



In memory of Thomas Turpin Bannister (1930–2018)

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Abstract

Tom Bannister (1930–2018) was an extraordinary person and a remarkably productive scientist. He began his career studying the basics of photochemistry, biophysics, and biology of photosynthetic pigments and later moved on to primary production of algae. His publications on modeling of primary production rates in aquatic systems are among the most widely cited in the field of phytoplankton ecology. His scientific enthusiasm was contagious, and his knowledge of photosynthesis and phytoplankton ecology enabled him to wisely mentor an impressive group of graduate students. He encouraged his students to strike out on their own but was always supportive and caring. Tom had a great love of life and nature, and he had a wonderful sense of humor. His students and those with whom he interacted remember him with great fondness. We have included here remembrances from some of us as well as from Rich Dempsey; Michael (Mike) Johnson; Stephen Lien; Janet Pelley; Bruce Selman; and Rudy Slovacek.

Keywords Photosynthesis · Modeling · Light · Nutrients · Chlorophyll *a* fluorescence · Oxygenic photosynthesis · Phytoplankton ecology · Limnology

Introduction

Thomas Turpin Bannister was born on April 20, 1930, in Orange, N.J. (USA) to Laura Charlotte Thomas Bannister and Turpin Chambers Bannister. He went to school in Troy, N.Y., obtained his BS (in Botany) in 1951 from Duke University, and then began his research career at the *Photosynthesis Center* of the University of Illinois at Urbana–Champaign (UIUC); his MS (thesis, 1953), under the supervision of Robert Emerson, dealt with one of the first measurements of excitation energy transfer in phycobiliproteins (Bannister 1954). See “[Appendix](#)” for information on

the Photosynthesis Center of UIUC, and some of Tom’s contemporaries.

Figure 1 shows a 2012 portrait of Tom Bannister.

After working for 2 years at the US Army Chemical Corp at Camp Detrick, he began his PhD studies (in *Physico-Chemical Biology*, PCB) under the mentorship of Eugene Rabinowitch (see Bannister 1972). Tom’s PhD research dealt with the ‘*Light-induced reduction of chlorophyll a*’ (Bannister 1959; also see; Bannister and Bernardini 1962, 1963). A major collaborative achievement during his graduate studies was his involvement in the measurement of the

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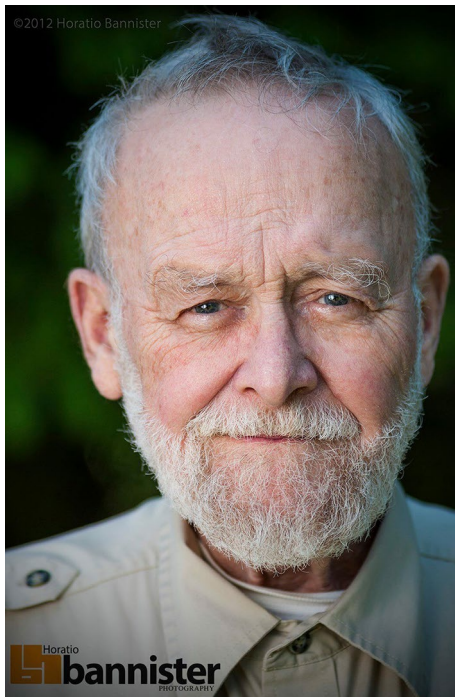


Fig. 1 A 2012 portrait of Thomas Turpin Bannister. Source: Horatio Bannister Photography

absolute quantum yield of chlorophylls in vivo and in vitro (Latimer et al. 1956).

Tom joined the faculty at the University of Rochester in 1958, rising from the rank of instructor to full professor in 1969. At Rochester, he continued to work for a while on the photochemistry of pigments in solution and in colloidal form [Bannister 1963a, b, c; Love and Bannister 1963; Love (PhD, 1960)], but soon thereafter his focus changed. In subsequent studies, he and his students explored other questions related to the mechanism of the photosynthetic process, including the dependence of the Emerson Enhancement effect on light intensity (Bannister and Vrooman 1964; Vrooman received her MS in 1963), the oscillations of photosynthetic oxygen evolution by the green alga *Chlorella pyrenoidosa* (Bannister 1965), and the relationship between chlorophyll *a* fluorescence and photosynthesis (Bannister and Rice 1968; Slovacek and Bannister 1973a, b).

Tom's fascination with the mechanisms of photosynthesis gradually evolved to an interest in limnology, perhaps stimulated by the proximity of Irondequoit Bay and Lake Ontario (see Bannister and Bubeck 1978). He developed a theoretical framework for estimating the rates of primary production in light-limited, nutrient-replete mixed layers that was published in *Limnology & Oceanography* (L&O) in 1974 (Bannister 1974a, b). These first publications in L&O were followed by subsequent papers in the same journal concerned with the practical aspects of collecting information

needed to implement his models as well as with the elaboration of the original theoretical framework (Bannister 1979; Atlas and Bannister 1980). During 1978–1979, Tom spent a sabbatical at the University of Hawaii, where he extended his earlier nutrient-replete model of phytoplankton growth to include nutrient limitation based on continuous culture studies of the marine diatom *Thalassiosira weissflogii* (Bannister and Laws 1980; Laws and Bannister 1980). Throughout the 1980s he leveraged the insights he had obtained from his modeling work by exploring practical issues related to estimating photosynthetic rates in natural bodies of water. Those issues were concerned mainly with the estimation of the spectral characteristics of subsurface light fields and the absorption of light by photosynthetic pigments (e.g., Bannister and Weidemann 1984; Bannister 1988, 1990a, b, c, 1992).

Remembrances

Sadly, Tom Bannister died on January 15, 2018 in Rochester, NY. In addition to being a remarkably inquisitive and productive scientist, he was a delightful and stimulating person to work with as a colleague or as a mentor. His legacy is reflected both in his scientific publications and in the scientists he trained and interacted with during his remarkably productive career. Below are reminiscences, beginning with those of Tom's son Horatio, followed, in alphabetical order, by his friends, students, and faculty colleagues.

Horatio Bannister

On Tom's upbringing and early life

Thomas Bannister was a Depression-era kid, which shaped much of his life. The term, “waste not, want not,” would be fitting until his death. My father (Pa) was, and always would be, especially unimpressed with consumption and excess. World War II also had a significant effect on his life. He was proud to be an American, he was proud of those who served, and he was proud of his own service in the Korean War. If he could have one wish answered in life, it would be that everyone should be a contributing member of the society. Above all else, high-level education, and high-level production in a field of expertise would be the measure of success, not monetary or greed-influenced measures.

Following Black Tuesday, the stock market crash of 1929, my father was born in 1930 in Orange, New Jersey. Born to highly educated parents, his father, an architectural draftsman, was 25 years old at the time. He was a kind and caring workaholic and accomplished much in his life. Tom's mother, a 27-year-old singer and secretary, doted on him as a baby. She was known to me as a loving, yet demanding

woman, who prided herself on perfect grammar and punctuation, and would often return letters from family, with corrections, circled in red ink. I can imagine Pa's early years of spelling and grammar. His excellent writing habits were influenced by her.

From the pages of his detailed baby book that she kept, I learned that Pa suffered from the measles, whooping cough, and many colds, had his tonsils removed, and that he planned to marry his neighbor, Jane, when he was 4 years old.

Spending much of his childhood in Troy, NY, it was when his father took a position at Auburn University in Alabama that Tom's life changed. It was there that Pa's love for the outdoors began, as well as the sparks of a lifelong infatuation with plants and botany. It was also the place that Tom began to keep snakes and attempted to raise rabbits for the purpose of selling the meat, as fresh meat was becoming a high-priced commodity. The depression was in full swing as was, after the invasion of Pearl Harbor in 1941, America's involvement in World War II.

My father went to Duke University on a full-ride academic scholarship and obtained his BS in Botany. From there he went to the University of Illinois at Urbana-Champaign and completed his PhD under Eugene Rabinowitch. But prior to finishing his PhD, Pa was drafted into the US Army to fight in the Korean War. As may seem typical in wartime, the army used my father's knowledge of photosynthesis, his love of air, light, and water in the development of life, to do the exact opposite. In fact, he and a chemist partner expanded on Arthur Galston's work (also at the University of Illinois at Urbana-Champaign) and tried, at the coaxing of the army, to make a better defoliant than Agent Orange. They confirmed that the two major defoliants, 2,4-D and 2,4,5-T, were about as good defoliants as one could concoct. Agent Orange was never used in the Korean War, but as we all know, it was used widely in Vietnam.

Tom married Mary Jeanne Hoggard in December, 1955; she was an accomplished musician. Figure 2 shows Tom Bannister with Mary Jeanne (1930–2005; see <http://composers-classicalmusic.com/b/BannisterMaryJeanneHoggard.htm>).

Figure 3 shows Tom and Mary Jeanne with their first child Nathan.

Mike Chalup (mchalup@virtual.net)

On Tom as an undergraduate mentor

I am saddened to hear of the passing of Tom T. Bannister (TTB). Like all those who wrote about Tom (and certainly many more), I was also incredibly fortunate to have known, studied under, worked for, been supported by, and been deeply inspired by him. Tom Bannister quite literally changed the course of my life. From an initial interest in



Fig. 2 Tom and Mary Jeanne Bannister; photo in the 1950s. Source: Bannister family archives



Fig. 3 Mary Jeanne and Tom Bannister, with baby Nathan; ~1962. Source: Govindjee's archives

Photophytophysioecology (the way he liked to answer the lab phone), modeling and quantitative biology, I can chart a continuous path that Tom influenced me from the day I stepped into his classroom 40 years ago through the work I did just today. My becoming Ed Laws' student at the University of Hawaii was one of those steps.

I could recount on many pages the memorable (and frequently light-hearted) interactions I had as Tom's student; he was the type of person who left a strong and wonderful

impression on all he met. Combining a prodigious intellect, an infectious passion for knowledge of many types, almost limitless personal energy, and an incredibly kind and generous soul, TTB really helped many in this world to succeed. He was certainly the highpoint of my undergraduate education, and I will always feel to be in his debt for his encouragement and support.

Rich Dempsey (rcd@cdrochester.org)

On Tom's interest in traditional community dance

Tom Bannister loved traditional community dance. He started Contra dancing shortly after a regular series was established in Rochester, NY, in 1976, quickly becoming one of the stalwart supporters of the dance, helping to put on the dance. His dancing was energetic and flirtatious, sprinkled with playful variations. He rarely missed a dance, except to travel on a "biological expedition", say, to Costa Rica. He used such occasions to recruit others in the community to cover for him during his absence. Somehow, those temporary substitutions turned into long-term organizing activities. In this way, he smoothly spread the organizing work over many hands. Tom also helped to promote community dance as a member of the Wakefield Dancers troupe, which gave public performances in costume in a variety of settings. When English country-dance came to Rochester, Tom happily joined those dances, too. He was known for bringing a jar of pickled herring and crackers and putting it out on the table along with all the sweets others brought for refreshments. He would go around and say, "Have you tried a bit of pickled herring?" and people would say, "eww", except for an adventurous few who liked it. Tom advocated for all the forms of traditional dance. When duple minor dances (see: <http://terpconnect.umd.edu/~eowyn/3LF/duple.minor.html>) became the fashion, he unabashedly requested triplets be added to the program. With characteristic scholarship, he knew the old chestnuts well, and discussed their virtues in comparison to recently composed dances. Even in his later years, when he no longer had the strength to dance much, he would come to sit at the Contra dances and speak with people. As a charming conversationalist, he would get very quickly to all the interesting details about you. People responded, delighting in his wit and encouragement to kick up their heels.

Figure 4 shows two rather recent photographs of Tom dancing and teaching the steps of dancing in Rochester.

George Hoch

On Tom as a colleague and friend

I first met Tom at a meeting on photosynthesis in Oxford, UK. He invited me out to dinner and put forth the idea that



Fig. 4 Top: Left to right: A 1984 photograph of Sharon Emerson, Susan Sauvain (daughter of Richard Sauvain), Tom Bannister and Richard Sauvain. Bottom: Tom Bannister teaching dancing. Source: Richard Sauvain

I should come to Rochester and join the faculty. His pitch was somewhat weakened by a news report that Rochester was having riots. He called his wife Mary Jeanne and got the good news that the riots were in another part of town.

I did join Tom in the biology department at Rochester, and we had many pleasant years together. He originally was working on the mechanism of photosynthesis but later switched to what might be called limnology, so our later interactions were mainly social. We did publish a joint report on an interesting bioenergetic aspect of the green alga *Chlamydomonas reinhardtii* (see Teichler-Zallen et al. 1972). Tom taught a course in botany that he liked very, very much and continued to do so after he had retired.

Tom was a member of the Irondequoit Canoe club, where he kept a dinghy and raced from time to time. He enjoyed the

social life at the club as he later did with the contra-dancing group. My wife and I spent many evenings with the Bannisters playing cards or having small dinners. Mary Jeanne wrote music, and sometimes she would play for us. My children always enjoyed his coming over to visit, as Tom had a fine sense of humor and liked children. He also enjoyed a bit of gardening; I remember ‘pole beans’ being one of his favorite crops. He also had some raspberry bushes, which are not fun to pick, but he was very kind and always brought some for us.

Now Tom, although generous, was what could only be called frugal. He was certainly not above joking about this. He kept his money in a pocket purse, which provided some amusement for me when he went to a cashier to pay a bill. Getting out the purse, opening it, finding the right bills and coinage always took a bit of time, as this part of his life was not to be rushed. I would sometimes mention that I saw some moths fly out of the purse. I shall never forget the Volkswagen minibus that he owned and which became a victim of the Rochester salt. He preserved the life of the machine by daubing it with red anti-rust paint, which gave him the only polka dot Volkswagen minibus in town.

Mary Jean preceded him in death, but I am sure she would have been terribly impressed by the wonderful musical memorial service that Tom put together for her. He had the music that she had composed played by various groups at the service. In a way, this was pure Tom doing something unusual and doing it right.

Figure 5 shows Tom with George Hoch (top) and with Govindjee (bottom).

Michael Johnson (MikeJ46281@aol.com)

On Tom's teaching of Botany (Plant Biology)

As a Biology major at the University of Rochester (1981), I took the Botany class taught by Dr. Bannister, thinking I should learn something about the Plant Kingdom. He made the subject highly interesting, and his level of engagement was just great; in my senior year I took his course on algae, and remember learning about his research in Hawaii with Dr. Laws at that time. We seemed to get the latest on algae as if it were “hot off the presses”. The class was enlightening in so many ways. He was an educator who seemed naturally interested in sharing with others what he knew most. He wanted us to learn, to feel the same enthusiasm that he so obviously did. In fact, I asked him to hand out my diploma at graduation, and I remember him encouraging me to “*get out there and explore*”. Finally, I learned about apples—yes... Dr. Bannister had his Botany students over to his house one autumn evening for apple tasting. As a group, we agreed that the red delicious apples were the best...



Fig. 5 Top: Tom Bannister with George Hoch; ~2014. Source: George Hoch's archives. Bottom: Tom Bannister with Govindjee; ~2014; Source: Archives of Govindjee

Robert Knox

On Tom as a faculty colleague

As a young theoretical physicist interested in biology, I was fortunate to make the acquaintance of Tom Bannister, George Hoch, and Tom Punnett in Rochester. They helped set my thinking straight, and one particular Bannister contribution to this effort is memorable. I thought I had a fairly reasonable argument that polarized light would be measurably more efficient than un-polarized light in oxygen production by chloroplasts. Tom, who was set up to make O_2 measurements, was finally persuaded—or convinced me he was—that it was worth checking out. The result was something like a rate ratio of 1.02 with an uncertainty of at least 0.02, bringing an end to my hypothesis. The backstory is

what Tom had to do to bring this about. “The hard part”, he said, “is exciting with UNpolarized light.” Indeed, every element of the experimental setup tended to introduce inadvertent polarization in the beam from a source of nominally unpolarized light. He produced many pages of detailed optical corrections necessary to obtain the unpolarized data. This made me greatly circumspect about asking for experimental checks on my future fancy predictions.

Edward Laws

On Tom as a sabbatical colleague and more

I received the sad news in January 2018 that Tom Bannister had passed away. I came to know Tom back in the 1970s when he spent a sabbatical at the University of Hawaii. He was about as delightful and stimulating a colleague as you could hope to have. I have very clear and fond memories of the time we spent together during his sabbatical.

I became aware of Tom (and his research) when I reviewed two manuscripts that he had submitted to L&O. The manuscripts were published as Bannister (1974a, b). I signed my reviews, and several years later Tom became eligible for a sabbatical at the University of Rochester. He asked me whether there might be a place for him at the University of Hawaii during his sabbatical. The answer was yes—we found an office for him right next to mine.

When Tom arrived in Hawaii, I had just finished a series of chemostat experiments with a diatom, called *Thalassiosira fluviatilis* (now *weissflogii*). The work had been done under limitation of light, nitrate, ammonium, or phosphate, and for each limiting factor, there was a series of growth rates. I asked Tom if he would be interested in contributing to the manuscript discussing the experimental results. He was enthusiastic, to say the least. He had developed a model of phytoplankton growth, something I knew as a result of reviewing the manuscripts mentioned above. Tom pitched in wholeheartedly in writing up the results, and within a few months we submitted a manuscript to L&O. The paper was published in 1980 (Laws and Bannister 1980); it is a pleasure to note that it has been cited close to 400 times.

I found Tom to be a delightful colleague and a stimulating thinker. He was great with graduate students because of his enthusiasm for science and knowledge of phytoplankton physiology and ecology. He loved his work, and I think that rubbed off on anyone with whom he interacted. He spent six months at the University of Hawaii before returning to Rochester. We continued to correspond and interact in various ways after his sabbatical. In addition to the paper in L&O, our collaborations produced a chapter in a book edited by Paul Falkowski (Bannister and Laws 1980) and a presentation at a symposium at the Brookhaven National Laboratory, also in 1980.

Tom was an excellent scientist with a wonderfully inquisitive mind, and he was also a very warm-hearted person who was a pleasure to have as a colleague. I watched him interact in very positive ways with graduate students at the University of Hawaii, and I would imagine that Tom’s own graduate students thoroughly enjoyed and benefitted greatly from the time they spent under his mentorship. He will be missed.

Stephen Lien (lienst2013@gmail.com)

On Tom as a thesis advisor

When I started my work in Tom Bannister’s lab in 1965, I became interested in studying the photosynthetic process using the simpler system of sub-chloroplast particles, obtained by sonicating chloroplasts, instead of the whole algal cells. Although this was not Tom’s primary focus, he was always curious about new and different directions; he actively supported my efforts, but warned me “*you need to be on your own*”. My thesis work led to the publication of a paper (Lien and Bannister 1971) in which we demonstrated, using sub-chloroplast particles, that DCPIP (dichlorophenol indophenol), an electron acceptor of chloroplasts, is reduced at two distinct sites in the system: (i) a slow reduction site located between PSII and PSI, and (ii) a fast reduction site located on the electron acceptor side of PS I. This must be due to physical accessibility of DCPIP to both PSII and PSI in the new preps.

Now, I present my thoughts on the personal attributes of Dr. Thomas T. Bannister, my beloved mentor, and whom I always consider as my older brother. In the lecture hall as well as in the lab, Tom often projected his characteristic penetrating and analytical mind, which, at times, could be highly intimidating, especially to some incoming graduate students. In reality, Tom was extremely personable and always a gentleman (in its traditional good sense of the phrase). As a mentor, he was demanding as well as understanding. At the same time, he was also patient and ready to help whenever his students would get stuck in their project or study. He almost always acted as if he was their knowledgeable, assertive and, at the same time, compassionate senior brother.

My most vivid memory about Tom was our 1967 trip to attend a symposium at the Brookhaven National Lab (see Olson 1967). To maximize the opportunity for exposing his graduate students to this major international photosynthesis research event of the time with minimal fiscal load on his lean NSF research grant, he offered all of us in the Lab a free ride in his 7- or 8-seat Volkswagen (VW) bus (from Rochester to Long Island and back). Counting his own family members of three (at that time) plus four graduate students and all of the luggage, this hopelessly overloaded and underpowered VW Bus often had to be “grazing” around 45–50 mph whenever it encountered any uphill stretches along the multilane

interstate I-95. Nonetheless, Tom, our intrepid leader, would just whistle away and push on (occasionally with tales of his Urbana days). In retrospect, I must admit that Tom provided us quite an effective team-building approach. We miss Tom and his ways of life.

Janet Pelley (pelley1941@gmail.com)

On Tom as a teacher

Dr. Bannister (TTB) was my most beloved teacher when I was a student at the University of Rochester in the early 1970s. I will never forget his thrilling limnology class where we discussed groundbreaking research on nutrient control of algal blooms. That class inspired me to complete a senior year research project with him and then go on to study aquatic ecosystems in graduate school. So, yes, TTB changed my life. He was a great role model—kind and generous of his time with students. He liked to laugh and had an appealing streak of skepticism and independent thought, essential for a scientist. I reconnected with him in the mid-2000s after I moved to Toronto, Canada and began driving regularly through Rochester on the way to visit my mother in Syracuse. I treasure those memories of sharing a meal with him, sometimes with his contra dance friends, and chatting about science, family, music, and politics. He lived a long and rich life and will be greatly missed...

Bruce Selman (brselman@gmail.com)

On Tom as an ideal mentor

My association with Tom Bannister began as an undergraduate student at the University of Rochester (1967) and continued through my PhD (1969–1973; it had to do with inhibition of photosynthetic reactions by trypsin; see Selman and Bannister 1971, 1974; Selman et al. 1973). It is with fond memories of my association that I write this short tribute. I believe that after all of these years many of my memories have been romanticized, but some remain quite fresh to this day.

As a graduate student, no one could have wished for a more supportive mentor. As Steve Lien has so eloquently stated (see above), he insisted that we do our own thing and find our own ways—with his guiding hand always stretched out. Oh, the days of grinding up pounds and pounds of spinach to prepare plastocyanin and ferredoxin remain in my memory. Ah, I recall the “wonderful” aroma of preparing, in the confines of our cold room, precipitates using acetone, followed by many hours of measuring electron transfer rates either spectrophotometrically or with a finicky oxygen electrode. (I would be remiss if I did not mention the pleasurable

hours that Rudy Slovacek (see below) and I had tossing a football around on the open quad!)

But the most important gift that I received from Tom was not that of having had the honor and pleasure of pursuing my graduate degrees with him, but rather what he totally unintentionally did for me as an undergraduate. I entered college believing that I was going to be a budding chemistry major. After a year and a half of that endeavor, I was frustrated and on the verge of dropping out (Vietnam War days), when just for fun I decided to take a biology course (not required for my major). I walked into that class with no expectations. And there was Tom Bannister at the podium—talking about some biochemical pathway—and, suddenly, like a light bulb, passion was ignited. The way he presented his lectures was so extraordinarily vivacious. To be able to take those boring chemical formulas and make them virtually come alive was absolutely captivating.

And so, after Tom completed his series of lectures, I went to talk with him, and that closed the deal. He put me to work on one of his projects and the rest is more-or-less history. Tom was not only a wonderful academic advisor, but he was also a dear friend. And he was able to keep the two separated. During my PhD thesis tenure, I had some hard personal choices to make, and he was always there and always supportive. And his laughter was contagious! Simply put, he was a wonderful person!

Rudy Slovacek (rudolf.slovacek@gmail.com)

On Tom as a research mentor with some details

At the end of my sophomore year in 1968, I approached Tom after taking a course in which he was team teaching and asked if he knew of anyone taking on summer interns, as I wanted to become more involved in some real research as opposed to the usual summer *burger joint* jobs. This was about the time (1970) Bessel Kok, following Pierre Joliot's experiments of 1969, came out with his four flash, oxygen clock mechanism for water oxidation. He agreed to take me on, and we designed a flow system with a platinum electrode for measuring oxygen and a flow system with a pump and a chamber that could be illuminated with a chopped light beam. We had no facilities for an expensive or complex Xenon flash system. After solving the turbulent versus laminar flow problem, we began experiments with *Chorella pyrenoidosa*, which I had learned how to grow in synchronous cultures, based on the work of Richard Wang (PhD, 1968), a previous graduate student in the lab. The system was less than successful and the results questionable. However, I stayed on working and learning in the lab with Tom's other graduate students: Greg Rice (PhD, 1972), working on simultaneous oxygen and fluorescence transients in *Chlamydomonas reinhardtii*; see Rice and Bannister (1980) and

Bruce Selman (see above), who was interested in trypsin inhibition of Photosystem II. It was during this time that we would sometimes retreat to the tennis courts on a nice day to play a “Gentlemen’s game of tennis”, which meant trying to keep a volley going for as long as humanly possible.

I began applying Tom’s simultaneous oxygen electrode and fluorescence measuring device to look at *Chlorella* in their maximum photosynthetic phase of the growth cycle, and we discovered that during active photosynthesis chlorophyll fluorescence was actually higher than when CO₂ was withdrawn, and the oxygen evolution had declined. This parallelism led us to postulate other mechanisms within the Photosystem II de-excitation process or energy distribution changes (see Slovacek and Bannister 1973a). We proceeded in our next paper (Slovacek and Bannister 1973b) to determine that NH₄Cl in the medium caused the fluorescence to rise in the absence of CO₂ but did not affect photosynthesis. (For an earlier paper on the effect of another uncoupler of chlorophyll fluorescence, see Bannister 1967.) This led to the suggestion that perhaps the uncoupling action of NH₄Cl was affecting the pH gradient in the chloroplasts or modifying a change in light distribution. We switched to looking at isolated pea chloroplasts (Slovacek and Bannister 1976) but were unable to replicate the quenching phenomenon, as others had postulated. (We were most likely dealing with thylakoid membranes rather than intact CO₂ fixing chloroplasts.)

During this time Tom was shifting his interests to measurements of bio-productivity in local waters such as lakes and Irondequoit Bay. When I left Rochester in 1975 Tom was settled in one of the graduate offices with his computer terminal and engaged in his mathematical modeling of nutrient flows or in the new lab that he shared with George Hoch, extracting chlorophyll with pyridine from water samples he had collected in the field.

Alan Weidemann

On Tom being a great mentor: lessons learned from him

I joined Tom Bannister’s research group at the University of Rochester as a PhD candidate in the fall of 1980. The Department of Biology was populated mainly by molecular biologists and geneticists, but with Tom’s help, I was given permission to take a special comprehensive examination that included sections on limnology and ecology. Otherwise it is doubtful that I would have been able to pass my exam. My doctoral work was concerned with the absorption and distribution of light in the water column of Irondequoit Bay, a topic of my own choosing. To carry out the relevant experiments, I needed a spectroradiometer, which I was able to acquire only with Tom’s help. When I was roughly at the midpoint of my doctoral work, I suffered a series of epileptic seizures as the result of an earlier blow to my head.

The problem persisted and became serious enough for a while that I was ready to quit, but Tom would not let me. He always had the right words to keep me going. When it came time to write my dissertation, I discovered that Tom was a perfectionist. He edited every chapter, and in those days, there were no word processors. I began to think that I would run out of correction tape for the typewriter. In retrospect, it was a great learning experience for me (see Weidemann and Bannister 1986; Weidemann et al. 1985). When it came time for me to find a job, Tom suggested that I look for a position in the field of oceanography, where there were many more positions than there were in limnology. With Tom’s help, I was able to find a post-doctoral position in Mississippi with physical oceanographers in the Naval Oceanographic and Research Development Activity (NORDA). That position eventually evolved into a full-time job for the next 34 years. I am indebted to Tom for all the help he gave me and for the lessons he taught me. Those lessons, which have served me well throughout my scientific career, include the following: (1) Be kind and respectful of everyone, even if your opinions are different. You don’t know all of the answers; so don’t take yourself too seriously. (2) As I had to learn with the epilepsy, keep a positive attitude and don’t quit, even when things don’t work out as you want or planned. You can’t plan for everything; there are going to be stumbling blocks: handle them with courage. (3) Know that people represent families, not just individuals. Whatever you do to someone will affect others. (4) And perhaps most important, have fun and at times, just go out and walk in the park, stroll around, and observe nature’s beauty. Tom was the best mentor I could have asked for. His kindness, wit, confidence, and guidance kept me on the path of science even when I had given up. Tom was the true definition of a mentor to me, and my family. Thank you, Tom.

Epilogue

As the foregoing recollections make clear, Tom was a wonderful teacher, researcher and a mentor of many students in biology at the University of Rochester. His earliest masters’ research, in 1954, on excitation energy transfer within phycobilins, remains unique, and his 1958 PhD thesis work on *Light-induced chlorophyll reduction in solutions* may have implications for current studies of artificial photosynthesis. Further, Tom was clearly, in the 1960s–1970s, one of the pioneers relating chlorophyll *a* fluorescence to oxygen evolution and photosynthesis. However, and more significantly, he was an authority on models for estimating rates of primary production in natural bodies of water. And, on the social side, he was a wonderful dancer (and dance teacher) till the end; he certainly had a great sense of humor, and he was a writer par excellence.

Tom leaves behind two sons, Horatio and Nathan; four grandsons, Brandon, Zacharym, Sebastian, and Hayden; and two granddaughters, Isabella and Eberlie. We all miss Tom Bannister.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Appendix

Photosynthesis Center at Urbana, Illinois, USA

Govindjee

During 1947–1959, the ‘*Photosynthesis Center*’ (also known as the ‘Photosynthesis Project’) at the University of Illinois at Urbana–Champaign (UIUC) was jointly headed by Robert Emerson and Eugene Rabinowitch; it was the major World center for studying photochemistry and biophysics of photosynthesis. For the life and work of Emerson (1903–1959), see Rabinowitch (1959, 1961), Govindjee (2004), and <https://www.youtube.com/watch?v=equPwbdOC64>, and for Rabinowitch (1901–1973), see Bannister (1972), Brody (1995), and Rabinowitch (2015). We note that Eugene’s year of birth was really 1898, and his name at birth was Evgenii Isaakovich Rabinovich. For both Emerson and Rabinowitch, see Govindjee (2004) and Ghosh (2004).

We would like all of us to remember a few others who are no more, who were trained at UIUC, and who were also contemporaries of Tom Bannister. They were Tom Punnett (1926–2008, a student of Emerson; see Hagar et al. 2011); Steve Brody (1927–2010, a student of Rabinowitch; see Hirsch et al. 2010) and Paul Latimer (1925–2011, a student of Rabinowitch; see Latimer et al. 2017). Bannister (PhD in 1958) was almost the last of the full-fledged students of Rabinowitch, except for Danny Rubinstein (PhD in 1964). The other three: Govindjee (PhD in 1960), Rajni Govindjee (PhD in 1961) and Carl N. Cederstrand (joint PhD with Rabinowitch & Govindjee in 1965) were really initially trained by Robert Emerson.

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A correction

Note that the web site

<<http://composers-classicalmusic.com/b/BannisterMaryJeanneHoggard.htm>>

should be

<<http://composers-classical-music.com/b/BannisterMaryJeanneHoggard.htm>>

(note the dash between classical and music).



The text from the above web site is:

Bannister, Mary Jeanne Hoggard (fem) 14.mar.1932-8.jan.2005 USA NY, Brooklyn - North Carolina, Huntersville pianist, 1935 grew up in Julian Oklahoma, began piano study at age four and composition in childhood, 1952 BM from Oklahoma City University where she studied piano with Nancy Laughbaum Ragsdale, 1954 MM in piano performance with Soulima Stravinsky from the University of Illinois in Urbana Champaign, 1956-1958 studied composition with Robert Kelly, did PhD graduate study and was staff accompanist at the University of Illinois, 1951 won the Silver Letzeiser medal and 1952 the Louis C Mersfelder award in Oklahoma City, 1959-2003 teacher piano and composition in Rochester Monroe NY, she died during a visit or stay with family in Huntersville ; daughter of Methodist pastor/canon/rector Calvin Clide Hoggard (Indiana, Purcell 4.jan.1906-21.oct.1988 Rochester) and Mary Helen Gibbs (Texas, Huntsville 11.may.1906-27.nov.2000 Rochester) ; 29.dec.1953 at St John's Episcopal Church in Tulsa Oklahoma she married University of Rochester professor Thomas Turpin Bannister (New Jersey 20.apr.1930-) ; they had 2 sons.