CELEBRATING THE LIFE
OF
ROBERT J. SILBEY

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

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OF
ROBERT J. SILBEY

ROBERT J. SILBEY
1940 – 2011

PROFESSOR OF CHEMISTRY
1966 – 2011

DEAN OF THE SCHOOL OF SCIENCE
2000 – 2007

BRAIN AND COGNITIVE SCIENCES COMPLEX ATRIUM
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

MARCH 17, 2012
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BIOGRAPHY OF ROBERT J. SILBEY

Robert J. Silbey, Class of 1942 Professor of Chemistry, Dean of Science, and beloved teacher was born October 19, 1940. Raised in a lower middle class family in Brooklyn during and just after the Second World War, Bob was strongly influenced by the liberal atmosphere of that time and place. His father was the manager of a bottling plant on the Brooklyn docks; his mother worked at the Red Cross headquarters in New York City. He and his older brother by seven years, Joel, went to the public schools and then on to the public university system of New York City. Sidney Silbey had studied chemistry at Cooper Union in Manhattan, and Bob often commented that his early interest in chemistry probably stemmed from his father's interests and education. Like many young people of his generation, Bob owned a chemistry set he used to conduct experiments on the kitchen table, from time to time setting the table on fire. The Silbeys were not rich, but their apartment was richly filled with books, a fact that puzzled many childhood friends. Surrounded by piles of books since childhood, Bob was a voracious reader his entire life.

After graduating from Erasmus Hall High School, Bob went to City College to study chemical engineering. He had been accepted at several schools, including MIT, but the family could not afford the costs at the private institutions. Within six months at City College, however, Bob realized that he was more interested in chemistry and physics than chemical engineering, transferring to Brooklyn College for his remaining three years of college. Fortuitously, his academic trajectory was set in his senior year when the professor asked students in a three-person seminar to read Pauling and Wilson, *Introduction to Quantum Mechanics*, and Mayer and Mayer, *Statistical Mechanics*. Bob has claimed that he did not understand the texts at the time he first encountered them, although the experience convinced him that he wanted to go to graduate school in chemistry, and specifically to attend the University of Chicago, where the excitement and intensity were exactly what he wanted.

During his senior year, Bob became engaged to Susan Sorkin. They had been acquaintances in high school and close friends throughout college, sitting next to each other in classes, sharing books and friends. The story goes that Susan purposefully did poorly in her first chemistry class so that Bob would tutor her in quantum mechanics. The relationship flourished quickly after that, together for the next fifty-one years. They were

twenty and twenty-one when they married, when he was still called Bobby by family and friends. To Susan, he was Bobby his entire life.

In his first year at Chicago, Bob decided to be an experimental chemist, joining Clyde Hutchison's research group. He began experiments on the electron paramagnetic resonance (EPR) of a ground state triplet molecule, diphenylmethylene, formed at low temperature by exciting diazo-diphenylmethane with light. Although he managed a successful experiment, obtaining good signals within a few months, he also realized that this was not work at which he would excel. Within the space of a week, he had broken enough large and very expensive dewars to be certain that his skills were not up to the standards either Clyde or he expected. So, he decided to change research groups and become a theorist. Clyde is reported to have claimed that Bob's departure from his group was God's great gift to theoretical chemistry. Working on theoretical chemistry problems with Stuart Rice turned out to be an inspired choice because Stuart allowed his students sufficient freedom to flourish while simultaneously giving them enough advice to make that possible. Stuart suggested a few topics, and connected Bob with Joshua Jortner, a senior visitor in the Rice group, with whom Bob worked on the exciton states of the polyacenes that became his Ph.D. thesis.

After Chicago, Bob won an AFOSR (Air Force Office of Scientific Research) postdoctoral fellowship, choosing to work at the Theoretical Chemistry Institute at the University of Wisconsin. Although he found the work sufficiently challenging to be fun, researching problems in perturbation theory with Joe Hirschfelder convinced him that he wanted to be more connected to novel experiments rather than solely developing theoretical methods.

As he moved from chemical engineering to chemistry, from experimental to theoretical research, and then away from devising analytic methods to explaining experiments, Bob discovered his scientific métier, developing the approach to theoretical physical chemistry for which he would eventually become known and respected: a theorist for experimentalists.

He began as an Assistant Professor of Chemistry at MIT July 1, 1966. Although he joked this was perhaps the lowest paying academic position he was offered, it was the group who gave him the hardest time at his job talk, so he knew that he would have challenging and exciting colleagues. Once at MIT, he discovered that his colleagues were not only stimulating, but unusually supportive and friendly, too. Many became life-long friends, sharing a commonsense, pragmatic approach to science as well as academic life, neither too esoteric and removed from ordinary life, nor too consumed by immediate material, government, or corporate interests.

During his early years at MIT, Bob focused on both his undergraduate teaching and graduate student supervision, working on problems having to do with electronic energy transport in solids: exciton energy levels, transport, spectral line-shapes, and phonon scattering. Over the years, he came back to these same issues as experimental techniques improved to provide data about both coherent and incoherent energy transport.

It was the second half of the sixties. The Viet Nam War was waging; civil rights marches and political protests were routine. Bob showed up at many rallies and teach-ins. He volunteered to teach in experimental programs MIT was developing to address student demands and increasingly diverse interests. At the height of the student protests and anti-war fervor, Bob became the junior faculty resident in Senior House. Both he and Susan organized mini-film festivals and political discussion groups, in addition to Bob's regular tutoring sessions for the dorm residents.

Bob's pedagogic talent was evident from the start. He commanded the classroom with his passion, clarity, and repertoire of humorous stories. A consummate lecturer at the undergraduate and graduate level, he owned the students' attention, mesmerized by the unexpected joy and excitement. He received every MIT teaching award at MIT, including the School of Science Teaching Award, the Graduate Student Council Award for Teaching, and the Baker Award for Undergraduate Teaching (voted by the undergraduates). In 1996, he was named a Margaret MacVicar Faculty Fellow, an honor that recognizes outstanding classroom teaching at MIT. Together with his colleague Bob Alberty, and later Moungi Bawendi, Bob adapted his lectures for publication in *Physical Chemistry*, now in its ninth decade of continuous publication, four editions under his authorship.

Throughout his scientific career, Bob kept in close touch with experimental research. He chose theoretical problems that were intimately connected with interesting and important experiments that led to observables easily accessible to measurement. For example, in the area of electronic energy transfer in condensed phases, Bob demonstrated the dominance of quantum effects at low temperatures and was the first to map the change to a classical, incoherent mechanism as the temperature increased.

In the 1980s, Bob recognized that the models used by physicists to explain the newly observed conductivity in doped, but non-metallic polymers such as polyacetylene amounted to Huckel theory, well-known to chemists, with the addition of electron-phonon coupling. In short, he provided a physical picture for the origin of the high conductivity as geometric distortions of the chain around the charge, induced by excitations. This work provided the first quantum calculations of the soliton, polaron, and bipolaron entities that dominate such polymers' conductivity, essential for polymers' myriad contemporary uses. These polymers have the largest known nonlinear polarizabilities and Bob predicted the saturation of their nonlinear optical properties with chain length, a phenomenon verified in collaboration with MIT synthetic chemists. This work also provided the first quantum method capable of predicting the redox potentials of these polymers, explaining a large amount of existing experimental data in hole burning, photon echo, and single molecule spectroscopies, all in agreement with his model and thereby spurring many new experiments.

Bob also worked closely with a global network of experimental chemists and physicists to interpret the optical spectrum of molecules in disordered hosts, in terms of the static and dynamic interactions with their surroundings. He showed that the "two-level system" model for thermal properties of low temperature glasses explained the experimental results of hole burning, photon echo, and single molecule spectroscopy. He went on to use these theoretical ideas for the interpretation of the spectrum of a single quantum dot, and in particular, for the spectrum of the light harvesting complex, which is the structure within plant cells that converts light to chemical energy in the process of photosynthesis. He and a colleague showed how quantum friction or noise both slows down and speeds up the energy transfer efficiency within the complex. Developing a wide range

of theoretical methods that have now become the standard techniques for studying photosynthetic energy transfer, Bob's work sets the foundation for the new field of quantum biology.

Bob's work was always a collaboration with his more than 65 graduate students and post-docs, for whom he was known as a caring mentor. He challenged them to work on problems of their choosing, yet supported their interests and ingenuity with guidance, insight, and encouragement. Acknowledging his role model, many of his students have gone on to positions of leadership in academia. All remember his love of science and his devotion to family and close friends as indivisible parts of his life.

Beginning with the department Head of Chemistry from 1990–1995, Bob took on a series of administrative positions at MIT, including the Director of the Center for Material Sciences, 1998–2000 and Dean of Science, 2000–2007. Although he never sought leadership positions, and was reluctant at each move to give up teaching, Bob found unexpected pleasure in the new science he was learning as the Dean of Science. He led by example through his own dedication to teaching, research, and the success of MIT's students, developing a reputation for extraordinary political acumen. He had the unique ability to work calmly through the most difficult issues, forging agreements from contentious and strong-willed colleagues while bringing people together through humor.

With his wit and abundant wisdom, Bob was the obvious person to chair committees whose work required consensus among competing factions. Just since 1998, he was the chair of the Task Force on the Undergraduate Educational Commons, co-chair of the Task Force of Student Life and Learning, co-chair of the Special Faculty Committee on Promotion and Tenure Processes, and member of the Review Board on Campus Police, Faculty Policy Committee, and the Skolkovo planning committee. Prior to that, Bob served as the chair of the Institute Calendar Committee, on the Committee on Women Faculty in the School of Science, on the MIT-Wellesley Exchange oversight committee, as an initial developer of Concourse, and was the person who convinced the MIT administration to release the data that led to the historic report "A Study on the Status of Women Faculty in Science at MIT." An advocate for excellence in teaching, Bob supported innovative approaches to undergraduate education such as the Technology Enhanced Active Learning program, which changed

the way freshman physics is taught. Bob also made multiple contributions to curriculum innovation. He was a participant in the SP01 experiment and most recently, with chemistry and biological engineering colleagues, he revamped the thermodynamics class, 5.60, that he had taught for many years, making the fundamental principles of energy studies available to students across multiple disciplinary boundaries. He also oversaw the construction of the Brain and Cognitive Sciences Complex and the Physics in-fill building, while beginning plans for the new Center for Cancer Research.

Robert J. Silbey was a fellow of the National Academy of Sciences, the American Academy of Arts and Sciences, the American Association for the Advancement of Science, and the American Physical Society. He was awarded the Max Planck Research Award of the Humboldt Foundation, and was a Dreyfus Foundation Teacher Scholar, Sloan Foundation Fellow, and a Guggenheim Foundation Fellow. He also received, among other awards, honorary degrees from his alma mater, CUNY Brooklyn College, and École Normale Supérieure in Cachan, France.

After a youth spent perfecting his skill at both chess and pool hall billiards, Bob took up sailing about the same time he began his term as department head. He told Susan that he needed some way to stop thinking about the administrative side of MIT. Sailing the choppy and unpredictable waters of Buzzards Bay from May through October, Bob shared his new-found passion for messing around in boats with his brother-in-law Dick Merians and any students, visiting scientists, or family members he could shamelessly seduce aboard for a day of boredom punctuated by crisis. During all seasons, Bob listened to jazz and read: the daily papers, the weekly *New Yorker*, the bi-weekly *New York Review of Books*, and hundreds of novels and histories. He insisted on completing the crossword puzzle each day before he went to work in his plaid shirt, jeans, and during sailing season, without socks. Nearly every picture of Bob is in a plaid shirt and jeans. It is unclear to this day whether he is wearing the same shirt in the pictures or whether his closet is filled with shirts too similar to tell apart. Bob had a style, both sartorial and irreverent.

There was never much separation in Bob's life between work and family and so his family was inescapably a part of his life at MIT. He often used family members as characters in the stories

with which he would regale students and colleagues. From early in his career, Susan, and as they arrived, Anna and Jessica, were often with him in his office, so much so that like Susan, his colleagues in physical chemistry also called him Bobby. And when the grandchildren, Charlotte, Harper, Henry, and Oliver arrived, he introduced this next generation to life at MIT. He was a caring and loving husband, father, and grandfather who provided unwavering affection and unparalleled wisdom.

After spending from 1970 to 1994 raising their young daughters in suburban Newton, Bob and Susan moved back into the city, to their roots as urban youths, no longer hanging out on street corners that had been their meeting ground as teenagers but walking to their favorite sushi restaurant, ice cream parlor, movie theater, the symphony, or Fenway Park. Bob could see MIT from his desk at home and could walk there in 12 minutes. After twenty-four years riding the bus or driving in his mammoth 1973 Chrysler, he returned to the urban life he called home.

In many ways, Bob's life was like the jazz he loved, improvising over a few basic lines. "You don't have to play all the notes," he would often say, paraphrasing Miles Davis. Elegantly understated, he let the silences do much of the work. And Bob Silbey could dance, boy, could he dance.

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… When he shall die

Take him and cut him out in little stars
And he will make the face of heaven so fine
That all the world will be in love with night
And pay no worship to the garish sun.

Romeo and Juliet, Act 3 scene 2

PROGRAM

PRELUDE

MILES DAVIS, *CONCIERTO DE ARANJUEZ* (1960)
MILES DAVIS, *ASCENSEUR POUR L'ÉCHAFAUD* (1958)

REMARKS

JESSICA SILBEY

MUSICAL INTERLUDE
PAUL ROBESON, *JOE HILL* (1942)

SUSAN HOCKFIELD
PRESIDENT, MIT

CHARLES M. VEST
PRESIDENT, NATIONAL ACADEMY
OF ENGINEERING AND
PRESIDENT EMERITUS, MIT

ROBERT A. BROWN
PRESIDENT, BOSTON UNIVERSITY

SUSUMU TONEGAWA
PICOWER PROFESSOR OF BIOLOGY
AND NEUROSCIENCE, MIT

SYLVIA T. CEYER
JOHN C. SHEEHAN PROFESSOR AND HEAD,
DEPARTMENT OF CHEMISTRY, MIT

MUSICAL INTERLUDE
GEORGE LEWIS, *BURGUNDY STREET BLUES* (1959)

BRUCE J. BERNE
HIGGINS PROFESSOR OF CHEMISTRY
AND PROFESSOR OF CHEMICAL ENGINEERING,
COLUMBIA UNIVERSITY

JEAN PIERRE BOON
PROFESSOR, CENTER FOR NONLINEAR
PHENOMENA AND COMPLEX SYSTEMS,
UNIVERSITY OF BRUSSELS

JAMES L. KINSEY
D.R. BULLARD-WELCH FOUNDATION PROFESSOR
OF SCIENCE, EMERITUS, RICE UNIVERSITY
AND CHAIRMAN, WELCH FOUNDATION
SCIENTIFIC ADVISORY BOARD

ALBERTO SUAREZ
PROFESSOR OF COMPUTER ENGINEERING,
AUTONOMOUS UNIVERSITY OF MADRID

MUSICAL INTERLUDE
EDITH PIAF, *NON, JE NE REGRETTE RIEN* (1960)

A VIDEO TRIBUTE

ANNA SILBEY

POSTLUDE

HARRY JAMES, *YOU MADE ME LOVE YOU* (1941)

RECEPTION

VIDEO PRODUCED BY
AMPS/MIT VIDEO PRODUCTIONS

PRODUCER/DIRECTOR: CHRIS BOEBEL
VIDEOGRAPHERS: CRAIG MILANESI, TOM WHITE
EDITOR: YARI WOLINSKY
PRODUCTION COORDINATION: AYN CAVICCHI

VIDEO WILL BE AVAILABLE TO VIEW ONLINE FROM
MIT TECHTV IN THE NEAR FUTURE.

GIFTS IN BOB'S MEMORY
MAY BE MADE TO THE
ROBERT J. SILBEY CAREER DEVELOPMENT
PROFESSORSHIP FUND

CHECKS OR QUESTIONS MAY BE DIRECTED TO
LIZ MCGRATH
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