this with perspective, i.e., who always sees the question ahead and perceives the contribution toward that more distant question. This perspective is what gave Doris’s work distinction, and it is what she has given to the rest of us, individually and as a field. She had an undying faith in the importance of nutrition and a clear vision of the future. She could communicate new concepts and understandings in a way that everyone appreciated: “people eat food, not nutrients,” or “if one nutrient is lacking, others are as well.”

**Doris, the Mentor**

Doris enjoyed teaching and working with her graduate students. Her students carried out the day-to-day work while being an effective administrator demonstrates her intensity, energy, commitment and integrity.

The findings from Doris’s research had a substantial effect on nutrition; her work led to new concepts, which in turn led to new programs and policies. Her early work on protein metabolism provided new solutions for convalescence and wound healing; her landmark studies on protein and energy requirements provided the foundation for past and current national and international dietary standards for those nutrients; and her later work on moderate malnutrition and physiologic function led to a more comprehensive view of dietary interventions, i.e., that the quality of the food eaten is just as important as the quantity. Consequently, she substantially improved the quality of life of persons all around the world.

For these scientific contributions, Doris received all of the most notable awards in Nutrition. She was elected a Fellow of the American Institute of Nutrition and was a recipient of its prestigious Conrad Elvehjem Award. She also was elected to the NAS Institute of Medicine. She received the Bristol-Myers Squibb/Mead Johnson Award for distinguished achievement in nutrition research. Upon her retirement in 1990, she was awarded the Berkeley Citation, and in 1992, she was selected to give the UC Berkeley Faculty Research Lecture.

Her research, accomplishments and awards clearly demonstrate her outstanding work as a nutrition scientist. However, those accomplishments are not her most important contribution. As George Beaton once said, “What Doris did during her scientific career is to create a model with which others may compare themselves.” It is a model of a scientist who values first truth in science and objectivity in interpretation, but who does this with perspective, i.e., who always sees the question ahead and perceives the contribution toward that more distant question. This perspective is what gave Doris’s work distinction, and it is what she has given to the rest of us, individually and as a field. She had an undying faith in the importance of nutrition and a clear vision of the future. She could communicate new concepts and understandings in a way that everyone appreciated: “people eat food, not nutrients,” or “if one nutrient is lacking, others are as well.”

**Doris, the Administrator and Leader**

Although Doris did not enjoy administration, she was Chief of the Nutrition Branch of the Armed Forces Food and Container Institute in Chicago, Chair of the Department of Food Science and Nutrition at Stanford Research Institute in Menlo Park, CA, Chair of the Department of Nutritional Sciences at UC Berkeley twice, and Provost of the Professional Schools and Colleges at UC Berkeley. She also held several leadership positions in professional societies. She was President and Secretary of the American Society for Nutritional Sciences, a member of the Executive Committees for FASEB and for the Food and Nutrition Board, and on the Advisory Councils for the National Institute of Arthritis, Metabolism, and Digestive Diseases, the National Institute on Aging, the U.S. Department of Agriculture and for the Pew National Nutrition Program.

As Provost of the Professional Schools and Colleges at UC Berkeley from 1981 to 1987, she worked diligently to give women and minorities equal chances for academic appointments. She felt diversity was extremely important and hired the first woman as Dean of the School of Public Health and the first African-American as Dean of the School of Education. She believed that proper mentoring was important for those individuals whose prior experience due to culture or other factors may not have prepared them to easily succeed. She did not accept that one’s race or sex was an excuse for lesser performance, only that it could make the road more difficult.

Dr. Sally Fairfax, one of her administrative colleagues at Berkeley, said, “Doris was a person with a very special kind of leadership that was both a convincing model of what we could be and do, and a clear expectation that we would be and do it. She was willing to advocate forcefully, directly, persistently, to push the rules, and to create opportunities. Beneath her wonderful sense of humor, she was austere, sentimental, and moral.”

Doris entitled her 1992 UC Berkeley Faculty Research Lecture, “Maintaining a Balance.” She could not have chosen a better title to depict her commitment to balancing her scientific and administrative work with her personal values of rigor, honesty, objectivity, integrity and human equality. Doris never let the little things interfere with her vision. She taught us not to be frustrated or discouraged, but just to get on with our work. In her office, she always had a small poster that said very simply, “Hunger is Violence.” She worked tirelessly to eliminate the inequities of hunger and malnutrition. The results of her efforts touched many. She leaves a legacy that will endure for decades.

**ACKNOWLEDGMENTS**

The author gratefully acknowledges the assistance of Kenneth Carpenter and Robert Nesheim in preparing this biography.