

Gilbert Stork: In His Own Words and in the Musings of His Friends**

Jeffrey I. Seeman*

“The absent-minded but organized Gilbert Stork...”

Koji Nakanishi^[2]

“Stork is as nice as they come. Few people of his brilliance are so completely free from any conceit.”

Louis F. Fieser^[3]

Born in Brussels, Belgium on December 31, 1921 and for 59 years a professor at Columbia University, Gilbert Stork is one of organic chemistry's most beloved and simultaneously eminent artists.^[1–3] His creativity extends far beyond his chemical successes. He has a special way, an aura that is and has been unique in our community of scholars and—yes—unique among a group of already rather eccentric practitioners.

Many celebrations highlighted 2011, the International Year of Chemistry. Some of these honored Gilbert's reaching the wonderful age of 90. See, for example, Gilbert's own recollections^[4] published in an issue of *Tetrahedron* honoring his 90th birthday and in a broad review of his chemistry published a decade ago.^[5] The reader is urged to read Gilbert's own articles.

Why so much attention on Gilbert Stork? It is because Gilbert has been one of the leaders of synthetic organic chemistry for decades. He has propelled the discipline of organic chemistry throughout the broader community of chemists by virtue of his research and scholarship, his legacy of graduate students and postdoctoral fellows, and his demeanor. Stork is not only one of the most esteemed and well-liked of chemists; he has mentored a cadre of some of the discipline's most successful organic chemists whose loyalty to and even reverence for this fine gentleman is extraordinary. As stated by one of his former students, “Gilbert is a global treasure! He has directly and indirectly inspired a legion of scientists who have gone on to make profound contributions to science, health care, medicine, materials, the economy, education and our quality of life.”

Arguably, his synthesis of cincholoipon (1946)^[6] was the first planned stereocontrolled synthesis, and cantharidin (1951)^[7] was probably the first natural product synthesized with high stereoselectivity. These early successes were bookended by the first stereoselective synthesis of quinine (2001)^[8] and the syntheses of reserpine (2005)^[9] and morphine, codeine, and thebaine (2009).^[10] Highlights of the fifty years in between

can be found in Gilbert's two recent reviews.^[4,5] He was not just a synthesizer of numerous important natural products; he was a major developer of methodology that sustains the experimental work of the bench chemist! The Stork enamine reaction and his radical cyclizations are just two examples of his major methodological contributions.

I am both a fan and a friend of Gilbert. I have long been involved in studying his research and life, first as a student in need of synthetic methodologies for my graduate research^[11] and later, much later, as a historian of chemistry (Figure 1).^[12]



Figure 1. Seeman and Stork examining the R. B. Woodward collection at the Harvard University Archives, August 2009.

(I might still be in graduate school had it not been for the Stork enamine reaction.^[13,14]) Thus, I wanted to make some special contribution toward the celebration of Gilbert's life. What better way, I realized, then assembling and sharing Gilbert's own words and deeds. So, what follows is mostly a collection of “Storkisms”. They—and he—are often funny and always insightful. These snapshots contain lessons in life. Enjoy, thank you Gilbert, and Happy Birthday!

Except as noted below, all the quotes are by Gilbert Stork himself.

Excitement of Science versus Making a Contribution

“Some things actually gave us a great thrill, which are not particularly important. Some were important, but not that much. For instance, the prostaglandin synthesis from glucose is a beautiful piece of work.^[15] It was not all that important, but in a way it sort of was one of the landmarks of establishing that you can use the chiral sugar pool to make a complex chiral compound which is not obviously embedded within the glucose structure. There were others like this. They were just simply a thrill. Like solving a mathematical puzzle. You get a thrill, but it doesn't mean that you're necessarily making an

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[**] Dedicated to the memory of an astute historian of chemistry and one of the interviewers of Gilbert Stork's 1991 oral history quoted herein,^[1] James J. Bohning, who passed away at the age of 77 on September 2, 2011.

important mathematical contribution. But that one was a thrill.”^[1]

Painful Lessons of Life

“I went to what the French called a lycée which is sort of a preparatory school for college ... What the French system was based on at that time was essentially memory. Now, this is not a very reasonable system but they teach you resistance to pain because it was really extremely painful to learn the amount of material you were supposed to learn and also, a certain skill at getting around the painfulness of the system for survival reasons. That probably has been very successful in fact. May have been the most important thing that I learned there.”^[16]

Stork's Childhood Naiveté

“I was good at French literature, and I was even selected to represent my lycée in a nationwide high school competition in French writing. I was not terribly self-confident, however, and did not think that I could get a job in what I liked to do. So I was actually considering getting some safe government position. Something in French Indochina seemed especially attractive to me. Things took a different turn. In 1939, my father became very concerned about what was going to happen in Europe and decided to emigrate [to the United States].”^[17]

Nonconformist and Novel Problem-Solver

As told by Frances Hoffman^[*]: “[Gilbert's] creative solutions to difficult problems also surfaced early. Gilbert's favorite occupation during his summers at Ostend was going for pony rides on the beach. Unfortunately, he often had to wait fifteen to twenty minutes because of the long lines. One weekend, Gilbert was left in the care of his favorite Uncle Alex. Gilbert explained his problem to his uncle and proposed that the way to solve it was to have a pony of his own. His uncle found this to be a good solution, but when the pony appeared on the grounds of his home, considerable rumblings from the neighbors mounted to a volcanic eruption when Gilbert's parents returned.”^[18]



Figure 2. Stork, ca. 1940. Photograph courtesy G. Stork.

On Overcoming the Difficulties of Learning

“The truth is, when you don't know a language, it's easy for people to say, ‘Well, you can learn it.’ It's obviously true. At one extreme, you say, ‘If one billion little Chinese can learn Chinese, it mustn't be that hard.’ That's one point of view.”^[1]

[*] Hoffmann is a friend and colleague of Stork's for decades, former Director of Chemical Laboratories at Columbia University.

On Taking Tests

“[As an entering undergraduate student at the University of Florida in Gainesville,] I was doing very well on the chemistry exams, which were a multiple choice thing, where I could test my hypothesis that the longest answer is statistically much more likely to be the correct one than the shortest one simply because it's harder to phrase correct things than incorrect things.”^[1]

My Undergraduate Summer Job

“I had a job as a waiter in a private establishment just outside of [the University of Florida]. I remember when somebody in a crowded room full of school teachers ordered what was probably beer of some kind, and I thought they wanted watermelon. [laughter] I made my way with this big watermelon through this crowded room, and it was not the right thing. Eventually I got fired from that job.”^[1]

On the Way to Graduate School: Slightly Older Naiveté

“I decided to go to the University of Illinois [for graduate school] because Roger Adams was there. Hard as it is to believe, I didn't realize that you had to apply for admission. The idea that they wouldn't immediately give me a lab didn't occur to me. I went to Illinois and demanded to talk to Roger Adams. A secretary told me that he was busy and could not see me. I thought this was outrageous and took the train to Wisconsin...”^[17]

Madison, Wisconsin

“I was quite happy in Madison [for graduate school] even though, when it was -20°F , you get the acute experience of having your scalp shiver—a strange thing—if you don't wear the proper clothing. [laughter]”^[1]



Figure 3. Stork as a graduate student, Madison, WI, ca. 1944. Photo courtesy G. Stork.

Giving Authorship to One's Professor

“I also did not know you were supposed to put your professor's name on your papers. It shows how tolerant [Samuel M.] McElvain^[19] [Stork's PhD advisor at Wisconsin] was. Most people would have been very upset. He flipped slightly, but not too much, when he picked up a *JACS* [in 1945] and saw there was this communication, my first paper^[20] [that he knew nothing about]... McElvain said, ‘You cut this fooling around out,’ and moved me next to his office. [laughter] Then I started working more seriously on [our joint projects]... [The end of that paper said, ‘The work in this Communication had to be discontinued almost two years



Figure 4. Stork with Professor and Mrs. McElvain, Paris, 1954. Photo courtesy W. S. Johnson.

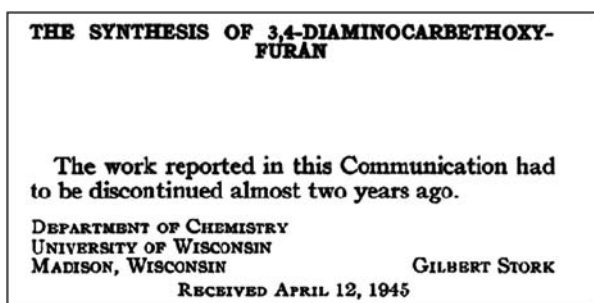


Figure 5. The title and last sentence of Stork's first paper.^[20] At the time, Stork was a graduate student at the University of Wisconsin. His Ph.D. advisor was S. M. McElvain. Stork and McElvain published four papers together in 1946 and one in 1947.

ago.' See Figure 5.] Well, that was McElvain saying, 'You cut that out.'"^[1]

"Private Communication to Chemical Abstracts"

"[In my first paper, the] melting point [of the final product] was a misprint; I think the two last digits are inverted. I forget what it says; does it say 113 degrees or 131 degrees or whatever for the melting point? It's the melting point of the diazide. [reading] 'melting point 166–167 degrees'. Yes, I think it's 176 degrees. I forget exactly what it is, but it's one of those digits that's wrong. I was shocked. I was shaken, because my melting point's wrong, and now it's published in the literature. So I wrote to *Chemical Abstracts* and said that when they

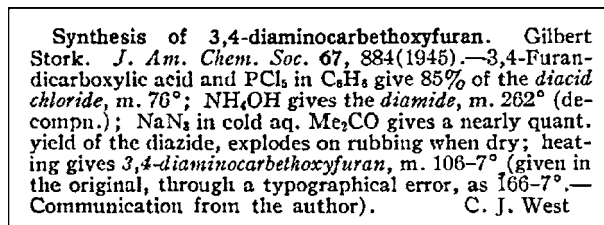


Figure 6. A rare if not unique example of an author correcting an error in his publication by a communication to *Chemical Abstracts*. *Chemical Abstracts* 1945, 39, 2991(5).

abstract this thing, they must put down the corrected melting point in the abstract. My abstract is the only abstract, so far as I know, which has a note that says, 'Private communication from the author'. [laughter] [see Figure 6] It does say that, actually; it's a private communication. *Chem. Abstracts* no longer does it. There are no more private communications to *Chem. Abstracts*."^[1]

Carl Djerassi, My First "Graduate Student"

"Carl Djerassi and I were overlapping graduate students. I guess he was a year behind me when he started; maybe, maybe not. We would have lunch together every day at the lab. Eventually I convinced him he was wasting his time doing a Ph.D. with [Professor] Al [Alfred L. Wilds], and that he should obviously work on my problem. He agreed that that was certainly reasonable. So he started doing that... Djerassi's problem was going to be to synthesize morphine. This lasted two weeks, until Wilds found out about it, and then we were both threatened with instantaneous expulsion. [laughter] So that stopped us... Even if it was for only two weeks, [Djerassi] was sort of my graduate student [laughter]... At the time, he was in the hospital; when I 'conned' him, he was weakened. [laughter] That's true. He was in the hospital. I don't remember what was wrong with him, but it was nothing terribly serious. He was in the hospital, so I went to visit him, and used the opportunity to convince him he should work for me."^[1]



Figure 7. Carl Djerassi, learning how to drive a tractor in Tarkio, Missouri, 1941. Photo courtesy C. Djerassi.

Blowing Up the Chemistry Department at Madison with my Steak

"There was this one really idiotic time. I remember I was really scared that I was going to blow up the entire Chemistry Department at the University of Wisconsin. I had a steak on the window ledge of my office. It was the winter, and I used the window ledge as a refrigerator. You obviously were not supposed to be cooking steaks in the lab, but I had a small lab where I was usually alone in there, and so I had a steak. But I also was not aware that biodegradable material is biodegradable, and this steak was clearly degraded on the window ledge. And the question was, what to do with it? And I decided to toss the steak in a hot acid bath which we used to clean up glassware. So, it's fuming nitric and sulfuric acid. It's really *aqua regia* in that bath, in that heavy lead dish, and the steak.

“And then, as I just had thrown it in there, and it fumed furiously and red fumes of who knows what, nitrous oxide of various kinds were being produced there. I became frantically concerned because fat is glycerides. So, I’m hydrolyzing the fat to glycerin. You make nitroglycerine by taking glycerin and nitric acid and sulfuric acid, and obviously, I’m going to produce a pile of nitroglycerine and blow up the entire building with my steak.”

“Now, what is an interesting point there, why didn’t it? And of course, the reason is kinetics. That is, the kinetics of oxidation of the glycerol at that temperature is much, much, much, I mean, infinitely faster than the cold temperature nitration of glycerin. And so the place was safe.”^[16]

Chemistry on One’s Birthday

“I used to make diethylaluminum cyanide myself, and I usually liked to do it on December 31st because it’s my birthday, and it was a sort of black humor that, if I died on that day, it would be easy to tell how old I was. And so I would do it. In fact, I sometimes did it in a tuxedo, which was really some ridiculous operation.”^[16]



Figure 8. Stork as a graduate student. Notice the lack of safety glasses, apparently not a concern to a graduate student who throws steaks into hot acid baths and wears tuxedos when working with toxic substances. Photo courtesy G. Stork.

Gilbert’s Experimental Prowess

As told by Derek Barton^[*]: “When I arrived at Harvard in 1949, Gilbert was working with his own hands on the synthesis of morphine. This was an ill-advised activity. Gilbert had, and still has, a brilliant mind. However, its extension to the control of his hands was somewhat lacking, so he did not accomplish very much until his first graduate students arrived...”^[21]

Why Synthesis?

“The origin [of my passion for synthesis] is the structure, and the structure needs methods. Not the method first and then the structure. Structure, problem, method, back to structure. It’s kind of a sculpture. It’s a challenge. Everybody gets interested; as soon as you can make a problem of something, it becomes interesting. Whether you’re a chess player, or

[*] During 1949–1950, Barton was Visiting Lecturer at Harvard, taking R. B. Woodward’s place during the latter’s sabbatical year. At that time, Stork was an Assistant Professor at Harvard.

whether you try to find a way of preventing paper bags from falling apart when they’re wet. If you can make it into a problem, it becomes interesting.”^[1]

The True Meaning of Success in Organic Synthesis

“The toughest question to ask in synthetic organic chemistry after the work is done is: what have you learned? And you can have extraordinarily complex things. They look complex as hell. Maybe they have 80 asymmetric centers and maybe the answer is, [you’ve learned] nothing. I mean, you could have learned that humans are capable of enormous focused efforts and are capable of sticking with a problem which is extraordinarily complicated. On the other hand, if somebody makes polyethylene, as somebody obviously did, then you learn a lot, even though it will not thrill most synthetic chemists because this would be comparable to building a highway for an architect. I mean, it’s important, but it’s fairly dull compared to [building] the Guggenheim Museum, for instance...”^[16]

“So something could be not terribly glamorous but extremely important, or vice versa. I think that B₁₂ was vice versa. It’s enormously complicated.”^[1]



Figure 9. Stork at Colombia University, 1997. Photo courtesy J. I. Seeman.

The Core Essence of Organic Synthesis

“I finally think I understand why people play golf. Why are they so fascinated by golf? If you really want to put that ball in that hole, there are many other things to do that. And the reason, of course, is that no one interferes with you. You’re 100% responsible for what you do, right and wrong. And so it’s nice. If you play team sports, well, maybe somebody didn’t pass the ball to you at the right time...”

“You can see why [individually focused activities] would make you passionately involved.... in synthesis because you can devise any scheme that you want... it’s also easy to do, in the sense that if an experiment doesn’t work, you just throw it out... it doesn’t take a year to do an experiment. In fact, that’s the beauty of synthetic organic chemistry still. You can think on the weekend a great idea and, if you’re really motivated, you go over the weekend and try it, and you can know at the end of that day that thing is no good... And so, it is both easy and very frustrating. So is golf. I mean, it’s easy to hit that ball with a stick...”^[16]

To Explore, Not To Sleep

“Most of my students have been graduate students. And these are students who are pretty well committed... You don’t really have to instill enthusiasm for chemistry that much, it’s already there. You have the problem of not killing it all together. They may not have the courage to try things. They

may have too much reliance on what is supposed to be known, rather than ‘this is true or maybe not’. If it’s neither explosive nor toxic, you should try it no matter what people tell you about it. It’s one or two steps, why not?”^[16]



Figure 10. Stork with Alicia Regueiro-Ren at Columbia, 1997. Photo courtesy J. I. Seeman.

On Being Mozart’s Teacher

“The truth is, I’ve thought about it a lot. And one of the nice things about being a professor is that you get credit, you get some credit, for the accomplishments of all these various students that have done very well. But of course there’s no question that they wouldn’t have done that well if, by the age of 23, 24, 25, they were not already potentially great. I mean, it is not likely that Mozarts can be trained. I mean, so one can take credit, ‘I was Mozart’s teacher.’ That’s nice, and I’ve not spent any large amount of time denying that I deserve some credit. But on the other hand, it’s highly dubious. I mean these people are already very good... but that doesn’t mean that you can’t kill what’s in there. So the main goal of your teaching Ph.D. students is to nurture what’s there.”^[16]



Figure 11. Max Tishler.

On Giving Advice to Carl Djerassi

“In the late 1940s, Carl Djerassi was working at Ciba. When Djerassi decided to join Syntex in 1949, I [Stork] told him he was ‘stark raving mad’... he wanted to [seek advice from] Max Tishler, who was at that time the industry–university connection statesman [at Merck]. I’ll always remember what Tishler told him. The president of Merck at that time was George Merck. The president of



Figure 12. The Syntex group, Mexico City, 1951. Stork (consultant to Syntex) is at the far left, standing. George Rosencranz and Carl Djerassi are seated, third and fourth from the left, respectively. The photo was taken at a press conference announcing the first synthesis of cortisone from a plant source. Rosencranz is holding what is, for photographic license, a test tube presumed to be filled with cortisone. But as only milligrams of cortisone had been synthesized, the test tube actually contained sodium chloride.^[22, 23] Photo courtesy C. Djerassi.

Syntex was George Rosenkranz. What Tishler said was ridiculous. He said, ‘Syntex is a nothing operation. When the president of the United States wants some advice, who does he call? George Rosenkranz or George Merck?’ [laughter] That was supposed to be a serious point. Djerassi had the good sense, I guess, of paying no attention whatsoever and taking off for Mexico, which took a lot of guts because he didn’t speak Spanish, among other things.”^[1]

Syntex Consultants

As told by Arthur Birch^[*]: “I recall with amusement the meetings of the Syntex consultants board... The meetings sometimes resembled gladiatorial contests with loud disputation but good humor, bets being freely exchanged about predictions, notably between Gilbert Stork and Carl Djerassi. The bets were even collected later, and I recall Carl framing a \$10 bill that he, somewhat unusually, won from Gilbert in a particularly hotly argued case. This attitude kept everybody on their toes with interest in what could easily have become drowsy meetings. Between bouts, Gilbert used to catch up on recent issues of journals, to the freely expressed annoyance of Carl.”^[24]

[*] In the early 1950s, Arthur Birch—after whom the academically and commercially invaluable Birch reduction was named—was invited by Carl Djerassi to be one of Syntex’ consultants along with Gilbert Stork.

Troubles Find Stork

As told by Frances Hoffman: "How can such an intelligent man [as Gilbert] insist on buying cars which, without fail, are incapacitated at least fifty percent of the time? One of these 'treasures' was a sporty, white Simca with red leather seats. After spending a good amount of money transporting it from France, a small fortune to adapt it to New Jersey requirements and further fortunes to keep it running, the engine blew up as he was driving to Yale to present the Treat B. Johnson lectures. With the usual Storkian luck, the car was on an incline which terminated in front of a gas station. Gilbert arranged for the car to be fixed and took a train to New Haven. He retrieved the car on the way back after contributing Yale's honorarium to the garage mechanic. While on the Merritt Parkway, the engine exploded again. While he was removing the license plates, a state trooper stopped to check on the strange situation. With characteristic aplomb, Gilbert struck a bargain—the state trooper could have the car in exchange for [\$25^[4] and] a ride to the nearest railway station. [Who] made out best on that one?"^[18]

Stork continues this episode by reporting, "When I called my wife for a ride from New York to our New Jersey home, she asked, 'What happened to your car?' 'I sold it to a policeman' was my answer."^[4]

Shenanigans

As told by Arthur Birch: "There are more car stories about him than anyone I know. I suspect he may have embroidered them a little. In his own estimation, he may be the second-worst car driver in the world. For instance, a wheel once rolled past him on the George Washington Bridge. 'Someone has lost a wheel... I have.' Question: 'Did I have a flat the day before? Did I change a wheel?' His guardian angel works overtime, as this and many other episodes indicate. He introduced me to the subtleties of bribing the Mexican traffic police, among his other creative activities."^[24]

On Driving with Gilbert

As told by Ron Breslow^[*]: "I remember being in the death seat in a car Gilbert was driving. While he was talking to me, he looked at me, not out the front window. That was Gilbert being polite, but how did he keep from an accident? Then I realized, when I showed a look of horror, he took it as a clue that there was something ahead and temporarily looked out the windshield."^[25]

[*] Ron Breslow did undergraduate research with Stork at Harvard, received his Ph.D. at Harvard with R. B. Woodward, did a postdoctoral stint with Lord Todd in Cambridge, England, and joined the Department of Chemistry at Columbia University in 1956 as Instructor in Chemistry.

Gilbert Not Unlike Woody Allen

As told by William S. Johnson^[*]: "There is nothing contrived about Gilbert's humor which just comes naturally, and being with him engenders a feeling that is not unlike watching a Woody Allen movie. Several chemists collect and exchange anecdotes about him; one of these is recorded here.

"On the occasion of the 1957 Spring ACS meeting in Miami, Gilbert was receiving one of the most prestigious honors in chemistry, the ACS Award in Pure Chemistry. The Storks and Johnsons had arranged to stay at a hotel at Miami Beach. It was very hot and we got badly sunburned before the meeting. Gilbert had rented a convertible for taxiing over to the city where the sessions were being held. While driving over, with the top down, just before his award address, he kept looking at some rather crumpled papers which he propped up on the steering wheel. When questioned, he put on air of nonchalance in the face of utter disaster and explained to us that he was trying to decide what he was going to talk about.

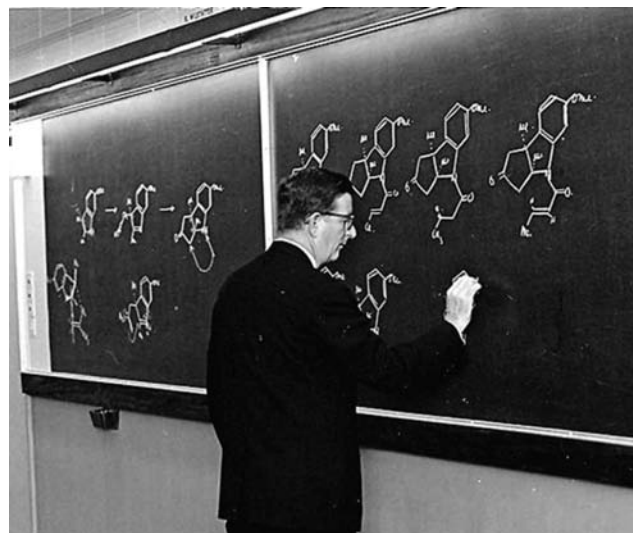


Figure 13. R. B. Woodward lecturing. Photograph courtesy Harvard University Archives.

"The very large auditorium was packed with people, most of whom had, not long before, heard a talk given by Bob Woodward who appeared, as usual, immaculately dressed in his blue suit and began his talk with the dramatic introduction, 'The lecture that I am privileged to deliver today concerns recent work that has never before been disclosed in the Western Hemisphere.' Now Gilbert, after being introduced, stood up at the podium looking quite non-Woodwardian in his rumpled suit that had suffered from the open air ride in the severe heat. Then he began, 'The lecture that I

[*] Bill Johnson was on the staff of the University of Wisconsin from 1940–1958, including while Stork was in graduate school at Wisconsin (1942–1945). They remained close friends, and Stork was one of the authors, together with Paul A. Bartlett, William R. Bartlett, and John D. Roberts, of "An Epilogue" that appeared in Johnson's autobiography^[26] that was published in 1998, three years after Johnson's death in 1995.

am privileged to deliver today concerns recent work that has never before been disclosed in Miami.' This brought the house down, and I laughed so hard as to cause conversion of an incipient hernia into a major rupture requiring surgery soon after I returned home. (Before writing the above anecdote, I phoned Gilbert to see how he felt about having it published. Among other things, he said, 'I never did understand why people thought my remark was so funny.'"^[26]

Gilbert as a Terrorist

As told by Carl Djerassi, on the receipt of his first honorary doctorate, from the Universidad Nacional Autónoma de México: "Gilbert Stork tried to photograph the occasion, and the flashbulb exploded in his hand as the rector of the university was placing that silly-looking hat on my head. Owing to recent bombings in Mexico City, everybody responded with panic—as the newspapers later reported—as if this were another terrorist attack."^[23]

The Origination of an Idea

"The Stork reaction [enamine alkylation and acylations] originated with wondering what might be going on in nature at a very primitive level... how does nature manage to make carbon-carbon bonds. That must be, obviously, a much milder process than we normally use in the lab. We take an enolizable carbonyl compound, treat it with a very strong base, at very low temperatures, and alkylate the resulting enolate with an alkyl halide. This is a violent operation and this is clearly not what goes on in nature. So I wondered about that, and I thought that maybe there was some sort of a reaction, not of an enolate of a ketone, which is what we chemists use, but an equivalent, which might be a nitrogen analogue of the enolate, such an enamine."^[17]

Emotional Attachment

"My quinine involvement is really quite something. It's somewhat typical of everything that's wrong with what I do and what has motivated me. What's wrong with it is the inability to give up something to which I'm emotionally attached. If it had been any kind of business decision, subject to the criteria of reasonableness, I should have given up quinine a long time ago. Still, it's important to make clear that I have not been spending all my time since 1942 trying to synthesize quinine, but I did come back to it every so often... Now [in 1991], I've finally decided to call it quits."^[1] [Note that Stork's stereospecific synthesis of quinine was published ten years later, in 2001!^[8]]

The Main Event

"[Derek] Barton and I overlapped in the sense that he spent a year at Harvard when I was there. He developed his conformational insights at that time. I was violently opposed to it... My objection was both reasonable and stupid; his was fundamentally not rigorous but brilliant. There's a difference.



Figure 14. Stork and Derek Barton on a trans-Atlantic voyage, ca. 1955. Photo courtesy C. Djerassi.

The difference is simply that there are things that are not absolutely correct with a capital 'C', but extremely worthwhile because they're major assumptions, which allow things to move forward."^[1]

Poor Choice of a Research Project

"We decided we ought to find out what would take place... So, we slipped into this [project]. We should never have messed with it. The result of our work was to add darkness to an obscure situation. [laughter] That was all.

"If you look back at a piece of work and you say, 'What is it that you know now?' There are several aspects, one, which could legitimately be, 'What is it that you now know that was not known before?' That's a tough one."^[1]

The State of the Art in Organic Synthesis

"There's another thing that gives a hint that there's something funny there. By now, there must be at least 40 groups worldwide, probably more, working on taxol. In the greater New York area, there are at least six. They're all different. They're all different syntheses, which sounds nuts but you don't get a huge waste of money because everybody's trying to do the same damn thing. This would be a problem if you were doing mechanistic work or structural work. If people work on a structure, they must all end up with the same structure if they are right. If people work on a mechanism, they must all end up with the same mechanism, if they are right. But in synthesis, they can all end up with something different; it's like writing a novel or something like that. But that also suggests that the state of the art is not that advanced

when all these people, who are very competent, all try to do the best they can, and they all come out with different answers! [laughter]"^[1]

On the Advancement of Synthesis

"The advance of organic chemistry has been absolutely spectacular, but it's hard to tell. The way you can tell is that no one in his right mind would have considered making a compound like erythromycin thirty years ago. I don't mean succeeded in making it; nobody would have considered the possibility of making it. Out of the question. Today people do this until you're bored to read this type of thing. I mean, there's another description of another damn macrolide antibiotic synthesis that someone made by controlling the aldol or not controlling this aldol. Who needs it?"^[1]

The Value of Named Reactions

"I have a tentative hypothesis that if there is a name attached to a reaction, it was probably discovered by someone else. I like to think that what some have called the Stork reaction may be an exception."^[17]

On the Huang Minlon Reduction

"Huang Minlon was a postdoc. Do you know the Huang Minlon reduction? His name was really Minlon Huang, but everybody's called Huang in China, so he inverted it. Huang Minlon was a postdoc of Fieser's. Mary Fieser used to delight in coming, sneaking behind him when he was working away in the lab, Huang Minlon, and shouting something in what she considered to be Chinese and startling the hell out of him. [laughter]"^[1]



Figure 15. Louis and Mary Fieser with their cats. Photo courtesy Harvard University Archives.

On Competition

"Sometimes people do engage in intense competition... Some people love the type of competition common in sport: 'Who will make cholesterol first?' At one time, everybody was fascinated by who would be the first to achieve a four-minute mile, and I must admit that I remember that it was [Roger]

Bannister. Today, many people run the mile in considerably less than four minutes. Is it important who did it first? It's not but it is striking."^[17]

On Rivalries within the Same Department

"There's no question in my mind whatsoever that if [good friends] went to the same place, that would be the end of [the friendship]. Forget it. [laughter] [Bill] Johnson and [Gene] van Tamelen faced that problem. They were very good friends, but eventually they would only write letters to each other through the [Stanford University] Post Office, even though they were only two doors apart. That's what happens. Obviously it could be the same woman; in that case, it was not very different, it was the same [scientific, chemistry] problem."^[1]



Figure 16. Gene van Tamelen, Barbara and Bill Johnson, and Mary van Tamelen, at the Caribbean Chemical Conference, University of the West Indies, 1969. Photo courtesy J. D. Roberts.

The Joy of a Crystal

"Nobody knows what a crystal is anymore. Chemistry is an intellectual thing now. Now you look at a peak in a spectrum; it's very analytical. You don't often get the thrill of making crystals... a real feeling of joy at the crystal, the crystal shape and coloring and that sort of thing."^[1]

My Office

"I shared the sixth floor with a physical chemist, who is a very famous physical chemist; he has a prize named after him from the ACS which is the Victor K. LaMer Prize in Colloid Chemistry. He was the other occupant of that floor. [LaMer] had no use whatsoever for organic chemists; he hated them. He had a thick white line painted on the floor, which was the frontier beyond which organic chemists were not to trespass. [Arthur C.] Cope was only here one year. He was involved in war work, and he worked mostly in Washington... On one of his trips, LaMer decided he needed more space. He took out all of the equipment of Cope's in a couple of the labs, tossed it out in the corridor, and put his people in. Presumably it is no

longer done that way. [laughter]... So Cope told me, 'I'll give you only one piece of advice. Stay away from LaMer.' The next thing I know, I'm sharing the floor with LaMer. [laughter]... "[1]

On Being Fearful

"I was at Columbia, and Bruce Ganem, who is now a professor at Cornell, was in a lab across the way from my office. I found a bottle of SO_3 , which is not that stable and had crystallized inside the bottle, which normally looks like Karo syrup, like molasses, and you pour it through a small opening. This thing couldn't be poured out and the question was, how do I get rid of this stuff? And so the idea was to find some solvent, some inert solvent, dissolve it, and pour it gently into ice. And as the solvent, I decided on carbon tetrachloride...

"To this date, I don't know what happened. There may have been a metallic impurity somewhere that catalyzed, ripping out one of the chlorines from CCl_4 in this extremely acidic medium... it was bubbling furiously, the bottle cracked

in the hood. Black crap was coming all over the place, and I could detect what I was convinced was the smell of phosphine.

"And I remember the dilemma that I had. I thought, 'Should I tell Bruce that he will probably die during the night or should I keep it quiet and just see what happens?' Well, the truth is, it was probably low enough in concentration, that nothing happened. But I remember I was really frantically concerned." [16]



Figure 17. Bruce Ganem at Columbia, 1970s. Photo courtesy B. Ganem.

On Hiring Ron Breslow at Columbia

"I knew Breslow when he was an undergraduate at Harvard. In fact, he did his first two papers with me^[27,28]... So I knew Breslow was an extremely bright guy. At that time, he was a postdoc for [Alexander, later Lord] Todd in England. He had been offered a position at Wisconsin, and I wrote him and said, 'You really should forget about Wisconsin. You should come here.' You know the way departments move. You've been around enough to know that this is not necessarily the fastest operation in the world. At that time, this place was sort of a frozen mastodon. So circumstances arose that I had to send a telegram to Breslow that we offered him this position, before discussing it with my colleagues. [laughter] Now, one should not do that, and I'm not advocating it at all. It just had to be done that way. It was a gamble that I would be able to convince my colleagues.

"So there was a department meeting. Things went slightly wrong, in that Breslow wired back a telegram to the chairman, Louis Hammett, accepting the offer. Hammett had not opened the telegram before the meeting. He'd collected together departmental stuff, and he would open these letters

and read them to the staff. And I didn't know anything about the telegram. Then he opened this telegram. When Hammett got a little excited, you could see red climbing up the back of his neck. He was obviously getting somewhat excited as he read this telegram, which said, 'Pleased to accept your offer of the instructorship.' Of course, [Hammett's] saying, 'What does this mean?' 'Oh,' I said, 'I'm sorry. This has no meaning. It's just a code, that he was supposed to wire back if he would accept it, if we decided to offer it to him, so we can save time.' Hammett said, 'Oh, I see.' Although we never talked about it, it was perfectly certain that he knew perfectly well the kind of skulduggery I'd been involved in and went along with it. So Breslow came. That was pretty good." [1]



Figure 18. Louis P. Hammett at Universal Oil Products, 1954. Photo courtesy L. P. Hammett.



Figure 19. From the left: Nick Turro, Ron Breslow, and Stork at Columbia University, 1970s. Photo courtesy N. Turro.

On Hiring Nick Turro at Columbia

"Turro came through the Jack Roberts connection.^[29] I was involved in bringing him here, but only as a conduit, not as an initiator.... the main reason why I was suggesting bringing Turro here was that he told a joke that was so bad, so outrageous, and so long that I decided he must have enormous self-confidence. He clearly has enormous drive, and is clearly intelligent, so obviously, he would be perfectly okay." [1]

As told by Nick Turro: “When I was to give my interview lecture, I was very nervous with Gilbert, Ron [Breslow], Tom [Katz] and Cheves Walling in the front row: a chemist’s murderer’s row if there ever was one! So to break the tension, I decided to tell a joke about an amateur photochemist, since this was the topic of my colloquium.

“Alexander the Great studied phototropism, the ability of certain dyes to change color when exposed to light. He noted that the color change in sunlight depended on the time of day. In a brilliant stroke, he envisioned the military applications of this phenomenon. He would take a cloth, soak it in the dye and then after it reaches a color for a certain time of day, freeze the color in the cloth with some fixing chemical. He would then give one of these cloths to each of his generals who would surround an enemy. They would wear the fixed colored dye with a fresh photochromic system, and when the colors matched they would attack! The enemy had no defense against this clever photochemical trick.

“To this day, the cloth that Alexander gave his generals is known as Alexander’s Rag Time Band!

“There was stunned silence when I finished the story. Then suddenly a roar of disbelief that a brash young interviewee could have the insanity to tell such a joke to start his interview!

“There is a cute Stork story to follow this talk. Ron had a reception for me in his apartment which was on the top floor of one of the buildings off of Broadway. I got there early but as the evening wore on, Gilbert had not arrived. Finally, the entrance buzzer rang, and it was Gilbert, announcing his arrival. Ron let him in the building.

“Twenty minutes later, no Gilbert! Then finally, the bell to Ron’s apartment and Gilbert at the door, red faced and out of breath. After a period of recovery, he explained that the elevator was so slow that he decided to take the stairs, up 15 flights! When he got to the top, exhausted, he realized that he was in a fire stair well and could not get onto Ron’s floor. So he ran back down the stairs and took the elevator. This was my first introduction to a real-life Storkism!”^[30]

The Columbia Chemistry Department’s Personality

“The Columbia personality has been unkindly described as a group of people whose natural tendencies would be to grab the microphone while someone else is still using it. That’s an unkind statement, which is not any kinder because I made it, originally. [laughter] But it has some truth to it. This may be the description of anyone who is going to make it in this world of chemistry.”^[1]

Giving Career Advice to Paul Wender

“I remember that Paul Wender had an offer [from both Harvard and several other institutions]. We spent a lot of time discussing it. ‘Do you want to go to the safety of [university names redacted], where it’s unimaginable that you would not get tenure, or do you want to go to Harvard, where it’s essentially unthinkable that they would give you tenure. But

the experience may be worth it.’ So eventually he had the courage and guts to go to Harvard and said, ‘Okay, let’s do that, and I’ll do the best I can.’ That worked out pretty well.”^[1]

As told by Paul Wender: “I was only two or three months into my two-year NIH postdoc with Stork when Woodward called. Much before I had planned, I had an offer in hand from Harvard. To Stork’s credit and a remarkable reflection of who he is and his exceptional mentoring skills, he encouraged me to think about where I would like to go. After discussions with him and also with Woodward, the decision was easy.”^[31]



Figure 20. Paul Wender at Harvard University, mid-1970s. Photo courtesy Paul Wender and Scott M. Sieburth.

On Being Playful in the Literature

“Woodward had developed a particular style at that time, using Latin phrases here and there to buffalo the assembled multitude. Obviously, I couldn’t use Latin phrases, but the purpose seemed obvious to me. So my thing was that I would use some English words which people didn’t know. The test of that was whether or not Barton had to use a dictionary to figure it out. So that paper has a footnote that the British school considered the S_N2' reaction their appanage... I was fairly pleased with that. But I got over that after a few more of these things.”^[1]



Figure 21. From the left: Albert Eschenmoser, Stork, R. B. Woodward, and D. H. R. Barton.

On the Consequences of Flippant Answers

“I made myself extremely unpopular once in Canada. I gave a lecture. Maybe 250 students were there and time came for questions and there was a tough time in Canada at that time... People had a hard time finding jobs.... And the first question, I expected something about chemistry... the first question is, ‘What do you think will happen with the unemployment situation?’ I was really not so prepared for that. And my answer was both unexpected and stupid, which was ‘Well, I... it’s... not... it wouldn’t be that tragic if people got a Ph.D. in chemistry and then were a bus driver because at least in traffic jams, they would have something interesting to think about.’

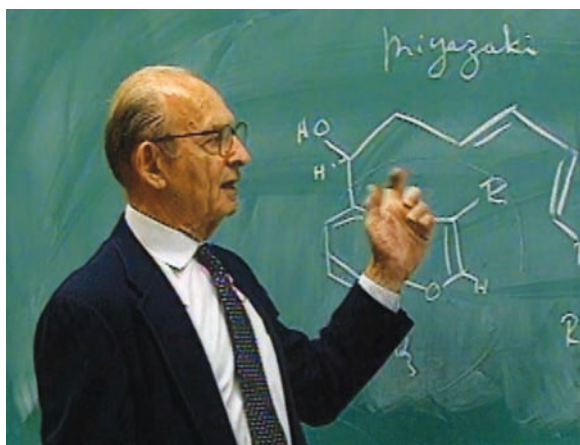


Figure 22. Stork lecturing at Columbia, 1997. Photo courtesy J. I. Seeman.

And that had the merit of cutting out any further questions, because of the resulting shock, and also to teach me eventually that one should give more thought to casual answers.”^[16]

On Being Honored

“To my surprise, there was recently an event that I didn’t know was going to take place during a meeting in Minneapolis where they had found some people to say more or less nice things about my scientific career. One of them was [Sam] Danishefsky. Danishefsky came with slides, which he had made of what he thought were the most interesting things I had done. The interesting result of that was that I was both interested and annoyed. For the obvious reason, if you’re a psychologist. I was annoyed because he didn’t pick Q, R and S, which I thought were great stuff. How come he didn’t pick that? [laughter] On the other hand, he picked some other stuff I thought was really not that great.”^[1]

In response to reading the above quote, Danishefsky says, “The story is true. I still think I picked his best works.”^[32]

A Call from the White House

“My wife and I were vacationing in the U.K. and were visiting friends, when the telephone rang and, improbably, ‘It’s for you’ followed. The person on the phone stated that this was the White House calling. I could only think of the White House Hamburger chain, and it took a little while to straighten things out. But they were straightened out, and I received the [National Medal of Science in 1983] in the White House, from President Reagan.”^[4]

A Final Word

“If we’re lucky, none of this will be published. [laughter]”^[16]

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