The Electrochemical Society

A Forum for Electrochemistry and Solid-State Science for 100 Years

The Electrochemical Society (ECS) has a birthplace of historic distinction – Philadelphia – the home of **BENJAMIN FRANKLIN** (and his famous kite) and the birthplace of the United States. The Society originally was called the American Electrochemical Society, but, like the nation, it had its roots in distant lands. ECS was like the nation in other respects. It was a melting pot; in this case, a melting pot of scientific and technological disciplines, and of their adherents, who came from countries from Australia to Mexico to Russia and points in between.

The following photo essay is a distillation of the Society's history – the usual dates, names, and significant markers, but also some amusing anecdotes and intriguing photographs. We hope you will enjoy this quick look at a society that has made its mark on the world of electrochemistry and solid-state science and technology.

Beginnings...

The Society's roots can be traced farther back in time than when our story begins. Relics found in the Middle East suggest that, thousands of years ago, voltaic cells were being used. Electroplating of some sort is known to have existed in those times as well.

1800—ALESSANDRO VOLTA concluded that a "pile" of dissimilar metals provided the electricity responsible for the twitching of frogs' legs reported by Galvani.

1815—HUMPHRY DAVY used a group of these "piles" to discover and isolate the elements potassium, sodium, and calcium. Davy also coined the term "electrochemical."

FARADAY

HALL

HEROULT

EDISON

DOW

REED

RICHARDS

1831—MICHAEL FARADAY was led to formulate the laws of electrolysis and was the first to use the terms anode, cathode, electrode, ion, cation, anion, and electrolyte. He was the first to propose that the passivation of iron in concentrated nitric acid was due to the formation of an oxide film.

1856—WILLIAM PERKIN invented the first synthetic dye. The Society of Chemical Industry instituted the Perkin Medal in his honor in 1906, and ECS is one of six societies able to nominate candidates for the award.

1879—THOMAS EDISON patented the carbon-thread incandescent lamp. This man of many talents (and patents!) joined ECS in 1903.

1886—CHARLES M. HALL in the United States and **PAUL L. T. HEROULT** in France (both became ECS members) simultaneously inaugurated electrolytic processes that had great industrial importance: the production of aluminum.

1888—EDWARD WESTON formed the Weston Electrical Instrument Co. Weston invented the Weston Cadmium Cell, which became the voltage standard throughout the world, and which is depicted in the Society's official seal. In 1873, Weston had adapted the electric generator for electroplating, the first important industrial application of electrochemistry.

1890—HERBERT DOW started the Midland Chemical Co., the first to use electrolytic apparatus to commercially manufacture a chemical other than metal; in this case, to extract bromine from brine.

1891—EDWARD ACHESON discovered silicon carbide, which he called carborundum, a better abrasive than any other known substance except diamond.

1901—Edison formed a battery company and marketed a rechargeable nickel-iron battery. At one time, Edison had a rather dim view of rechargeable batteries, judging from a quote attributed to him: "The storage battery is... a mechanism for swindling the public by stock companies... Scientifically, storage is all right, but, commercially, as absolute a failure as one can imagine."

By the beginning of the 20th century, many talented individuals had invented and were building the foundations and infrastructures for the communications, electronics, illumination, and entertainment revolutions that would come to play such important roles in our lives and in the yet-to-be formed ECS.

Founding...

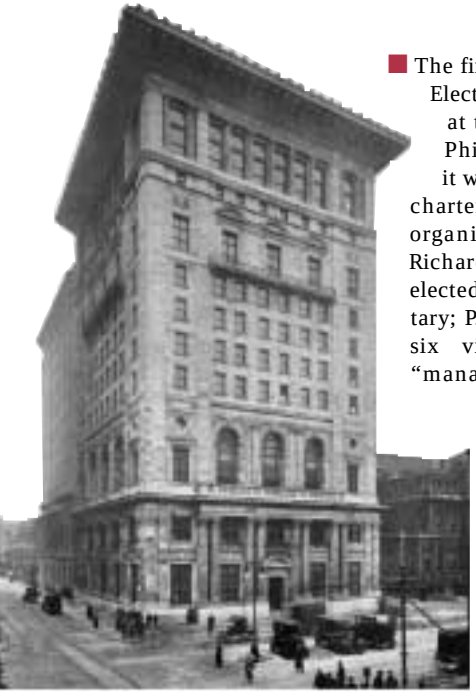
1902

■ The first Tyrannosaurus rex fossil was discovered by the famous fossil hunter Barnum Brown.

■ Feeling the need for a forum at which electrochemical matters could be discussed and argued, some members of the American Chemical Society (ACS) proposed the formation of a new section devoted to the field of electrochemistry. ACS demurred. One man, **C. J. REED**, was especially interested in creating a new society as such a forum, and gained the support of **JOSEPH W. RICHARDS**, a prominent professor of metallurgy at Lehigh University. A letter was sent to about 30 engineers, chemists, and scientists, soliciting members for the new society. The qualifications for membership were rather simple – express an interest in electrochemistry and pay the $5 annual dues.

A wonderful drawing of Edward Weston's company in Newark, NJ, where the first dynamo was made.

Photos of **PAUL HEROULT, CHARLES M. HALL,** *and* **HERBERT DOW** *are provided courtesy of the Williams Haynes Portrait Collection, Chemical Heritage Foundation Image Archives, Othmer Library of Chemical History, Philadelphia, PA.*



The Manufacturers' Club – site of the founding meeting of The Electrochemical Society.

■ The first meeting of the American Electrochemical Society was held at the **MANUFACTURERS' CLUB** in Philadelphia on April 3, 1902; it was attended by 52 of the 337 charter members. A motion to organize passed unanimously. Richards, the acting chairman, was elected president; Reed as secretary; P. G. Salom as treasurer; and six vice-presidents and seven "managers" also were elected. This leadership represented a good mix of scientific and technological disciplines and indicated from the start that the term "electrochemistry" might encompass a broader range of interests than the name implied.

■ The original constitution called for publication of papers presented at the meetings and of the discussions that ensued; this was accomplished in 1902 with the new publication, *Transactions of the American Electrochemical Society*.

1903

■ Marie and Pierre Curie shared the Nobel Prize in Physics and the Wright brothers made the first powered flight.

1904

■ John Ambrose Fleming invented the vacuum diode tube.

■ The international ties were strengthened when the sixth Society meeting was jointly sponsored with the Bunsen Gesellschaft and the Faraday Society. The Board discussed a request from members at the University of Wisconsin, asking to form the Society's first Local Section, which would come to fruition in 1907. (The "Local" was dropped in 1998.)

1906

■ J. J. Thomson discovered the electron and Lee de Forest invented the triode vacuum tube.

■ The 10th meeting was held at Columbia University. Professor **CHARLES F. CHANDLER**, dean of American chemists, welcomed the gathering: "Mr. President and fellow members of the youngest scientific organization in this country, which, I think, may prove the most important… You have already worked a revolution in many branches of chemical industry and seem destined to change entirely the character of a large proportion of chemical operations…" Chandler would later be named the first Honorary Member of the Society.

■ One of the popular features of the 10th meeting was an "excursion" to **THOMAS EDISON'S LABORATORY** in West Orange, New Jersey. Edison had been approached earlier, but declined. This time, Edison agreed, and in response to a letter confirming that the Society would schedule an excursion, Edison noted to his secretary, "Say it will be all right but I have very little that will be interesting."

1907

■ ECS member **LEO BAEKELAND** developed Bakelite, the first synthetic plastic that could be molded into durable products. In 1995, the Jupiter probe used a form of Baekeland's invention for its heat shield.

■ The four-page monthly *American Electrochemical Society Bulletin* began circulation to the membership. It contained such things as lists of individuals applying for membership, newly elected members, information on meetings, situations wanted, positions available, and general news of interest to members. Many issues contained listings of patents of interest to electrochemists, as well as book reviews. *The Bulletin* was discontinued in 1948, with the appearance of the *Journal of The Electrochemical Society.*

1908

■ Henry Ford introduced the Model T car.

1910

■ The agenda for the 1910 fall meeting included an evening smoker with entertainment by SECTION Q. The special "section" was apparently organized by the Canadian **W. LASH MILLER** to "promote intimacy and friendship." It seems that Miller provided all members at the initial meeting of Section Q with lighted candles and at the appropriate time there was a lighted procession to visit a laboratory. This was reported to have resulted in much joviality – one wonders why, but perhaps it was the bagpipers who led the procession. Lawrence Addicks, in his Fiftieth Anniversary address, recounted a number of other Section Q shenanigans. One was

Thomas Edison's laboratory in Menlo Park, NJ. (From Vol. 54 of the Transactions*).*

CHANDLER

BAEKELAND

MILLER

the bribing of two New York City policemen to accompany two hired vaudeville actors in staging a mock raid on a technical session in the Chemists' Club, to the horror of Carl Hering, "the embodiment of gentlemanly reserve."

1911 ■ The **FIRST EMBLEM OF THE SOCIETY**, a handsome blue enamel and gold pin (pictured at right), was made by Tiffany of New York.

1915 ■ At the spring meeting in Atlantic City, Technical Committees were established to consider and report on topics related to electrochemistry. The first ten were: Primary Batteries, Secondary Batteries, Electric Furnaces, Electrolysis, Electroanalysis, Electrometallurgy, Electroplating, Radioactivity, Chlorine and Caustic, and Experimental and Theoretical Electrochemistry.

■ At the invitation of the **PANAMA-PACIFIC INTERNATIONAL EXPOSITION**, the Society journeyed to San Francisco for its 28th meeting. The Society was welcomed officially by the management and presented with a commemorative medal (pictured below).

1916 ■ Einstein published the general theory of relativity.

1917 ■ With the advent of World War I, the Society was asked for its opinion on such weighty matters as the optimum size for the navy and how to defend against submarine attacks on U.S. shipping.

1918 ■ The purpose of the **APPALACHIAN SOUTH MEETING** was to tour electrochemical centers in that region for the education of northern and western members. It was necessary to get the permission of the Director-General of Railroads (the war was still on) to use a special train. Everywhere the party went it was received with "distinguished consideration." At some places the railway stations were decorated with bunting and banners of welcome stretched across the streets. At others, school children waving flags lined up on the pavement and greeted the party with cheers. The trip included the interesting experiment of "ducking in flour for coins."

Ducking for coins was a special feature of the 1918 Appalachian South Meeting.

*The image of the **MANUFACTURERS' CLUB** came from the 1914 "Yearbook of the Twentieth Annual Architectural Exhibition," which was held by the Philadelphia Chapter of the American Institute of Architects, and the T-Square Club. Image courtesy of The Athenaeum of Philadelphia.*

FINK

DEBYE

ACHESON

TONE

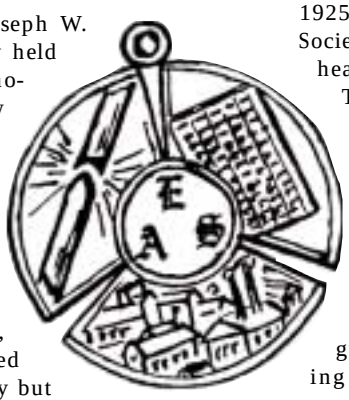
WHITNEY

The Colin Fink Era...

1921

■ Shortly after the fall meeting, Joseph W. Richards died suddenly. The Society held an extraordinary meeting in his memory in New York City. The Society now needed a secretary as dedicated to its needs as was Richards. Fortunately, **COLIN C. FINK,** who had also served as president, was such a man. Fink was a hands-on, take-charge kind of person. The Society was equally fortunate that during Fink's 26-year tenure, Columbia University not only allowed Fink to pursue his duties as secretary but provided sufficient office space to house the Society's operations.

■ The Society's bylaws were changed to provide for the formation of the Divisions, with representation on the Board. Members were allowed to register for membership in any Division of interest.



The first design (above) for a Society emblem was created in 1924, but the Board rejected it. The final version of a seal was approved in 1925, and with the addition of the incorporation notice of 1930, is the final version (see page 27) of the Society's corporate seal.

■ The roots of the **HIGH TEMPERATURE MATERIALS DIVISION** (HTM) trace back to 1921, when it was founded as the Electrothermics Division, the first formalized division of the Society.

1922

■ The **ELECTRODEPOSITION DIVISION** was officially formed at the spring meeting, but the first important symposium on the science of electroplating was recorded in the 1913 volume of the *Transactions*.

■ The fall meeting was held in Montréal. Prohibition was the law of the land in the U.S., and the Canadian venue was perhaps an attractive one for those who enjoyed a little wine with dinner. An old-fashioned smoker was on the program, and given the venue and the convivial atmosphere, there was doubtless a session of Section Q. Smoking was quite in fashion in those days and smoke-filled rooms were by no means restricted to political conventions.

1925

■ Irving Fellner and E. M. Honan were asked to draw up a design for a **SOCIETY EMBLEM** in 1924. That drawing (pictured at left) was rejected; but in 1925, a new design was accepted by the Board. The Society seal made its first appearance on the masthead of the December 1925 issue of the *Bulletin*. The center field of the design incorporates a Weston Standard Cell and an arc playing between horizontal electrodes, symbolizing electrolytic and electrothermic reactions.

■ The *Transactions* often make reference to programs for the "ladies." In the early days, any women in attendance were almost certainly the spouses of the male members or guests. A notable visit for all at the spring meeting was a visit to the Niagara Falls Power Company. The visitors witnessed a demonstration of the power company's **LARGE-SCALE MODEL OF THE FALLS** (pictured below). The model was 1/100th of the size of the Falls and used 28,000 liters of water per minute. As the number of women participating as technical registrants increased, the term "nontechnical registrant" was used, but the interesting programs continued to be offered.

Attendees of the spring 1925 meeting made a visit to the Niagara Falls Power Company, and witnessed a demonstration of a large scale-model of the Falls – 1/100th the size of the real thing.

1926

■ Colin G. Fink patented the chromium plating process. (Columbia University's chemistry department is still the repository of Fink's famous doorknobs, the first objects to be plated with chromium by this process.)

Charter members photographed at the Silver Jubilee Meeting in 1927 in Philadelphia. From left to right are: Carl Hambuechen, J. H. Clamer, Louis Kahlenberg, Wilder D. Bancroft, Herbert H. Dow, Frederick M. Becket, Lawrence Addicks, Samuel S. Sadtler, Alfred H. Cowles.

The Northwest Train Trip Meeting allowed attendees to don authentic mining apparel for a trip to the Leonard Copper Mine in Montana.

1927 ■ Werner Heisenberg proposed the Uncertainty Principle.

■ **Thirteen Charter Members** attended the Society's Silver Jubilee Meeting in Philadelphia. Papers were presented by **Peter Debye** and Victor LaMer on the electrochemistry of concentrated solutions; these papers were important in developing the theoretical aspects of this subject. Debye would go on to win the Nobel Prize in Chemistry in 1936.

■ The **Northwest Train Trip** was unlike any Society meeting before, or since. The trip consisted of technical sessions and a great deal of sightseeing. The meeting "began" in Chicago, Illinois on September 5 and made its way to Vancouver, British Columbia. There were many stops along the way, including one to the famous Leonard copper mine in Montana, where members had the opportunity to don authentic mining apparel. The meeting "ended" on September 21 back in Chicago. (For a full account of this fascinating meeting, see the fall 1997 issue of *Interface*.)

The Society's official seal, revised in 1930 to reflect the deletion of "American" and the addition of the notice of incorporation.

1928 ■ A major development was the receipt of $25,000 from **Edward Goodrich Acheson** to establish a fund that would support a gold medal and prize award. The Acheson Award became a major award of the Society. The spirit of giving was rampant in 1928, for later that year, a fellowship fund was established, following another gift of $25,000, this time from **Edward Weston**.

1930 ■ The international nature of the Society was officially recognized by dropping "American" from the name. The Electrochemical Society was incorporated in the State of New York, and the basic design of the **Society Seal** was modified to its current form.

1931 ■ Max Knoll and Ernst Ruska invented the electron microscope and Ernest Lawrence invented the cyclotron.

■ A significant event of the Salt Lake City meeting was the establishment of the **Electronics Division**. This Division was to remain quiescent for two decades or so before becoming a major force in the Society.

1935 ■ At the fall meeting in Washington, DC, the Acheson Medal was awarded to **F. J. Tone**, president of the Carborundum Company and a former Society president. However, headlines in the Washington Post on the following morning read, "Franchot Tone's Father Receives a Medal." Franchot Tone was a leading Hollywood actor, who had portrayed characters such Roger Byam in the original 1935 "Mutiny on the Bounty." In his final presidential address back in 1904, Joseph Richards had referred to Tone's "electrometallurgical triumph" of producing silicon: "I had a somewhat uncanny feeling when Mr. Tone introduced me to his half a ton of silicon… What will be made of

Photo of **Willis Whitney** *courtesy of the Williams Haynes Portrait Collection, Chemical Heritage Foundation Image Archives, Othmer Library of Chemical History, Philadelphia, PA.*

it? Can it become as useful as iron? Probably not. Can application be found for it, which will bring it among the ordinary metals of everyday life? Possibly." The answers to his questions would have astounded Richards and Tone alike!

1936

■ The Niagara Falls meeting presented exhibits of products of the electrochemical industries. A former president, the eminent **WILLIS R. WHITNEY**, presented an entertaining and informative address entitled, "More Research." The talk was wide ranging, covering subjects as diverse as turtles, blushing shrimp, winking of the eye and the optic nerve, battleship communications, and luminaries such as Volta and Bacon. Whitney, founder of the General Electric Research Laboratories and a Society president, was the object of Section Q's attention at an earlier Niagara Falls meeting (1909). Whitney was known to be an avid hunter of Indian relics. At a picnic down in the gorge, Whitney found a nice arrowhead. He then found some other arrowheads and naturally became quite enthusiastic. Then he found a really good one – made of carborundum! Section Q had struck again.

■ The **PHYSICAL ELECTROCHEMISTRY DIVISION** was originally established as the General and Theoretical Electrochemistry Division at the spring meeting. Chairmanship and responsibility for organization of the new Division were delegated to **DUNCAN A. MACINNES,** who in 1936 also took office as president of the Society. MacInnes went on to receive the Acheson Medal in 1948.

1938

■ The Great Depression and the low level of membership in the 1930s raised doubts as to the financial solvency and stability of the Society, in spite of the dedicated work of Secretary Fink. President R. L. Baldwin convened an informal meeting to consider whether the Society should dissolve or possibly affiliate with ACS. (At one Board of Directors meeting, a member reported that he had offered the Society to the AIME and that the offer was rejected!) The alternative was to continue, with efforts to raise more funds, attract new members, and improve meeting quality. Needless to say, this latter course was chosen.

1940

■ The founding of the Electro-Organic Division (now called the **ORGANIC AND BIOLOGICAL ELECTROCHEMISTRY DIVISION**) was spearheaded by Society president H. J. Creighton during the years 1939-1940. He had the assistance of Sherlock Swann, Jr., who would go on to publish (with Richard C. Alkire) the 1,000-page *Bibliography of Electro-Organic Synthesis* in 1979.

1941

■ A category of Sustaining Membership was established as a means whereby industrial companies could support the Society. This "**CONTRIBUTING MEMBERSHIP**" program, as it is now called, was initiated by Colin G. Fink in 1940, and he was largely responsible for obtaining the first members. The recipient of Fink's first letter of solicitation was the Mathieson Alkali Works. They have since become a part of the Olin Corporation, which remained an active Contributing Member. The other charter members were the Dow Chemical Corporation and Canadian Industries, Ltd. (now ICI Canada, Inc.).

1942

■ The **CORROSION DIVISION** had its origin in the Corrosion Technical Committee, formed in 1922 under the chairmanship of Colin Fink. In 1942, the Corrosion Division was formally established as the sixth Division of the Society.

1943

■ One of the first Technical Committees established by the Board in 1915 was the Chlorine and Caustic Committee, which reported annually on the technical developments and statistical data of the chlorine-alkali industry. This committee was replaced in 1943 by the newly formed Industrial Electrolysis Division, which later would become the **INDUSTRIAL ELECTROLYSIS AND ELECTROCHEMICAL ENGINEERING DIVISION** (IEEE).

1945

■ Vannevar Bush proposed "hypertext," a PC prototype that would display text and pictures from microfilm. The former MIT professor was President Roosevelt's science counsel during WWII. The year also saw the first test explosion of a nuclear device near Los Alamos, New Mexico.

1946

■ The **DIELECTRIC SCIENCE AND TECHNOLOGY DIVISION** was founded in 1945 as the Electric Insulation Division. **THOMAS D. CALLINAN**, a later chairman of the Division, would note in 1952 that already there was a shift of interest from "power transmission to intelligence transmission" and suggested that the recently discovered transistor would have a major impact on the field of dielectrics.

■ The University of Pennsylvania developed the ENIAC computer, containing 18,000 vacuum tubes.

■ A Committee on Future Activities, under the chairmanship of former president **H. S. LUKENS**, made some far-reaching recommendations, including that a monthly journal be established and that steps be taken to advance the professional status of members.

BURNS

READ

UHLIG

1947

■ Considering that batteries are as "electrochemical" as anything can be, it might come as a shock to learn that the **BATTERY DIVISION** was not formed until 1947. During World War II, work on batteries became extensive, and it was clear that a home had to be found where battery information could be freely exchanged and reviewed for publication; the Society was the obvious choice.

■ In the spring, Colin G. Fink announced his resignation as Secretary, to take effect on July 1 of that year. He had served for 26 years and, by sheer personal effort and devotion, had maintained the Society headquarters and minimized costs during a period of meager finances.

■ **ROBERT M. BURNS** accepted the post of secretary with the proviso that an assistant secretary and a managing editor be hired. Robert J. Hollian became the first assistant secretary. Burns was to serve just two years as secretary but, before, during, and after his term, his influence on the future of the Society was profound. No one else has served the Society as president, vice-president, secretary, and treasurer. His additional contributions as editor of the *Journal* and chairman of the Publication Committee would influence greatly the early development of the *Journal* into a quality scientific and technical publication.

■ Late in the year, an event would occur that would result not only in an expanded ECS but also in technological marvels that would change the way of life for many of the world's inhabitants. The event was, of course, the invention of the transistor on Christmas Eve, at Bell Laboratories in Murray Hill, New Jersey.

Transition and Revival...

1948

■ The *Journal of The Electrochemical Society* debuted in January 1948; and publication of *Transactions* was discontinued after the 1949 issues. This publication of technical papers on a monthly basis provided much earlier distribution of the content than had been possible through the *Transactions*. Robert Burns, who was also serving as secretary at the time, was the first editor. **HAROLD J. READ** served as Technical Editor, with the responsibility for reviewing all papers assigned to Divisional representatives for their appropriateness and technical content. He served until 1950 and would be named an Honorary Member in 1986.

■ One of the Society's prime objectives was to fill an obvious need for a *Corrosion Handbook*. ECS sponsored the publication and appointed **HERBERT H. UHLIG** editor. When it was published in 1948, it became the second of the Society's monographs, and would go on to sell over 24,000 copies. In the following year, Uhlig would become editor of the *Journal* and would serve until 1951.

1949

■ **HENRY B. LINFORD** became secretary and served from 1949 to 1959. Linford, a professor at Columbia University, completed the transformation of the Society office and operations. The post of secretary had been an elective one throughout the history of the Society until Linford's appointment by the Board. The post then reverted to being an elective one upon Linford's election as vice-president in 1958. Henry Linford would become president in 1961 and Honorary Member in 1974. Linford's 35-year career at Columbia was marked by his distinguished teaching, and an ECS award for teaching would be named for him.

1951

■ Carl Djerassi (ECS plenary lecturer, fall 2000) synthesized the first steroid oral contraceptive, the key to the development of "the Pill."

■ The *Corrosion Handbook* had been so successful, that the Board established the Palladium Medal Award, employing royalties from the book and palladium metal generously donated by the International Nickel Company. The first recipient of the Palladium Medal Award was **CARL WAGNER**, who was presented with the award at the 1951 fall meeting. Wagner was honored for his outstanding contributions to the theory of oxidation and tarnishing of metals. Wagner was also widely known for his seminal contributions in the field of defect chemistry of solid-state materials.

1952

■ The spring meeting in Philadelphia celebrated the **50TH ANNIVERSARY** of the Society. A highlight of the meeting was a talk by **LAWRENCE ADDICKS**. He recalled some of his founding colleagues. Richards "liked to appear in remarkable gray frock coats... and kept a herd of St. Bernard dogs at his house on the Lehigh campus making it look like a Swiss hospice." Wilder Bancroft was remembered as often "saying plaintively, 'You can never convince anybody with facts,' a remark of much wisdom." Leo

A group of past presidents attended the 50th anniversary meeting in Philadelphia. Pictured here are (seated, left to right): H. S. Lukens, C. G. Fink, L. Addicks, F. C. Mathers, and W. G. Harvey; (standing, left to right): R. M. Burns, A. T. Hinkley, H. J. Creighton, W. C. Moore, G. W. Heise, and J. A. Lee.

ADDICKS

KING

ENCK

Baekeland wasn't happy when "we started to substitute a lantern (projector in today's terms) for the blackboard." Baekeland's experience with the lantern when lecturing at Columbia was that "when he turned the lights back on he found that half his audience had sneaked out and the other half was asleep." Recognition of the anniversary year was emphasized in the *Journal*, which published an anniversary feature in every issue that year.

■ The presentation of 137 papers at the fall meeting in Montréal was the first to require simultaneous sessions.

1953 ■ James Watson and Francis Crick proposed the double helix structure for DNA.

■ The Society's first monograph began life as a 1941 symposium on plating, sponsored by the Electrodeposition Division. A volume was published in 1942 and was entitled *Modern Electroplating*. A revised volume with some new material appeared in 1953, also as *Modern Electroplating*, sponsored by the Society and published by John Wiley & Sons (New York). This "first" edition would be followed by three others.

1955 ■ **CECIL V. KING** became editor of the *Journal* and served in that capacity until 1969. King would write a number of memorable editorials for the *Journal*, some of which are excerpted in this issue of *Interface* (see page 38). King would become president of the Society (1971-1972) and would receive the Acheson Award in 1974.

■ **ROBERT SHANNON** began to manage the Society office in 1955 as assistant secretary. In 1958, he was named executive secretary, the title he had when he died suddenly in 1964.

1957 ■ The Washington, DC meeting featured a symposium on "The Structure of Electrolytic Solutions," which was held in honor of the 70th anniversaries of Arrhenius' postulation of the theory of electrolytic dissociation. The National Science Foundation gave a $10,000 grant to the Society for the publication of a proceedings volume, the beginning of a succession of grants for similar symposia held by the Society.

1958 ■ Jack Kilby of Texas Instruments invented the integrated circuit. Kilby received the 2000 Nobel Prize in Physics for his work, and was the keynote speaker at the Society's first meeting in China in 2001.

■ **WILSON GREATBATCH** invented the implantable cardiac pacemaker. In The New York Times Magazine article (December 9, 2001), the 82-year-old Greatbatch said, "I'm going to build a rocket that has a propulsion that will give an acceleration of one G… One day we will be able to get halfway to Mars in 25 hours. We don't have the rocket or spaceship yet. But it will happen." Greatbatch has been a member of ECS since 1985.

1960 ■ Theodore Maiman invented the laser (light amplification by stimulated emission of radiation).

1961 ■ Soviet cosmonaut Yuri Gagarin became the first human in space.

1963 ■ *Electrochemical Technology* began in 1963 in order to publish informative technical articles that merited publication but did not report original research, as was required by the *Journal*. The first editor, **AL LOONAM**, did an outstanding job in launching and sustaining the new publication. (When Loonam died suddenly in 1965, Norman Hackerman agreed to take over the reins of *Electrochemical Technology* in addition to his duties as editor of the *Journal*.) The publication had a relatively short life. A later committee recommended that the Society publish only the *Journal*, and that it include three technical sections: Electrochemical Science, Solid-State Science, and Electrochemical Technology. These recommendations were adopted and put in effect in 1969. The changes resulted in more economical publication and more editorial efficiency.

1964 ■ At one of these programming sessions in 1964, the Society suffered a great loss when Bob Shannon, Executive Secretary of the Society, was stricken with a heart attack and died. **ERNEST G. ENCK** stepped in to fill the vacancy. Enck was a dedicated active member of the Society and would go on to serve the Society until the end of January 1976.

1965 ■ One of the members of the Electronics Division and co-founder of Intel, **GORDON MOORE**, proposed in 1965 that the number of transistors on a silicon chip would double every year (later revised to every

18 months). Moore joined the Society in 1957 and would give two plenary talks, in 1981 and 1997.

1967

■ Although many changes had taken place in publications, there was no assured record of papers presented at meetings, for Divisions had the option of publishing booklets of abstracts from their symposia, or not. To bridge the gap, the Society began to publish softcover volumes containing **MEETING ABSTRACTS** (then called Extended Abstracts) of all the papers to be presented at the meetings.

■ In the mid-1960s, the question was raised as to whether the name of the Society reflected its broad interests. There were strong feelings on this matter, but the response to a 1967 letter poll was overwhelmingly in favor of retaining the current name, rather than changing it to another, such as the **J. WILLARD GIBBS SOCIETY**. Back in 1863, Yale University had granted its first PhD in science to Gibbs. In 1876 and 1878, Gibbs established the field of chemical thermodynamics with the publication of his treatises on thermodynamics, which were to be of great significance to electrochemistry.

1968

■ Richard Bechtold, on a lengthy European assignment, resigned as secretary. The Board appointed **DENNIS TURNER**, secretary-elect, to fill the remaining four months of Bechtold's term. When Turner took over as secretary he found that, surprisingly, the secretary was in charge of finances, while the treasurer was in charge of meetings! Turner quickly reversed this assignment of duties to its more logical condition with the treasurer being in charge of finances. Turner was responsible for a number of beneficial changes to the Society's staffing and governance, and would give over three decades of service to the Society. He was president from 1978 to 1979, received the pretigious Acheson Award in 1992, and received the Vittorio de Nora Award in 2000. Turner would also serve as the Society historian for a number of years, write a number of "ECS Classics" articles for *Interface*, and prepare material for the 100th anniversary history book.

1969

■ The U.S. Defense Department developed the "Arpanet," the precursor to the Internet. Intel designed the first microprocessor. People walked on the moon for the first time – Neil Armstrong and the U.S. Apollo 11 mission.

■ The Society introduced softbound volumes containing the full-length papers of symposia. These Symposium Volumes (renamed **PROCEEDINGS VOLUMES** in 1976), available either at the meeting or shortly thereafter, were to be available as up-to-date treatments of the particular fields of the symposia.

■ The post of Technical Editor of the *Journal* was eliminated and **NORMAN HACKERMAN** was appointed Editor for a period that would run until 1990. Hackerman joined the Society in 1943. In addition to his editorial responsibilities, he served as chairman of the Corrosion Division (1951) and was elected president in 1957. He received the Olin Palladium Medal Award in 1965, was made an Honorary Member in 1973, and received the Acheson Award in 1984. Hackerman would have an illustrious career outside of ECS as well. He joined The University of Texas chemistry department in 1945, and eventually became Vice-President, Provost, Vice-Chancellor for Academic Affairs, and finally the University's President in 1967. In 1970, Hackerman would become President of Rice University until his retirement in 1985.

1970

■ After the Richards Lectures were discontinued in 1958, the practice of having plenary lectures didn't begin until 1970. The new series began with **LEO BREWER**, who spoke on "Electrons – The Universal Glue." The list of notables, in both series, includes a number of Nobel Laureates: William Shockley (Physics 1955), Arthur L. Schawlow (Physics 1981), Jean-Marie Lehn (Chemistry 1987), Rudolph A. Marcus (Chemistry 1992), Richard E. Smalley (Chemistry 1996), and William D. Phillips (Physics 1997).

The list of Nobel Laureates involved with ECS goes on, including those who have joined the Society or have spoken at its meetings, including: Fritz Haber (Chemistry 1918), Peter Debye (Chemistry 1936), Linus Pauling (Chemistry 1954 and Peace 1962), Walter Brattain (Physics 1955), Jaroslav Heyrovsky (Chemistry 1959), and Jack Kilby (Physics 2000).

MOORE

TURNER

HACKERMAN

BREWER

Photo of **GORDON MOORE**
© 1996 Louis F. Bachrach.

1971 The Society Headquarters moved to U.S. Route 1, in the Princeton, New Jersey area. The building had been constructed using steel that came from the India Pavilion at the last New York World's Fair. The period on U.S. Route 1 was not without incident. One day, a U.S. Mail truck dropped a bag of Society mail containing meeting registrations and checks on the busy highway. Unfortunately, the mail was scattered and largely destroyed by passing cars and trucks. The building itself was not of the highest quality construction. The roof leaked and water would sometimes emerge from electrical outlets. Wind would blow through the building even when the windows were closed. On the occasion of the Society hosting an open house for the Metropolitan New York Section, a water main burst, resulting in several inches of ice covering the parking lot.

1972 The Society Headquarters office was assigned responsibility for the nontechnical arrangements of Society meetings. This action benefited the meetings by relieving the Sections of the problems associated with organizing them and by making accessible other venues that could handle multi-session meetings with over 1,000 attendees.

New Horizons...

1973 The solid-state revolution was in full swing. The Society presented its first Solid State Science and Technology Award to **WILLIAM G. PFANN** at the spring meeting in Chicago. Pfann was honored for his invention of zone refining, which yielded semiconductor materials of unprecedented purity. Not your typical Bell Labs researcher, Pfann joined the Bell Labs Chemical Research Department as a technician with no college degree in 1935 and was to become one of Bell Labs' most productive scientists.

1974 Because of what happened with one of its major awards, the Society could be said to have been involved in the Cold War! Professor **V. G. LEVICH** was named the 1973 recipient of the Palladium Medal Award. However, the Soviet Union would not allow him to come to the meeting to receive the award. After some controversy and a number of failed attempts, the prize was finally delivered to Levich by Bruce Hannay at Bell Labs in 1980.

In 1974, the Society first presented its fourth major award, the Electrochemical Science and Technology Award, to **ABNER BRENNER**. Brenner, who died in 1999 at the age of 91, was best known for his invention of the electroless nickel-plating process, upon which a whole industry is based, as well as his many other seminal contributions to the field of electrodeposition. Prolific to the end, he received his last of over 30 patents at the age of 90!

In 1977, this award would begin to undergo a number of changes. **VITTORIO DE NORA** and the Diamond-Shamrock Company, agreed to fund an endowment with a gift of $70,000. In 1990, de Nora most generously added $70,000 to the endowment. In 1991, after the company had been re-structured, the award was renamed the Vittorio de Nora Award. The award's namesake is most known for his contributions to industry in the manufacture of chlorine and in the development of dimensionally stable electrodes, which have revolutionized the electrochemical and electrometallurgical industries. He was named an Honorary Member in 1982.

1975 Ernest G. Enck had served the Society as a member, officer, and staff member for many years and after announcing his retirement, was named Executive Secretary Emeritus and Honorary Member. **V. H. "BUD" BRANNEKY** became the executive secretary of the Society. Branneky was slated to serve the Society until 1991, and also would become an Honorary Member. His tenure as executive secretary would be characterized by a dedication to maintaining a high sense of fiscal responsibility in the Society.

PFANN

LEVICH

BRENNER

DE NORA

BRANNEKY

WOOD

MILNER

BERKOWITZ

1976

The Board of Directors approved the formation of the Energy Technology Group, with Jerry Woodall (dry) and Supramaniam Srinivasan (wet) as the co-founders. (It would become the **ENERGY TECHNOLOGY DIVISION** in 1987.) The Society's first Group was formed to act as a bridge between the "wet" and "dry" sides of the house in energy-related matters and to cover those areas of energy-related topics not being adequately covered in the existing Divisions. ("Dry" here refers to the solid-state, high temperature materials, dielectrics, etc. areas; while "wet" encompasses the more conventional electrochemistry including batteries, corrosion, electroplating and electrodeposition, and biological electrochemistry.)

The Council of Sections Excellence Award was established under the guidance of **GWENDOLYN B. WOOD** and was first presented to the New York Metropolitan Section for the 1975-1976 period. Wood had been an active member of the Society from 1952 until her death in 1975, actively supporting the National Capital Section and serving on the Council of Sections.

1977

Society Secretary Paul Milner and Executive Secretary Branneky introduced computer technology for handling Society business. **PAUL MILNER** would give many years of service to the Society, providing his services and expertise behind the scenes as well as in more prominent Society roles. He became a member in 1958, secretary from 1974 to 1980, and would become president in 1984. He continued to assist the Society staff in solving computer and software problems, and wrote several programs to help in many phases of Society business. A state-of-the-art Milner computer program to help reduce lag time in the *Journal* was introduced in 1991 and lag times indeed improved remarkably.

1979

JOAN BERKOWITZ became the first woman president of the Society. Berkowitz joined the Society in 1961. She was active in what is now the HTM Division and served as vice-chairman and chairman. She became a Divisional editor of the *Journal* in 1966 and served on many Society committees. Berkowitz designed, for the lunar space program, experiments in metals melting and eutectic solidification in space; and co-authored a monograph on industrial utilization of NASA developments in electroplating.

1980

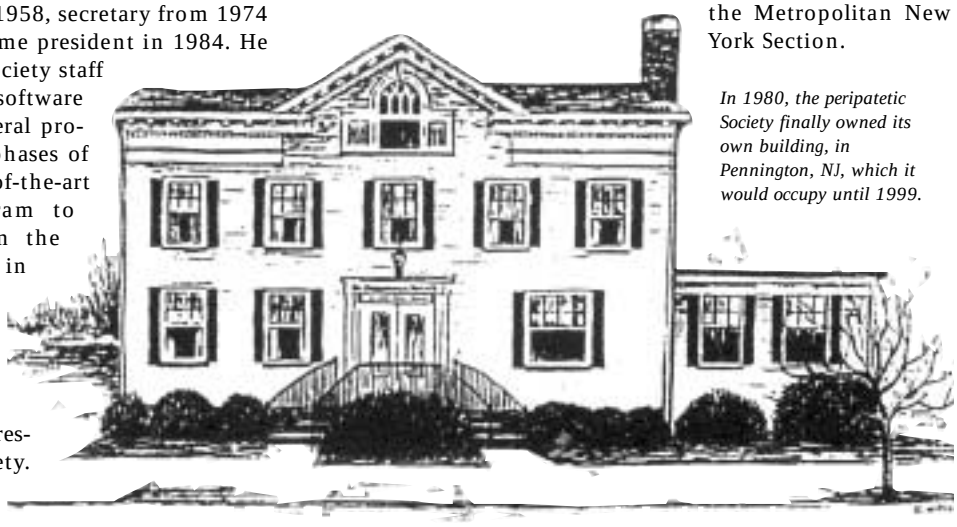
Society Headquarters moved from rented space on U.S. Route 1 to its own building at **10 SOUTH MAIN STREET** in Pennington, New Jersey (see below). The property originally was purchased in 1849 by one D. C. Titus, a cabinetmaker according to an 1860 map. In 1902, Titus' daughter, Rosalie Blackwell, inherited the property, tore the old building down, and rebuilt it in 1903. Rosalie was reportedly the first female lawyer in the United States.

1981

Gerd Karl Binnig and Heinrich Rohrer invented the scanning tunneling microscope.

1982

Under the leadership of George Gillooly, F. M. Ryan, and Martin Royce, luminescence activity was resurrected. Their efforts culminated in 1982 with the formation of the Group that would become, in 1993, the **LUMINESCENCE AND DISPLAY MATERIALS DIVISION** (LDM) of the Society. The LDM Division had its roots in the Electronics Division and the first luminescence symposium was held in 1945 at a regional meeting of the Metropolitan New York Section.



In 1980, the peripatetic Society finally owned its own building, in Pennington, NJ, which it would occupy until 1999.

MILLER

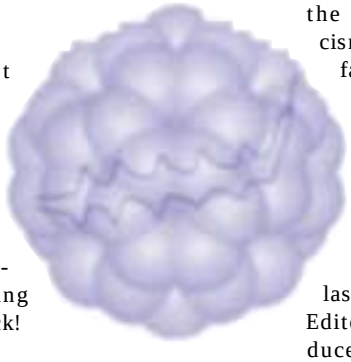
CALVO

KOHL

1985 ■ Sir Harold Kroto, J. R. Heath, S. C. O'Brien, R. F. Curl, and Richard Smalley discovered the unusual stability of the carbon-60 Buckminsterfullerene molecule and deduce its structure. Smalley later would give a talk at an early ECS fullerenes symposium.

1986 ■ K. Alex Mueller and J. Georg Bednorz discovered high-temperature superconductivity in ceramic materials.

1987 ■ The Society held its first joint international meeting with the Electrochemical Society of Japan and the Japan Society of Applied Physics, in Hawaii, and it was the largest meeting in the Society's history to this point. Over 1,700 papers were presented, which resulted in a huge "souvenir" – the meeting abstracts volume was almost 3" thick!



A new class of materials came on the scene in the 1980s—the interesting carbon-60 molecule—that would lead to the field known as fullerenes.

1988 ■ President Ron Enstrom appointed an ad hoc Long Range Planning Committee consisting of Richard Alkire, Ralph Brodd, Larry Faulkner, Florian Mansfeld, Barry Miller, Arnold Reisman, Laura Rothman, Forrest Trumbore, Bruce Wagner, and Dennis Turner as Chairman. Their report, submitted to the Executive Committee in 1988, treated 14 different issues, a couple of which were thought to deserve immediate attention. A major revision of the *Journal* and its editorial staff structure was recommended to improve the quality of the *Journal* and the efficiency of reviewing manuscripts; and a new publication was recommended to communicate better with the membership, making the *Journal* a strictly technical journal. It was felt that the Society needed to recognize active members who had made significant contributions to science and technology, through the establishment of the category of Fellow. These recommendations were all adopted.

■ The rapid growth of electrochemical sensor science and technology spawned many symposia on sensors in the early 1980s. Dennis Turner decided that the Society needed a Sensor Group and, to that end, organized a symposium on Chemical Sensors for the 1987 fall meeting in Honolulu. The Sensor Group (now the **SENSOR DIVISION**) was approved by the Board of Directors at the spring meeting in Atlanta.

1989 ■ When Martin Fleischmann and Stanley Pons announced "**COLD FUSION**" on March 23, 1989, a special evening session was quickly scheduled to the upcoming spring meeting in Los Angeles. By the evening of May 8, the session featured talks by the principals, supporters, and critics. The criticisms were devastating and cold fusion was to fade from the scene until 2002, when new announcements would emerge.

1990 ■ Tim Berners-Lee, of CERN, coined the name World Wide Web for the global hypertext system.

■ Following the recommendation of the last Long Range Planning committee, a new Editorial Board structure for the *Journal* was introduced. Reduction of lag time for manuscripts became a principal goal. Norman Hackerman retired from the *Journal* after 40 years service as Technical Editor and Editor.

■ **BARRY MILLER** became Editor of the *Journal* in 1990, after his serving as a Divisional Editor (1974-1989) under Hackerman. He was chairman of the Physical Electrochemistry Division (1987-1989) and a co-organizer of the first symposia within the Society on fullerenes and on high temperature superconductors. Miller would be made an ECS Fellow in 1992 and become president in 1997. He was instrumental in the planning of the Society's first joint international meeting in Europe – the fall 1997 meeting in Paris.

1991 ■ **ROQUE J. CALVO** was named Executive Secretary upon Bud Branneky's retirement. During Calvo's administration, the needs of the Society would change in ways, and at a pace, undreamed of by his many predecessors. Technological advances would greatly affect the way Headquarters did business. It would begin with modems, faxes, and LANs and rapidly progress to advanced databases and online publishing. Calvo's title changed from Executive Secretary to Executive Director in 1994.

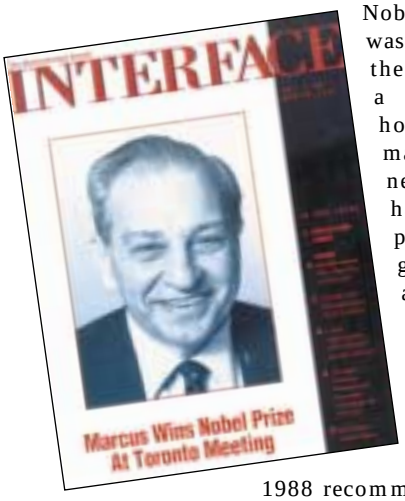
TALBOT

TOBIAS

HANNAY

1992

During the fall meeting in Toronto, it was announced that **RUDOLPH MARCUS** had won the Nobel Prize in Chemistry. Marcus was attending the meeting and the Society staff quickly arranged a full-scale reception in his honor. The publications staff made some quick changes to the new members magazine, which had been some time in the planning. After obtaining a good photograph of Marcus, and quick conferences with the designer, the inaugural cover of Interface featured a Nobel Laureate.



That new magazine was the implementation of a 1988 recommendation. It was intended to serve all the functions of the "C" pages of the *Journal*, to broaden communication with the members, and encourage new members to join the Society. The first issue of *Interface*, with Paul Kohl as editor, appeared in the winter of 1992.

1993

A major new class of materials had burst upon the scene in the 1980s – a form of carbon containing 60 atoms in a structure resembling a soccer ball (called Buckyballs, after the architect Buckminster Fuller) – and spurred a worldwide effort that became known as fullerenes. The New Technology Subcommittee responded by sponsoring symposia on the topic. The response was outstanding and a **FULLERENES GROUP** was formed at the fall meeting. (At the time of this writing, the Group is applying for Divisional status.)

1995

Early in the year, the Society launched the **ECS WEBSITE**, and in June, began accepting electronic meeting abstracts via e-mail.

PAUL A. KOHL became Editor of the *Journal*. Kohl had served as the first editor of *Interface*, the Society's members' magazine, until his appointment to the *Journal*. Kohl received the Society's Carl Wagner Award in 2001.

Jan Talbot became editor of *Interface* when Kohl was named editor of the *Journal*. Talbot was a member of a number of Society committees, co-chaired many symposia, organized the first few general Society student poster sessions, and co-edited a proceedings volume. In 2001, Talbot would become Society president.

1996

Two outstanding past presidents died just a few months apart: Charles W. Tobias and N. Bruce Hannay. Both had distinguished careers in science and technology and contributed greatly to the growth and stature of the Society.

CHARLES TOBIAS is credited with founding the modern science of electrochemical engineering through his teaching and research at the University of California, Berkeley. Tobias contributed to the Society in many ways: through presentations of his work at meetings and in publications, and his service as a leader of the Physical Electrochemistry Division and as Society president (1970-1971). The Society honored him with numerous awards: Edward G. Acheson Award and Prize in 1972, Honorary Member in 1977, Henry Linford Award for Distinguished Teaching in 1982, and the Vittorio de Nora Medal and Prize in 1990.

N. BRUCE HANNAY had a distinguished career at Bell Laboratories, rising to be vice-president of research and patents from 1973 until he retired in 1982. He was a leader in the research and development work that produced practical transistors and other solid-state devices. He became involved in the Electronics Division of the Society soon after the transistor was invented and was influential in improving the stature of the Division and in attracting to the Society many new members involved in the new science and technology of semiconductors. Hannay received many honors and awards, including the Society's Edward G. Acheson Award and Prize in 1976, the Perkin Medal in 1983, and the Gold Medal of the American Institute of Chemists.

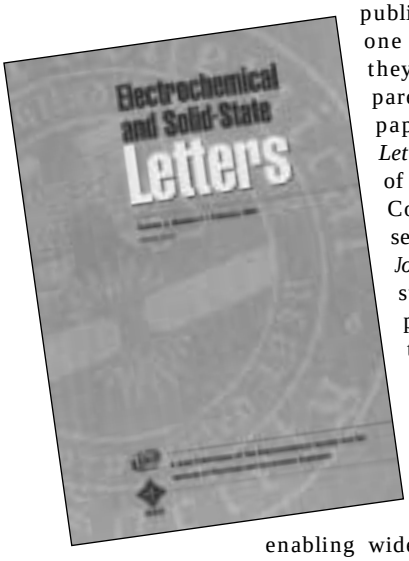
1997

■ The year saw the first meeting of the Society outside the U.S. or Canada, and it was the first joint venture with the International Society of Electrochemistry (ISE). The fall meeting, the largest in the Society's history, was held in **PARIS, FRANCE**. The meeting was a rousing success, with 2,900 registrants and 2,463 papers, though the tragic death of Britain's Princess Diana in Paris added a sobering note.

■ Although the charter members of the Society had long since passed away, a very nice remembrance of one of them came in 1997. The Society received a large bequest from the estate of **CARL HERING**, a founding member and the Society's first Secretary. The Society placed the money in a separate fund, the interest to be used to help support the Centennial activities planned for the 2002 spring meeting in Philadelphia.

1998

■ In July, the rapid-publication online journal, *Electrochemical and Solid-State Letters*, was launched. It was the first journal in the field to use a system of publishing papers online first – one article at a time, as soon as they have been accepted and prepared for publication – with paper publication to follow. *Letters* was the natural outgrowth of the former Accelerated Brief Communications and the subsequent Letters section of the *Journal*. To further ensure its success, ECS developed a co-publication agreement with the Electron Devices Society of the IEEE. The online publication also benefits from an arrangement with the American Institute of Physics (AIP) to produce the journal in a special format, enabling wide interconnection among all online technical journals.



RAJESHWAR

SCROSATI

1999

■ With so much growth, the Society Headquarters staff needed more space, and was finally able to move in December to a new building at **65 SOUTH MAIN STREET**, just down the street from the existing Headquarters Office.

■ **KRISHNAN RAJESHWAR** was named Editor of *Interface*, after Jan Talbot resigned to take up her new role as a vice-president of the Society. Rajeshwar brought a number of innovations to the magazine, including alternating issues featuring Divisions, with ones focused on special topics. "Raj," as he is known, has been a member since 1978 and has been active on many committees. He was chairman of the Energy Technology Division and the New Technology Subcommittee. He has been an organizer for many ECS symposia as well as an editor for proceedings volumes. (For the full story on Raj, see the spring 1999 issue of *Interface*.)

2000

■ The Board of Directors unanimously voted to adopt an **OFFICIAL ACRONYM AND TAGLINE** to identify Society. The adoption of "ECS" formalized the shorthand that had been used informally for decades by the members. The tagline would also help to give more prominence to the "dry" side of the house, a need recognized by many planning committees since the 1950s.

2001

■ The **10TH INTERNATIONAL MEETING ON LITHIUM BATTERIES** (IMLB X) was held in Como, Italy. The conference was organized by **BRUNO SCROSATI**, who became an ECS vice-president, and who is scheduled to become (2003-2004) the Society's first president from outside North America. The tenth IMLB was the first organized by ECS, and the program included the presentation of the first special award of the European Section, the Volta Medal. It was given to Michel Armand for excellence in electrochemical and solid-state science in Europe.

The Society's first meeting in Europe, and its largest to date, was sponsored jointly with the International Society of Electrochemistry (ISE). Pictured here at the meeting are (left to right): Katsumi Niki, president of ISE; Jean-Marie Lehn, guest plenary lecturer and 1987 Nobel Laureate (Chemistry); Laurence M. Peter, ISE Pergamon Medal lecturer; and Barry Miller, president of ECS.

The central building on the ECS "campus" at 65 South Main Street in Pennington, NJ.

The spring meeting had what must have been one of the liveliest and most spirited plenary lectures in the history of ECS. With copious use of buckets of liquid nitrogen, flipping of flattened frozen exploding balloons into the audience, levitation of spinning magnets, Nobel Laureate **William Phillips** made sure that no one dozed off during his early morning lecture on laser cooling.

The **International Semiconductor Technology Conference** (ISTC), organized by Ming Yang of Texas Instruments, was held in Shanghai in May and was a first in many respects. It was the first ISTC meeting and it was the Society's first major meeting in China. The highlight of the conference was the plenary address given by Jack Kilby, the winner of the Nobel Prize in Physics (2000) for his invention of the integrated circuit.

Today and Tomorrow...

At the beginning of 2002, the membership stands at a little over 8,000. Every continent on the globe is represented in the ranks, with approximately 40% of the membership coming from outside the U.S. Just as the country that gave birth to ECS has become even more of a melting pot, so has ECS continued to embrace a broad spectrum of people, research, and ideas. With the assimilation of so much new communications technology, and the scheduling of meetings all over the world, members from outside North America are able to take a more active role in Society affairs.

The *Journal* has become the top-ranked technical journal for publication in the various disciplines covered by the Society. *Electrochemical and Solid-State Letters* has become a medium for rapid dissemination of important work. *Interface* not only keeps its members informed, but also delivers informative articles and comments about technical interests and achievements in the field.

The Society maintains its alertness in recognizing and encouraging the incorporation of new areas into the Division/Group structure, and the resulting meetings grow larger, proceedings volumes more prolific, both offering a broader range of technical content.

All together, ECS continues to be that "forum" for electrochemical and solid-state science and technology that C. J. Reed envisioned over one hundred years ago.

Nobel Laureate William Phillips (above) made sure no one dozed off at his Monday morning lecture on laser cooling. Phillips delivered the plenary lecture at the spring 2001 Society meeting, using buckets of liquid nitrogen, levitating spinning magnets, and flipping flattened frozen balloons into the audience.

The Society officially adopted the use of the acronym - ECS - and an official tagline in 2001 (see below).

the society for solid-state
and electrochemical science
and technology

*This article was prepared by **Mary Yess**, Interface's Managing Editor, based on the forthcoming ECS centennial history book. The book (see the inside front cover) was written by **Dennis R. Turner** and **Forrest Trumbore**. All photographs, unless otherwise noted, are from the ECS archives at ECS Headquarters and at the Chemical Heritage Foundation in Philadelphia.*