Reuben Lasker: A REMEMBRANCE 1929 - 1988

THIS ISSUE OF THE Fishery Bulletin *is in memory of Dr. Reuben Lasker who, until his death, was Chief of the Coastal Fisheries Division of the Southwest Fisheries Center, National Marine Fisheries Service. The contributors and I feel both a debt of gratitude and a strong bond of friendship to this scientist who profoundly influenced our investigations, our careers, and the field of marine larval ecology. Our regret is that Reuben will not see this tribute.*

Andrew E. Dizon, Ph.D.
Scientific Editor

It is the spring of 1989 in La Jolla, California, almost a year since our friend and colleague, Reuben Lasker, left us after a valiant battle against cancer. We remember him fondly, with respect and admiration for the man and for the scientist whose intellectual honesty and humanity endeared him to his associates. We, therefore, dedicate this Festschrift to the memory of a remarkable human being, a warm and caring man, who combined a lifelong passion and dedication to the marine sciences with a bright intelligence, a lively curiosity, and an abiding appreciation of the world around us.

Reuben was born in Brooklyn, New York, December 1, 1929, the only child of Theodore and Mary Lasker. As a child he contracted rheumatic fever, and as was customary at that time his doctors prescribed bed rest for an extended period, when Reuben read avidly. The illness, which left Reuben with a slight heart murmur, influenced his activities and increasingly the boy turned to bookish pursuits. He did well in school, attending the prestigious Boys' High School in Brooklyn, graduating at 16. Because of his health, his father decided that Reuben should go to college in Miami, Florida, to escape the rigors of the severe winters in New York. Accordingly, in 1946, Reuben enrolled at the University of Miami as an English major.

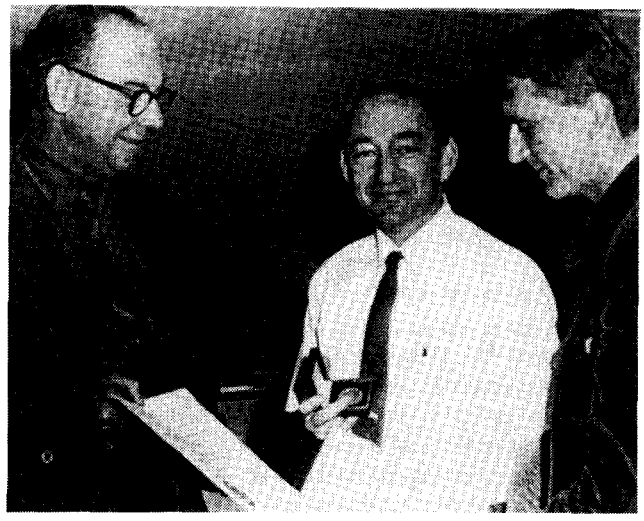
Midway through his college career, Reuben switched his major to zoology with the thought of becoming a medical doctor and in fact actually served as president of the premed society. He received his B.S. degree with honors in zoology, with a minor in chemistry, from the University in 1950. When a graduate research fellowship became available in marine biology, Reuben made a fateful career decision to abandon medicine and applied for the post. He was awarded a full tuition scholarship with stipend for studies in marine biology at the University of Miami where he concentrated on studies on the physiology and cellulose digestion in the shipworm, *Teredo*. He was granted his M.S. in marine biology from the University of Miami in 1952.

Approaching the end of his fellowship at Miami, Reuben began to investigate options for continuing his graduate education. He corresponded with the physiologist, Professor Arthur C. Giese of Stanford University, who had an ongoing marine program at the Hopkins Marine Station. With Giese's encouragement Reuben applied for and was granted a predoctoral fellowship from the National Institute of Health for his doctoral studies at Stanford University. Initially, Reuben was given a small stipend to study the nutrition of the plentiful sea urchins around Monterey Bay. With his young wife, the former Caroline Hayman, the couple drove west in their 1941 black Ford sedan.

Reuben spent the years from 1952 to 1956 on the Stanford campus in Palo Alto researching and writing his doctoral thesis on cellulose digestion in the silverfish. He picked his doctoral topic by chance, although he believed in Pasteur's maxim that chance favors the prepared mind. As Reuben

Opp. page, left: Dr. Gotthilf Hempel of West Germany took this relaxed picture of Reuben during a visit to his laboratory in Building T-21 on the Scripps campus in 1963.

Opp. page, right: Examining a 1 m CalCOFI plankton net in 1965 on the deck of the Bureau of Commercial Fisheries research vessel, *Black Douglas*.



Right: Reuben receiving the U.S. Department of the Interior Silver Medal in 1970 as Gerald V. Howard, Regional Director of the Southwest Region and Alan R. Longhurst, Director of the Fishery-Oceanography Center look on.

was fond of telling the story, he was sitting in a gloomy roomette where the only object left by the former occupant of the cubicle was a box of tissues used in laboratory work. When he reached over and pulled one out, an insect fell down to the table top, skittered away, fell to the floor and disappeared into a crack. The tissue was full of holes and he realized that what he had seen was a silverfish who had made a meal of the paper. Cellulose is difficult to digest by most organisms, and the conventional thought was that animals that eat cellulose, such as the cow or termites, have microorganisms in their stomachs to do the digesting for them. Reuben reflected that since no one had ever mentioned how a silverfish did its cellulose digesting, this might be a suitable topic for a Ph.D. thesis. On completion, the thesis was ranked "Superior" by Stanford University and established Reuben's reputation as an authority on the physiology of this insect. He received his Ph.D. degree in biology in 1956.

In February 1956, Science magazine carried a small announcement in its back pages that a meeting, sponsored by the Rockefeller Foundation, was to be held at the Scripps Institution of Oceanography in La Jolla, California on the future of marine biology. A small amount of money had been set aside for graduate students who were asked to apply to Dr. Adriano Buzzati, the convenor. Reuben promptly wrote to Buzzati, explaining that he was a graduate student at Stanford in marine biology and eminently qualified by inclination and interest to attend. By return mail he received a round-trip ticket from Palo Alto to San Diego and a check for $50 "to cover expenses." At the train station in San Diego, Reuben was picked up by Leo Berner, then a graduate student at Scripps and presently a professor and former dean of oceanography at Texas A&M University, who later became a close friend.

Famous names in marine biology were in attendance at the meeting—Albert Szent-Gyorgyi, Nobel Laureate for the discovery of vitamin C; the English biochemist Ernest Baldwin; Eugene Odum, ecologist from the University of Georgia; Roger Revelle, then the Director of the Scripps Institution of Oceanography and later one of the founders of the University of California, San Diego; John Isaacs, professor of oceanography who was destined to have a profound influence on Reuben; and many others who collectively represented the forefront of research in marine biology, worldwide.

Buzzati, a geneticist, was then a professor at Scripps. He offered to submit a proposal for Reuben to the Rockefeller Foundation to culture euphausiid shrimps, a project on which Reuben had been working. On his return to Stanford, Reuben wrote the proposal and by return mail received notice that he had been awarded a postdoctoral appointment for $5,000 a year (tax-free). By the following September, Reuben and Caroline arrived in La Jolla in a car packed with all their possessions.

The project Reuben chose for himself was to attempt to maintain euphausiids in reasonable health in the laboratory and to find out how effi-

Reuben with Walterio Garcia, Jacobo Melcer, and Paul E. Smith aboard the research vessel *A. Humboldt* in 1975.

Opp. page, left: In foul weather gear aboard the University of Alaska's research vessel, *Alpha Helix*, during a research cruise to the Pribilofs in 1982 to study groundfish.

Opp. page, right: Showing off the Huntsman Medal for Excellence in Biological Oceanography awarded him in 1983 by the Canadian government's Bedford Institute of Oceanography.

ciently they used their food. Since no one offered to provide him with live animals to work on, Reuben arranged to go to sea on the Scripps T-boat (the U.S. Army's designation for Transportation), an 80-foot vessel with a 3-man crew. Dosed massively with Dramamine, the former Brooklynite who never learned to swim, was taught how to catch euphausiids by Scripps researchers Elizabeth and Brian Boden. During one particularly eventful trip, Reuben was 10 miles off San Diego where the vessel had been stopped to deploy a plankton net. Alone on deck, in heavy seas and without a life jacket, Reuben remembered the ship giving a sudden lurch that propelled him forward over the chain railing. Fortunately for Reuben he managed to save himself by grabbing a projecting object as the ship steamed ahead at 10 knots away from where he would have been hurled into the sea.

Until he finally figured out the correct dosage of Dramamine, Reuben was very susceptible to sea sickness. Although it was necessary to go to sea to collect live specimens, Reuben preferred to keep his sea trips as brief as possible. Serendipitously, he located an area of the ocean in the lee of Pt. Loma which not only produced euphausiids and fish larvae in abundance but also had the virtue of being relatively calm. This became his favorite spot for collecting specimens and in years to come became well known to his colleagues as Lasker's Lake.

The postdoctoral year went quickly with Reuben who was working on the energy balance of euphausiids and looking for a job. A notable event for the Laskers during this time was the birth of their daughter, Pamela.

It was also during Reuben's sojourn at Scripps that a meeting took place which had important implications for his future. Through a mutual friend he met John C. Marr, Director of the U.S. Department of the Interior's Bureau of Commercial Fisheries, South Pacific Fisheries Investigation, who had recently relocated his laboratory in the old Director's residence on the Scripps campus. Marr was interested in Reuben's work on euphausiids, and some months later when the laboratory was reorganized he asked Reuben to head up a physiology section. Meanwhile, Reuben had accepted a job at Compton Junior College; although it provided him with his first taste of teaching, he informed the dean that he would not be renewing his contract because he wanted to return to research. At the end of the academic year, the Lasker family left Compton and returned to La Jolla, where Reuben had been granted a Lalor Faculty Fellowship at the Scripps Institution of Oceanography. In the interim Marr was able to complete the arrangements for Reuben's recruitment. Accordingly, in June 1958, Reuben entered on duty at the federal fisheries laboratory in La Jolla, as a fishery research biologist. Thus began a creative, productive partnership, an association that lasted through numerous federal reorganizations and changes in research emphases, and which endured until Reuben's death some 30 years later.

In establishing a Physiology Program and

selecting Reuben as its principal investigator, Marr embarked on a major change in the direction of research on pelagic marine fishes. He believed that there were many problems that could be solved only through controlled laboratory experiments. Heretofore, few studies had been made on the physiology of pelagic fishes. It had not been possible, for example, to study the fecundity of sardines and other pelagic fishes under laboratory conditions, since fish held in aquaria were not known to spawn. However, under proper conditions of diet or by control of endocrine development, it was at least theoretically possible to induce normal spawning in aquaria. Marr proposed that Reuben undertake such studies as the investigation of the efficiency of food utilization by larval fish, the influence of various factors on the rate of growth, the change in body conditon during ovarian development, and the like.

With this as a mandate, Reuben moved into T-21, one of the gray clapboard cottages (former residences of Scripps' professors) that dotted the hills around Scripps Institution of Oceanography. With the help of his newly hired assistant, Gail Theilacker, a former graduate student at Scripps, he proceeded to establish a laboratory oriented toward basic research, whose main purpose was the study of the innate and adaptive responses of marine organisms. Although Reuben's main academic interest was the investigation of energy exchanges between marine animals and their food supply, he was also interested in other physiological functions that could affect an organism's ability to survive in the sea.

The Physiology Laboratory in T-21 whirred with activity as Reuben threw himself into his new job, infecting others with his customary energy and enthusiasm. Soon, old white bathtubs with clawed feet were filled with seawater and located inside and outside T-21 to hold experimental animals. A particularly robust colony of brine shrimp and algae flourished as a self-contained ecosystem in yet another outside bathtub. One of the first high-speed Beckman ultracentrifuges, used to separate different sardine proteins, hummed upstairs. In another room a continuous oxygen measurement system, using one of the first double electrode probes, which had been invented by Reuben's close friend and colleague, Dr. John Kanwisher, of the Woods Hole Oceanographic Institution, produced quantities of exciting data.

Because government funds were scarce, Reuben took every opportunity to take advantage of federal government surplus property to equip his laboratory for experiments on respiration and energy uptake of sardine eggs and larvae. In the absence of a proper cold room, he located a meat packer's cold locker and set this up outside the building. Another piece of equipment picked up from government surplus lists was a hot dog cooker that had small, rotating aluminum rods to heat the wieners. This, minus the heating element, was adapted by Reuben and Gail to turn syringes

filled with sardine eggs rather than wieners. In his enthusiasm to properly study respiration in sardine eggs directly from the sea, Reuben and Gail even installed their Warburg respirometer, without the cooling and shaking system, on the Bureau's old research vessel, the *Black Douglas*, reasoning that the continual shaking motion of the ship would adequately mix the eggs with seawater. Since the work required a constant cold temperature, the only location that met the requirement aboard the *Black Douglas* was deep within the bowels of the ship, accessible only by crawling into the confined space on hands and knees.

It was also about this time that the Cahn electrobalance, now a staple of well-equipped laboratories was developed. The inventor himself set up the equipment in Reuben's T-21 where it was used for weighing individual sardine eggs and larvae. Reuben also took pride that he was one of the first scientists to use the carbon-hydrogen-nitrogen analyzer, and in fact field tested it for the company manufacturing the equipment.

The laboratory soon became a magnet for visiting scientists, investigators, and graduate students. During the summer months, high school students labored at various tasks, measuring euphausiid lengths, collecting limpets, and extracting substances from the tube feet of starfish. From his vantage point at a large wooden desk before a picture window with the panorama of the California coastline curling north, Reuben supervised this activity, while continuing to author or co-author numerous papers on energetics of euphausiids, energetics of sardines, physiology and ecology of fish larvae, and ultimately to studies of the mechanisms underlying recruitment of fishes.

In 1963, Reuben organized a symposium on larval fish biology that would encompass topics ranging from systematics of fish larvae to the technology of fish rearing to the basic physiology of single fish eggs and larvae. In the process Reuben forged close personal and professional links with many of the scientists who attended—James Shelbourne of the Fisheries Laboratory in Lowestoft, England; Gotthilf Hempel of the Institut für Hydrobiologie of the University of Hamburg; J. H. S. Blaxter and F. G. T. Holliday of Aberdeen University; and others—associations which continued throughout his life.

In 1966, Reuben and his family, which now also included a son, Paul, traveled to Aberdeen, Scotland to work at the University of Aberdeen for one year with Blaxter and Holliday. Here Reuben applied the techniques perfected in his work on euphausiid shrimps to the study of the food chain in an experimentally developed fishery, utilizing hatchery-reared larval and juvenile plaice. The year in Scotland with his family proved to be one of the happiest in Reuben's life, leaving him with an abiding affection for all things Scottish.

In October 1964, the Bureau of Commercial Fisheries, Fishery-Oceanography Center, as it was then called, was completed, adjacent to the campus of the Scripps Institution of Oceanography. It was an imposing structure of four concrete buildings grouped around a central courtyard, 220 feet above the Pacific Ocean. The gray cottage, T-21, site of many research accomplishments, was abandoned. Reuben and his staff moved into a wing of the Center which was equipped with the most modern equipment and perhaps most importantly gave access to an experimental seawater aquarium with temperature control rooms for physiological studies and rearing experiments, all of which Reuben helped to design.

With the move into his well-equipped new laboratory, Reuben assembled a dedicated cadre of behaviorists, physiologists, oceanographers, population dynamicists, and experimental biologists. At this point in his professional life he had already established a solid basis of scientific achievement on which others could build. His work on the energy exchange between fishes and their food supply, his work on osmoregulation by sardine embryos and larvae, and his work on the effect of temperature on the growth and development of both sardine and anchovy larvae were fundamental to understand the dynamics of fish populations and provided the scientific rationale for the project to rear pelagic marine fish in the laboratory. Subsequently, under Reuben's direction and leadership, more than 30 species of pelagic fishes, including the commercially valuable sardine, anchovy, and mackerels, were reared from eggs, through larvae, to subadult stages, for the first time ever in a laboratory. Reuben's papers on marine invertebrates and on the energy budget of clupeids in relation to their planktonic food were widely read and quoted. His

paper on the feeding, growth, respiration, and carbon utilization of a euphausiid crustacean became a citation classic (Current Contents, 1983, Volume 14, page 17).

With outstanding researchers and equipment, particularly the facilities of the experimental seawater aquarium, at his disposal, Reuben was able to concentrate his research on ecological and physiological factors that would help answer one of the most important and fundamental questions in fisheries: What determines how many young fish will survive the rigors of life in the sea to become reproducing adults?

Ever the creative and imaginative scientist, Reuben constantly came up with fresh and innovative scientific approaches. An example was an experiment in which he took anchovy larvae spawned in the Center's seawater aquarium to sea in order to test his idea that laboratory-raised anchovy could be used in lieu of naturally spawned larvae as an assay of conditions in the sea.

Another remarkable idea came to Reuben when he was on a cruise to sample patches of larval food. Following a storm with strong winds that mixed and diluted the dense layer of larval forage from which he had drawn his samples, it occurred to him that upwelling events and storms are detrimental to fish larvae because these events dilute concentrations of larval food. He suggested that larval survival increases during periods of weak winds when the coastal seas stratify and the forage of larval fishes concentrates in layers. This "stability" hypothesis has greatly interested oceanographers and fishery biologists both in this country and abroad and has stimulated efforts of individual researchers to study the definitive links between fish larvae and their microenvironment. Now known as "Lasker Events" (see following article on "An eponym for Reuben Lasker" by Daniel Pauly), these calm periods could be the key factor in larval survival, and ultimately recruitment.

The years passed quickly and happily for Reuben. As Chief Scientist of what would become the Coastal Fisheries Resources Division, he directed the efforts of a multidisciplinary research team and was signally successful in stimulating and inspiring his staff to pursue promising avenues of research. This record of research achievement received mention in the review conducted by the National Academy of Sciences in its evaluation of the National Oceanic and Atmospheric Administration's ocean research and development. The examiners wrote, "The Coastal Division represents a center of excellence . . . the Division has a high scientific awareness, much talent and enthusiasm, and is doing some excellent research."

One remarkable example of how Reuben's leadership and influence led to a major breakthrough is his role in developing the estimation procedure for anchovy biomass assessment. He was among the first to recognize the unique potential of this method and was responsible for bringing together the disparate disciplines and people that made it work. The method permits the estimate of biomass from the ratio of the egg production rate in the sea to the daily fecundity of the spawning fish stock. This new method of pelagic population analyses was accomplished by a team effort and was founded almost entirely on previous research done by Reuben and others, research which provided the essential background information on which to build. In order to develop the anchovy biomass assessment, a wide variety of studies on sampling, statistical methodology, fish biology, ecology, behavior, and physiology had to be made. All of these studies added greatly to the knowledge of clupeoid biology.

As of this writing, the biomass assessment method has been incorporated into the Northern Anchovy Management Plan as a guide for setting anchovy fishing quotas in the coastal waters of the U.S. Pacific Coast and has been adapted in other countries such as South Africa and Peru. It is increasingly viewed by many fisheries scientists as the best current assessment technique for fishes with pelagic eggs.

In 1970, in response to a request from the administrators of the fisheries service, Reuben (with the able assistance of the late Lon Manar as the managing editor) undertook the task, as scientific editor, of revitalizing the venerable U.S. *Fishery Bulletin*. Before 1971, the Fishery Bulletin appeared irregularly for lack of sufficient contributions of merit. Authors sought other journals because it took 2–3 years to get papers published in the Fishery Bulletin. During Reuben's first year as editor, the Fishery Bulletin became a quarterly and the number of pages printed per year almost tripled. Be-

cause of his scientific reputation, Reuben was able to attract to the pages of the Fishery Bulletin not only outstanding contributions from members of the NMFS staff but also major contributions from scientists outside NMFS. He initiated and enforced a peer review system for reviewing manuscripts, not only for the Fishery Bulletin but also for other NMFS publications. His impact on the scientific image, character, and tone projected by NMFS publications was a reflection of his own standards of scientific excellence and personal integrity. The revitalized Fishery Bulletin, an indispensable research journal to those in the field of fisheries, now reaches several thousands of readers worldwide. Reuben's contributions as Scientific Editor were even more remarkable becaues he worked at this job only half-time while continuing his research on fish physiology.

Reuben also served as an essential link to the surrounding academic community, particularly the nearby Scripps Institution of Oceanography with which the fisheries laboratory had long maintained close ties. In 1966 he received an appointment as an Associate Professor of Marine Biology in Residence at Scripps and in 1973 was appointed Adjunct Professor of Marine Biology. He supported and encouraged his graduate students, and participated with his usual enthusiasm in faculty committee work. It was most typical of Reuben that although his strength was sapped by his illness he introduced his last graduate student at a thesis defense several days before his death with humor and wit.

During his 30 years as a government scientist he put together many workshops and meetings which attracted scientists from all over the world and fostered creative collaborative efforts. For example, in recent years, he organized workshops for the Sardine-Anchovy Recruitment Program (SARP) which brought together scientists from all major upwelling regions of the world to develop a practical plan for studying recruitment. Major credit for the active and productive SARP programs that exist today in many parts of the world belongs to Reuben's efforts and interest.

He was a gregarious man who loved people and conversation. He delighted in travel to the far places of the world. Many of the letters received after his death testify eloquently to the warm affection and regard in which he was held by hundreds of his colleagues throughout the world.

During his lifetime Reuben was the recipient of high honors. The U.S. Government awarded him the Meritorious Service Award of the U.S. Department of the Interior (Silver Medal Award) in 1970 and the Distinguished Service Award of the U.S. Department of Commerce (Gold Medal Award) in 1974. The Canadian Government's Bedford Institute of Oceanography awarded him the Huntsman Medal for Excellence in Biological Oceanography in 1983.

Reuben's preeminent role as outstanding researcher, his practical wisdom, wide experience, and knowledge made him much sought after as a prime mover, advisor, and member of many prestigious committees, commissions, and boards where he served with distinction, most recently as a member of the Ocean Studies Board of the National Academy of Sciences.

He maintained close ties with friends and colleagues around the world, through voluminous correspondence and telephone calls. He was ever the optimist and many of his correspondents never realized the gravity of his illness which re-occurred in March of 1987. As his lifelong close friend, Dr. Howard Feder of the University of Alaska wrote later, "I can hear Reuben's voice in my head saying, 'Goodbye, old buddy. Don't be sad. I did everything I wanted; I have no regrets. Remember, Howie, life goes on! Enjoy yourself.'" On April 27, 1988 his friends scattered his ashes from the National Marine Fisheries Service research vessel, *David Starr Jordan*, appropriately enough, in the sea off Point Loma, known as Lasker's Lake.

For those of us lucky enough to have shared this life with him, the thought of Reuben will always bring the warmest memories. As his friend Lucian Sprague wrote, "As long as there are friends who remember him, students to read his papers and to carry on his work, he will be very much with us in spirit."

In the year which followed Reuben's death, his friends organized the Reuben Lasker Memorial Fund. The Fund is administered by the Coordinator of the California Cooperative Oceanic Fisheries Committee (CalCOFI) and is used for travel fellowships for students to attend the annual CalCOFI meeting. Anyone interested in contributing to the

fund may do so by writing to the CalCOFI Coordinator, P.O. Box 271, La Jolla, CA 92038. Also in 1988, the American Institute of Fishery Research Biologists posthumously awarded Reuben their Outstanding Achievement Award for his distinguished lifetime career accomplishments in fisheries science and for his outstanding contributions to research and management.

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An Eponym for Reuben Lasker

Reuben Lasker published in 1975 and 1978 two papers in which he suggested that the maintenance—through a "period of calm"—of thin layers of food-rich patches was crucial to the survival of newly hatched northern anchovy larvae. These papers had an enormous influence on fisheries research throughout the 1980s, as can be easily assessed, e.g., through citation analysis.

Recently, Peterman and Bradford (1987, their note No. 16) operationally defined the periods of calm alluded to above as periods of four consecutive days with wind speed below 10 m s^{-1}. They also proposed to view periods of five consecutive calm days as two partly overlapping 4-day periods, period of six days as three partly overlapping periods, etc.

I recently proposed (Pauly 1987), in a book largely devoted to following up on R. Lasker's work, the term "Lasker events" as an eponym for a period of four calm days with winds less than 5 m s^{-1}. The present volume provides an appropriate context to reiterate and refine this suggestion.

Thus, to allow different authors to identify different hypotheses related to the effects of periods of calm, I propose to use the notation "*i/j* Lasker event" for period of calm lasting *i* days and defined by winds not exceeding *j* m s^{-1}. Thus, e.g., Peterman and Bradford (1987) worked with "4/10 Lasker events", while Mendelssohn and Mendo (1987) worked with "4/5 Lasker events".

This suggestion offers a parallel for the more general "Lasker-hypothesis" now widely used as an eponym for the mechanism proposed by Lasker (1978, 1985).

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