

Nutrient Pioneers

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The Williams Brothers

Among the many nutrition scientists I encountered in my work over the years, several stand out in my memory after all these years of retirement. Like George Burr, who with his wife, when I first met him in 1930, had just discovered the one essential nutrient that is not a vitamin, a mineral, or an amino acid, but is equally essential, now known as the precursor in metabolism of the arachidonic cascade. Like Herb Wilgus, who discovered the relation of manganese to chick perosis, and Malcolm Lyons, who discovered ditto for hatchability, and who was killed accidentally while target shooting with research buddies.

Like the dignified Paul Gyorgy, who had a role in the discovery of *riboflavin*, *Pyridoxine*, and *biotin*. Like D. W. Woolley with whom I went swimming on Gibson Island, brilliant and blind, discoverer of the vitamin *inositol*, who many years later became involved in the biochemistry of psychosis. Wayne Woolley, an inveterate traveller despite his blindness from diabetes since age 30, died in the late sixties of an altitude-induced heart attack in Cuzco, Peru. In 1944 he had married a co-worker, Janet McCarter, who carried on at the Rockefeller Institute after his death. Or Sam Lepkovsky, an outstanding researcher who refused to stop his

research when the building was on fire.

Like Walter Haworth, with whom I rode the train from Denver to Chicago in the fall of 1946. He spelled his name for me and when I pronounced it, he said I was the first American he had heard pronounce his name correctly (hahrth). I didn't know that he already had a Nobel Prize for working out the "Haworth" ring structures of sugars, including vitamin C. I never met Albert Szent-Gyorgyi, who worked in Haworth's lab in England, and also had a Nobel Prize. In chemistry, sugar names end in -ose, and there's a legend that when "Saint George" proved that vitamin C is a kind of sugar, but was ignorant of its formula, he suggested to an editor that it be called *ignose*. When the editor objected, he came up with the name *Godnose*. In the end he named it *ascorbic acid*.

I also remember Glen King; I think he first crystallized pure *ascorbic acid*. And Give McCay, who gave rats Coca Co/a instead of water to drink. When the phosphoric acid in

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Fourth in Series



Six million dollars Robert Williams and Robert Waterman received for patent on thiamine went to set up a "Williams-Waterman Fund" under Research Corp., where it was used to advance better living through nutrition chemistry for all the world.

the *Coke* ate their teeth down to the gums, he went to the *Coca Cola* Company to complain. Their only suggestion was that they had another recipe that used sulfuric acid! I remember Fred Stare, whom I recall as a brash young whippersnapper with a crew cut. But most of all, I remember the Williams brothers, Robert and Roger.

Robert discovered *thiamine*, and Roger discovered *pantothenic acid* and was a co-discoverer of *folic acid*, which he named.

I think too much is made of where, when, and by whom a vitamin was "discovered." In many cases the discovery has been a process of accretion. Is the moment of discovery when a nutritional deficiency syndrome is first recognized? Or when a natural source of the vitamin is found? Or when it is crystallized? Or its chemical structure proved? Or is it discovered when it is first synthesized chemically?

Robert Williams was an exception. In the case of *thiamine* he did the last three of these. This became a marathon obsession with him, taking not 26 miles, but 26 years. The Williams boys, Bob and Roger, were sons of missionaries and were born in India. They grew up deeply disturbed by the sight of the

terrible nutritional deficiency diseases that surrounded them. They resolved to dedicate their lives to trying to alleviate these conditions.

Both obtained Ph.D. degrees from the University of Chicago. Back in 18%, Bob was ten and Roger was only three. That's when the first clue was obtained accidentally that beri beri is a nutritional disease. Dr. Christiaan Eijkman had been sent to the Dutch East Indies to find the germ that caused the disease. The nutritional aspect occurred when an assistant fed fowls unpolished rice by mistake and it cured them. Although the evidence was staring him in the face, Eijkman resisted it with all his might.

More than half of the world's human food comes from cereals, mainly rice, wheat, and corn (maize). Rice is the principal item of diet in the orient. Before cooking, the outer coating with all its good vitamins and minerals is removed by "polishing," so that all that's left to eat is the starchy inner part. This processing is what was causing the hospitals to be full of patients with beri beri. It was assumed to be an infection. After all, hadn't Louis Pasteur proved that disease is caused by germs? How could it be anything else?

By 1910 Robert Williams was back in a lab in the Philippines, where a doctor showed



Roger Williams (left); A. Rae Patton 1957 (in Patton home).

him a syrup made from rice polishings, which would cure beri beri. Robert resolved to find out what was in it.

Returning to the United States, he worked first in a Government laboratory, but the \$2500 annual salary wouldn't feed his family, so he took a job with Bell Telephone in Summit, New Jersey, where he later became Chemical Director. I lived nearby in Metuchen.

His work with Bell was very remote from nutrition, but he stubbornly continued his nutrition research at home at his own expense. Working after hours, he patiently fed rice polishings fractions to rats, kept in cages in his garage. He was helped by Robert Waterman, his daughter's boy friend and later his son-in-law.

The years went by, the Depression came, and the Telephone lab went on a three-day week. More time to work at home. After going through many tons of rice polishings, in 1936 they were able to get out enough of the elusive substance in crystalline form to learn its formula and make it synthetically.

Robert Williams had finished the discovery of one of the vitamins in McCollum's "water soluble B," namely vitamin B-1, which he named *thiamine*, because it contains sulfur (*thia-*) and is an amine (*NH2-*). They sold a patent on thiamine for six million dollars, but they didn't keep the money. It was put into a nonprofit "Williams-Waterman" fund, to help

others do nutrition research.

Roger Williams visited in our home in 1957. He used an electric shaver, which surprised me for an "old-timer" born in 1893. He liked bow ties. AH his life he had trouble with his eyes. He would be ninety-one now, and I understand he is nearly blind.

In order to get his Ph.D. at the University of Chicago, Roger took a Fleischmann fellowship. The only catch was that he had to do his research on yeast. I think he hated yeast because of its connection with alcoholism. I remember he told me he felt that alcoholism is a nutritional deficiency; in fact he said he believed that no one who followed good nutritional practices would ever become an alcoholic. He pursued research and wrote books to back this up.

Roger has written many outstanding books, both for the layman and for the nutritionally-wet-behind-the-ears physician. His comments concerning the nutritional foibles of the medical fraternity are witty and biting. He found that the lesser-known amino acid, *glutamine*, when added to an alcoholic's diet (it is tasteless) would alleviate the insatiable appetite for alcohol. Physicians who tried it reported it didn't work. The reason it didn't work was, that in every case, instead of *glutamine* they had used the more readily available glutamic acid, apparently

being too ignorant to know the difference!

If Roger had to work on yeast, then he would use the very least yeast possible: a single cell. So he washed out one cell, put it on a slide under the microscope, and sat down to watch it divide. Stubborn as he was, he was outstubborned by that yeast cell, which refused to divide. Making a long story short, by adding this or that, he finally found a substance which enabled the yeast to divide.

It turned out that he had discovered a new vitamin, also necessary for animals and humans (1938). He named it *pantothenic acid*. Dietary *pantothenic acid* is the precursor of *pantetheine*, the functional moiety in *Coenzyme A*. *Pantetheine* was discovered and named by Gene Brown, a former biochemistry student of mine. *Pantothenic acid* combines with *beta-mercaptoethylamine*, which provides the *-SH* group that holds the *acetyl* group in *acetyl-Coenzyme A*.

I know of no one who has been more active in spreading the word about Orthomolecular nutrition than Roger Williams. He also developed the genotrophic concept of biochemical individuality. Sometimes his lectures made people angry, because they swept away walls of prejudice and bigotry. Since one must accept people with different shape stomachs, different vitamin requirements, different sexuality, different body chemistry, different pain sensitivity, different retinas, different everything, how is one to justify intolerance of others with different skin color, different facial characteristics, different religion, different origin, different sex?

I saw in Roger Williams something a great deal more than a nutritional biochemist. I saw in him a kind of missionary, a man with a message. It may sound silly now, but I actually said to him, "Roger, I think you're not just a biochemist. I think you're an evangelist. I mean this in the most positive way, but I think you're the 'Billy Graham' of biochemistry." He didn't deny it.