Green thoughts in a green shade*

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Abstract

The author gives an autobiographical sketch of his path to chlorophyll research, and describes some results. The discussion is largely focused on long wavelength forms of chlorophyll and how they might be generated by self-assembly. Dimers or oligomers, (Chl),, result from coordination interactions between the central magnesium atom of one macrocycle and nucleophilic side chains of another i.e., keto C=O...Mg in the case of Chl a. Coordination interactions mediated by a water molecule coordinated to Mg in one macrocycle and to a nucleophilic group in another e.g., Mg...O(H)H...O=C keto, form aggregates with very different structures and properties; where more than one strong nucleophile or hydrogen bonding group is present in the chlorophyll, e.g., the formyl group in Chl b, the acetyl group of Bchl a, or the hydroxyethyl group of Bchl c, they may also participate in direct coordination interactions with Mg as well as hydrogen bonding to water coordinated to Mg. The magnetic resonance properties of Chl a/water aggregates have provided the basis for the special pair concept for the primary electron donor in photosynthesis. Structural information derived from small angle neutron scattering studies on chlorophyll aggregates is now providing an experimental basis for comprehensive models that integrate antenna and photoreaction center chlorophyll functions.

I was born in Detroit, Michigan April 19, 1912. My parents were Jewish immigrants from Czarist Russia. Neither of my parents had any formal education. My father at various times was a peddler, worked on an automobile assembly line, and for a while had a small dry goods store, which failed during the twenties. My mother died shortly after my thirteenth birthday. We never went hungry, but otherwise ours was a marginal existence.

I was educated in the public schools of Detroit. I was an indifferent pupil in grade school, but in high school I finished the four year curriculum in three years, and at the age of sixteen, being unfit for anything else, entered the College of the City of Detroit (much later to become Wayne State University). I continued to live at home, and commuted to school by street car. Although tuition was minuscule by modern standards, it was still beyond our means. I was able to borrow the money for tuition and books from a Detroit philanthropist, incurring a debt of about $800 for my college education, which I was able to repay only many years later.

Although I had only a faint idea of what a chemist did for a living, I enrolled as a chemistry major. The chemistry teachers were conscientious, but none as far as I know had any research interests. Class-room and laboratory instruction...