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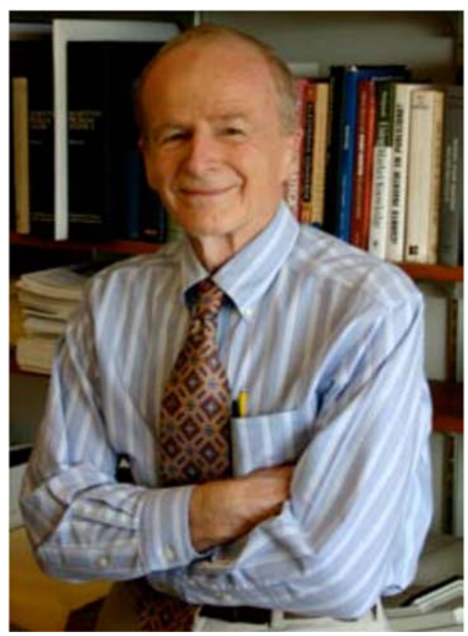
JOHN R. HAUSER AND GLEN L. URBAN

The development of operations research (OR) after World War II (WWII) was greatly influenced by OR pioneers who applied their knowledge and experiences to the problems of business and industry. In parallel, they brought OR methods and practices into academia, and created the environment for the development and training of a new cadre of OR practitioners and researchers. In the forefront of this new group, we find John D. C. Little. From being the first to receive a Ph.D. in OR, John went on to leave his own lasting imprint on the field as a progenitor of the field of marketing science and its applications, the person behind the eponymous Little's Law for queues, an influential academic leader, and a highly successful OR researcher, practitioner, and entrepreneur.

For his innovative and seminal research in marketing, John received the American Marketing Association (AMA) Charles Parlin Award for contributions to the practice of marketing research (1979), the AMA's Paul D. Converse Award for lifetime achievement (1992), and MIT's Buck Weaver Award for outstanding contributions to marketing (2003). He was president of the Operations Research Society of America (ORSA) in 1979, The Institute of Management Sciences (TIMS) in 1984–1985, and first president (1995) of the Institute for Operations Research and the Management Sciences (INFORMS), one of only two individuals who have served as president of the three organizations.

BOSTON BORN, MASSACHUSETTS BRED, AND ON TO MIT



John D. C. Little was born in Boston, Massachusetts, on February 1, 1928, the son of John D. and Margaret J. Little, and grew up in Andover, Massachusetts. Both his father and mother were natives of Massachusetts, he was born in Malden and she in Gloucester. Margaret graduated from Smith College and, after her three children had grown up, became an English teacher and then the principal of a private school in Andover. John D. attended Malden public schools and Dartmouth College, but left without graduating to become an ambulance driver in France during World War I. Later, he held various positions including reporter for the *Boston Herald*; editor for a financial journal in Washington, D.C.; bond salesman for a Boston brokerage firm; writer for the Office of War Information in Washington during WWII; and a credit manager.

John (D. C.) lived in the West Parish part of Andover, which was then quite rural, an exurbia from which his father commuted to Boston by train. John attended Andover's elementary and middle public schools and was a good student, especially in mathematics and science. For high school, he obtained a scholarship to the independent Phillips Academy in Andover and won most of the science-related prizes. He graduated Andover in 1945 and started college at the Massachusetts Institute of Technology (MIT). Due to the wartime acceleration of MIT's academic program, his freshman year began in the summer. He decided to major in physics, which appealed to him as a worthy intellectual challenge. John did more than study—he became editor-in-chief of *Voo Doo*, the MIT humor magazine. He also "took a minor in hitchhiking to Wellesley [a women's college]" (Little 2008). He graduated in 3 years, receiving an S.B. degree in 1948. Tired of school and not yet wanting to enter the working world, John hitchhiked around the country for 10 months. This brought him to the point where work seemed better than poverty, so he joined the General Electric Company as an engineer. In 1951, he went back to MIT, enrolling as a graduate student in physics. Although he passed his general exams in physics, his intellectual curiosity caused him to search out other areas—a research assistantship (RA) on an unclassified air defense project with the psychologist J.C.R. Licklider, and a course in the new field of OR taught by George Wadsworth of the mathematics department.

John, inspired by the challenges offered by the embryonic field of OR, obtained an RA working for the physicist Philip Morse. Morse, a WWII pioneer in OR, is recognized as the founder of OR in the U.S.—he had established the first U.S. OR group for the Navy in 1942. After WWII, Morse founded and directed MIT's inter-departmental Operations Research Center. John's RA was for a Navy-sponsored project, "Machine Methods of Computation and Numerical Methods."

Machine computation meant Whirlwind, one of the earliest digital computers—it had been built in the late 1940s by MIT personnel to support the Navy's research program. John's task was to learn about Whirlwind, how to program it, and to compute a book of tables for spheroidal wave functions—rather esoteric functions used for calculations in theoretical physics. John did not think the resulting book was going to be a big seller, but, in assuming the task, he thought "an RA is an RA"; one usually does not question the professor, especially when the job helps pay your tuition. More importantly, John became one of the few people in the world with access to a digital computer. The knowledge of what a computer could accomplish was central to his future research and consulting activities. He felt that "computers are cool" and he can often be found "playing" with the latest technological devices (Little 2008).

When John asked Morse about possible thesis topics, Morse mentioned a few from physics and then wondered if John would be interested in an OR topic. Physics or OR? John faced the decision and concluded, "Physics is fine, but look at it this way. Bohr solved the hydrogen atom and it's beautiful. Then somebody named Hylleraas solved the helium atom. It took him 7 years on a hand-crank calculator and it's ugly. Beyond helium there are another 100 or so elements with bad prognoses. I'm searching for a field with a lot of unsolved hydrogen atoms. OR looks good" (Little 2007, 3).

John's dissertation research dealt with the study of water-flow management in a hydroelectric reservoir and dam system (Little 1955). In particular, his analysis dealt with Washington State's section of the Columbia River, its Grand Coulee hydroelectric plant, and the Franklin Delano Roosevelt Lake (the reservoir that formed behind Grand Coulee Dam).

The problem was how best to schedule the amount of water flow used to generate electricity. The system is naturally dynamic with the available water to generate power a function of seasonal rainfall and the runoff from snow melting in the mountains during the spring and summer. In the fall and winter, when precipitation falls as snow in the mountains, the natural river flow drops drastically. Water leaves the reservoir from spill-over (wasted energy) and when the water is drawn down to generate electricity. The problem is interesting because the power is proportional to the head, the height of the water behind the dam relative to the water below the dam, and to the rate of water flow. A greater flow generates more electricity, but also reduces the head at a faster rate.

The tradeoff was challenging. As John notes, decisions have to be made: “... in the spring and summer, the right decisions about water use are obvious—indeed they are hardly decisions—whereas in the fall and winter such decisions require a balancing of the benefits of future against immediate water use in the face of uncertain future flow” (Little 1955, 188).

John formulated the problem as a dynamic program, although, at the time, he did not know it was a dynamic program. John faced the dynamic-programming “curse of dimensionality,” the rapid increase in computing time with the number of state variables (Bellman 1957, ix). The simplest credible formulation required two state variables: one for the amount of water in the reservoir (which determines the head) and the other for the current river flow. Thanks to Whirlwind, John was able to finish his thesis before his RA ran out (Little 2007, 4).

The thesis was very likely the first non-defense application of dynamic programming to a problem of practical importance. Real data were used for the historical stream flows. The models of Grand Coulee and its reservoir were simplified to save computing time, but were based on actual physical dimensions (Little 1955).

John received his Ph.D. in OR in 1955, the first person in the world to receive such a degree—his dissertation title was the “Use of Storage Water in a Hydroelectric System,” and his advisor was Philip Morse. John, to be precise, describes his Ph.D. as being in physics and OR, since his general exams were in physics and his thesis in OR (Little 2008).

In 1953, John married Elizabeth (Betty) Alden, an MIT physics graduate student who worked on ferroelectrics under Professor Arthur von Hippel, a pioneer in dielectrics, especially ferromagnetic and ferroelectric materials. She received her Ph.D. in physics from MIT in 1954, one of very few women to do so at the time. After their marriage, Betty and John moved to Marlborough Street in Boston’s Back Bay. The rent was high “but not too bad and we could split it” (Little 2007, 4). Beginning a lifetime of exercise (John jogs and bicycles daily at age 80), they had to walk up five flights to reach their tiny, top floor, two-room apartment. It had sloping ceilings to conform to the roof, but it suited their purposes admirably.

ARMY, CASE INSTITUTE, AND LAYING DOWN THE LAW

In early 1955, 3 months after completing his thesis, John was drafted into the Army. He was stationed for 2 years at Ft. Monroe, Hampton, Virginia, where he served as an operations analyst working on military OR problems that included probabilistic models of land mine warfare. As an antidote to the Army, John and Betty bought a sailboat and had a wonderful time getting in and out of trouble on the Chesapeake Bay. Their first child, John N. Little, was born in the Ft. Monroe Army hospital. Upon his discharge from the Army in 1957, John began his academic career as an assistant professor at Case Institute of Technology (now Case Western Reserve University) in Cleveland, Ohio. There he had his first experiences working on industrial OR projects.

A project with M&M Candies introduced him to advertising problems, and a project with Cummins Engine, Inc. introduced him to the issues of conflict between a manufacturer and its independent distributors. At M&M, the president had deliberately stopped all advertising after a long period of operating at a high level to see what would happen. The Case team analyzed the resulting sales over time. At first, sales changed very little and then started into a serious decline. With their response analysis and further data, the team calibrated a model which led it to recommend a new policy for buying TV spot advertising. At Cummins, top management was dismayed that, when the company provided extra sales support to its independent distributors, the latter rather quickly reduced their own. John devised a graphical profit analysis showing that such behavior by the distributors was entirely rational. With his accumulation of such real-world experiences, he developed and taught a graduate course—OR in Marketing—that may have been the first such marketing science course.

Although not a problem in marketing, John also worked on the traveling salesman problem (TSP), whose solution procedures for finding the minimum TSP route were computationally challenging. In addressing the problem, he and his coauthors introduced and popularized the term branch and bound as a technique for solving the TSP, as well as other combinatorial optimization problems (Little et al. 1963, 972). For a while, the authors held "the indoor record for size of problem solved, 40 cities on the fastest machine at MIT at the time, an IBM 7090" (Little 2008). It turns out, over four decades later, that the TSP is relevant to modern marketing science. With automatic tracking of supermarket shopping carts and recorded checkout data, researchers are using optimal traveling salesman solutions as reference routes for studying how shoppers actually move around in stores.

John's research at Case (and later work) was clearly influenced by his mentor Philip Morse, who began his career as a theoretical physicist but, in the course of his OR activities, became both an experimentalist and a theoretician. John was guided by the definition of OR promulgated by Morse and George Kimball in their book, *Methods of Operations Research* (Morse and Kimball 1951, 1) "Operations Research is a scientific method of providing executive departments with a quantitative basis for decisions regarding operations under their control." John, in his retrospective review, "Philip M. Morse and the beginnings" (Little 2002) notes: "The definition leaves room for the tremendous development of methodology that we have witnessed in the past 50 years, but it keeps our feet on the ground with the requirement for data, models, and decisions. I like that, and I am sure it is what Morse intended" (Little 2002, 148).

Being true to this paradigm, John, in a study of a real-world problem, would often meet with managers to learn how they perceive the problem. Then he would formulate tentative hypotheses about underlying processes that, if understood, might permit improvement in operations. After that, he would look for relevant data and/or design and execute a plan for collecting it. Whenever feasible, he would do this with students. Often, iteration was required between the observed and modeled worlds until the model was right for the job at hand. This style marked his professional behavior in such disparate subfields of OR as hydroelectric systems, traffic signal synchronization, the process of managing, and eventually marketing.

An exception to the paradigm is the paper underlying Little's Law. This paper, written while John was at Case, established him in OR history. He published the first general proof of the famous queueing formula, $L = \lambda W$ (Little 1961a). Assuming steady state operation, the formula says that the average number of customers in a queueing system over time (L) equals the average arrival rate of customers to the system (λ) multiplied by the average time that each customer spends waiting in the system (W). A customer can be anything from a consumer waiting for a teller in a bank, to an aircraft waiting to land, to a packet of data waiting to be processed in a computer network. Little's Law allows an analyst to obtain all three of these fundamental performance measures of a queue by calculating (or measuring) only two of them. This is useful because the analytic methods used to calculate L and W are usually quite different and, often, one is much easier to carry out than the other.

John taught a queueing course at Case and, among other sources, used Morse's pioneering book on queueing theory for OR applications, *Queues, Inventory and Maintenance* (Morse 1958). In one of John's lectures, he pointed out Morse's observation that the curious formula $L = \lambda W$ always seemed to apply to queues whose operational behavior Morse had solved the long, hard probabilistic way, that is, by making specific assumptions about arrival processes, service time distributions, and queue disciplines (Morse 1958, 75). John went on to sketch a figure on the blackboard, similar to the one that appears in his paper (Little 1961a, 385). He used the figure to give a heuristic argument why the formula should hold in great generality for steady state queues. In discussion after class, one of the students wondered how difficult it would be to prove the general case. John obligingly answered, "It shouldn't be too hard." "Then you should do it!" was the response (Little and Graves 2008, 99).

The discussion stuck in John's mind and he started to think about how he might turn his heuristic proof into a formal one. He bought and read some books on general stochastic processes. In those years, he and Betty would pile themselves, their children, their summer clothes, and a stack of books for John's research projects into their Ford Falcon station wagon and head for Nantucket (Island), Massachusetts to spend the summer. This particular year (1960) he took his new books and worked on $L = \lambda W$ as one of his major projects. The books did not have any magic formulas, but they gave him important ideas—the outcome was his paper, "A proof of the queuing formula $L = \lambda W$" (Little 1961a). John decided then and there not to make a career out of being a measure-theoretic stochastic process mathematician—he has never regretted it. Little's Law has entered OR folklore. At an ORSA conference in New Orleans, T-shirts were sold to raise money for ORSA. A best seller was the one that proclaimed: "It may be Little, but it's the Law."

WHAT'S IN A NAME? THAT WHICH WE CALL A ROSE….

There has been much curiosity about what John's D. C. middle initials stand for—he has been asked often. An extreme case of curiosity occurred when an OR teacher in Oklahoma City challenged his OR class to find out the exact middle names of the person after whom Little's Law is named—the first student who did so would get a reward. This resulted in John receiving much email from Oklahoma City. Out of curiosity, John decided to pursue the challenge and searched the Web for the answer. He was surprised to find how difficult the task was. He was able to do it, but admits he was aided by knowing that the names are in two places on the MIT Web site.

Many people have guessed that D. C. came from direct current based on John's early work on hydroelectricity, which, by the way would be A. C. (alternating current). Others have guessed District of Columbia from John's contributions to OR in the U.S. It is not DC Comics, although many people consider John a super-hero, nor DC Shoes for skateboards—John jogs. It is not Dominican College or the Dublin Core, nor is it D. C. United, the Department of Corrections, desert combat, or digital camera.

The answer is Dutton Conant. His father, who was John Dutton Little, did not want John to be called junior and so added another middle name. His father was close to his grandmother whose maiden name was Conant. Thus, John became John D. C. Little. John has noted that, although there are many people named John Little, he has never found another who was John D. C. Little. He finds this helpful in searching for himself in Web documents (Little 2008).

RETURN TO MIT, EVOLUTION OF THE SCIENCE OF MARKETING

In 1962, John interviewed for a faculty position at MIT in the School of Industrial Management, now the MIT Sloan School. He had been a tenured associate professor at Case and, without any qualms, he accepted MIT's offer as an untenured associate professor. John viewed the scope of OR broadly and was attracted back to MIT by the promise of new problems and new research directions. MIT was an excellent base of operations with good colleagues and great students—he has never left!

John, perhaps frustrated by Boston drivers, who are alleged to be the worst in the U.S., first continued his work on traffic flow and traffic signal control, a problem he had begun at Case—traffic delays due to additional time to travel over a route as a result of traffic and traffic lights (Little 1961b). He had also worked with a master's student, John Morgan, who programmed the synchronization of traffic signals on a two-way street on the Case computer. This was the first time the problem had ever been approached in this manner. Previously, it had been done graphically by hand. It is trivial to synchronize the signals on a one way street so that cars traveling at an average speed can traverse the length of the street without stopping. The problem becomes combinatorial and quite difficult on a two-way street when it is desired to have the cars in both directions be able to do the same. The fraction of the signal cycle time for which cars in both directions can travel without stopping is known as the bandwidth of the street (Morgan and Little, 1964). Finding the maximum bandwidth (MAXBAND) is a challenging optimization problem.

At MIT, John extended this work to complete street networks, seeking to maximize a linear combination of the bandwidths of the various arteries in the network (Little 1966a). The methodology was based on mixed-integer linear programming. He was joined by colleagues and research assistants and supported by the Federal Highway Administration to produce the software package, MAXBAND—it was distributed to municipalities so they could optimize their street systems (Gartner et al. 1981; Little and Cohen 1982). This stream of research defined a new state of the art in the field of synchronizing traffic signals on arteries and networks.

In a quite different direction, John, now in a business school, had the vision to perceive marketing as source of interesting and relevant unexplored opportunities for OR and management science (MS). As an example, the effectiveness of a company's advertising is likely to vary over time. No matter how good the response function used to calculate an optimal advertising rate at one point in time, it is likely to drift to something different. What to do?—run an experiment to re-measure effectiveness and update the advertising response function. For example, take five medium-sized markets and set them at higher than the currently presumed optimal advertising rate and set another five markets lower. The resulting measurement can be used to reset the advertising response function and obtain a more profitable advertising rate for use nationally. But the 10 experimental markets are being deliberately operated differently from the perceived best rate, thereby incurring a calculable cost. The adaptive system optimization, however, takes the next step by setting the number of experimental markets so as to maximize total system profit, including the cost of the experiment. John thus became the first scholar to develop adaptive control methods for the field of marketing. He was particularly pleased that his model could be applied readily (Little 1966b). For John, it was not enough to develop a nice mathematical solution—he wanted somebody to use it. He also published a generalized version of the mathematics in terms of optimal adaptive control (Little 1977).

During this period, John became increasingly interested in advertising budgeting and media selection. He and Leonard Lodish, one of his Ph.D. students, developed an on-line, computer-based system for selecting and scheduling advertising media. They described it as a media planning calculus and named it MEDIAC (Little and Lodish 1969). MEDIAC replaced heuristic analyses with the optimization of a measure more closely related to sales and profits.

In 1968, while he was conducting an MIT summer session on OR in marketing, John was approached by attendees from Nabisco (formerly the National Biscuit Company) who asked him to develop a model to set advertising spending levels for Oreo cookies. John realized that Nabisco had some explicit, hard data, but that other key data were buried in managers' heads. Managers with experience in this area had implicit knowledge of how sales would respond to advertising. The challenge was how to unlock that information in a manner that could augment rather than replace the hard data. From this challenge, John developed the concept of a decision calculus as described in "Models and managers: The concept of a decision calculus" (Little 1970).

This revolutionary paper starts out with the sentence: "The big problem with management science models is that managers practically never use them" (Little 1970, B466). But it was not a negative paper—John wanted to improve matters. First, it broke with standard practice for empirical models that all constants be estimated at once on a single data set. If data were not available on, say, advertising, then advertising could not be in the model. John's paper took the view of those who wanted to apply management science models and set forth guidelines that would be critical to implementation. John defined a decision calculus as "a model-based set of procedures for processing data and judgments to assist a manager in his decision making," and proposed that models, to be useful to managers, should be "simple, robust, easy to control, adaptive, complete on important issues, and easy to communicate with" (Little 1970, B-469, B483). John's insight was that for managers to use a model, they must understand the model well enough that they could control it. His theme was: "I claim that the model builder should try to design his models to be given away. In other words, as much as possible, the models should become the property of the manager, not the technical people" (Little 1970, B-483). The decision calculus paper was cited as one of the ten most influential papers published in the first 50 years of the journal *Management Science*.

John demonstrated the relevance of the decision calculus by applying it to the complex problem of selecting the entire marketing mix. He espoused eclectic calibration. Some submodels, like manufacturer advertising and its effect on brand share, are almost sure to include time lags and be dynamic. Others, like seasonality and trend, may be straightforward and standard. Still others, like coupons, premiums, and production capacity constraints might be handled by simple indices based on data analysis or the product manager's prior experience. The resulting model—ADBUDG (Advertising Budget)—is given in Little (1970). This model was later expanded into BRANDAID, which is a more complete on-line marketing-mix model that provides AID for the BRAND manager by permitting the evaluation of new strategies with respect to price, advertising, promotion, and related variables (Little 1975a, b). The latter paper describes a case study for a well-established brand of packaged goods sold through grocery stores.

THE MARKETING DATA EXPLOSION

John, in his paper, "Aggregate advertising models: The state of the art" (Little 1979), summarized and critiqued the previous decade's modeling knowledge and advances in modeling advertising phenomena. After posing a set of modeling questions, he reviewed the published empirical data and studies that bore on them. He then listed five phenomena that a dynamic model of advertising response should, at a minimum, be able to incorporate: assist annual budget setting, geographic allocation of funds, allocation over time, and incorporate media and copy effects.

One of John's concerns was that available data to test and calibrate such models were aggregate in nature, for example, historical time series at a national or market level. He observed (Little 1979, 629): "Although many models have been built, they frequently contradict each other and considerable doubt exists as to which models best represent advertising processes. . . . Future work must join better models with more powerful calibration methods." Central to this objective was the need for accurate data at the point-of-sale (local) level. John noted that such a data revolution was on its way (Little 1979, 663).

Products had begun to be labeled with computer readable Universal Product Codes (UPC), supermarket scanners were being installed that could read such codes, and computer technology was becoming distributed—no longer just mainframes—to collect, organize, and analyze those data. The marketing field would soon be inundated with data.

To address the new issues in using such data, John and Peter Guadagni, one of his master students, built a disaggregated model—a logit model of brand choice calibrated on scanner data—that predicted actions at the level of the individual consumer making individual purchases (Guadagni and Little 1983). A novel aspect of the model was that it included what John termed a loyalty variable; an exponentially smoothed history of past purchases treated as 0–1 variables and, thus, a measure of the customer's past propensity to purchase the product, weighted most for recent purchases. This paper is one of the most cited papers in *Marketing Science* and has been republished as one of that journal's eight classic papers. The logit model has been improved, reanalyzed, expanded, kicked, and modified. New phenomena have been added and new data have been analyzed. But the basic structure (and the power of the loyalty variable) remain. An entire generation of marketing science academics and students have been influenced by the original and extended UPC logit models.

The logit models are powerful, but could be intimidating to managers who, according to John's decision calculus theme, should be able to understand the model well enough that they could control it. Managers wanted answers in a form they could digest. More importantly, computer technology had gotten to the point where the logit models could work behind the scenes to create automated reports in the form that managers could use. This thinking led to a decision support (expert) system termed CoverStory that was developed for Ocean Spray Cranberries, a fruit-processing cooperative. Ocean Spray tracks sales and assesses the effectiveness of its marketing program using large data bases collected through bar-code scanners in supermarkets (Schmitz et al. 1990).

For a brand manager, CoverStory rapidly and automatically computes and summarizes a large amount of output generated by the system's models. The output—structured as a memorandum to the manager—includes a single page of charts and a series of descriptive lines customized for the markets in which the brand competes, showing performance vis-à-vis competitors' brands. The number of brands, individual products, and regions make it infeasible to do such an analysis manually. Modern computers, artificial intelligence, and advanced marketing science models form the CoverStory system—they are combined in such a way as to have a direct, positive impact on marketing practices, as well as managerial efficiency and effectiveness. John had come a long way from Whirlwind.

EDUCATOR, LEADER, ENTREPRENEUR, AND SERVICE

John is an innovative and devoted educator across all programs of the university—undergraduate, MBA, and Ph.D. Since 1990, he has been chair of the Undergraduate Program Committee of the MIT Sloan School. As such, he is involved in policy matters, but he always has a group of undergraduate advisees. MIT undergraduates who major at MIT Sloan receive an S.B. degree in Management Science, which John calls an MIT-style business degree (Little 2008).

From the time he developed a course on OR in marketing at Case, John has been interested in teaching master students how to solve marketing science problems. At MIT, he developed MIT's first course in marketing models—a course that was a staple fixture in the marketing group until marketing models ultimately invaded almost all marketing courses. In the 1970s, he pioneered a new specialty program at the MIT Sloan School called Fast Track. John would read all the files for admitted students and, if they had very strong quantitative skills, he would invite them to join the Fast Track program. He found that the students thrived in the challenging advanced courses in mathematical programming, information technology, and statistics. John has served MIT in many capacities. At MIT, he was director of the Operations Research Center from 1969 to 1975, succeeding Philip Morse. For the MIT Sloan School, he headed the marketing group and eventually the Management Science Area (MSA) from 1972 to 1982. During this period, he was instrumental in making the MSA cohesive and interdisciplinary. In 1982, John was asked to work his magic again—the Behavioral and Policy Science Area (BPS) at MIT Sloan was formed after a major reorganization. It was not a cohesive group and, surprisingly, did not include anyone who might be labeled either an operations researcher or management scientist. It was primarily a collection of faculty from the less quantitative fields of organizational studies, research and development management, human relations, and strategy. John led the group for 6 years and his legacy was the establishment of a sound foundation for the area and a potent BPS faculty. In 1989, John was appointed an MIT Institute Professor—a special rank and honor reserved for a very few faculty at the university. In this capacity, John has undertaken some sensitive and important MIT-wide projects. He reports directly to the Provost.

AT HOME WITH J.D.C.L.

John often invited students to his house for social functions that usually included squid tasting. A special time was Thanksgiving Day when John would invite foreign students and their families for dinner at his home in Lincoln. John also made it a dinner to invite new faculty to Nantucket during the summer to enjoy the island and be exposed to New England culture. A stay in John's little cabin and fishing for bluefish off Miacomet Rip have provided particularly vivid memories for many. John loves seafood and claims that "anything from the sea was good to eat until proven otherwise." Sea urchin roe pizza is a Little specialty (Little 2008).

JOHN'S FAMILY

John's wife and former fellow physics graduate student, Betty, was an impressive scientist in her own right. For her Ph.D. thesis, she studied the dynamic behavior of domain walls in barium titanate—she finished her thesis before John finished his and published a paper on it in the *Physical Review* (E. Little 1955). She did not pursue a full-time career, being the one who agreed to stay at home as they raised their children: John N. (Jack), Sarah A., Thomas D. C. (Tom), and Ruel D. Betty became a teacher's aide during the time her children were in public school, and later, in 1985 at age 58, having become interested in Nantucket history and its native-American archaeology, received an M.A. in Anthropology, with concentrations in archaeology and geology, from the University of Massachusetts-Amherst. Betty continued her archaeological research and writings for many more years. After a 2-year battle with cancer, she died in 2003.

Their children could not escape their parents' scientific, engineering, and entrepreneurial influences. Jack Little graduated from MIT in electrical engineering and received an M.S. in Electrical Engineering from Stanford University. In 1984, he co-founded MathWorks, a leading developer of technical computing software for engineers and scientists in industry, government, and education. Sarah Little graduated from Stanford in physics and then joined the MIT-Woods Hole Oceanographic Institute Ph.D. program, graduating in geophysics with a thesis that involved making dives in the deep-ocean submersible *Alvin* and collecting data on hydrothermal vents in the Pacific. Tom Little graduated from Rensselaer Polytechnic Institute in biological engineering, and earned a Ph.D. in computer engineering from Syracuse University. He is now a professor in the Department of Computer Engineering, Boston University School of Engineering. With a former student he co-founded a web software and consulting firm, Molecular, Inc., which they have since sold. Ruel Little has a B.A. in physics from Johns Hopkins University and an S.M. in mechanical engineering from MIT. After working for many years for solar energy companies, he helped found GreenRay, a solar energy startup that is developing labor saving technology that simplifies construction and installation of solar modules for delivering electricity directly into home appliances and lighting.

As a grandfather, John answers to eight grandchildren.

John D. C. Little's family, Nantucket Island, summer 2002 (John, Betty, and their children in bold face) Back row(left to right): **JOHN, RUEL**, Sara, Max, **TOM**, Nancy, **JACK** Front row(left to right): **BETTY**, Kathy, Avery, Isaac, **SARAH**, Cora, Doug, Emily, Dyson, Erica. The families of John and Betty's children are: **JACK** Little and Nancy Wittenberg / Erica and Emily Little; **SARAH** Little and Doug Hersh / Cora and Isaac Hersh; **TOM** Little and Sara Brown / Max and Stephanie Little (Stephanie not born until 2003); **RUEL** and Kathy Little / Dyson and Avery Little.

John's interest in modeling real-world problems led him, in 1967, to co-found Management Decision Systems, Inc. (MDS), a company whose objective was to create and commercialize marketing models and marketing decision-support software. MDS grew to over 200 employees. In 1985, MDS merged with Information Resources, Inc. (IRI) with John serving on the IRI board until 2003. John continued his entrepreneurial activities by investing and serving on the board of a start-up company, InSite Marketing Technology. InSite provided a new class of e-business applications that identify the buying style of the customer and the selling style of the company, and dynamically integrate them to help the customer through the buying process. In 2000, InSite merged with the Kana Corporation, a multichannel customer service software company that integrates telephone, email, Web chat, and collaboration channels with knowledge management capabilities in a unified application.

John served as president of ORSA in 1979 and president of TIMS in 1984–1985. During his ORSA term of office, he and Frank Bass, then president of TIMS, persuaded the two societies to found the joint journal *Marketing Science*. When the two societies merged in 1995 to form INFORMS, he was elected its first president (he chaired the committee whose efforts led to the merger).

HONORS AND AWARDS

John has been recognized for his innovative and seminal research in marketing by the Paul D. Converse Award, a lifetime achievement award given by the American Marketing Association (AMA) (1992); the AMA Charles Parlin Award for contributions to the practice of marketing research (1979), and MIT's Buck Weaver Award for outstanding contributions to marketing (2003). He was elected to the National Academy of Engineering for outstanding contributions to operational systems engineering, including research, education, applications in industry, and leadership (1989). He has received the ORSA's George E. Kimball Medal for recognition of distinguished service to the society and profession of OR (1987), and the Distinguished Service Medal from TIMS. He is a member of the International Federation of Operational Research Societies' (IFORS) Operational Research Hall of Fame (Larson 2004), and a fellow of INFORMS and of the INFORMS Society of Marketing Science (ISMS). John has received honorary degrees from the University of London; University of Liège, Belgium; and Facultés Universitaires Catholiques de Mons, Belgium. He has been honored by having a most prestigious annual award in marketing science named for him—the John D.C. Little Award—given annually by ISMS for the best marketing paper published in an INFORMS journal (including *Marketing Science* and *Management Science*).

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