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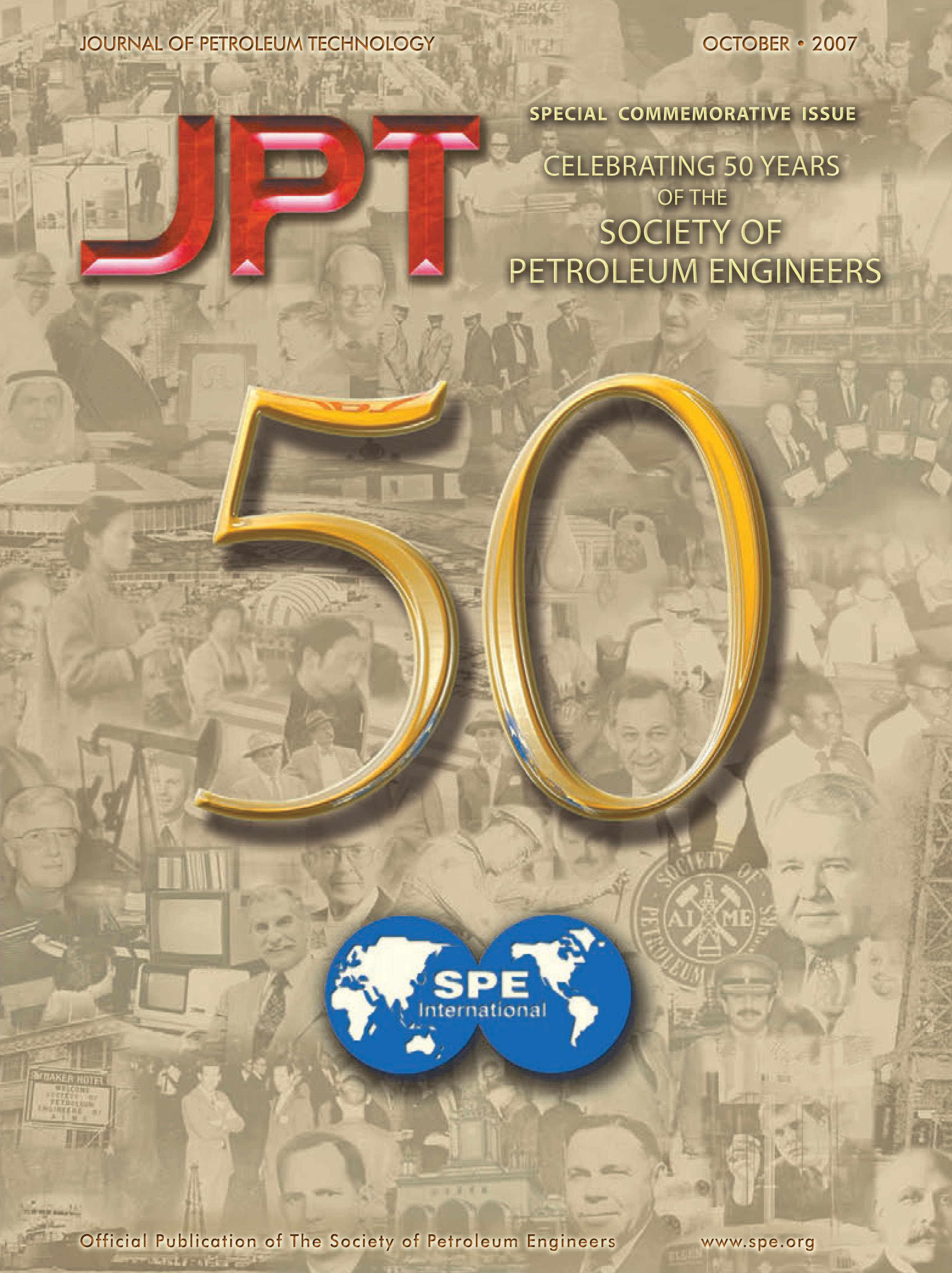
OCTOBER • 2007

JPT

SPECIAL COMMEMORATIVE ISSUE

CELEBRATING 50 YEARS OF THE SOCIETY OF PETROLEUM ENGINEERS



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Special Commemorative Issue
Celebrating 50 Years of the Society of Petroleum Engineers

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1970–1979

1980–1989

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JOURNAL of PETROLEUM TECHNOLOGY

1990–2007

Celebrating a Half-Century

John Donnelly, *JPT* Editor • jdonnelly@spe.org

Welcome to this special issue of *JPT* celebrating SPE's 50th anniversary. A half-century ago, the society came into being as a small, primarily US-based technical organization, a spinoff of the American Institute of Mining, Metallurgical, and Petroleum Engineers. Today, SPE is a 70,000-member technical-professional society with members in 114 countries and offices around the world, producing some of the industry's best publications and meetings.

A lot has happened along the way. Inside this issue, you will find the stories of SPE's creation and growth, its accomplishments and challenges, and its notable leaders and members. As the society is inseparable from the oil and gas industry it serves, there are accounts of the significant events and changes that have occurred in the petroleum business as well, from the hallmark advances in technology to the evolution of the petroleum engineering profession and engineering education.

There are some familiar faces here. Thirty-three past SPE Presidents reflect on the milestone events of their terms, and several industry experts look back on their journeys through the industry. Many readers will recognize *JPT* and technical journal writers and editors from the past, including Keith Millheim, Joseph Warren, and Dennis Beliveau.

But it is not all about looking back. SPE membership is at an all-time high and growing, with new sections and student chapters sprouting across the globe. One of the big stories in SPE's history is international growth, a process that continues today. New offices are opening around the world, providing expanded services and programming for members. Several of the guest columnists in this issue offer perspectives on the future, tinged with optimism but allowing that the next 50 years could be as challenging as the last 50.

A special thanks goes to all of those who contributed guest columns and reminiscences, as well as those members and companies that provided historical information and photographs, in particular, Shell, Baker Hughes, Schlumberger, and Halliburton.

JPT is always eager to hear from its readers. If you have any comments or suggestions, please contact me at jdonnelly@spe.org or by phone at +1.713.779.9595 ext. 616.

What SPE Has Meant to Me

SPE's current and incoming presidents and staff executive director reflect on how the society has influenced their careers.

William M. Cobb, 2008 SPE President

It has been my privilege to be connected with SPE for more than 43 years, as a student, as a junior member, and then as a full member. Since 1969, I have attended every SPE Annual Technical Conference and Exhibition (ATCE, in years gone by, was also known first as the Fall Meeting, then the Annual Meeting) but 1977. I have had opportunities to serve our society at the local, regional, and international levels.

This 43-year relationship has been exciting, technically inspiring, and professionally rewarding for me. As I reflect over these years of service, I unearth many fond memories. One of my first memories was my participation in the Gulf Coast Region student paper contest in 1967 while I was a graduate student at Mississippi State University. I did not win, place, or show, but the experience of conducting a research project and then learning to make an oral presentation about it to my peers was one of the most enlightening adventures of my career. To this day, I am grateful for the guidance and constructive criticism from William D. McCain and T. Don Stacy and from my classmates. This early mentoring and networking set my feet firmly on the SPE path that I have found so gratifying throughout my career. (In 1968, I won the graduate-level competition at the first West Coast Region student paper contest while working on my PhD degree at Stanford University.)

Another key moment came in 1972, when Professor W. John Lee asked me to serve on the Well Test Analysis Committee to help solicit abstracts and select papers for the 1973 ATCE in Las Vegas. This was my first opportunity to participate at the societywide level of SPE. The returns to my volunteer efforts were immeasurable—working with some of the most brilliant minds in our industry from around the world, exposure to the latest technology, and the chance to help shape one of our industry's most important events. (My wife, Carolyn, and I were married in May 1973, and the 1973 ATCE trip was our honeymoon. Unfortunately, I was bedridden with the flu during the entire meeting, but Carolyn kept me apprised of all of the activities.)

Another special moment occurred in January 2000, when I received a call advising me that the SPE Nominating Committee had nominated me to serve a 3-year term on the SPE Board of Directors as Vice President of Finance. I was deeply honored, but very surprised at this invitation! After phone calls to several past presidents and a few days of mulling the invitation, I accepted the nomination. This 3-year assignment involved a significant commitment of work and travel, but also fun and friendships. I also gained a deeper understanding of how our society functions and supports our industry. Once again, the "return on investment" in SPE was personally and professionally high.

I could talk of many other experiences with SPE, including serving on the Editorial Review Committee, being a Distinguished Lecturer, receiving the 1999 Reservoir Engineering Award, filling almost every assignment available through the Dallas Section as well as every position within the Hydrocarbon Economics and Evaluation Symposium committee structure, and leading the team that recommended the opening of the SPE office in Dubai. The recommendation to open that office followed a great deal of work by a group of dedicated members and the SPE staff. Executive Director Mark Rubin and I spent a speedy 5 days meeting with SPE leaders in Dubai, Abu Dhabi, Bahrain, Saudi Arabia, Kuwait, Qatar, and Oman for input, guidance, and support. (Mark and I continue to be indebted to Faisal Al-Mahroos from Bahrain, who arranged for a much-needed, very relaxing Turkish bath near the end of our trip.)

As I reflect over my 43 years of SPE membership for this article, I can see and appreciate the many contributions our past and current leaders—both members and staff—have made in making SPE the outstanding organization that it is today. I have enjoyed contributing to and benefiting from SPE's core mission of collection, storage, and dissemination of technical information. Based on my personal experiences, travel, and general knowledge of the petroleum industry, I believe our industry is one of the most engaged professions of high technology in the world. Significantly, our industry has a bright future.

Through SPE I have attempted to make my professional life one of continuous learning. Learning inspires one to seek more knowledge, experiment with new ideas, and expand the frontiers of technology. Further, the personal and professional relationships that I have developed have been a blessing.

In closing, I want to strongly encourage our young professionals to join and actively participate in SPE. There is a place for all of you. SPE and I are looking for you to lead our technology development for the next 50 years. I am confident you will find your relationship with SPE to be maturing, technically challenging, and professionally rewarding.

Abdul-Jaleel Al-Khalifa, 2007 SPE President

During my early years, I thought of SPE as the prime vehicle of knowledge transfer and professional networking. But is it only that? Is SPE only technical conferences and exhibitions of leading-edge technologies and networking with friends and colleagues? SPE has come to mean much more than that to me.

Being privileged to serve as 2007 SPE President, it is now clear to me that SPE is also a very effective means for advancing growth and prosperity. This is clearly manifested as SPE continues to nurture a strong cadre of energy professionals. Such a noble objective has over the years energized all SPE Boards, staff, and members to exert their utmost efforts in support of our industry.

Serving as a board member for 3 years gave me the opportunity to have a satellite view of not only our society but the entire industry. I realized the critical need to articulate a vision for the petroleum industry to 2020. This was the focus of my presidency, during which I elected to emphasize the role of talent and technology. "People first" was a theme that I aimed to underscore in most of my monthly editorials in *JPT*. My deep conviction is that our industry will flourish and shine if we can live the values of fairness and integrity while meeting commercial objectives.

I was pleasantly surprised by the overwhelming support for this focus from my colleagues on the board and the SPE staff. The feedback from others in the industry, especially fellow SPE members, was also extremely encouraging and heartwarming. This initiative developed great momentum during this past year within SPE and the industry at large.

• Many conferences scheduled panels and plenary sessions to discuss the talent issue and to explore ways to resolve our people concerns.

• We started the quarterly magazine *Talent & Technology.*

• We held the SPE Industry Summit, which was a remarkable success. Seven industry senior executives championed the summit among 75 industry executives attending this 1-day high-level conference. The discussion was vibrant and fulfilling.

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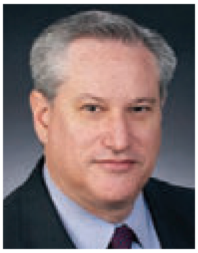
SPE will soon form the Industry Advisory Council, involving 20 industry senior executives, as well as a talent council and a carbon capture and sequestration committee. The summit was a true moment of inspiration for me, as it reflected the strength of our industry when it acts in a united way.

My visits to SPE sections were extremely rewarding. I felt the true unity of human beings through the global diversity of SPE. While our members' race, religion, and gender are diverse, I found them to be very similar when it comes to human values. We should be proud of the sincere interest of all SPE members to attend to human needs. The extracurricular activities of the SPE sections and student chapters to help poor communities, and our individual members' efforts to provide fresh water to underprivileged communities, are very inspiring. Such activities need to be augmented in the future, as they can definitely polish the image of our industry.

We cheerfully invest our time and effort to serve our international SPE community. I am honored and proud to be an SPE member.

Mark A. Rubin, SPE Executive Director



As a petroleum engineering student many years ago at Texas A&M University, my professors made it clear to me that it was essential to my career to be a member of SPE. They were right. The people I met at the Annual Technical Conference and Exhibition and section meetings as a young engineer always impressed me, with both their professionalism and their unfailing willingness to extend a helping hand. Most importantly, I found that SPE provided real-life solutions for the myriad technical problems I encountered early on as a production engineer.

In those days (a full decade before the eLibrary was born), I would call the company librarian and ask her to send me technical papers on problems I was dealing with in several oil fields in east Texas. She would always send me SPE papers that showed how the problems had already been solved by someone else, often in distant corners of the world. Those papers provided invaluable insights and ideas I could not have found any other way. Finding answers is far easier today with keyword searches of the eLibrary or OnePetro, the new multisociety library that SPE has championed and now operates for the benefit of the industry. I am very proud that SPE has been able to make such a treasure trove of knowledge easily available to petroleum professionals anywhere in the world.

The opportunity to network through the East Texas Section was also invaluable. Little did I expect that I would come to lead this prestigious organization as executive director. Even though SPE has grown and expanded throughout the world, our members keep alive the personal touch that sustained me in my early days. JPT

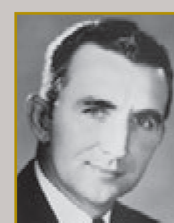
Gallery of SPE Presidents

The official portraits of each of SPE's presidents, from 1957 to the present.

John P. Hammond
1957

Basil P. Kantzer
1958

John S. Bell
1959



Wayne E. Glenn
1960

Earl M. Kipp
1961

R.A. Morse
1962

L.P. Wharton
1963

John C. Calhoun Jr.
1964

Lincoln F. Elkins
1965

H. Mark Krause Jr.
1966

H.A. Nedom
1967

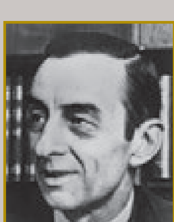
H.J. Gruy
1968

J.M.C. Gaffron
1969

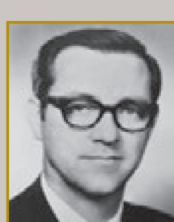
Robert H. McLemore
1970

Lawrence B. Curtis
1971

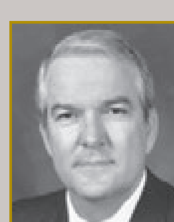
M. Scott Kraemer
1972



Gerald E. Sherrod
1973



Donald G. Russell
1974



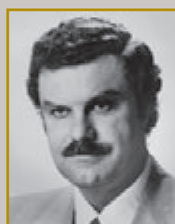
Edward E. Runyan
1975

C.A. Hutchinson Jr.
1976

F.F. Craig Jr.
1977

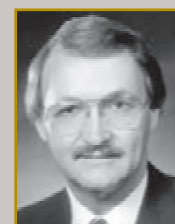
Hugh B. Barton
1978


Charles L. Bare
1979

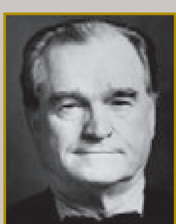

Marvin L. Katz
1980


Arlen L. Edgar
1981


W. Clyde Barton Jr.
1982


T. Don Stacy
1983


James R. Jorden
1984


Kenneth W. Robbins
1985


Dennis E. Gregg
1986


Noel D. Rietman
1987


R. Lyn Arscott
1988


George H. Sawyer
1989


Orville D. Gaither
1990


Arlie M. Skov
1991


Roger L. Abel
1992


Jacques Bosio
1993


E.A. Breitenbach
1994


Roy H. Koerner
1995

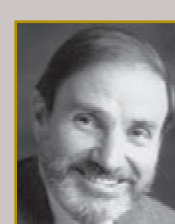

Peter D. Gaffney
1996

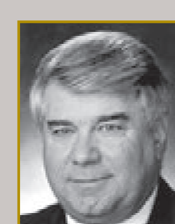

T. Scott Hickman
1997


DeAnn Craig
1998


Gustavo J. Inciarte
1999

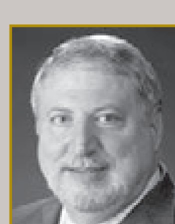

John A. Colligan
2000


Bruce E. Bernard
2001

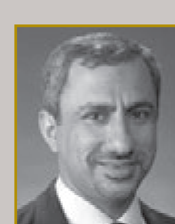

Stephen A. Holditch
2002


Andrew A. Young
2003


Kate H. Baker
2004


Giovanni Paccaloni
2005


Eve Sprunt
2006


Abdul-Jaleel Al-Khalifa
2007


William Cobb
2008

SPE Presidents Look Back on 50 Years of Growth and Accomplishment

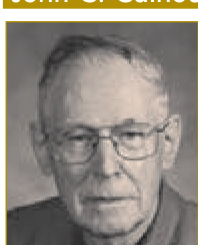
The history of SPE is perhaps best told by the men and women who have guided it through the past 5 decades, from a primarily US offshoot of the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME) to the worldwide technical and professional society it is today.* JPT *asked each of SPE's living past presidents to reflect on their terms—the highlights, the challenges, and the milestones.

Wayne E. Glenn, 1960

This year was an important one in the history of SPE. At a time when other professional societies were cutting back on services or increasing prices, SPE was adding services and holding dues the same and giving members more for their money. SPE established many important programs at this time. The Distinguished Lecturer Program was created in 1960 as was the new quarterly journal, *SPE Journal,* the society's first technical journal. Both were historic milestones for SPE.

SPE Executive Secretary Joe Alford and I began discussing the possibility of expanding SPE worldwide and starting up sections overseas. I had the Conoco plane at the time, and we traveled all over the world—to Europe, to Russia—to try to set up sections. We tried to find good people on the ground who were interested in SPE, and we met with government officials and left behind SPE literature. The funny thing was, often the person we left in charge of setting up the section, after the government saw how efficient and capable he was, would hire him away and put him on the government payroll and we would have to start again from scratch.

John C. Calhoun Jr., 1964



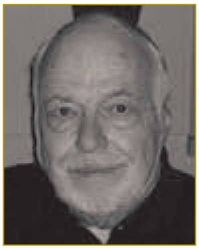
In February 1964, during the AIME Annual Meeting, I officially became SPE President, succeeding L.P. Wharton. Although SPE had become an autonomous unit of AIME in 1957, a period of transition still existed, which accounts for the February date for assuming the office of SPE President. This transition period, along with several other elements of change of concern to SPE, drove the society's agenda.

In my 1964 Presidential message, I took note of the fact that President Wharton had asked the question, "What are SPE's aims and obligations?" The very phrasing of this question reflected the relative youth of petroleum engineering and of SPE as a professional association, a situation that few in today's SPE world are aware of. I gave a three-fold response to that question: our need to be a learning profession, to seek out and nurture new members of the profession, and to enlarge our awareness of a role for SPE with respect to the broader issues of our general society. When, in the fall of 1963, as President-elect, I had outlined these views, the *Oil & Gas Journal* reported it as a three-point education program—the education of SPE members, the education of those who will become petroleum engineers, and the education of the public at large. These were the challenges that SPE faced in becoming a truly separate and higher-quality professional association that represented a fully recognized branch of engineering.

At the time of my presidency, the mood of the US was focused on science, engineering having taken a backseat. All engineering, not just petroleum engineering, was going through a period of self-examination. This mood, brought about by the scientific successes of World War II, the Cold War, nuclear issues, and space concepts, was exacerbated by a growing number of social problems, such as environmental pollution, that were being identified and associated in the public mind with engineering and technological advancement. Engineering enrollments had fallen sharply, especially in petroleum engineering. The Engineers Council for Professional Development was in the process of setting new standards for engineering curricula, and only a decade earlier had declared that petroleum engineering was a "fringe" curriculum, unworthy of full engineering recognition. Less than half of the SPE membership itself consisted of individuals with a degree in petroleum engineering.

As a consequence of these transitory factors, I cannot identify any great SPE projects during my presidential tenure or milestones that clearly identified a new level for the society. Rather, the activities were incremental by nature, steps that successively wove together the infrastructure that we know today. The number of regional meetings was increased, critical topics were identified for monographs, short courses for upgrading society-membership capabilities were initiated, and special attention was directed to involving the petroleum industry in the affairs of petroleum engineering educational programs at universities. The program activity was characterized by the personal interest and activity of individual members of the SPE Board in all of these arenas. It was an exciting time, but much of what we now know as SPE with its international dimensions was still in the future.

H.A. Nedom, 1967

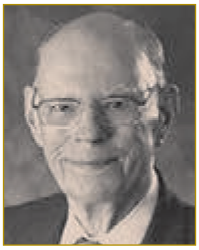


In 1967, SPE was a constituent member of AIME but was growing in membership, publications, and services for its members. Developing a rapid and efficient means of transferring technology was one of the society's goals then as it is today.

The first of the Monograph series, *Pressure Buildup and Flow Tests in Wells* by C.S. Matthews and D.G. Russell, came out that year. More than 5,000 copies had been sold by year's end, and five other monographs were in preparation. Continuing education was emphasized by the board, and, late in the year, the first videotaped course was circulated to the sections. It was a 30-hour course titled "Fundamentals of Reservoir Engineering" taught by Ben H. Caudle of the University of Texas at Austin. The course was warmly received and resulted in a series of video-instruction courses.

Of particular interest during 1967 were the numerous meetings with other societies in planning the first Offshore Technology Conference (OTC). SPE and its Executive Secretary, Joe Alford, took the lead, and SPE has administered the conference ever since. OTC fulfilled a huge need for offshore engineering information and will always rank as one of SPE's finest accomplishments.

John M.C. Gaffron, 1969



This was a dynamic year for the society. Membership was at a record high, and we were confident that vigorous growth would continue. SPE had grown from an infant branch of AIME to its largest constituent society. We were reaching new highs in attendance at regional meetings as well as in pages published in journals and conference preprints. Member services were increasing—the Continuing Education Committee had put together two successful videotaped lectures and was working on a third, and our second monograph, a landmark work on hydraulic fracturing, was completed. Close to 2,000 members were now participating in our continuing-education activities and programs. The board also created a standing committee on career guidance to more effectively aid local sections in career guidance activities.

And, of course, it was also the first year of OTC, an event in which SPE took considerable pride. The application of engineering to the ocean environment was an emerging technology that involved not only petroleum engineering but other disciplines, and the event became a hallmark for SPE working with other leading engineering and scientific societies.

Lawrence B. Curtis, 1971

During my term, we celebrated the centennial of AIME with SPE being one of its constituent societies. The year had a special aura and was a proud one for all of AIME's societies—mining, metallurgical, and petroleum. John Bell was President of AIME and maintained a progressive stance relative to technology development and dissemination to professionals in each society. Since he was from SPE, we knew we could count on his support for any reasonable proposal to the AIME Board.

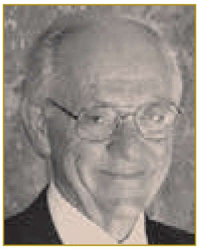
More American petroleum companies were moving into the international upstream arena. It really started in the early 1950s, but now was accelerating with demand for petroleum increasing by 10% per year and the United States, except for Alaska, becoming a maturing upstream province. Many SPE members already were engaged in international operations (I was one) and were stationed overseas. They were associating and working with engineers and peers abroad, many of whom were also members of SPE. In this industry environment, we knew we had to do something to maintain and grow a strong SPE that could help solve world energy problems.

In 1970, when I was President-elect and Bob McLemore was President of SPE, the Executive Committee of AIME and the SPE Board debated extensively whether SPE should become more internationally oriented and become a truly international professional society, encouraging worldwide membership and serving members through newly established sections in other countries. The answer was yes. But we knew that this would be a large undertaking and an aberration to system politics. The plan, approved by the board, was to move forward with minimal conflict. We wanted to maintain a low profile in bringing this about, but at the same time make significant progress.

In the fall of 1971, I was privileged to give the opening talk at the first meeting of the newly created SPE London Section. Also, David Riley, then Executive Director of SPE, and I attended the World Petroleum Congress in Moscow in 1971, and on our return to the US, we stopped in Paris to visit the Director of l'Institut Français du Pétrole and discuss forming a local SPE section in Paris. But it soon became very clear that we would not be successful. It would remain for a later regime and time for that to happen. It was not easy to create local sections in foreign lands.

Another trend influencing SPE members and upstream technology at this time was the dramatically increasing activity in offshore marine basins around the world. The North Sea, west Africa, the Persian Gulf, and the South China Sea were areas of surging industry presence. In the Gulf of Mexico, and to a certain extent in Lake Maracaibo in Venezuela, the industry was developing and proving new offshore technology and engineering concepts. This surge in offshore development led SPE to focus more on marine technology, an interest that only a few years earlier had spawned OTC, to address technology needs in this rapidly growing segment. I personally felt privileged to be a leader of SPE of AIME during this dynamic time frame. What is amazing is that it was less than 40 years ago, and we are now discussing the possibility of the world reaching peak oil production in the foreseeable future.

Donald G. Russell, 1974



The year was a whirlwind of activity for me—SPE meetings, board meetings, visits to SPE sections, participation in the beginnings of the SPE Foundation, helping in the effort to make the public aware of the facts surrounding the oil and gas business during the turbulent oil-embargo period, and doing the best job I possibly could for Shell Oil Company. These things all required all the time I could afford to give them and still be Norma's husband and father to Karen and Steve.

In spite of the activity, what I remember most vividly were the people I was so closely associated with. The SPE staff, headed by David Riley and Dan Adamson, was absolutely great. They provided incredibly good support and advice that was invaluable to me, and also did an excellent job of day-to-day management of SPE affairs. I also was fortunate to have a very talented SPE Board to work with. During the years before 1974, I got to know a group of members through my SPE involvement who were pioneers in establishing the successful path SPE has been on through the years. The support SPE received from men like Wayne Glenn, John Bell, Scott Kraemer, Buck Curtis, Ed Runyan, Marvin Katz, Arlen Edgar, Don Stacy, Arlie Skov, and Ken Robbins, just to name a few, who enthusiastically gave their time, wisdom, and money to our society over the years, was a prime factor in its successful growth. I personally found that there was always a bank of these talented people who were never too busy to respond to a call for help or advice.

Early in my term, the industry in the US was being bombarded with an avalanche of negative information and groundless charges about the energy crisis by the news media and some members of Congress. The OPEC embargo of oil exports to the US had shocked the American people, and they wanted some answers. Wayne Glenn of Conoco, who was President of AIME in 1974, was a tireless advocate for the petroleum industry and was a great model for me to follow as I also got involved in speaking out with facts about our energy situation. I like to think that speaking out for our industry ultimately helped to get us where we are today. We are a much less regulated industry than in 1974, and as a nation, we are much more aware of both the domestic and worldwide energy situation. We likewise are aware that energy conservation always must be part of the solution, as well as development of alternative energy sources.

Finally, I was privileged to be in the executive structure of SPE during the formative years of the SPE Foundation. The foundation has matured and taken on excellent programs and projects over the years. I believe the foundation has benefited greatly from the support of past SPE Presidents as well as that of the ongoing SPE Boards and elected leadership.

In closing, I would be remiss if I did not mention the evolution of SPE into a truly international organization. In 1974, SPE was primarily an American organization with a group of overseas local sections. The years since then, thanks to excellent dedication and leadership, have helped SPE grow into a truly global organization. Hurrah!

The final act I performed as SPE President was the inauguration of my successor and great friend, Ed Runyan. During the dinner and ceremony, Dave Riley slipped me a note stating that SPE membership growth in 1974 exceeded growth in all prior years. It would not have been appropriate for me to take credit for that, but it sure seemed the perfect ending to a very enjoyable year.

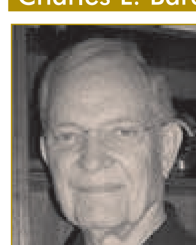
Edward E. Runyan, 1975

One of the major issues considered by SPE in 1975 was addressing the need to become an international organization. As archaic as it may seem now, in 1975 there was a great deal of opposition to actively entering the international arena. Eighty-two percent of our members lived in the US, and many of them felt that they should keep the technology and, therefore, their jobs in the US. Fortunately, SPE, as it usually does, arrived at the right answer and continued to expand internationally. It is great source of pride to see SPE where it is today.

Another major subject of debate was SPE governance. In 1975, SPE was a wholly owned subsidiary of AIME. SPE did not even file a tax return because it had no legal standing. Because all SPE actions were subject to approval by the AIME Board, conflicts did exist, particularly regarding international expansion. One of the outgrowths of this structure was the formation of the SPE Foundation, which was and is a free-standing corporation governed by former SPE Presidents and was therefore outside AIME jurisdiction. It took another 9 years before separate incorporation was allowed by AIME and SPE International was formed.

One of the personal highlights of my year was a trip Dave Riley, then SPE Executive Director, and I made around the world visiting SPE sections and laying the groundwork for new ones. The first local section in East Asia, the Japan Section, was chartered on this trip in April 1975. Although commonplace today, I think that perhaps Dave and I made the first trip completely around the world for SPE.

Charles L. Bare, 1979



The most significant event during the early part of 1979 was the sudden death on 14 March of David Riley, who had been Executive Director of SPE since 1968. He was only 48 years old, and his loss was felt by all those active in SPE. We were extremely fortunate that Dan Adamson was already on staff and could immediately take on this role, which he held for more than 2 decades.

Energy sufficiency has been a crucial topic for as long as the petroleum industry has existed. In 1979, a particular focus on reserves was initiated with a more serious technical basis. The US Securities and Exchange Commission (SEC) began to expect a better presentation of reserves volumes in stockholder reporting. The result was a dedication of engineering talent to the economic basis as well as the physical determination of stated reserves volumes. Industry committees were formed at the request of SEC for more-formal reserves category definitions as well as a more consistent basis for physical determination of the reserves values within each category. SPE was active in advising SEC concerning the talent and resources required to meet these goals.

This year was also a watershed for the increased international focus of the society. During my trip through the East Asia sections, the society received a request from the Chinese Petroleum Society to visit Beijing to further cooperation between our organizations. On 13 April, I flew to Beijing with Doug Ducate to discuss this topic with the Chinese. Their request was for the society to supply technical seminars for Chinese engineers on a broad range of technical topics. I discussed with them the need to hold an exhibition of industry technology and services in conjunction with the technical seminars. After 2 days of stressing this dual approach, we were introduced to the government entity responsible for conducting exhibits. Doug and I toured the Soviet-built exhibition center with a current exhibit of industrial goods. After an additional day of discussions, the government agreed to a format including an exhibition accompanied by technical presentations. I was very pleased to attend this joint meeting, which was held 17–24 March 1982. It was by all measures a success, with 1,000 overseas visitors and an estimated 150,000 Chinese in attendance.

While it was not an experience associated with my presidential term, I must speak to another topic related to our international focus. While I was working in Conoco's London office, I became aware of the very successful and beneficial Offshore Europe exhibition and conference held biennially in Aberdeen. This event was founded and sponsored by Spearhead Exhibitions. I was able to lead negotiations on behalf of the society to purchase a half interest in this event. This purchase was concluded in 1990. Offshore Europe continues to be a very important means of providing technology and industry updates to a large segment of our membership and the industry. The opportunities that were afforded to me by SPE to interact with fellow professionals within the petroleum industry more than compensated for the energy and time I invested.

Marvin L. Katz, 1980

Both the industry and SPE were in a period of rapid transition during the 3 years I served in the presidential rotation and traveled. Our Executive Director, Dave Riley, died suddenly the day before he was due to leave with my wife, Suzanne, and me on our first international trip. The society was working actively on organizing itself as a truly international organization—this was still controversial, as many in SPE and on the Board of AIME favored keeping SPE primarily a US organization. There were many people, especially in my own local section in Dallas, who wanted SPE to play a more active role in promoting a strong US national energy policy. Those of us who favored a truly international outlook felt that participation in US politics would be a serious mistake and that we should concentrate on technical-information dissemination and professional affairs and leave politics and national policies to trade groups. I remember being amused and a bit dismayed to find that, after fighting to recognize SPE as a separate organization from AIME, at one of my first stops, in Dhahran, the meeting at which I was scheduled to speak was advertised as an "AIME Meeting" rather than as an "SPE Meeting." And it was! There was very little participation by Saudi engineers. We have come a long way since then.

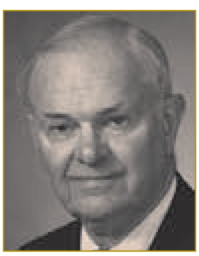
Those of us who favored a truly international outlook felt that participation in US politics would be a serious mistake and that we should concentrate on technical-information dissemination and professional affairs and leave politics and national policies to trade groups.

Since much of my career had been in the "ivory tower" of research, I found the opportunity to visit sections around the world extremely rewarding as I learned more about large operations and the many differences between domestic and international technological concerns. I fear I bored many people to death with my early talks—the intricacies of enhanced-oil-recovery technology were of little interest in most international sections. But people were kind, and we had many wonderful experiences and opportunities to meet new friends.

In the industry, the turmoil in the Middle East was beginning to rapidly escalate. I remember standing on a platform in the Arabian Gulf in 1979 and having one of the engineers point to a flare that could be seen on the Iranian side of the Gulf. The Iranian revolution and its implications were on everyone's mind. Other areas of the world were just beginning to open up. In 1980, Dan and Diane Adamson and Suzanne and I were invited to China to discuss relationships between SPE and China and an international SPE meeting to be held in Beijing. We arrived at a large new airport that was almost empty, and were relieved to find people out in front who had been sent to meet us. We stayed in the "Friendship House," a government facility, as there were no commercial hotels. Most people wore Mao jackets, and the streets were full of bicycles and tractors, but there were very few cars. Diane made a special impact as she wore her open-toed shoes on the streets of Beijing. People would stop and stare at her feet, as they had never seen such shoes! I remember being impressed with how much things had changed in the relatively short period before attending the March 1982 SPE conference in Beijing. From what I see and read, the rate of change has not slowed much since.

It is truly gratifying to see how international in scope SPE has become. I hope the role we played back then contributed in some way to guiding the society in this direction.

Arlen L. Edgar, 1981



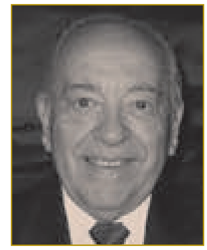
After taking office as SPE President at the 1980 SPE ATCE in Dallas, one of my first duties (and an unexpected one) involved a trip to Washington, DC. Michel Halbouty, who headed the transition team of US President-elect Ronald Reagan, called a meeting of the Presidents of SPE and the American Association of Petroleum Geologists (AAPG) to discuss US petroleum availability in case of an emergency. Topics discussed included the Strategic Petroleum Reserve and US producing capacity. The discussions led to mobilization of members and staff of SPE and AAPG to conduct a survey of US oil-producing capacity (there actually was some excess at the time). The study was completed and presented by Halbouty to Congress.

The year was a significant one for the society in many respects. It marked the halfway point in the 10-year SPE Long Range Plan adopted in 1976; a review showed that substantial implementation had been accomplished, primarily in the area of internationalization. And in February, the SPE Board endorsed plans for a new headquarters building to be built in Richardson, Texas, by the SPE Foundation. Additional office space was critically needed to accommodate expanded activities and staff.

On a visit to sections in the Asia Pacific region, I had the honor of presenting a charter to the new Malaysia Section, the 76th in the society. On this same trip, meetings were held in Beijing with representatives of the China Society of Petroleum Engineers. Plans were made for the first International Petroleum Technical Symposium and Exhibition to be held in Beijing the following year. A highlight of the 1981 Hydrocarbon Energy and Economics Symposium in Dallas was the keynote address by former US President Gerald Ford. The presence of Secret Service agents added a unique flair to the event.

My presidential term ended at the 1981 ATCE in San Antonio, Texas. Attendance set a new record at 11,400, compared with 9,390 in 1980. The 340 exhibitors also represented a new record. My tenure also saw crude-oil prices reach record levels. While I would like to claim credit for this achievement, honesty (and ethics) prevent my doing so.

W. Clyde Barton Jr., 1982



When I became President of SPE for 1982, the industry was enjoying significant growth. SPE was enjoying growth as well, with membership rising in the US as well as internationally. The SPE leadership had recognized the rapidly growing importance of internationalization and took the initiative to push SPE to the forefront as the premier technical society for the worldwide petroleum industry. Total membership essentially had doubled in the past decade to more than 42,000, while technical meetings increased both in number and participation. Local sections had increased to 78, including 20 sections outside the US.

One of the highlights of my term was the first SPE oil and gas conference in Beijing in March 1982. Thanks to the efforts of my predecessors, the SPE staff, and the Chinese Petroleum Society, the planning and arrangements for this meeting were excellent. The meeting was highly successful and played a major role in opening China to the technical community and to equipment suppliers outside China. I had visited China on business for my employer in 1978, and the positive changes I saw in a little more than 3 years were but a modest indicator of China's future growth.

SPE exists to provide a technical platform for engineers to exchange ideas and grow professionally. This mission requires open and free communications within the technical community. As the society grew, we found that communication between the leadership and local sections was becoming a serious problem. Keep in mind that we did not have an Internet with its nearly instant worldwide connections. We made a serious effort to improve the dialog at all levels of the society through more publications, meetings, and leadership visits with local sections. Travel by volunteer members can be burdensome, and this effort was difficult, but rewarding. SPE has benefited over the years by the continuing corporate support of industry management, which recognized the bottom-line value of SPE.

As president, I was asked my view of petroleum engineers of the future. I responded that they would not be much different in the future than in 1982—they would have the same curious mind, the same dedication, and the same creative enthusiasm. They might be much better equipped to tackle their jobs, thanks to a tool box full of advanced technology supplied in a large part by the successes and failures of their predecessors, but they would need better tools because the job is getting tougher. I think that view was correct and still holds true today.

I have long been an advocate of freedom and the free market. The underlying strength of SPE is its dedication to the voluntary exchange of technical ideas and information. Such exchange can best be done in an atmosphere of freedom in which goods and services are also free to cross borders. It was said long ago that if trade does not cross borders, guns likely will. My wish is that freedom can become a reality for all people.

T. Don Stacy, 1983

Few significant events are conceived and accomplished during the single term of any SPE President. Most overlap two, sometimes three, terms and are the results of efforts from several people. During 1983, a significant event was the groundbreaking for the new SPE headquarters building in Richardson, Texas. As significant as this event was, it was overshadowed by an even more significant one—the completion of the evolution of SPE from a constituent society of AIME to a worldwide body of professional engineers, independent of any other engineering organization. This maturation of the society led to the decision to move the headquarters to Richardson, and the groundbreaking ceremony was held on Valentine's Day in 1983.

Companion actions to the above were the formation of the SPE Foundation and the first SPE endowment fund to own and finance the headquarters building. Living presidents can claim their own due in these matters but I want to recognize the efforts of M. Scott Kraemer, who was SPE President in 1972 and who was a significant force in accomplishing all of these matters.

Also in 1983, SPE proposed a change in its bylaws to create a new standing committee on microcomputers to "find ways to apply 'personal' computers to solve petroleum engineering problems." That ripple now has become a tsunami, and we did not even dream of the Blackberry.

James R. Jorden, 1984

I was inducted as SPE President in October 1983 at the ATCE held in San Francisco. In an interview published in *JPT* at that time, I said, in response to a question about the oil industry's economic recovery, "Most forecasters are predicting a slow growth for the next few years." Little did we know of the impending oil-price crash that would occur in less than 3 years.

Rather than focus on just the events of 1984, I choose to highlight the significant activities of 1983, 1984, and 1985—my 3 years in the presidential rotation. Each administration builds on the work of its predecessors and passes on to its successors some achievements. It is a continuum of progress. In my view, the most significant events during these 3 years of SPE history were

• The opening of the new SPE headquarters in Richardson. This move enabled SPE to use money, which would otherwise be spent with third parties for rent, for member services.

• The separate incorporation, in November 1984, of SPE as a totally autonomous, independent organization.

• The beginning of the national councils within the SPE governance scheme. This idea was first sketched on a cocktail napkin by Dan Adamson and me in 1984 while some 30,000 ft in the air between Melbourne and Perth, Australia. National councils have now morphed into regional councils, which enhance communication among sections in their geographic area. However, at the time, national councils served a valuable purpose to assure non-US members and sections that SPE was sincere about the internationalization of the society.

• The presentations, in 1984, of five new awards—the Drilling Engineering Award, Production Engineering Award, Reservoir Engineering Award, Public Service Award, and Young Member Outstanding Service Award.

I completed my presidential year in October 1984 at the ATCE in Houston, where the headquarters hotel was the Shamrock Hilton, now torn down. My most enduring memory of these 3 years—indeed of my entire involvement with SPE—has been the respect and friendship I have gained working with the competent and committed people, both members and staff, who work to enhance the petroleum engineering profession.

Dennis E. Gregg, 1986

I became President in September 1985 in Las Vegas, Nevada. I do not know if that choice of a site for the ATCE was symptomatic of the heady years the industry had been enjoying with oil prices climbing to USD 40/bbl and rig counts over 4,000 or was prophetic of the many tough years ahead after the price plummeted to USD 10/bbl. At any rate, the board had to deal with falling revenue and, thanks to the reserve fund, did not have to hit the panic switch and cut programs drastically.

Recommendations from the first report by the Task Force on Reserves Definitions, appointed the year before, were tabled for further review, but the work by that task force has been the foundation for reserves-definition efforts by SPE and other organizations that are still continuing.

A highlight of every SPE President's term is visits to the sections. I was most impressed by the diversity of engineering challenges on the one hand, and by the consistent dedication to solving them on the other. One tour took me to sections in West Virginia and Kentucky; another to the Middle East. My talk was about project management, and the example was a near-billion-dollar project in the North Sea. I could not wait to see the jaws drop in the Appalachian sections when I showed the movie of the big jacket sliding off the barge and the derrick barge lifting the huge modules onto the deck. And I fully expected to have people lined up for job applications. Well, they seemed to appreciate the talk, but they had problems and opportunities of their own—such as new water-disposal regulations that could cause one operator to shut in hundreds of wells and lose significant production. In Saudi Arabia at that time, there were no wells on artificial lift, and wells from their biggest (the world's biggest!) offshore field were shut in if they produced any appreciable amount of water.

Noel D. Rietman, 1987

The biggest event in my term really started in 1986 and continued through 1988. SPE had successfully weathered the jump in oil prices of the 1970s followed by the significant downturn of 1982, but the free fall in prices in 1986 was new and stunning to all of us. We did not know what it would do to our membership, our income, our reserve fund, and our member programs. In typical SPE fashion, we formed an ad hoc committee to look at the problem and tried to project likely outcomes. Despite the many jokes about committees, this one performed like most SPE committees do. It provided us with excellent guidelines to cut costs while minimizing the reduction of member services and the impact on the reserve fund. Even today I marvel at the effectiveness of SPE committees, both ad hoc and standing.

Since 1987, we have seen several other significant price changes, both up and down. It seems ironic that during and before the 1960s, we were not that good at projecting future performance of reservoirs but we certainly thought we knew what future prices were going to be. Although we have continuously developed better skills and tools for predicting performance, today's price uncertainties have made future income still difficult to predict.

R. Lyn Arscott, 1988

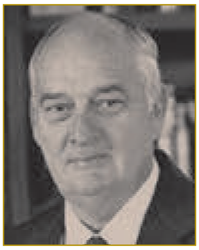
I became SPE President after 3 years serving as Treasurer. The price of oil had crashed in 1986, and SPE spent many years adjusting to the new economic reality. We were fortunate to have established a reserve fund in the early 1980s, but because of a significant reduction in advertising revenue and a drop in meeting attendance, we had to reduce SPE staff by 10%, reduce operating expenses by USD 1.5 million per year, and raise membership dues from USD 30 to 40 to balance our accounts. OTC attendance went from 56,000 in 1985 to 25,000 in 1987. Enrollment in petroleum engineering schools dropped from 10,000 in 1982 to 1,600 in 1988.

An amazing coincidence occurred in 1988–89 when the presidents of SPE, AAPG, the Society of Exploration Geophysicists, and the Society of Petrophysicists and Well Log Analysts all were Chevron employees, so it was a great opportunity to build our relationships and look for synergies in programs. We started meeting regularly, and I am pleased that this communication effort has continued up to the present. That year was also the start of the monthly president's column in *JPT.*

The 1980s were a period of massive change in how oil and gas companies managed their businesses because of an avalanche of environmental regulations. SPE played its part in collecting and disseminating information by organizing a health, safety, and environment (HSE) committee in 1989, and we began planning international conferences in HSE. In 2008, we will hold the eighth SPE International Conference on HSE in France.

My most pleasant memories were the family vacations we tacked on to the end of the summer board meeting, which were often held in the Colorado Rockies, and the impressive hospitality I received when visiting sections in Europe, North America, Africa, and Asia.

Orville D. Gaither, 1990



SPE had been talking the talk of an international body, but there was little walking the walk. As an executive involved in the international oil business, it made perfect sense to carry the walk to as many sections as possible. My tenure as president was characterized by travel, travel, and more travel—more than 250,000 miles in commercial and private aircraft.

I addressed a huge number of international sections and opened the first SPE Asia Pacific Conference in Australia. Not wishing to slight our domestic base, I attended the Appalachian Regional Conference and spoke at section meetings from Mississippi to Montana. Amoco was simply wonderful and assigned one of its smaller jets to get me to sections that were off the beaten path for domestic airlines. My monthly column was titled "Enroute" simply because I wrote these columns on planes going to or coming from SPE functions. I suspect that I will always hold one record—that of addressing the Cairo Egypt Section three times during my tenure as President.

On the international front, we were opening sections almost weekly. I recognized that SPE needed to elect an international engineer as president and also that women were becoming more of a factor in engineering and other Earth science professions. I am pleased to say that this groundwork was laid to accomplish both objectives. The individuals selected were truly outstanding.

During 1990, not everything went well. I vividly remember seeing my eldest son in the audience at my first speech, which was in New Orleans. He was wrapped in bandages from burns suffered in a compressor fire. I could not help remembering my admonishment to him that the field of petroleum engineering would extend well beyond my life and probably his too. Two of my sons followed that advice, but unfortunately both suffered burns in compressor fires in the field within a year of each other.

The first thing that I recall from that year is the very tiny baby steps that we took toward abstracting SPE papers of the past to allow SPE to better serve its entire spectrum, domestic and international members alike. It was a small but vital beginning. To sum the year up in a single word, I would have to say, "Enroute."

Arlie M. Skov, 1991

The year 1991 was an extraordinarily exciting time to be SPE President. The society was in the midst of a greatly accelerated international presence. The London office was opened in 1991 and the Kuala Lumpur office 4 years later, both landmark events. During the 8-year period from 1989 to 1996, SPE added 42 sections outside the US.

The first SPE section in China was formed in 1991 and the first in Russia a year later. I had the good fortune to visit both Beijing and Moscow as these two sections were formed, and to personally see the interest and eagerness of the new members. Today, those two important nations have a combined total of 12 SPE sections with more than 2,000 members!

Correlating with this greatly accelerated international growth of SPE, most of my memories as 1991 President are of international travel—to Europe, the Middle East, Africa, China, Australia, and South America. I visited a total of 33 sections outside the US as well as 22 within it, and I was perhaps the first SPE President to visit that high a proportion of non-US sections. It was a wonderful experience for me, and I am delighted that SPE continues its international growth.

Roger L. Abel, 1992

"Change"—not the kind that jingles in the pockets after a night out with friends, but the kind generated from creative tension of the times. That single word would describe the exciting time I served as SPE President. I wrote about it monthly in a *JPT* column titled "Lagniappe" and could not keep up with it. The society was changing during that time and, for the most part, the changes were good. Here are just a few things that were done during my tenure.

We held the First International Conference on HSE in The Hague, organized jointly with the Dutch Royal Institute of Engineers. This was not without controversy, as one might imagine. A technical society made up to a great extent of engineers of major companies providing a forum for environmental activists was regarded by some with skepticism. But a number of majors saw the benefits of finally engaging the environmental community on a technical basis rather than an emotional one, and provided the support to make it a success. And that event was followed up by a number of companies publicly taking a more active role in environmental care. Offshore Europe also continued to grow, and SPE successfully concluded negotiations for the acquisition of SPE Europe's holdings in this profitable venture.

The world was changing rapidly, and SPE saw the need to change its way of doing business also or become less relevant. We recognized the need to step in and become the training vehicle for the independents as the demographics of the industry shifted. We recognized the need to modify the membership of the board to provide more representation of technical interests. We recognized the need for more international offices for member support. And we recognized the need to join the electronic information age, establishing a group to investigate the cost of changing SPE from a paper organization to an electronic-data organization.

SPE was becoming more and more international in membership and conferences. Consistent with this, we voted to add the word "International" to the SPE name and to modify the logo. It now sounds like a small thing, but it was not then. And with the opening of the former Soviet Union, I was privileged to be the president who presented the charters to the organizational meetings of the first two SPE sections in Russia, Tver and Moscow. My head still hurts from the toasts with my many Russian friends after the lunches.

It was a memorable year, and I was able to travel and meet some great members and make some lifelong friends. But nothing is more memorable or makes me prouder than to be the president who, in leaving, handed the gavel to the first non-US president, Jacques Bosio.

Jacques Bosio, 1993

Just a few anecdotal words on what has now become history: Back in 1985, when we founded the French Section, the SPE world was divided into 14 regions. Eleven of those regions were in the US, one in South America, one for Europe and Africa, and one for the Middle East, Asia, and Australia. The USSR was totally ignored!

SPE was perceived as a US professional society. Not very many members of the successive SPE Boards had realized that geology has no borders and that the center of gravity of the oil business was not in Texas anymore but traveling east, drawn by the North Sea and especially the Middle East. But some were visionaries. Under the impulse of Orville Gaither and a few others (not very many, let us face it!), the decision was made, for the future good of the society, to really go international and to make it known.

Why not elect a non-US President, a foreigner? And a real one, not a Brit who speaks about the same language and could be perceived as not really being a foreigner. Let us take the worst kind, said someone on the Nominating Committee!

And this is how I entered my second family, with my dad in SPE, Dan Adamson, and a dedicated and efficient staff, and an amazing group of colleagues at the board of directors.

Let us talk about the Board a little. You find there some of the best professionals in the world, sometimes not easy to manage, but look at the results: In 2 decades, SPE has managed to become the number one professional society in our industry, with 70,000 members.

E.A. Breitenbach, 1994

The title of the 1994 ATCE, "The Energy of Change," was as appropriate as the title of my monthly column, "Winds of Change." Political changes in the world made immature basins such as those found in the former Soviet Union, China, several countries along the Pacific Rim, and many countries in South America become available for exploration for the first time in decades. This exploration was primarily funded by the sale of assets in mature basins, such as those in most of North America. The result was a permanent dislocation of many facets of our industry, and the "downsizing" and "rightsizing" to reflect these changes. Exciting growth was occurring in the immature basins, while careers were impacted and jobs lost in mature areas. And the SPE membership and member needs were changing equally fast.

I had four primary goals. First, to review the SPE financial system so that we could more accurately investigate costs and income and return to profitability. This was accomplished. Second, to define the new SPE worldwide organization that would reflect the changes that were occurring and get it in place. The short-term organization was approved and put in place, and the long-term organization was being defined at the close of the year. Third, to adopt a policy and proceed with intersociety relations. A policy was defined and adopted that allowed SPE, for the first time, to make clear its role within our industry and to proceed with discussions with several professional societies in various parts of the world. The last goal was to begin to solve the question of how to provide our technology to the new generation of "competent generalists." This effort was begun with changes to *JPT* and formation of a new task force to field test ideas.

Though I get to write this summary of substantial progress, it was the major efforts by the Board members and staff that made it happen. We had many heated arguments, as one would expect in such times of major change. However, these arguments were always about how to provide our members with better services within our budget. My role during this challenging period was to be the designated SPE cheerleader leading the pursuit of our vision. It was an honor to serve.

Roy H. Koerner, 1995

"It was the best of times, it was the worst of times," in the words of Charles Dickens. And that aptly described the restless years of the mid-1990s for us. Recall that in the decade just before, the industry had suffered a roller coaster ride. It began with a period of spiking crude prices subsequent to the Iranian revolution, and there was talk of eventual USD 100/bbl crude. That was followed by a severe downturn in the 1980s, and corporations began a series of reorganizations and the elimination of layers of many middle and upper managers. Thus, companies purged the ranks of experienced leaders, primarily in North America. As a result, many of those whom SPE had drawn on for board and officer positions were replaced by young, bright, and "upwardly mobile" professionals. Interestingly, companies from outside North America continued to furnish a cadre of experienced management for SPE positions. Change was in the air and was needed for SPE, as well.

Just before my watch but while I was on the Executive Committee, there were some power struggles and resignations, but in the midst of this disquieting activity, some exciting concepts emerged. One of these concepts surfaced as a passionate desire to serve the membership and to find out what they really needed and wanted from SPE. Another was the realization that SPE was truly becoming an international society, and what, in a practical sense, did that demand in terms of change? Also, it was recognized that the SPE staff needed restructuring, that the society needed to be broader geographically, and SPE needed to improve the use of information technology to meet the ever-increasing global membership requirements.

This "reinvention" of SPE, while retaining the bedrock foundation of our basic mission, led not only to restructuring the staff but the board as well. Studies were conducted, consultants were hired, action steps were hotly debated, and decisions made. Today, the SPE Board and staff stand on the foundation of those decisions, some made more than a decade ago. The organization has been greatly improved since then, such that all who were involved, then and now, can take great pride in the results. While many professional engineering societies still struggle, SPE is growing and prospering and, I dare say, is the finest of its kind.

Peter D. Gaffney, 1996

Petroleum engineers are often in the business of assessing past production and forecasting future performance and we are always looking to history-match the past to help define the future. So permit me to tweak a few recollections in my history match.

In late 1995–96, there were concerns about oil oversupply and price. The latter reached the mid-USD 20/bbl, at least for a while, which were heady numbers indeed to those of us who had experienced the previous 10 years. The opening up of substantial exciting onshore acreage and other opportunities also was part of the mid-1990s tapestry. The former Soviet Union, significant parts of Latin America, and much of the rest of the world opened up to investment opportunities previously closed. The international recognition of gas was then getting into full swing, beginning what has been a major 10-year growth story that continues.

The market then, as now, was to a large extent driven by investments analysts, and this led to an extreme focus on costs and head counts. Large companies cut substantial professional staff numbers, particularly in exploration. Professionals who would indeed have been the leaders and, even more importantly, the mentors of today were lost during this era. Short-term-ism and perception—rather than the reality of price, costs, and production—were driving the industry then, much as it does today. Overspecialization in our business made it difficult for some of our members to retain jobs, as the market was interested in the "competent generalist," a demand even more evident today.

Perhaps one of the biggest changes of the era as a result of the push on costs was the reduction in upstream R&D by the major companies, which has led to nearly all new technology being made available from the service and manufacturing sector. This has made it much easier for national oil companies and small- and medium-sized companies to compete with the larger concerns. Interestingly, SPE already was well geared to take advantage of the changing international dynamics, and its network of services and professionals has benefited the new environment significantly.

T. Scott Hickman, 1997

Throughout the 1990s, the challenge to SPE was to realign its programs and priorities to the reality of an industry still consolidating in the aftermath of the mid-1980s' price collapse. More than 400,000 jobs had been eliminated, including those of thousands of engineers and geoscientists. The workplace atmosphere was characterized by job insecurity, lack of company loyalty, and fewer employees expected to do more, leaving less time for professional activities. The situation was compounded by the reduction in company-sponsored training and mentoring opportunities, placing the individual professional in charge of his own career development. This had tremendous implications for SPE, where providing career-enhancement programs always had been the stepsister to technology dissemination in its mission.

Ironically, while oil companies were exiting mature basins, they were rapidly expanding into frontier areas and to exotic reservoirs that required ever-more advanced technology. The pressure to collect and disseminate an expanding volume of technology worldwide strained SPE resources and procedures. Fortunately, foresighted individuals among my predecessors had engaged in a series of strategic planning sessions so the board was well along in identifying, prioritizing, and investigating the main issues that arose from a changing industry. In broad terms, the issues for SPE were how to (1) increase diversity in geography, language, culture, and economic means; (2) ensure more effective and representative governance; (3) increase career-enhancing opportunities; (4) provide full services to members around the world; (5) use advances in information technology to improve communications, meetings, and technology collection and dissemination; and (6) make SPE's case to a new generation of management.

The governance of the society is an ongoing process, and any accomplishment is the result of a collaborative effort by successive Boards of Directors, committees, and task forces over a 3- to 10-year period. Recent programs involving young professionals and global certification had roots in the mid-1990s. During 1997, the SPE/World Petroleum Council Reserves Definitions were approved by the Board, Technical Interest Groups were initiated, and a meeting policy was approved. Task forces were appointed to study short- and long-term governance issues, minimal professional competency, and the society's revenue and expense trends. The real accomplishment of the directors and officers was their willingness to break with tradition and face up to the reality of what it means to be a truly global organization. This was demonstrated by the enthusiastic manner in which the first person from outside the North America/Western Europe sphere was nominated and approved as the official presidential candidate at the October 1997 board meeting after the original candidate suddenly resigned for health reasons. In the last decade, the officers, directors, committee chairs, and technical editors have become increasingly more representative of the membership. I am proud to be a 50-year SPE member and honored to have served as president.

DeAnn Craig, 1998

During my presidential rotation, I would describe the society as being "in transition." Most of our membership was from the US but it was obvious that the most growth, both in members and oil and gas production, would be outside of the US, a significant change from the past. Making the change was neither easy nor quick. There were quite a few members who were resistant to the change. I was fortunate to have had so many wonderful presidents before and after me and to have had the support of such a great executive director and staff that could see SPE's future was international.

SPE would not be what it is today without the Internet and the computer and associated systems. The Internet enabled the society to communicate globally. One of our big challenges was to get *JPT* into the hands of our non-US membership in a timely and cost-effective manner. SPE finances during my tenure were not as healthy as they are today. Oil prices were low, and layoffs and reorganizations were common. SPE had a series of excellent treasurers who worked very hard to get control of the finances and to put in place systems that provided a detailed understanding of the revenues and costs.

For me, being President of SPE was one of my great, life-changing experiences. The opportunity to visit so many of our members and our sections across the globe made me realize that my education was lacking. My engineering training had focused on the technical; my MBA education had focused on the financial. But in the future, it was going to be the political that was important. So many people in so many countries see oil and gas production as the means to economic growth and a better way of life. For this reason, I temporarily left the industry and returned to the university to earn an interdisciplinary PhD degree focusing on the political aspects of oil and gas production.

Gustavo J. Inciarte, 1999

When I became president, I was locked up in the New Orleans Hilton because of the potential hurricane that eventually missed the city, so I did not have the usual handover ceremony. I always looked at the SPE Presidency as a continuum, from serving on the board through being past-president in my final year with the SPE Board. So it is not very easy, nor even ethical, to claim any particular responsibility for anything that happened or materialized during my term on the Executive Committee.

During those days, I think SPE finally began looking at its cultural diversity more as an asset rather than as a challenge. Being only the second non-Anglo Saxon president elected, I dare say, contributed to breaking the strong cellophane wrapped around this US-based society, thus letting it begin to bear the fruits we are now experiencing. The efforts undertaken to improve the age distribution and to create new international sections have very notably been improved, and the society continues growing to levels previously unimagined.

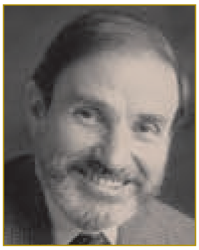
We dealt with many issues during this time, including reserves definitions, meeting policy, membership fees, adopting computerized systems before spe.org really took off, and SPE governance at both the regional and board level. Another significant item was SPE's contact with the other professional societies, such as AAPG, SEG, and some European societies. Some of those contacts initially were difficult, at least for me, but have begun to benefit all concerned. We are now integrating some of our professional activities in line with the industry's multidisciplinary approach, even as each society maintains its own personality. Another area where we planted some seeds was in R&D. Although SPE had been a technical professional society that contributed to technology development and its storage/dissemination, it never really dedicated to R&D the effort that it deserved and required, but that has changed. This has materialized in a full-fledged R&D Advisory Committee and the first SPE R&D Conference last April. All of these efforts will continue to improve our society's future in line with our most challenging expectations.

John A. Colligan, 2000

The oil price had been USD 24/bbl, but when I was asked to be SPE President, it was USD 15/bbl and heading south, and early in my time as President-elect, it went below USD 10/bbl. Not the most auspicious time to start on the job. I had been asked by 1998 President DeAnn Craig to coordinate the preparation of the 2000 SPE Long-Range Plan, and I put together a team, each member of which spearheaded one aspect of SPE's future. As we progressed on this, it became obvious that one of the most significant challenges for the future was how to position SPE in an electronic world. Kate Baker coordinated this aspect, and the result was the initiative, described as "a major and costly program," that eventually led to today's spe.org. At the same time, we had a Long Term Governance Task Force whose conclusions led to creation of the position of Technical Director, adding another dimension to SPE's governance. It was also envisaged that there could be greater intersociety collaboration and that ATCE could be planned outside the US, both of which have been realized. Another initiative resulted in a tiered dues structure, now well developed. A Member Needs Survey was carried out to ensure that SPE was developing in ways that reflected both existing and potential members' wishes.

The most lasting memory of my presidency was the visits to sections, and their enormous diversity. Initially, with declining oil prices, questions often were asked about whether the future was at all bright, and I remember trying to give a longer view in Victoria, Texas—now, alas, no longer a separate section—and at other US sections, where members were really struggling. Layoffs and cost cutting were major concerns, as was the lack of young people joining our industry and SPE. But as the economic climate improved, the mood changed, with, notably, many highly motivated young members appearing, often in countries with little traditional SPE membership. In Egypt, the former oil minister attended the meeting at which I spoke, and the section was getting its own permanent office to support members. In North India there was a unique ceremonial reception, with an attendance of more than 500 at the meeting. The Croatian Section championed Dubrovnik as a location for Applied Technology Workshops, and attending the vibrant annual SPE conference organized by the Nigerian sections was quite an experience. Many other section visits, all fascinating, underlined both the diversity of SPE activities over a truly international scope and the potential for the future. It is gratifying to see how SPE has responded to the opportunities with many new initiatives leading to its current strength.

Bruce E. Bernard, 2001



The title of my *JPT* articles was "Journey," which reflected my own career experiences as well as my day-to-day travels as SPE President.

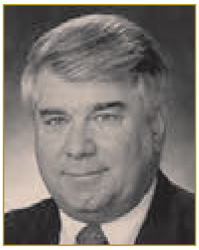
Cherished memories from my SPE journey include the remarkable young professionals and students I encountered, like the group in Ecuador who traveled by bus overnight to attend an SPE section meeting in Quito, or a similar group in Trondheim, Norway, or Trinidad, where we often talked for hours late into the evening. I also recall fondly the many amazingly talented professionals to whom I had the honor to present SPE awards around the world, and I distinctly remember each person and how they were deeply moved just by the "simple" act of genuine peer recognition.

The big issues of the day included the electronic SPE, the integration of our previously siloed specialties, SPE's reaction to that by adding Specialty Directors (now called Technical Directors), and the overall struggle to find the hearts and minds of everyone jolted by restructuring across our industry. I had the good fortune to work with very proactive and open-minded colleagues on the Board.

What an amazing organization of people our SPE is! Members are the engines of SPE, volunteering valuable time and talent, sharing knowledge and experience, and being on both the giving and receiving ends at different times on our journey. It was clear to me as SPE President that SPE staff differentiate SPE from any other such organization; they were always there and ready to go the extra mile. I am confident that all who follow in the years ahead will find the same enjoyment and untold benefits from their personal journeys with SPE. I remain forever grateful for the opportunity and honor to have served as SPE President. Congratulations SPE!

The Past is History,
The Future is a mystery,
The Present is a Gift.

Stephen A. Holditch, 2002



My term as SPE President began on 4 October 2001, a beginning unlike most other SPE Presidents for two reasons. First, ATCE was in New Orleans, 3 weeks after the terrorist attacks of 11 September 2001. Attendance at ATCE was reduced by about 1,000 because our members found air travel difficult for a variety of reasons. Second, I was the first SPE President in a couple of decades who had to get the job done without the aid of Dan Adamson. He was missed, but the new Executive Director, Mark Rubin, was an able replacement and has done a terrific job for SPE.

For years, some of our board members had lobbied to open more SPE offices in areas such as the Middle East, but the board could never make the decision to open such an office. It could only debate the issue. To help make an informed decision on the subject, I appointed a board task force "to develop a strategy concerning opening new offices outside of the United States." As a result of the task force recommendations and additional investigation, SPE eventually opened the office in Dubai, reorganized itself to be a true international organization, and likely will open new offices in the future.

I also appointed two other board task forces during 2002 that led to positive results. One task force took a look at "learning initiatives" and how to better transmit technology to our members. Another task force revised the SPE meetings policy so we could better manage meetings and allocate costs properly. The results from these two task forces were positive and led to the continued development of more and better meetings. If one really evaluates SPE, its primary business is to plan and conduct meetings, a business that it does very well.

Andrew A. Young, 2003

SPE is about professional support and development, being inclusive not selective, involving participation and volunteerism. The new millennium brought in a major sea change in the operation of the society. From the formative years of SPE as primarily a North American society growing out of AIME, 50 years on, we can proudly say that we have a truly international and unique society, embracing all disciplines that contribute to the success and sustainability of our industry.

Personally, I am delighted with the enormous achievements of the Board of Directors from 2002 through 2004, including the major internationalization movement, the opening of an office in the Middle East (following the success of the office in Asia Pacific), the incorporation of the parent organization in The Netherlands, the opening of sections in major oil provinces previously not served by SPE, and the expansion of intersocietal, cooperative international conferences and exhibitions outside of the US. This is truly a Society of Professional Excellence.

Kate H. Baker, 2004

Each SPE President stands on the foundation laid by past presidents, boards, and section officers and the prior actions of individual members and SPE staff. Each comes with his or her particular enthusiasms and priorities to progress within the framework of the Long-Range Plan. All things are possible to those who can delegate, but organizations have only so much capacity. Thus, the plan provides important guidance and continuity, ensuring focus on the things that matter.

I served between two energetic presidents who had many ideas for building a truly international society and tapping the tremendous potential of young members. I defined my presidency as a bridge: supporting past initiatives while positioning SPE for the future by starting work on the fifth SPE Long-Range Plan. Regarding existing initiatives, I believe the four most important milestones achieved during the 2004 presidency through the efforts of many were

- Opening the SPE office in Dubai, and seeing extraordinary growth in Middle East and North African programs as a result
- Restructuring SPE to align its board and business structure with its worldwide operations
- Arriving at a place in which the geographical distribution of SPE's Editorial Review Committee and the numbers of papers submitted from members in each region mirrored the society's membership
- Building the value and capability of SPE to deliver services electronically thanks to the multimillion dollar generosity of corporate, individual, and section contributors to the "Tomorrow's SPE: Investing in spe.org" campaign.

When I started my term, we had completed, or were near to completing, all of the major milestones in the fourth Long-Range Plan. It was time to set ourselves new targets to ensure continued focus on the things that matter. Nearest and dearest to me are reserves and resource definitions and guidelines, and intersociety collaboration.

Collectively, we are now pursuing the grand themes and milestones laid out in the fifth plan. I delight in our progress on these big, difficult, and audacious goals. Yet I believe what binds us together is not just the collective ends we pursue, but also the attention of each member, in his or her own way, to the quadruple bottom line: technical excellence; economic rigor; social responsibility; and care for the safety of oil and gas operations, the health of our workforce, fence-line communities, and the natural environment. An SPE President has the great fortune to meet many, many members and to see firsthand how you go about this. It is amazing, uplifting. I thank you for your involvement, your interest, and your contributions to SPE and to your industry, past, present, and future.

Giovanni Paccaloni, 2005

At the beginning of my term, I stated clearly that my first goal was to ensure continuity with my predecessors by fully supporting their long-term objectives. In fact, SPE leaders' continuity in pursuing the society's mission is one of our strengths, once more demonstrated by this *JPT* initiative celebrating SPE's golden anniversary. In light of demographics showing an aging industry, the public image of our sector, and rapid global changes, I did add three "personal" objectives for my presidency:

- To launch a new set of activities designed for young professionals under the age of 35, including a new magazine totally devoted to them
- To motivate our student members to view SPE as a terrific opportunity to speed up their personal and professional growth, and to focus the attention of educators and industry leaders on the need to provide better, updated training to young members
- To expand SPE's presence in new, promising geographical areas characterized by accelerated business potential, including Russia, the Caspian Sea region, China, India, and other emerging areas

To maximize the chance of reaching these objectives, I started working on them when I was President-elect, and I received strong support from my predecessors, the global staff organization, and my company, Eni.

Visiting sections is one of the most important duties of the SPE President, so he or she can hear directly from members worldwide about their needs, suggestions, and degree of satisfaction. I visited as many sections and universities as possible, and the reward I received was huge. I remember that more than 20 universities that had never before been approached asked enthusiastically to form SPE student chapters. I want to acknowledge and again offer my thanks to the sponsors that significantly supported our students: Halliburton, Schlumberger, and BJ Services.

The young professionals (YP) program did take off, with an exponential growth of activities, including workshops, section groups, the YP Coordinating Committee, the Ambassador Lecturer Program, and the new magazine *The Way Ahead*. I am delighted to see that three young professionals who championed the program in its initial phase were recently nominated to serve as SPE Board members: Helen Chang, John Donachie, and Josh Etkind.

The penetration of SPE into Russia, China, Kazakhstan, and India has increased remarkably, with corresponding increases in membership, local interest in SPE activities, and new events, such as the first SPE Russian Oil and Gas Conference in Moscow.

Lastly, I have to mention the drastic modification to our dues structure that was carefully reviewed and approved by the board in 2005 as a consequence of comments from many members in various parts of the globe that our dues were unaffordable. The rapid decision of the board to implement a more equitable way to serve our members worldwide remains a milestone, proving that our society is truly and continuously committed to its mission, vision, and values.

My thanks to every member of the board; to Mark Rubin for his loyal, endless support; and to the numerous SPE staff members who, in close cooperation with our active members, ensure the success of this unique, excellent, and truly international organization. On the occasion of this 50th anniversary, my wish is that all of our many leaders (section and group chairpersons, university tutors and educators, committee heads, conference managers, board members, and presidents) add two more important ingredients to their invaluable dedication of time and talent: enthusiasm and a true passion for their jobs.

Eve Sprunt, 2006

This was the year in which the catchphrase "people are our most important asset" became very real for the petroleum industry. Sustained high petroleum prices spurred a surge in industry activity and, in turn, soaring demand for technical talent. The demographics of upstream technical professionals switched from being a subject of conversation to a critical priority for everyone from top management down.

Technical talent of all ages is benefiting. Companies desperately need the mature workforce that just a few years before was being encouraged to retire early. Experienced professionals are essential for implementation of development plans and to train the next generation. Technical professionals are now enjoying promotions, bonuses, and benefits that rival those given to management.

The new generation will not look like the old guard. Universities in the countries that previously fed industry ranks cannot satisfy the demand. Companies are scouring the world looking for technical talent and are getting very creative in overcoming barriers to accessing the people with critical skills. Companies are opening technical centers in India, which was not previously an oil-industry focus, and other countries. Several countries in the Arabian Gulf, including Bahrain and Kuwait, now have more women than men graduating with engineering degrees. Saudi Aramco is providing scholarships to women to study around the world. The gender and ethnic mix of the industry is changing rapidly. The oil patch will never be the same.

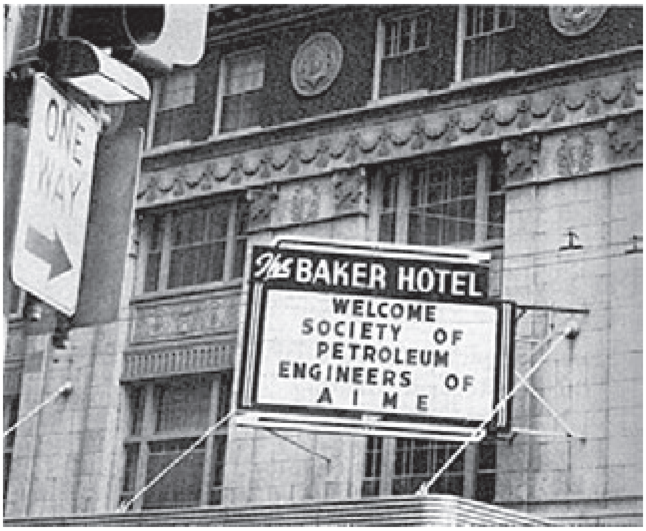
As SPE President, I focused on securing broader approval and implementation of SPE reserves and resources classifications so that we can better understand future energy supplies, and on talent and technology issues so that we have the personnel to bring those supplies to market. I initiated planning for workshops addressing career challenges facing the new generation, including one on better management and retention of dual-career couples, one on making the technical career ladder more attractive relative to the management ladder, and one in Bahrain for women in engineering, science, and technology. SPE will play a big role in shaping these new technical experts. **JPT**

1957–69: The Early Years

John Donnelly, *JPT* Editor

Before there was SPE, there was AIME. The Society of Petroleum Engineers had its origins in the American Institute of Mining Engineers, an organization created by a small band of Pennsylvania miners in 1871 to help promote and develop their trade. Petroleum was not part of the institute's original charter, but after the historic Spindletop oil gusher blew in at Beaumont, Texas, in January 1901, oil gained new significance. SPE's history then followed the trajectory of the oil and gas industry—it began as a small AIME committee in the industry's infancy, grew in stature as the science and technique of applying engineering principles to oil production took root, and blossomed after World War II when it became apparent that the world was going to run on oil.

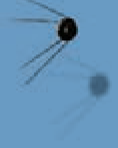
Captain Anthony Lucas, an Austrian native and the engineer behind the Spindletop discovery that ushered in the modern oil industry, was one of SPE's founders. Lucas was not your average saloon-and-boom-town wildcatter, but a pioneer petroleum engineer who studied and understood geology. Shortly after the Spindletop gusher, Lucas delivered a paper on the technical details of the discovery at an AIME gathering. He had used a relatively new technology, rotary drilling, to make his famous discovery. Three years later, Lucas would exemplify his understanding of the need for appropriate production methods and conservation, commenting that Spindletop's



Site of the 1957 Fall Meeting in Dallas, where SPE held its first Board of Directors meeting.

1957

- Petroleum Branch of AIME becomes full-fledged professional society, the Society of Petroleum Engineers of AIME.
- Introduction of density log enabling bulk density measurement using gamma rays (Schlumberger).
- Price of Arabian Light crude averages $1.90/bbl.
- Soviet Union launches Sputnik space satellite.
- European Economic Community established.



1958

- SPE Reprint Series begins with publication of *Well Logging*.
- Last year that water depth of wells drilled in US Gulf of Mexico equaled depth of wells producing (135 ft).
- First purpose-built pipelay vessel (Brown & Root).

- First commercial helicopter service in US Gulf of Mexico (PHI).

rapid decline came from being "punched too full of holes." He added: "The cow was milked too hard, and, moreover, she was not milked intelligently."

By 1913, oil had achieved enough prominence to deserve its own small committee in AIME, and Lucas became its first chairman. Petroleum engineering as a profession was growing, and some universities began teaching petroleum engineering courses. By 1922, the 11-member committee had evolved into the Petroleum Division of AIME, one of the institute's 10 professional divisions.

Other historic oilmen besides Lucas were instrumental in forming what eventually would become SPE, including Everette L. DeGolyer, often called the father of applied geophysics. In fact, pioneer petroleum geologist Wallace Pratt called DeGolyer—a founder of the American Association of Petroleum Geologists (AAPG)—the "true father" of the Petroleum Branch, which succeeded the Petroleum Division and eventually would become SPE.

"I think it is valid to declare that, but for De (DeGolyer), the Petroleum Branch would not have come into being when it did," Pratt wrote SPE Executive Secretary Joe B. Alford in 1957. "At the time the Petroleum Branch first began to take form, there was considerable opposition to it, among both geologists and engineers. Resentment and jealousy were rife. De lent his support and influence to the project of a Petroleum Division. Numbers of his friends opposed the new division. For one thing, they were hostile to AIME, and, for another, they planned to bring the petroleum engineers into AAPG. DeGolyer, with great energy and industry and no little courage, persisted in his efforts and finally put into execution the plans he himself had worked out for the new society."

The Growth of an Industry

Between 1922, when the Petroleum Division was born, and the early 1950s, global oil use, demand, and interest exploded. Oil was now one of the major industries in the world, and petroleum engineering had established itself as an important professional discipline, although some nonpetroleum engineers would view it with skepticism. Many industry events

Petroleum Branch Executive Secretary Joe Alford, far right, toured local sections around the US with AIME officers in 1952.

Shaikh Ahmad Salah Jamjum, head of the Saudi Arabian government's Economic Development Committee, spoke to the new Saudi Arabia Section in 1960.

SPE's first videotape instruction program on the "Fundamentals of Reservoir Engineering."

1959

- Offshore rotating hoists lift 800 tons.
- High-temperature cement developed (Halliburton).
- Exploration activity offshore Alaska begins.

An Important Milestone

The following was written by SPE's first President, John Hammond, to the society's members following the creation of SPE.

"An important milestone in the progress of the petroleum engineering profession was reached when our organization became the Society of Petroleum Engineers of AIME.

The significance of this change of name and increased stature of our professional society cannot be overemphasized. This action signalizes a maturity which the petroleum engineering field has fully achieved. It gives a clearer emphasis to the petroleum engineer's position in the oil industry, and his relationship to engineers in other industries. It will enhance further progress in petroleum technology.

The Society of Petroleum Engineers of AIME comes into being, not as a new venture, but as a mature professional organization with a long historical heritage behind it. The formation of the Society, from its predecessor, the Petroleum Branch of AIME, was largely caused by the attainment of this maturity.

The Society has become through the years the professional organization around which the art and science of petroleum engineering evolves. Its facilities and forums are the tools of the petroleum engineer; its continuity of service is the foundation for his professional growth. His future, and that of this professional society, are synonymous. Both will play a significant role in the growing reliance of the oil industry on technology to help meet the constantly rising demand for oil and gas production.

The industry will continually place even greater emphasis on technology, for this is an area with much challenge for progress. It is the area of services of the petroleum engineer, and he shall be equal to this challenge. Our progressive professional organization under its new name, the Society of Petroleum Engineers of AIME, will continue to earn and gain prestige. It will constantly expand its service to the engineer, the industry, and the nation."

that would help define the century occurred during this period. Oil was discovered in Venezuela, Iraq, Kuwait, Saudi Arabia, and in the East Texas oil field. The Leduc discovery triggered a boom in western Canada, and the first offshore well was drilled near Louisiana. Automobile use surged after the end of World War II, and petroleum consumption in developed countries soared.

As a result, petroleum engineering technology and education continued to accelerate, and AIME began publishing a quarterly periodical titled *Petroleum Technology* in 1938. But AIME—which now had combined with the American Institute of Metals to become the American Institute of Mining and Metallurgical Engineers—continued to carry a strong bent toward mining and metallurgy in programming and publications. Some petroleum members of the organization became restless, noting that AIME, which was headquartered in New York City, was far removed from the petroleum membership, which was concentrated largely in the southwestern and western part of the US. In response, AIME created a Petroleum Division office in Dallas in 1946 to oversee services to petroleum members. The office employed four people.

One of the first things the new office staff requested was to expand *Petroleum Technology,* which had been available to petroleum members only on request, publish it monthly out of Dallas, and send it to petroleum members in place of AIME's monthly journal. In 1948, AIME's Board of Directors agreed to the proposal and established three monthly publications, each serving a branch of the AIME membership. The Petroleum Division became the Petroleum Branch, and the *Journal of Petroleum Technology,* which carried both peer-reviewed technical papers and petroleum news, was produced out of the Dallas office and launched in January 1949.

The institute further decentralized member affairs in 1952, and all petroleum activities now were supervised out of the Dallas office, which quickly began to establish local sections and devise ways to serve the needs of its burgeoning membership. Membership in AIME with a predominantly petroleum

1960

- 1960 – Membership reaches 14,806.
- OPEC formed.

1961

- First issue of *SPE Journal* is published.
- SPE Distinguished Lecturer Series begins.
- Introduction of guar in fracturing fluid (Halliburton).
- First digitized dipmeter logs completed by computer—first successful computer processing of logs from tape (Schlumberger).

- First subsea well completed (Shell).
- Russian Yuri Gagarin becomes first man in space, followed 3 weeks later by the space flight of American Alan Shepard.

interest was rising sharply, having grown from 2,300 in 1945 to 3,700 in 1950 and would reach 10,000 by mid-decade. Some AIME sections with a petroleum focus began to form. But even under the new structure, some members yearned for something more. The Petroleum Branch commissioned an ad hoc committee to study its possible future. It proposed to the AIME Board of Directors that the institute be organized into three groups, each with its own staff and officers responsible for its own programming and publications.

The Creation of SPE

The proposal eventually was accepted and, in February 1957, the AIME Board voted to reorganize the institute into three semiautonomous societies formed from the institute's branches: The Metallurgical Society of AIME, the Society of Mining Engineers of AIME, and the Society of Petroleum Engineers of AIME. The first SPE Board of Directors meeting was held in Dallas on 6 October 1957, with President John H. Hammond presiding, marking the official beginning of the society.

Following an AIME practice begun in the early 1950s, SPE established new local sections where possible to take the society directly to members of the profession in their home areas, and membership continued to rise. "Better evidence need not be stated that our local sections are the foundation on which the society has grown and on which its future will be built," SPE Executive Secretary Alford wrote in a letter to members. The guiding philosophy was that a petroleum engineer's professional development benefited in two ways under such a structure. The society would take care of basic member services, such as publications and major meetings, as well as the business structure and long-term development plans. But the local sections would offer frequent meetings and events for technical, informational, and social exchange and act as a sounding board for membership opinion.

Although some local petroleum sections had formed under the old AIME structure, creation of new sections and section activities now began to flourish. Sections hosted dinner

Past Chairmen of SPE's Predecessor Organizations

Chairmen of the AIME Committee on Oil and Gas

1913–19	Anthony F. Lucas
1920–21	A.F.L. Bell

Chairmen of the Petroleum Division of AIME

1922	Ralph Arnold	1937	M. Albertson
1923–24	E.L. DeGolyer	1938	George Corless
1925–26	F. Julius Fohs	1939	W.H. Geis
1927	John M. Lovejoy	1940	T.V. Moore
1928	A.W. Ambrose	1941	Eugene Stephenson
1929	Joseph B. Umpleby	1942	Harry Stolz
1930	C.V. Millikan	1943	C.A. Warner
1931	C.E. Beecher	1944	W.S. Morris
1932	Earl F. Oliver	1945	M.L. Haider
1933	W.E. Wrather	1946	H.F. Beardmore
1934	H.D. Wilde	1947	Howard C. Pyle
1935	Harry Power	1948	I.W. Alcorn
1936	Hallan Marsh		

Chairmen of the Petroleum Branch of AIME

1949	Lloyd Elkins	1953	Claude Hocott
1950	John Sherborne	1954	John McMillan
1951	Richard French	1955	R.B. Gilmore
1952	Paul Turnbull	1956	T.C. Frick

SPE and AIME

1871—AIME founded

1913—AIME members set up Petroleum and Gas Technical Committee

1918—First AIME division formed when institute absorbs the American Institute of Metals

1922—AIME creates Petroleum Division

1946—AIME Petroleum Division opens office in Dallas

1949—AIME reorganizes into three branches, including the Petroleum Branch

1952—AIME expands branches' role in section administration

1957—AIME reorganizes into constituent societies, including the Society of Petroleum Engineers of AIME

1983—AIME drafts bylaws revision enabling separate incorporation of constituent societies

1984—SPE becomes a separately incorporated society

1962

- SPE forms 10 technical committees to improve technical scope of programs and publications.
- First semisubmersible drilling rig (Bluewater and Shell).

- First fully functional coiled tubing unit developed (Bowen Oil Tool and California Oil Company).
- Cuban Missile Crisis.

Looking Back . . .

from the pages of JPT

"The advantages of using high-speed computing equipment in engineering work fall generally into two categories. First, it is possible to conserve engineering manpower in that the inherent high computing rate of these devices can be directed so as to perform the engineering calculation work of many men. The second and potentially more significant advantage afforded by effective application of the high-speed computer is the ability to produce information which otherwise would not be available to the engineer." **— October 1957**

"Since the advent of Sputnik, the Translation Department of the Engineering Societies Library has noted a substantial increase in inquiries from American engineers and firms interested in translations of Russian technical publications. ...In contrast to the period immediately following World War II, the Russians are making their technical publications much more readily available. This exchange is of great benefit to America, and will be further developed." **— January 1958**

"The fundamental premise in the society's efforts to obtain new members is that the exchange of technical knowledge on oil production by more and more people will result in a continuing increase in oil recovery for our nation. ... We urge that you approach your associates who are not members and simply ask, 'Will you join the Society of Petroleum Engineers of AIME?'" **— May 1958**

"During the last 5 to 10 years, the application of automatic computing equipment in engineering work has developed into what appears to be a major technical development." **— May 1959**

"'Why study petroleum engineering when the oil industry is nearing the end of its heyday' is a question heard more frequently. The petroleum industry will provide the great bulk of the energy needs for the next half century and will be a major factor in the half century after that." **— October 1959**

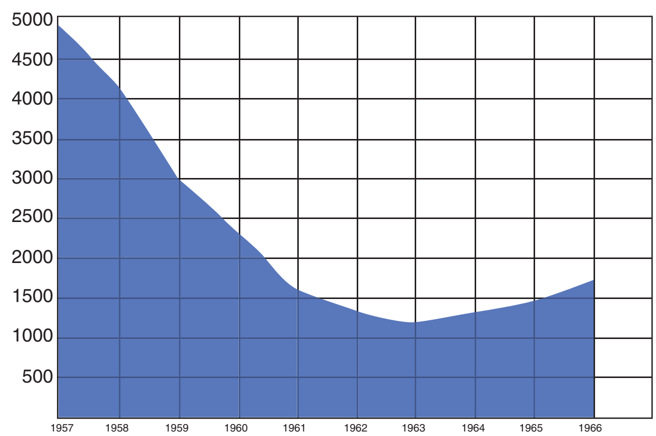
"The total number of petroleum engineering graduates is expected to drop by some 41% between the peak year of 1958 and the expected low point in 1962. … If the economic condition of the petroleum industry maintains the pattern followed in the 1950s, it would seem reasonably safe to assume from the results of this survey that the industry may be faced with a shortage of petroleum engineering graduates in the early 1960s." **— July 1960**

"The SPE Distinguished Lecturer Program is growing by leaps and bounds. This is evidenced by the fact that 43 local sections and student chapters will hear one or more lecturers during the coming year, or an increase of more than 30% over the sections participating last year." **— September 1962**

1957–69

meetings featuring talks about the industry, dances, picnics, study groups, and field trips. Sections were growing outside the US as well. By 1958, 10% of SPE's membership resided outside the US. "As this trend continues, the need for new sections will arise, and we hope to continue the policy of taking the society to members of the profession in their home so they may derive maximum value from it," Alford wrote in *JPT*, suggesting that more non-US growth was inevitable. The first seeds of a truly international petroleum organization had been planted.

The society was flourishing. By the end of 1958, SPE had become the largest society in AIME. New sections were being formed in places such as Edmonton, the San Antonio/Austin area of Texas, the Williston basin of North Dakota, and Saudi Arabia. The number of local sections had grown to 40 and the number of student chapters to 19. Growth was so rapid that the SPE Board of Directors was forced to re-examine its basic organizational structure. An ad hoc committee recom-



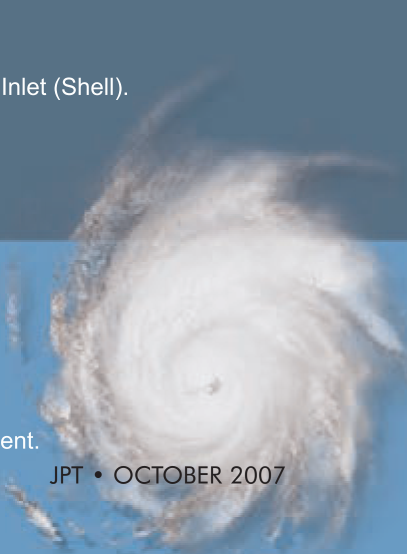
Total petroleum engineering enrollments in the US (graduate and undergraduate students)—1957–58 through 1966–67.

1963

- Oil discovered off Alaska in Cook Inlet (Shell).

1964

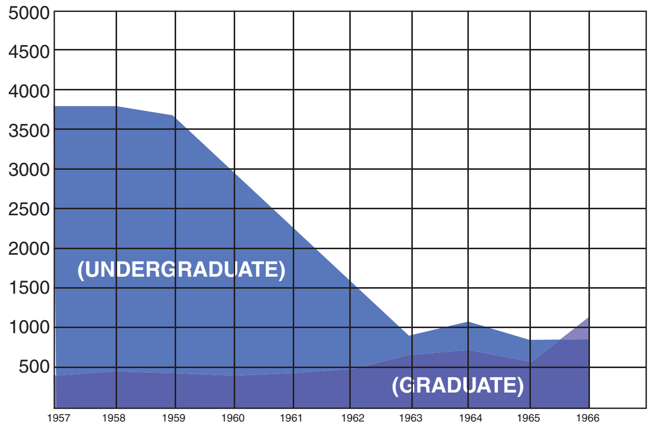
- Invert emulsions for drilling operations introduced (Baroid).
- Hurricane Hilda is first hurricane to force offshore design improvement.



mended, and the Board adopted, a plan to divide the society into 11 regions—10 in the US and an Overseas Region that included the Caracas, Eastern Venezuela, Western Venezuela, Saudi Arabia, and Sumatra sections.

New Hurdles

But by the late 1950s and early 1960s, membership began to slow, reflecting a downturn in the industry. In the mid-1950s, petroleum membership had been growing at an average rate of 18% per year. By the early 1960s, that rate had stabilized to 4–5%, or about 500 new members a year. The oil industry was facing some of the same challenges it would confront in the decades to come—competition from more "glamorous" professions, economic swings, dips in engineering student enrollment that would lead to staffing shortages, reports that the world was running out of oil, and a flagging public image. Membership would remain at just under 15,000 for 5 years beginning in 1960.



Total petroleum engineering degrees in the US (graduate and undergraduate)—1957–58 through 1966–67.

1965

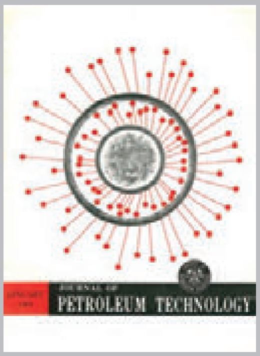
- Deepwater coring begins from research vessel *Glomar Challenger.*

- Escalation of Vietnam War.

"Where today we are recovering an average of perhaps 40% of oil in place, we certainly will continue to improve recovery efficiency with some of the methods that are now on the horizon." **— November 1962**

"The median salary of 213,000 engineers covered by a recent survey is $10,375 yearly. The average starting salary for engineers in 1962 was $6,925." **— March 1963**

"Offshore platforms have been installed in open water in depths slightly over 200 ft. Even with the recent developments in floating drilling and underwater completion techniques, platforms are necessary for development of offshore oil fields and will remain necessary for the foreseeable future." **— April 1963**



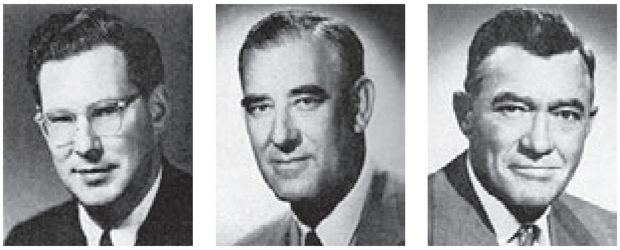
"Special attention to the future is more important today than it ever has been before because of the enormity and difficulty of the job that lies ahead—satisfying an ever-increasing demand for petroleum under conditions where new supply is increasingly difficult and expensive to find." **— November 1965**

"Regardless of which mining scheme is eventually chosen, the future of the Athabasca tar sands is assured. Commercial development has already started and in future years this source of oil will certainly supply a significant portion of North American energy needs. However, the task in arriving at this objective will not be an easy one. Oil from tar sands is a new science, and there is still much for the engineer to learn." **— October 1967**

"The worldwide spread of interest in the search for petroleum offshore in recent years has been extraordinary. …Ten years ago, there were only three or four countries and about five companies with offshore petroleum interests. Today, hundreds of companies are exploring the shelves of 75 countries, and already 28 countries are producing or are about to produce subsea oil and gas." **— April 1969**

"It is small wonder that Alaska continues to be in the spotlight of petroleum exploration and production. A look at the latest figures on rotary rig activity reveals that drilling activity on land in the state of Alaska has jumped from four rigs on July 8, 1968 to 38 rigs on July 7, 1969." **— July 1969**

"For several years, SPE has been typically defined as either a technical-professional society or a professional-technical society. The word order might suggest that there is some doubt as to our primary purpose. Actually, both areas need equal treatment. But SPE's emphasis in the recent past probably has been much the same as that of its counterparts—it has been on the technical side of the term. Grass-roots comment to the effect that the Society should increase its services in the professional area have been voiced frequently and loudly in recent years, and there are at least hints that we are moving to expand our efforts in this area." **— September 1969**



Calhoun Arps Otis

John C. Calhoun Jr., Jan J. Arps, and Herbert Otis, SPE's first Distinguished Lecturers.

The number of students studying petroleum engineering plummeted between 1958 and 1962—as much as 50% at some US universities. Engineering enrollment was down across the board, but petroleum engineering enrollment decreased three times as much as engineering in general. A worldwide recession beginning in 1958 hurt oil demand, and job prospects looked dim. Meanwhile, Sputnik and the promise of space travel had captured the public imagination and lured countless students who showed a talent for science and engineering. A 1960 survey by the US Professional Engineers Conference Board of Industry found that one of four engineers believed that engineers were thought of as second-class professionals. There were reports in the media that nuclear energy would displace the need for hydrocarbons within a decade. All of this led to a gloomy outlook for engineering in general and petroleum engineering in particular.

"Engineering, although an honored profession, is generally not held in as high esteem by the populace as is medicine and law," wrote professor John M. Campbell of the University of Oklahoma in an essay in *JPT* published in 1959. "In addition, engineering is receiving serious competition from mathematics and physics as these become more glamorous in the space age. Petroleum engineering has additional competition from the more glamorous-sounding, new entrants—engineering physics, nuclear engineering, aeronautical engineering, and the like."

Petroleum engineering was still experiencing growing pains. "In the early 1960s, petroleum engineering was still a relatively new branch of the engineering profession, with only a small number of universities offering programs in the field and having a relatively small part of the total engineering enrollment," says John C. Calhoun Jr., Distinguished Professor of Petroleum Engineering–Emeritus at Texas A&M University. "It was not a branch of engineering with which the average person might come into contact. Petroleum engineers were employed by a small group of companies rather than by a broad spectrum of the industrial economy. Consequently, petroleum engineering was a branch of the profession that was not so much held in low regard as it was poorly known."

Despite the slowdown in membership growth, SPE made several moves to further the professional standing of the society, including strengthening membership requirements in 1960. Members now had to have at least 6 years of active practice in petroleum engineering or a related discipline in the oil industry and have held a "position of responsible charge" for at least 3 years. Becoming a Junior Member required a college degree in engineering or related science and the qualifications to hold a subordinate position in the industry. An Associated Membership, which formerly required no particular training or experience, now required a college degree and 4 years of experience in a responsible petroleum industry position.

A Decade of Member Services

SPE continued to look for ways to improve professionalism and member experiences. This would usher in what some have called SPE's "decade of member services." It strengthened the technical program of the SPE Fall Meeting (now called the SPE Annual Technical Conference and Exhibition) and placed less emphasis on social functions at the event. The number of technical papers delivered at the event would more

1966

- Thermal-decay-time tool developed for through-tubing production logging (Schlumberger).

1967

- SPE Monograph series begins with publication of *Pressure Buildup and Flow Tests in Wells* by C.S. Matthews and D.G. Russell.
- First SPE videotape lecture is produced.
- Commercial production begins from Athabasca Oil Sands in Alberta, Canada (Sun).
- Diverless subsea completion (Brown Oil Tools).
- Arab-Israeli War.

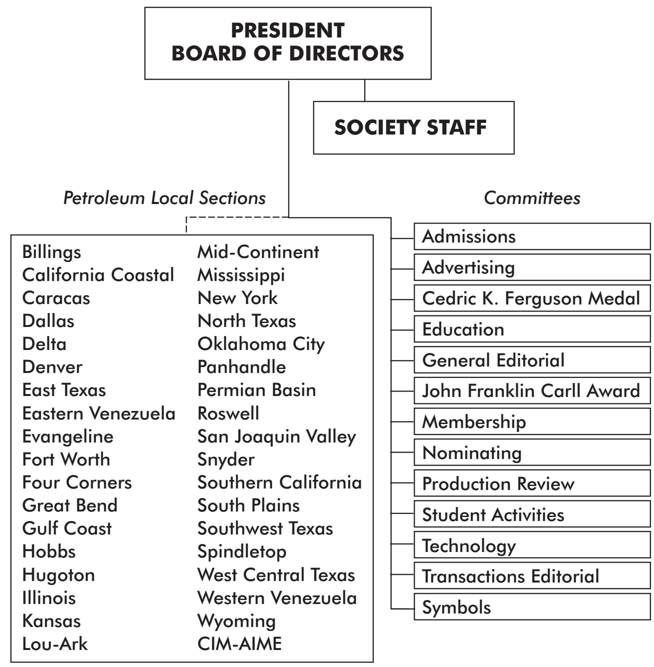
than double during the decade, from 68 papers at the 1960 meeting held in Denver to 151 technical presentations at the 1970 meeting in Houston. And, during the next several years, SPE would launch several programs, meetings, and services that would increase the value of its membership while solidifying its standing in the petroleum engineering profession.

Reaching out to local sections, the board established the Distinguished Lecturer Program in 1960, which quickly flourished and continues today. It would bring the knowledge and experience of some of the industry's top experts to members in their home region. In the inaugural year, lecturers John C. Calhoun Jr., Jan J. Arps, and Herbert Otis would make 28 talks to 19 sections.

The SPE Reprint Series—collections of technical papers on a single subject, aimed at helping members specializing in other technical areas to educate themselves on the subject—was begun. The first volumes were *Well Logging, Water Flooding, and Estimating Reserves and Oil and Gas Property Evaluation.* And in late 1960, a new quarterly publication was announced: *SPE Journal.* The new technical journal would contain peer-reviewed papers that were considered significant but did not have as wide a reader appeal among SPE's 15,000 members as did other papers published in *JPT*. The new journal would contain limited advertising and no society or general industry news. A new publication, the SPE Monograph Series, came in 1967. The new series would offer books on a single subject to provide a state-of-the-art review of a particular technology for the practicing engineer. The first three monographs covered pressure behavior in wells, hydraulic fracturing, and multiphase flow.

Outside the US, a regional meeting was held in the Middle East, SPE's first significant program outside North America. The first Regional Petroleum Technological Meeting, sponsored by the Saudi Arabian Section, was held in Dhahran in early 1961, with registration totaling 132 people representing 14 companies, including 52 people from outside Saudi Arabia. Seventeen technical papers were presented. The Saudi Arabian section had grown to 150 members in a little

Organization Chart 1957
Society of Petroleum Engineers of AIME



over a year since its creation, and SPE was seeing growth in Europe as well. It now had 60 members in France, 40 of them living in Paris. The Netherlands Section, which was established in 1960, also saw rapid growth.

SPE officials were confident for the future. "I am convinced that our society will play a very significant role in development and recovery of petroleum in the future," SPE President R.A. Morse wrote in a message to members in November 1962. "The forum we provide for the exchange of knowledge will contribute greatly to the expansion of technology in our industry, and I submit to you that technology has been largely responsible for making the oil industry the booming business it is today."

1968

- Prudhoe Bay field discovered in Alaska (Arco).

1969

- First Offshore Technology Conference held with 4,200 in attendance.
- Oil discovered at Ekofisk in Norwegian North Sea (Phillips).
- O-ring sealed journal bearing drill bit introduced (Hughes Tool).
- Santa Barbara blowout and pipeline leak.
- Arapanet, forerunner of the Internet, is created.
- American Neil Armstrong becomes first man on the moon.

As membership began to now grow steadily, so did its diversity in different branches of engineering and job classification. Because the society was oriented toward a specific industry rather than a specific discipline, it was attracting a variety of professionals. In 1962, SPE had established technical committees in the 10 primary fields of interest of the membership. The committees were charged with the responsibility of guiding the literature within these fields and helping to develop programming for the annual Fall Meeting. A year before, the idea had been rejected out of fear that it would lead to departmentalization of the membership into their areas of specialization and the organization as a whole would suffer. But now it was seen as something the membership wanted and needed. The new committees covered Drilling and Well Completions, Education and Professionalism, Economics and Evaluation, Formation Evaluation, Gas Technology, Geological Engineering and Groundwater Hydrology, Management and General Interest, Production Operations and Engineering, Reservoir Engineering, and Fluid Mechanics and Oil Recovery Processes.

In 1965, SPE's Continuing Education Committee was formed "to provide opportunities for individuals to develop and maintain technical skills to the level of state of the art of those technical areas embraced by the society." Little had been done in this area either at the local or societywide level before this time. But by the end of the year, 10 sections already had conducted continuing-education courses. In 1966, the committee published a booklet to help sections create courses, and the program took off. A year later, the society created videotaped courses to assist members in smaller and remote locations.

The Industry Rebounds

By the mid-1960s, there was new life in the industry. Engineering enrollments were now on the rise after bottoming out in the earlier part of the decade, and SPE membership growth was climbing. In 1965, membership applications were at their highest since 1960. By the late 1960s, growth was in full swing. In 1967, SPE reached all-time highs in membership (15,577), number of meetings held (15), attendance at the Fall Meeting (2,479), total attendance at various regional meetings (5,521), and in its reserve fund (USD 398,549). Growth in membership and in member services, combined with the rapid expansion of technology being used in petroleum development and recovery, appeared to put SPE on firm footing for the future.

SPE also was proving its value to the industry at large. In 1965, the society completed a report with the American Petroleum Institute on reserves definitions that had taken 2 years of study and discussion. The 12-person committee issued "Definitions of Proved Reserves for Property Evaluation." SPE has continued this important work of helping the industry to define and classify resources and reserves throughout its history, often in partnership with other professional associations and industry organizations.

In 1968, the SPE Board voted to partner with 11 other industry associations to establish a new conference that would focus on the growing offshore industry. As the industry increasingly looked offshore for new sources of oil, SPE realized its responsibility to provide a forum for disseminating related technology information. The Offshore Technology Conference (OTC) would become one of the society's most successful ventures, and it signaled SPE's talent for readily adapting to industry needs while helping lead it into the future.

By the end of the decade, a foundation for success clearly had been laid. Local sections were sprouting, membership was rising, and OTC was in place and already exceeding expectations. In just a little over a decade, SPE had established itself as a premier industry and technical society and was growing rapidly.

Possible Existence of Deep-Seated Oil Deposits on Gulf Coast

Anthony F. Lucas, Washington, DC

Editor's Note: Originally published in AIME Transactions, this paper, which is heavily excerpted here, discusses the possibility of oil lying beneath salt domes along the US Gulf Coast.

The discovery of oil in 1901 on the Spindletop dome, Texas, inaugurated a new industry on the Gulf Coast, an industry which has grown with the discovery of successive fields, until today it engages the services of thousands of workers and employs enormous capital. New fields are being discovered from time to time and doubtless some still remain to be found, though of late years, discoveries have become more infrequent. Nowadays, several hundred dry holes are drilled each year in a fruitless and blind effort to discover new fields, for as yet geologic science has developed no effectual method of locating the coastal oil deposits in advance of drilling.

Moreover, despite the occasional discovery of new fields, the total production of the Gulf Coast is today no greater than it was in 1906, for the added production of the new fields has been offset by the rapid decline and more or less complete exhaustion of some of the older ones. Careful geologic work within the fields has in some cases increased the production temporarily, but has developed no really new supplies. The Gulf Coast oil industry seems to have passed its period of greatest expansion and to be declining at a fairly steady rate, and this condition is naturally viewed with alarm by the more far-sighted operators.

In my opinion, the time has come for the adoption of radical and aggressive methods of prospecting; and a fraction of the money wasted yearly in drilling shallow wells in hopeless locations might well be devoted to this purpose. Many facts lead me to believe that all the salt-dome oil has had a common origin; that it has migrated up from considerable depth along lines of structural weakness; and that a deep well, properly located, stands an excellent chance of discovering the parent reservoir and thus of developing new and probably great supplies.

All of the oil produced in the coastal region of Texas and Louisiana is probably associated with salt domes, though in Goose Creek, Edgerly, and one or two other fields no salt has yet been actually penetrated. As a result of the innumerable wells that have been drilled on the various domes, it is now known that a typical salt dome consists of a very thick mass of pretty pure rock salt, generally almost flat-topped, but sloping abruptly away from the rim on every side. The flat top of the salt is generally covered by rock 25 ft to several hundred feet thick, consisting chiefly of limestone, dolomite, anhydrite, or gypsum, with generally more or less sulfur. The sediments above the salt are slightly domed and those on the sides of the salt mass generally slope at angles of 30 to 60°, and in some fields at even greater angles. These sediments consist of sand, gravel, shale, and gumbo, arranged in beds so lenticular and irregular that they can seldom be correlated from one well to another.

Of the many salt domes already discovered on the Coastal Plain, there are no two whose structures are identical. Each has its individual peculiarities of size, height, steepness, character of cap-rock, and wealth or absence of oil. Some of the domes, like the phenomenally rich Spindletop, are only a few hundred acres in extent; others, like Humble, Damon Mound, and some of the salt islands of Louisiana, cover several square miles. The salt itself is physically different in different mounds; in most of them it is hard and well crystallized, but in others it is soft, granular, and almost incoherent.

Anthony F. Lucas, the first chairman of AIME's Oil & Gas Committee and the discoverer of the famous Spindletop oil gusher, wrote several technical papers during his membership in AIME. The following paper, which he delivered at an AIME meeting in Colorado in September 1918, is contained in SPE's eLibrary.

Occurrence of Oil on Salt Domes

The salt-dome oil occurs under conditions just as irregular and impossible to determine in advance of drilling as the structure of the dome itself. The oil at Spindletop occurs chiefly in a hard cavernous limestone layer which forms the cap-rock of the dome. In only one dome, Belle Isle, Louisiana, has oil been found within the salt itself, and in this locality the salt contains much gas under enormous pressure and also a small quantity of high-grade paraffin oil.

As few of the domes are more than a mile across, it is evident that the productive area is very limited in extent, though where oil occurs on the flanks of the salt mass the field is somewhat larger. The largest field, Humble, is, however, less than 2 miles square. Salt-dome oil thus occurs under conditions very different from those in the Appalachian fields, where the oil is found in well-defined gently folded sands traceable over large areas. In the Gulf Coast fields, the wells are more extensive and less likely to find oil, and though their production may be enormous for a short period, their decline is usually rapid.

Of the four or five dozen salt domes now known in Texas and Louisiana, fewer than two dozen have produced oil in commercial quantities and less than one dozen have become really important fields. Many are perfect blanks as far as production is concerned, and though apparently similar to richly productive domes and characterized by apparently identical surface indications, they may yield only a puff of gas while drilling and a showing of oil so slight that it may have found its way into the well from the surface machinery. These conditions suffice to emphasize the practical importance of arriving at a solution of the origin of the domes and their associated minerals, and of determining, if possible, the ultimate source of the oil and the conditions that have controlled its migration and accumulation.

A method for locating hidden domes has been suggested by a high authority in geologic and physical science, whose name I am not as yet permitted to mention. This method is based on the fact that the domes are composed chiefly of salt, gypsum, and limestone, while the surrounding material is clay, silt, and gravel. Such difference in rock character is likely to be marked by at least a small deflection in the magnetic currents, and if this deflection exists, the presence of a dome might be detected by a sufficiently delicate instrument. The scientist I refer to has perfected an extremely delicate dipping needle, which, it is claimed, will easily detect magnetic differences only one-twentieth as strong as the ordinary dipping needle can detect. Knowing the capabilities of the gentleman, I am sure that as soon as he is ready to release his discovery he will receive every consideration, not only by leading scientists but also at the hands of the oil companies who are so vitally interested in the discovery of new domes.

Wide Distribution of Oil in Mexican Gulf Region

Before discussing the source and origin of the salt-dome oil, a brief review of the known occurrences of oil in regions adjacent to the Gulf of Mexico, and especially under the Gulf, may be of interest. Showings of oil are found in many localities along the littoral of the Gulf of Mexico and the Caribbean Sea, including points in Venezuela, Colombia, Panama, Costa Rica, Honduras, Salvador, Guatemala, the Isthmus of Tehuantepec and the Tampico region of Mexico, and the coast of Texas and Louisiana.

Perhaps the most interesting indications of oil in the whole region are those that reveal its presence beneath the Gulf of Mexico itself. Lieutenant John C. Soley, US Navy, in his paper "The Oil Fields of the Gulf of Mexico," gives a chart showing the location of all reported occurrences and discusses their origin and geologic significance.

It will be noted that Soley in part ascribes the appearance of bodies of oil off the Louisiana coast to the escape of oil under great pressure along lines of structural weakness from a main reservoir below. This excellent paper was called to my attention only recently, though I have long been aware of the reports of sea captains concerning oil bodies on the Gulf and have long considered them evidence of the presence of oil and gas activities or disturbances beneath the sea bottom. In my opinion, the escape of these bodies of oil periodically must necessarily be ascribed to excessive gas pressure accumulating on a line of structural weakness in a main reservoir, so that when the pressure rises above or in excess of its overburden, it opens the reservoir and ejects a certain quantity of oil and gas until, automatically, it is closed again by hydrostatic pressure, to be again reopened at a later period, somewhat on the order of the intermittent geysers of Yellowstone Park.

To encourage investors, Spindletop's oil was allowed to flow openly. (Photo courtesy of Texas Energy Museum.)

Source and Origin of Salt Dome Oil

Owing to the fact that all our prospecting on the Gulf Coast has so far been confined to the upper surface of the salt domes, we know little of their complete structure. We have innumerable and conflicting theories as to the origin of the domes and of the oil found on them, but little positive knowledge. On one point, however, all geologists now agree, that, as I contended in 1901, the salt domes are of secondary origin, and the oil was not formed in the beds from which it is now produced, but has migrated into them. Some believe that the oil originated fairly close to where it is now found, but others that it has ascended from a considerable depth. Many facts lead me to concur in the latter view.

When I began boring on Spindletop, I never for a moment expected to find oil under the conditions which prevailed in Corsicana or the other stratified oil fields, for my exploratory work carried out previously on the barren salt domes of Louisiana had taught me that conditions were very different. I have always believed that the salt, gypsum, dolomite, etc., composing the dome are of secondary origin and that the oil and gas have migrated to their present position. In this connection, I had a long series of arguments with Professor R.T. Hill in 1901, and it was only with difficulty that I convinced him of the existence of dome structures and of the secondary character of the dome-forming materials, facts that Hill and all other geologists now admit.

When I first started drilling on Spindletop in 1900, I was told by some of the best geologists in the United States that this slight elevation and accompanying phenomena did not prove it a dome and had no significance, and that I was wasting my time and money; and similarly today many geologists doubtless disagree with my views that further supplies of oil are to be found in the domes at greater depth.

It has never been possible to drill on the Gulf Coast with the standard tools so extensively used in many oil fields, owing to the drift and quicksand encountered and to the probability of blow-outs. At the time I drilled on Spindletop, the rotary method was in its infancy and during the past 15 years, enormous improvements have been made. Extremely heavy tools are now manufactured and many extra appliances have been devised. The rotary or hydraulic machine of the early days of my pioneer work compares with the rotary of today as the early steam engine compares with our modern triple-expansion engines. **JPT**

SPE: A 1957 Snapshot

Erica Shillings, *JPT* Assistant Features Editor

The year 1957 was a time of advancement in technology, science, and education around the world. On 16 January, three B-52s took off from Castle Air Force Base in California on the first nonstop, round-the-world flight by jet plane, which lasted 45 hours and 19 minutes. The "space age" began on 4 October when the Soviet Union launched Sputnik, the first man-made space satellite. This led to the US's first attempt at putting a satellite into orbit, which failed when Vanguard TV-3 blew up on the launch pad at Cape Canaveral, Florida, on 6 December 1957. The complete microscopic theory of superconductivity was proposed in 1957 by John Bardeen, Leon Cooper, and John Robert Schrieffer, and the Treaty of Rome was signed by France, West Germany, Italy, and Benelux, establishing the European Economic Community.

In medicine, there were several breakthroughs, such as the invention of the temporary artificial heart by Willem Kolff. Alick Isaacs and Jean Lindemann produced interferon, and the internal pacemaker was created by Clarence W. Lillehie and Earl Bakk. Less dramatic events that year included the introduction of the electric watch by Hamilton Watch Company and the Frisbee by Wham-O, and a patent was awarded for Velcro.

Among these historical moments in politics, science, and popular culture came the official creation of SPE. John P. Hammond, 1957 President of the SPE of the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME), led the society through its first year of transformation. Hammond, who had graduated from the University of Tulsa, was Assistant General Superintendent of the Production Department of Amerada at the time. Since joining AIME in 1938, he held numerous chairman positions within local sections and committees.

In the beginning, SPE meetings were held only in the US and Caracas, Venezuela, and most meetings took place in Texas and Louisiana, where the oil business was thriving. As membership increased, meetings cropped up in places such as Montana, California, and West Virginia, with meeting locations dependent on local section support. To hold a meeting, a section or a sufficient number of members needed to be able to sponsor and prepare the event. SPE's meeting schedule in 1957 was as follows:

- 14–15 February, Joint Annual Technical Meeting, University of Texas and A&M College of Texas, Austin, Texas
- 24–28 February, AIME Annual Meeting, New Orleans
- 18–19 April, Permian Basin Oil Recovery Conference, Midland, Texas
- 23–24 May, Third Annual Joint Meeting, Rocky Mountain Petroleum Sections, Billings, Montana
- 6–9 October, SPE of AIME Annual Fall Meeting, Dallas
- 17–18 October, Southern California Petroleum Section Fall Meeting, Los Angeles
- 17–18 October, Second Annual Conference of the Electrical and Radioactivity Logging Oil Institute, Abilene, Texas
- 6–9 November, Second Annual Regional Meeting, Venezuela Petroleum Sections, Caracas
- 8–9 November, Central Appalachian Section Annual Meeting, White Sulphur Springs, West Virginia

The AIME Annual Meeting was the big event of the year and featured programming for the petroleum sector and the other societies that made up AIME. The petroleum program for the 1957 meeting centered on a discussion of the oil situation in the Middle East and Far East and the importance of maintaining an adequate supply of oil in the western hemisphere. The Annual Meeting also held a Petroleum Dinner and a Welcoming Luncheon. The Delta Section of AIME hosted the meeting, which was attended by 3,600 people.

The SPE of AIME Annual Fall Meeting took place in Dallas on 6–9 October and included SPE's first official board meeting. The Technology Committee planned three sessions for

SPE Then and Now

	1957	Today*
Members, excluding students	11,651	56,496
Student members	1,007	16,739
Non-US members (including students)	1,015	41,012
Countries represented by membership	43	114
Sections	36	164
Student chapters	15	170
Meetings held	9	90
Attendance at ATCE	3,584	9,300
Technical papers presented at ATCE	75	477
Publications	3	8
SPE employees	13	187
Offices	1	6
Awards conferred	4	18
SPE standing committees	13	40

*2006 or 2007

SPE MEMBERS' PRIMARY TECHNICAL INTERESTS IN 1957

Primary Interest	Number of Members
Exploration	1,565
Exploitation	656
Drilling	1,385
Production	2,827
Well Completion	640
Reservoir Engineering	1,723
Valuation	445
Management	896
Economics	87
Education	88
Total	**10,312**

each day of the meeting. Entertainment activities included a Ladies Luncheon Style Show, Welcoming Luncheon, and Membership Luncheon. Attendees also could purchase tickets to see *My Fair Lady* and visit the State Fair of Texas while it was in town. More than 3,500 people attended this event, which was hosted by the Dallas Local Section and had a technical program that included 75 papers for presentation.

A Regional Meeting also was held in Caracas that year, on 6–9 November. Attendance at this event, which included the three Venezuela Petroleum Sections, attracted 264 individuals. During a 2-day technical session, 16 papers were presented. Social events included a men's luncheon, cocktails, and dinner/dance. Women at the meeting attended a "get acquainted tea," a sightseeing tour, and a luncheon. The host for the meeting was the Caracas Petroleum Section.

The Permian Basin Oil Recovery Conference in Midland, Texas, featured 14 technical papers and was jointly sponsored by the Permian Basin Section of AIME and the Texas Petroleum Research Committee. Attendees came from Texas, Oklahoma, New Mexico, Louisiana, and Arkansas. The Second Annual Conference of the Electrical and Radioactivity Logging Oil Institute was held in Abilene, Texas, on 17–18 October. The conference was sponsored by the West Central Section of AIME, the Abilene Geological Society, and McMurray College. The 2-day program presented 13 technical papers.

Sections

Petroleum sections already had begun to grow under AIME before 1957, but after the official creation of SPE, they really took off. SPE established a philosophy of creating sections wherever its members resided to ensure that programs and activities were close to the membership. Five new sections were established in 1957: the Caracas Petroleum Section in Venezuela; the California Coastal Section at Ventura, California; the Four Corners Petroleum Section in Farmington, New Mexico; the Roswell Petroleum Section in southeastern New Mexico; and the Snyder Local Section in west Texas. The Colorado-Nebraska Subsection, the Austin-San Antonio Subsection, and the Uintah Basin Subsection also formed that year. A second joint section of the Canadian Institute of Mining-AIME was formed in Edmonton, Alberta, Canada, following the earlier creation of the section in Calgary.

Student Chapters

While SPE members needed an outlet for business networking and a source to gain oil and gas knowledge, college students began to create society-related groups at their own universities. Many student chapters were actively involved in SPE of AIME events during 1957.

The Department of Petroleum Engineering and the Student Chapter of the University of Texas at Austin sponsored the Joint Annual A&M College and University of Texas Technical Meeting in 1957, which featured 19 papers and was attended by 250 people.

The meeting of Texas and Louisiana student chapters of AIME that year was attended by six schools. The program was held at A&M College of Texas on 3–4 May. Papers were submitted by undergraduate and graduate students from Texas A&M, Texas Tech, the University of Texas at Austin, the University of Houston, Southwestern Louisiana Institute, and Louisiana Polytechnic Institute. The Texas A&M Department of Petroleum Engineering and the Petroleum Club, an AIME student chapter, sponsored the meeting. First-place winners in the graduate and undergraduate divisions received USD 50, junior membership dues in SPE for 1958, and a complete set of AIME *Petroleum Transactions* volumes.

The University of Kansas Student Chapter, founded in 1955, sponsored an Annual Engineering Exposition in 1957, a 2-day open house in which students presented an exhibit that they constructed relating to different phases of engineering. Students were awarded for the most interesting and instructive display. In addition to the exhibit, the University of Kansas Student Chapter prepared the regional AIME student paper contest. The chapter was very active, with regular business meetings,

In 1957, SPE of AIME had 36 local petroleum sections, compared to 164 today, which included:

1. Billings
2. California Coastal
3. Caracas
4. Dallas
5. Delta
6. Denver
7. East Texas
8. Eastern Venezuela
9. Evangeline
10. Fort Worth
11. Four Corners
12. Great Bend
13. Gulf Coast
14. Hobbs
15. Hugoton
16. Illinois
17. Kansas
18. Lou-Ark
19. Mid-Continent
20. Mississippi
21. New York
22. North Texas
23. Oklahoma City
24. Panhandle
25. Permian Basin
26. Roswell
27. San Joaquin Valley
28. Snyder
29. South Plains
30. Southern California
31. Southwest Texas
32. Spindletop
33. West Central Texas
34. Western Venezuela
35. Wyoming
36. CIM-AIME

SPE Members' Professional Fields in 1957

Professional Field	Number of Members	Professional Field	Number of Members
Petroleum Engineering	4,002	Petroleum–Business Administration	28
Chemical Engineering	588	Chemical–Electrical	6
Civil Engineering	114	Chemical–Mechanical	19
Electrical Engineering	285	Chemical–Geological	53
Geological Engineering	551	Chemical–Physics	46
Mining Engineering	149	Civil–Geological	22
Mechanical Engineering	718	Electrical–Mechanical-Geological	6
Metallurgical Engineering	35	Electrical–Mechanical	33
Chemistry	163	Electrical–Physics	24
Geology	303	Geology–Mechanical	21
Geophysics	15	Geology–Mining	102
Physics	149	Geology–Physics	31
Petroleum–Geology	1,203	Geology–Geophysics	4
Petroleum–Chemistry	329	Mining–Geology	35
Petroleum–Civil	78	Mining–Metallurgical	15
Petroleum–Electrical	55	Mechanical–Metallurgical	9
Petroleum–Mining	69	Business Administration	21
Petroleum–Metallurgical	6	Law	7
Petroleum–Physics	34	Law–Engineering	15
Petroleum–Chemical-Geology	112	Other	191
Petroleum–Geological-Electrical	92	General Engineering	68
Petroleum–Geological-Mining	134	Petroleum–Mechanical	368
Petroleum–Mining-Metallurgy	4		
		Total	**10,312**

monthly general meetings, and events promoting the importance of the oil and gas industry.

Among other student chapter activities that year:

• The Colorado School of Mines chapter, established in 1955, organized a membership drive by sponsoring a barbecue and dance.

• The University of Houston Student Chapter, which had 35 members, was actively engaged in lectures, field trips, and other industry-related activities. Organized in 1952, the chapter was the first student chapter of the Engineering Founder Societies on the campus. It held a picnic each year in honor of graduating seniors and participated in the spring functions of the Gulf Coast Section of AIME.

• The AIME Chapter of the Missouri School of Mines was established in 1955 and in 1957 had 90 members. The chapter won the National Student Membership Contest in 1955. The USD 100 contest prize was used to establish a loan fund in which students could borrow up to USD 5.50 to pay national and local AIME dues without being charged interest for 30 days.

• Student chapters that were established in 1957 included the University of Wyoming and Southwestern Louisiana Institute.

Contests

SPE local sections began partnering with student chapters in the 1950s to conduct student paper contests.

The Wyoming Section sponsored a student technical paper contest during 1957 among engineering students at the University of Wyoming. Students submitted papers on a variety of engineering topics, including refining and production methods, at the discretion of the faculty. The purpose of the contest was to encourage student affiliation with AIME and to promote closer relationships among industry, the faculty, and engineering students. Awards of USD 25, 15, and 10 were presented to authors of the top three papers. The Denver Petroleum Section also held a student paper contest that year. The section awarded the first-place winner an all-expenses-paid trip to the Rocky Mountain Petroleum Section Joint Meeting in Billings, Montana.

SPE also sponsored membership contests to encourage local sections to boost enrollments. Sections were divided into groups according to base membership. In each category, SPE awarded prizes for percentage increase in membership and for total increase in membership during a year. Winners of the 1957 contest were the Western Venezuela, Spindletop, Delta, Dallas, and Caracas sections.

SPE's Parent Achieved Its Own Lasting Legacy

John Donnelly, *JPT* Editor

SPE's parent organization has its own significant history and has made many valuable contributions to industry as well. The society that eventually gave birth to SPE was founded in 1871 by 22 mining engineers in Wilkes-Barre, Pennsylvania. The American Institute of Mining Engineers (AIME) would become the American Institute of Mining and Metallurgical Engineers in 1919 and the American Institute of Mining, Metallurgical, and Petroleum Engineers decades later.

AIME was one of the first engineering societies established in the US and is known as an Engineering Founder Society, along with professional organizations representing civil, electrical, mechanical, and chemical engineers. The goal of AIME is to "advance and disseminate, through the programs of the member societies, knowledge of engineering and the arts and sciences involved in the production and use of minerals, metals, energy sources, and materials for the benefit of humankind." One of its most impor-

Herbert Hoover was President of AIME in 1920.

A History of AIME

- **1871**—AIME founded in Wilkes-Barre, Pennsylvania
- **1873**—First *Transactions* Printed
- **1904**—AIME establishes the United Engineering Society with the American Society of Mechanical Engineers and the American Institute of Electrical Engineers
- **1906**—AIME incorporated in New York
- **1910**—American Society of Civil Engineers joins AIME
- **1911**—First local sections formed in New York, Boston, Spokane
- **1918**—AIME absorbs American Institute of Metals
- **1919**—Renamed American Institute of Mining and Metallurgical Engineers
- **1920**—Herbert Hoover serves as AIME President
- **1922**—Petroleum Division formed
- **1928**—Iron and Steel Division formed
- **1930**—Coal Division formed
- **1938**—*Petroleum Technology* journal published
- **1948**—Three new journals authorized: *Mining Engineering, Journal of Metals,* and *Journal of Petroleum Technology*
- **1949**—Technical activities separated into three branches: Mining, Metals, and Petroleum
- **1956**—Name Changed to American Institute of Mining, Metallurgical, and Petroleum Engineers
- **1957**—Three semiautonomous societies formed from institute branches: The Metallurgical Society of AIME, Society of Mining Engineers of AIME, and the Society of Petroleum Engineers of AIME
- **1961**—Headquarters moves to United Engineering Center on United Nations Plaza in New York City
- **1974**—Fourth society, Iron and Steel Society, formed
- **1984**—Four societies become separately incorporated

AIME's Membership

	Mining	**Metals**	**Petroleum**
1949	8,100	3,750	3,750
% of Total	*52*	*24*	*24*
1961	12,400	8,300	14,100
% of Total	*36*	*24*	*40*

tant legacies has been in the numerous technical papers it published from almost the very beginning of the organization. In the mid-1980s, the four divisions of AIME—The Minerals, Metals & Materials Society, the Association for Iron & Steel Technology, the Society of Mining Engineers, and SPE—became separately incorporated organizations. These organizations make up AIME's membership. Today the memberships of the AIME member societies total about 100,000.

Petroleum's Rise

At the time of its founding, the commodities of most interest to AIME members were coal, iron, lead, salt, gold, and silver. It would be years before petroleum rose to significance, according to the book *Centennial History of the American Institute of Mining, Metallurgical, and Petroleum Engineers 1871–1970.*

"The petroleum industry was still an infant, although the famous Drake well, near Titusville, Pennsylvania, had been discovered 12 years earlier. The chief market product was kerosene to burn in lamps, for [Thomas] Edison's first incandescent electric bulb was 8 years in the future.

"The light fraction from petroleum known as gasoline was something of a nuisance, and the refiners produced as little as possible. The devising of a horseless carriage was in the minds of various inventors, but the use of gasoline as its source of power was given scant consideration, and the few who toyed with the idea of a flying machine fueled with gasoline were visionary dreamers. Duryea's gasoline automobile came in 1892, and the airplane became practical about 20 years later."

Hoover and Carnegie

Among the most famous members of AIME were Herbert Hoover, the 31st president of the US, and well-known philanthropist Andrew Carnegie. Hoover, a successful mining engineer and consultant whose career included work in the US and Australia, gained fame heading up US relief efforts after World War I. He served as AIME president in 1920. In 1921, he accepted a post as US Secretary of Commerce. He served as US president during 1929–33. His grandson, Herbert Hoover III, has been an SPE member for 50 years.

Carnegie was chairman of the Committee on Arrangements for the AIME fall meeting in 1890. In 1904, he gave USD 1.5 million to the institute—quite a sum at the time—for the construction of a headquarters in New York City. The building was dedicated in 1907.

As membership needs and specialties grew, AIME's divisions eventually took on more responsibility. Its four societies, including SPE, separately incorporated in 1984. Today, AIME's corporate headquarters is located in Littleton, Colorado. SPE has maintained a close relationship with AIME through the years. Many SPE presidents have served terms as AIME presidents as well. **JPT**

A Celebration of a Remarkable Half-Century

John M. Campbell Sr., SPE Honorary Member and Distinguished Member

I joined the Petroleum Branch of the American Institute of Mining and Metallurgical Engineers in 1952 as member number 2552. What a fortunate move. The "Big Bang" period of petroleum technology was in progress and, like our universe, it has continued to expand at an ever increasing rate. It was both a chaotic and exhilarating time. I had become a part of what was as much a challenge as my previous work on the Manhattan Project during World War II. There were so many folks doing such great things and rising to the challenge.

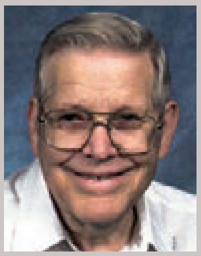
Of course, there had been a long period of innovation preceding it that effectively began with the work of John Franklin Carll in the 1870s (for whom a major SPE award is named). As is always the case, technological innovation was triggered by the growing needs of the industry. At the end of the 1940s, a very basic foundation had been established to meet the needs of the industry. This involved primarily the drilling of rather shallow wells that had a short payout, with the primary surface processing being the separation of the oil from the water, solids, and gas. Because of the depth, the producing pressures were low and much of the gas not required to operate the lease was flared.

Most of the technology had been adapted from other industries. Reservoir measurements and analysis were rudimentary. The electric log invented by the Schlumberger brothers in 1918 had been adapted for petroleum reservoir use in the early 1930s. Also in the 1930s came other developments such as pressure testing, a material-balance approach for analysis, and improvements in the tools used to drill and complete wells.

After the end of World War II, demand for energy exploded and, as usual, the industry responded. But this required the exploration and exploitation of deeper reserves in less friendly environments. What was needed was new technology, quickly. One example was the development of reserves in the "swamps" of southern Louisiana and the shallow waters just offshore. The industry sought technology that would allow this to occur in a favorable economic manner. The front-end costs increased markedly, and a national market for natural gas complicated production strategies. Better methods for locating potentially profitable drilling sites were needed. Technology that previously had been a secondary concern in many circumstances now became a critical part of the decision process.

In the space of just 2 years (from 1950 to 1952), well logging became a more quantitative tool with the introduction of the microlog, laterolog, and microlaterolog, which enabled us to better define reservoir characteristics. Several reservoir engineering books had been written, and more were expected. Pressure-testing techniques were being developed to help ascertain reservoir characteristics; the growth of natural gas utilization dictated the need for developing and handling higher-pressure gas reserves; and initial project investments were increasing rapidly with attendant longer payouts, with concerns about the time value of money. Many of the old, traditional ways of doing business no longer were viable.

The key was effective communication between those of us involved primarily in developing new technology and those who were practicing it in operations. Then, as now, this has been the challenge that SPE and its predecessor has met admirably.



John M. Campbell Sr. *is an internationally renowned expert in the petroleum industry who served as chairman of the University of Oklahoma School of Petroleum Engineering for 15 years. He earned a BS degree from Iowa State University and an MS degree in chemical engineering from the University of Oklahoma as well as a PhD degree in economics there. After working on the Atomic Energy Project in Hanford, Washington, where he was part of the team that developed the commercial manufacturing of plutonium, he began teaching at the University of Oklahoma, where he held the Halliburton professorship, served as Director of the Petroleum Research Center, and was chair of the School of Petroleum Engineering.*

Campbell is the author of more than 150 technical articles in the areas of production operations, phase behavior and properties, economics, and analysis of risk management of money. He is the primary developer of the application of time value of money concepts to the petroleum and mineral industries. Campbell wrote the first textbook to outline the principles of the time value of money and decline curves. He proposed the integrated system of property evaluation that is currently in use throughout the industry. Campbell developed the first unified system of applying risk and uncertainty to the evaluation of exploration investments and coauthored the three-volume book Mineral Property Economics, *which extended the scope of his earlier work to oil shale and coal.*

Campbell has received many awards in recognition of engineering innovation, researching, teaching, and the management of technology. He is an SPE Honorary Member, an SPE Distinguished Member, and a recipient of SPE's John Franklin Carll Award and the AIME Mineral Economics Award, and he was elected to the US National Academy of Engineering.

During his 19 years as a university professor, Campbell became a consultant to the global petroleum industry, which led to the formation of The Campbell Group, which serves both the private and public sectors. He is the author of A 20th Century Odyssey, *published in 2006.*

Campbell speaks at the 1978 ATCE after winning the John Franklin Carll Award.

Joe B. Alford was the Director of the Petroleum Branch and helped keep a degree of order in these challenging times. Along with Bill Taylor, editor of the magazine that was then called *Petroleum Technology,* Alford did a masterful job. He should be regarded as the “George Washington” of SPE, for it was largely through his skilled efforts that our branch became a full-fledged society of AIME in 1957. Although this change appeared somewhat symbolic at the time, it was important. We now had increased credibility in the engineering community and structurally had a firm foundation for future growth.

The remainder of the decade of the 1950s continued the surge in new technology as both articles and textbooks served as a continuing basis for the education and support of the new cadre of petroleum engineers. It might come as a surprise to many young SPE professionals that many of the analytical procedures now being used have their foundation in this time period. Rather embryonic forms of digital computers were appearing. Although not widely used, they were very promising tools that would replace the crude calculation devices available previously. The first reservoir simulation calculations were made that involved using multiple calculation cells.

But there was no time to rest on our laurels because the burgeoning demand for energy required the development of deeper, more complex reservoirs that sometimes were in challenging environments. The front-end costs continued to rise along with the degree of monetary risk involved. So, we added probabilistic calculations to our arsenal of technological weapons. Secondary recovery became a common practice to recover reserves from fields where the natural reservoir energy was inadequate to maintain commercial flow. In some circumstances, it was initiated early in the reservoir life.

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1970–79: Change and Challenge

John Donnelly, *JPT* Editor

During the 1970s, SPE evolved from a technical organization into a technical-professional society, established firm groundwork for international expansion, and began to map its future course through its first Long-Range Plan.

It was a momentous decade for both the oil and gas industry and for SPE. Energy was front and center in international political debate. Oil came under heavy scrutiny from politicians and the public as air and water pollution, company profits, oil embargoes, OPEC's ascendancy, gasoline shortages, and government regulation dominated the news. The decade began with the first politically charged "Earth Day" and ended with the Iranian revolution and the second "oil shock."

For SPE, it was a decade of soul-searching. Just what was the society and in what direction should it go? Should it join—or avoid—the contentious political debate of the times? Was it an organization just for disseminating technical information, or should it be concerned with the larger issues of professionalism and the public standing of petroleum engineering? Was it an adjunct of an American organization, AIME, or should it embrace the internalization of the oil industry, which was rapidly tearing down artificial borders?

Air and water pollution emerged as a leading subject of debate, and government regulation began to affect members' jobs. Pollution control was the main topic of the 1970 Fall Meeting in Houston. Representatives of government, the industry, and academia were featured in two 5-paper technical sessions covering petroleum technology and its impact on pollution and oil-spill control. Technical papers at other meetings and in the pages of *JPT* also addressed these topics. Beginning with the passage of the US National Environmental Protection Act in 1970, the oil and gas industry faced a flood of new regulations. The US Congress passed 14 major federal statutes between 1970 and 1980, including the Clean Air Act and the Clean Water Act, designed to protect the health and safety of people and the environment. These statutes generated thousands of pages of regulations at both the federal and state levels, and most of them affected E&P operations.

The media were rife with stories about pollution and the oil industry's role in it, articles that often were plagued with inaccuracies. Several SPE local section officers, particularly those from the Gulf Coast Section, began to lobby the SPE Board of Directors for permission to establish a public affairs committee that would work to correct technical

1970

- SPE membership reaches 17,682.
- Deep ocean mining begins.
- First deepwater re-entry performed *(Glomar Challenger)*.
- Bright-spot seismic technology used by Shell and Mobil to evaluate tracts offered at GOM lease sale.

1971

- The first Offshore Europe is held in Scotland under the name "Oiltech."
- First Technical Information Committees, designed to educate general public, formed.
- SPE Board creates committee to study potential international membership growth.
- First logging system combining gamma ray spontaneous potential,induction spherically focused resistivity, sonic, and caliper logs (Schlumberger).

inaccuracies being presented to the public. The SPE Board concluded that the best way that the society could contribute to the public debate regarding environmental matters was to provide a forum for the dissemination of knowledge on the technology for improving environmental quality, and to establish a literature base on environmental quality as it applied to the industry. The Board also approved a plan permitting members to participate in public affairs by contributing interpretations of technical issues. The plan allowed local sections to establish Technical Information Committees (TICs) to offer assistance to local civic and government groups and to the news media on matters involving E&P. By the end of 1971, seven TICs had been formed throughout the US.

A year later, the Board recognized the need for one societywide TIC that would provide information on E&P matters, work with government agencies at all levels, offer information to the news media, and encourage accurate reporting on petroleum issues worldwide. The committee began publishing a monthly column in *JPT* called "TIC Facts," designed to give members factual information they could use about topics involving the oil industry, such as profits, taxes, and oil and gasoline prices. The columns were reprinted for distribution by the TIC and local sections.

Political and environmental topics would dominate the decade and affect several SPE activities and programs. By 1975, five of the seven talks in the Distinguished Lecturer Program were about social and political issues surrounding the energy industry. In 1976, SPE members participated in a White House Conference on Energy and Minerals in which 200 administration and congressional officials listened to various industry viewpoints on energy issues. Several former SPE presidents delivered talks at the conference. A year later, SPE President Forest F. ("Woody") Craig Jr. testified before a congressional committee in Washington to explain the technical aspects of oil recovery as Congress examined regulation of oil operations on federal lands. Politics had become so important to the energy business that 24 pro-

1972

- Responsibility for all member services transferred from AIME to SPE and other constituent societies.
- Polycrystalline-diamond-compact drill bit introduced (Christensen).

- Mud pulse telemetry introduced, enabling accurate determination of bit location while drilling (Teleco).

SPE President McLemore toured South America in 1970 to find out about member needs for programs.

Newly formed Region X (Europe) members visit with SPE officers in 1975 in London.

The 1979 SPE Middle East Technical Conference and Exhibition in Bahrain was attended by Bahrain's emir, left, and Shaikh Zaki Yamani, Saudi Minister of Petroleum and Minerals, one of the most powerful oil industry figures in the world at the time.

fessional societies, including SPE, asked the two US presidential candidates running for office in 1976 to answer a detailed questionnaire about their views about energy and the policies they would pursue if elected.

In 1977, SPE sections in New Mexico, Colorado, California, and Texas hosted more than 350 state, local, and federal government officials at five community programs aimed at discussing issues surrounding natural gas regulation, production methods and prospects, national energy policy, and other energy issues. The session in New Mexico, sponsored by the Hobbs and Four Corners Petroleum Sections, became embroiled in controversy when a New Mexico representative denounced from the floor of the legislature a talk by former SPE President M. Scott Kraemer on natural gas supplies and the effects of price controls. Other legislators who attended came to Kraemer's defense, calling the criticism political grandstanding. Newspapers and television stations gave widespread coverage to the events.

Program Services Growth

Since the late 1950s, SPE membership had doubled and membership services had mushroomed, and the society's budget and staff had increased along with that growth. Although SPE-AIME services directed toward local sections now were handled by the society's headquarters in Dallas, student chapter affairs and individual member services still were handled from AIME headquarters in New York City. At the request of the SPE Board, administrative authority for all services was transferred to the three AIME constituent societies beginning in 1972. Moving those responsibilities to Dallas meant expanding the SPE staff further and installing data-processing equipment.

Member services were adapting to new technologies. Before 1967, SPE had disseminated technical information primarily through print—*JPT, SPE Journal,* the Reprint Series, monographs, and preprints of technical papers. But in 1967, SPE produced its first videotaped lecture. Building on that, the society's continuing education program produced two major projects in 1971—a videotaped course and a traveling lecture series. The lecture series, separate from the popular Distinguished Lecturer Series, was designed to furnish local sections with industry and university speakers for live continuing-education instruction. The first year featured 18 lectures in six subject areas, including well completions, thermal recovery, and logging.

SPE also began to offer more nontechnical programs and to concern itself with the professional standing of the petroleum engineer. A certification program that would measure and recognize the technical competence of individual members was a major discussion topic during 1974. But after 2 years of debate, the Board voted to reject a committee proposal for a certification program for petroleum engineers for more study.

In spite of all the political controversy surrounding the oil industry during the 1970s, SPE was thriving. Membership reached 26,000 in 1976 with a record 2,500 new members joining in one year. Programs and services had become so numerous that SPE published a booklet to inform members of all of the services that existed and of the opportunities to serve in offices and on committees.

International Promise

A significant issue for the society that arose during the 1970s was whether it should remain primarily a US organization. The gravity of the oil and gas industry was certainly shifting—the Middle East had the bulk of the world's hydrocarbon assets, oil had been discovered in the North Sea, and prospects in Asia showed great promise. In the past, some non-US SPE sections had been formed by engineers on assignment overseas, but the landscape was changing as nations increasingly asserted control over their own hydrocarbon assets.

"In the 1960s, the whole oil industry revolved around the US," says William Cobb, who will take office as 2008 SPE President. "The idea of oil production in Nigeria, Indonesia, and the Middle East was really far-fetched for me. Yes, we

1973

- Arab-Israeli War leads to Arab oil embargo and oil crisis.
- US withdraws from Vietnam.

1974

- First ship-shape production vessel installed at Ardjuna field, Indonesia (Arco).

1975

- First oil produced in UK North Sea at Argyll field, employing first floating production unit (Hamilton Brothers).
- US Energy Policy and Conservation Act passed, establishing production price incentives, Strategic Petroleum Reserve, and auto/truck fuel-efficiency standards.
- Microsoft founded.

had some SPE members in those areas, but it never dawned on me that I might some day go to those places in my professional career."

In 1971, the SPE Board created a special committee to study developing membership and member programs on an international level, recognizing that the future growth of the oil industry was likely to be outside the US. An opinion survey was taken of members residing in 21 countries where no SPE sections existed, and the results were almost unanimous that a global technical and professional society was wanted and needed. As a result of the survey, the Board began studying the feasibility of establishing local sections in several target areas, including Indonesia, Iran, Nigeria, and Trinidad. "Petroleum engineering technology is faceless and knows no national boundaries," 1971 SPE President L.B. Curtis said.

At the time, SPE had 64 sections, 54 of them in the US. But that ratio would begin to change. In 1971, the London Section was established with an initial membership of 200. It was the first non-US section created since the Colombian Section in 1967. Within a few years, new sections emerged in the UAE, Aberdeen, and Stavanger. In 1973, SPE held its first European meeting in Amsterdam in an attempt to establish an annual meeting involving members in Europe, North Africa, and the Middle East. More than 500 attended. The next year, a second European meeting was held in London. In 1975, the first non-US administrative region of SPE was formed, comprising the four European sections: London, Aberdeen, The Netherlands, and Stavanger. The US also was educating scores of petroleum engineering students from overseas. "(SPE's internationalization) could not have happened had there not been a preceding lengthy period of time during which students from other countries came to the US to study petroleum engineering," says John C. Calhoun Jr., Distinguished Professor of Petroleum Engineering–Emeritus at Texas A&M University.

In 1976, the Board appointed two of the most important subcommittees in its history—one on International Relations and the other on Internal and External Structure. The key questions to be examined were: Should SPE be a truly international organization, and, if so, how should the society and the Board be structured to encourage and accomplish

Exhibits fill the Astrodome during the 1976 OTC.

1976

- Board adopts first SPE Long-Range Plan.
- Production concessions of international oil companies nationalized by Saudi Arabia and Venezuela.
- Oil discovered in Mexico's Bay of Campeche (Pemex).

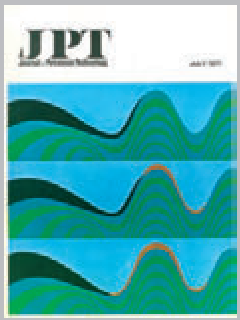
1977

- First floating production storage and offloading system installed at Castellon field, Spain (Shell).
- First pipelay barges with 1,000-ft capability (Viking Piper and ETPM 1601).

that? This also raised the question of the society's relationship with AIME. "What we have to do with regard to AIME or any program or policy is to continually re-evaluate it to see what it is doing to benefit our SPE members," President H.A. Nedom said at the time. SPE appeared to be gradually weaning itself from the parent organization. In 1977, SPE Board members were installed during the society's annual Fall Meeting rather than at the AIME Annual Meeting in February for the first time.

The question was not just whether SPE's members, most of whom lived in the US, would welcome true international expansion, but how welcome SPE would be in non-US countries. Would they view SPE as a neutral technological and professional society or an American enterprise? And how would SPE function in a country that had nationalized its oil industry? SPE leaders felt confident that the society would be seen for what it was—a nonpolitical technical/professional organization. By the end of 1976, one-fifth of SPE's local sections and one-sixth of its total membership were outside the US. Between 1970 and the end of 1976, 14 new sections had formed, and only four of those were based in the US.

"SPE and the oil industry have always been two sides of the same coin. As the industry grew in technology, complexity, and geography, so did SPE match it with its own growth and development," says Sadad Al-Husseini, who recently retired as Saudi Aramco Executive Vice President for E&P and who worked for Aramco during the 1970s. "The move of investments and production capacity away from North America starting in the mid-1970s made it necessary for US-based professionals to redirect their focus abroad. As their jobs moved, they took with them their social traditions and networks, including their network of academic centers, their professional values, and their access to professional societies. This was a real boost for professionalism throughout the world, and the benefits to international operators made SPE welcome virtually everywhere in the global arena."



Looking Back . . .

from the pages of JPT

"And what do we see for the 1970s? There are at least two big areas—the Far East and the Arctic—in which huge capital outlays for development will be made in the 1970s. Both of these areas are far from the major markets, and if they develop the productive capacities that appear likely, transportation will prove to be one of the major projects for the next decade." **— February 1970**

"The actions of all engineers are going to be intensely scrutinized by various social agencies in the 1970s. For the engineers in our society, this great social implication will be the one associated with the pollution of air and water by our industry." **— February 1970**

"In these unsettled times, the U.S. may be closer to a revolution than we think. Not of the classical, historic variety, but a revolution nevertheless. The subject? Metrication—meaning simply that the government has targeted 1970 as the year to decide if this nation will part company with the dwindling number of countries that have not yet picked up the metric system banner." **— June 1970**

"Energy shortages, government regulations, pollution—three relative newcomers to the SPE Fall Meeting scene—received the lion's share of attention at the 1970 Houston gathering." **— October 1970**

"So as the decade of the 1970s begins, the computerized system in the production phase is meeting greater acceptance by engineers in the field. It is not a perfect system and cannot yet do all things. The computer cannot and will not replace the engineer. But it can help him immensely if he will let it." **— November 1970**

1978

- First Europec conference held in London.
- Cognac platform set in more than 1,000 ft of water in US Gulf of Mexico (Shell).

- First SPE Forum is held at Colorado Mountain College.

- Measurement-While-Drilling technology introduced (Teleco).

The First Long-Range Plan

During the 1970s, the breadth of industry technology, the professional interests of the membership, and the geographic reach of the society were expanding. This raised further questions about the scope of society activities. Should SPE broaden its focus along with the industry, covering in its publications and meetings, for example, such issues as offshore rig design, geophysics, Arctic technology, profitability analysis, and regulatory issues? If SPE's scope was not broad enough, it risked members splintering off to form their own organizations or join others. If its focus became too broad, it risked diluting the expertise that made it the outstanding technical organization it had become. The society's future direction often dominated SPE Board meetings during this time.

All of this signaled the need for a road map that would help chart SPE's future course. The Board appointed a Long-Range Planning Committee to assess existing SPE programs and services and the direction the society should take over the next several years. The committee drafted a Long-Range Plan in June 1975 that was offered to the membership for comment. Recommendations by the committee covered the scope of the society's technical coverage, information-dissemination platforms, continuing education and training, membership, worldwide services, and the society's structure, among other issues.

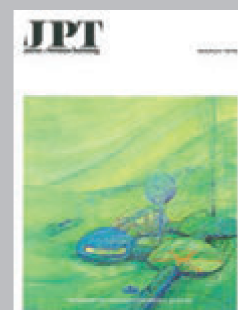
In 1976, the Board approved the first Long-Range Plan, culminating 3 years of study and evaluation of society operations. A separate Implementation Committee then recommended several proposals for immediate action, including

• Developing stricter requirements for manuscript presentation and publication

• Actively soliciting more practical drilling and production operations papers for meetings and publications

• Developing guidelines for continuing education

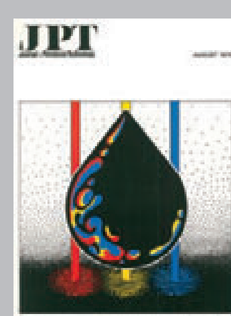
• Modifying membership materials to reflect SPE's international growth while affirming English as the society's official language, and deleting the term "foreign" from all publications and references



"The new year is with us, and with it comes new problems to view with the unsolved ones of 1974. The energy situation, while perhaps not as bleak as it was last January when fuel rationing loomed and lines to gas pumps stretched for blocks, is far from stable. The consuming nations find themselves over an oil barrel in dealing with the producing nations." **— January 1975**

"The quality of a career in the petroleum industry will rest squarely on the ability of the industry to survive and prosper. And the ability of industry to do that is becoming increasingly a function of government." **— February 1976**

"With overall petroleum engineering enrollment increasing rapidly, it should not be viewed as unusual that the number of women seeking professional careers in the petroleum and natural gas industries is also increasing. The female engineer is no longer an oddity." **— February 1976**



"The law of supply and demand continues to work to the advantage of petroleum engineers, with the average starting salary for new first-degree graduates $1,412/month, or slightly less than $17,000 annually." **— August 1976**

"SPE comprises engineers and managers who hold dissimilar political theories about petroleum's role in national and international politics. The tenet that links them in a cooperative goal is SPE's only objective: to share, update, and foster application of improved technology for producing energy." **— May 1979**

1979

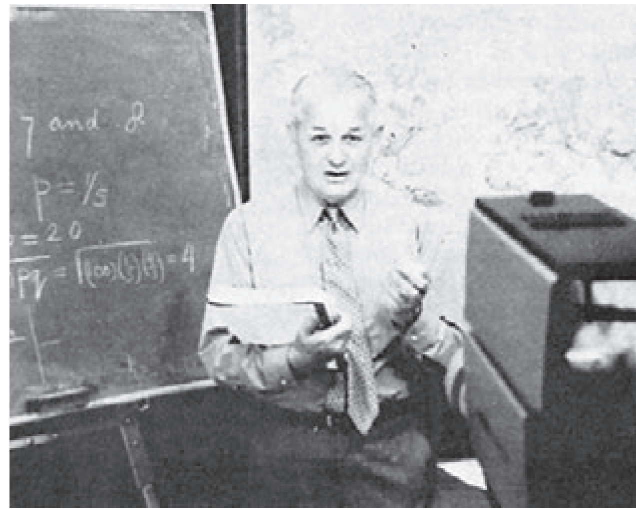
• First Middle East Oil and Gas Show and Conference is held in Manama, Bahrain.

MEOS

• Islamic Revolution deposes Shah of Iran, and Ayatollah Khomeini assumes power. Iran later cuts oil exports, causing new oil crisis.

• Three Mile Island accident leads to lower nuclear power demand.

The SPE Forum Series in 1979 drew hundreds of members including attendees shown here at Colorado Mountain College.



University of Texas at Austin professor Folkert Brons videotapes a course for SPE in 1970 as part of its continuing-education program.

• Forming an advisory council at the Board level to represent members residing where no operating regions existed

• Forming a Technical Coverage Committee to guide and evaluate SPE's total programming efforts

• Establishing new meeting formats and enlarging the scope of the publications program

The plan promoted SPE's growth as an international society. "The sharing of available technology through public forums on an international scale is a sound philosophy of benefit to members, the energy resources industries, and the public," the plan stated. "Worldwide indigenous engineers will assume an increasingly important role in the production of energy resources in their countries."

SPE's international growth did seem inevitable. A report from SPE's Subcommittee on International Relations, reported in the January 1976 *JPT,* put it this way: "Wherever industry went, SPE followed, bearing the fruits of research and experience. Into South America in the mid-1950s, Europe later that same decade, the Middle East, Africa, and the Far East—SPE initially went along in the carry-on baggage of American expatriate engineers who were sent by their multinational employers to develop the world's petroleum resources with a technology that, for the most part, had been spawned and nurtured by American and other multinational oil companies." But the industry was changing, and SPE would change along with it. Nationalization of oil interests was occurring in the Middle East and South America, and indigenous engineers were becoming more prominent. SPE membership was growing around the world, and those members needed the society's programs and services.

New Meetings Created

Another important development occurring in the industry and within the society during this time was the growing coordination and cooperation among geologists, geophysicists, and petroleum engineers to advance exploration, production, and development. Increased cooperation among these disciplines was seen as crucial to meeting the world's growing energy needs, and no longer was the dividing line between exploration and production stark. Often, this combination of interdisciplinary possibilities and international growth paid off in new meetings. In 1978, SPE held the first European Offshore Petroleum Conference and Exhibition in London, cosponsored with the Institute of Petroleum, with a technical program focused primarily on the North Sea.

Also that year, SPE held its first Forum Series, which drew more than 140 registrants. The Forum Series grew out of ideas contained in the Long-Range Plan, which said that SPE should "consider and test other meeting formats, including limited- or controlled-attendance meetings that have as a primary purpose the stimulation of thoughts and the acceleration of results in selected operations and research areas, and where no formal record of discussions would be made." The Board had appointed an Ad Hoc Committee on Controlled-Attendance Meetings with Michael Prats as Chairperson, and it had recommended establishing the Forum Series at the October 1977 SPE Board of Directors meeting. The committee's recommendation to the Board contains the elements that still define SPE Forums as meetings that promote a maximum of discussion and a minimum of prepared presentation, with reporting of new and unpublished results encouraged. The Forums are off the record, with note-taking discouraged.

The first Forums were held in 1979 at Colorado Mountain College near Glenwood Spring, Colorado, on "Properties of Saturated Rocks of Interest to Petrophysicists and Geophysicists" and "The Physical Control of Solids in Drilling Fluids." Forums were held exclusively in North America until the late 1980s, when the SPE Forum Series in Europe was created. Events were added in the Asia Pacific region and the Middle East in 1992.

In 1979, SPE inaugurated its first full-scale meeting in the Middle East with the 4-day SPE Middle East Technical

Conference and Exhibition in Bahrain. Almost 4,000 people attended, including Saudi Arabian oil minister Shaikh Ahmed Zaki Yamani, one of the world's most powerful figures at the time. Before this event, only two SPE meetings had been held in the area in the past 20 years.

SPE's traditional conferences also were doing well. The Offshore Technology Conference had swelled from 4,200 registrants and 385 exhibit booths in its inaugural year to more than 78,000 attendees and 2,000 exhibits in just a decade, and the conference had expanded to 4 days. It had become the industry's premier offshore event.

The decade closed with the sudden death of SPE Executive Director David Riley, who died of a heart attack in March 1979. He had held the position for a little more than a decade. He was replaced by Dan Adamson, who would hold the position for more than 2 decades.

It had been a decade of explosive growth in membership and programs and had seen the society enter unchartered territory. International membership growth and an industry boom helped almost double SPE's membership during the decade, from 17,682 in 1970 to 34,297 by the last quarter of 1979. Local sections had grown from 62 in 1970, seven of them outside the US, to 74 sections, with 16 of them outside the US. The number of technical papers reviewed, attendance at the annual Fall Meeting and at regional meetings, and the publication of monographs and reprints all rose sharply during the 1970s.

David Riley

Dan Adamson

The decade had begun with SPE trying to define its role in public affairs. By the end of the decade, 1979 SPE President Marvin Katz would state a position that has been fundamental for SPE since then—that it was "inappropriate for SPE, as an international society, to take positions on any government's programs or legislation." There was no question now that SPE was on its way to becoming an international society that would continue to grow globally and be less and less US-focused. **JPT**

Membership Rolls Have Contained Many Notable Pioneers

John Donnelly, *JPT* Editor

Through its history, SPE has counted among its members many oil and gas pioneers, high-profile executives, noted educators, some politicians, and others who have made important contributions to the industry and to society. Many of these individuals belonged to both SPE and one of its predecessors and were honored with some of the society's top awards during their distinguished careers.

The work of many members helped shape petroleum engineering technology as we now know it, and much of it has been in the realm of reservoir engineering. Ralph J. Schilthuis, Jan Arps, and William Hurst were all pioneers in reservoir science; M.R.J. Wyllie made major advances in the interpretation of reservoir analytics; Sylvain Pirson wrote one of the first reservoir engineering textbooks; and A.F. van Everdingen did significant work in the mathematics of reservoir performance.

Other important contributions to oil and gas technology came from individuals such as noted educator and author Donald L. Katz; Stuart E. Buckley in petroleum conservation; Keith Coats, who helped create and introduce the first reservoir simulation software; Preston Moore and William C. Goins, who broke new ground in drilling engineering technology; Forest Dorn, credited with being the first to use waterflooding to boost recovery; and Joseph Clark, R. Floyd Farris, George C. Howard, and C. Robert Fast, who developed much of the fundamental work in hydraulic fracturing.

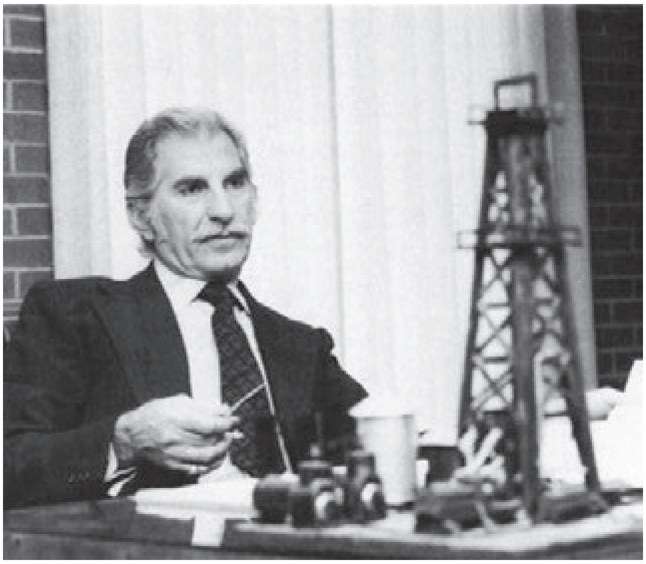
Many prominent industry executives have belonged to SPE over the years, including Robert O. Anderson, who merged Atlantic Refining with Richfield Oil to create Arco in the 1960s; Herbert C. Otis, the founder and chairman of Otis Engineering; Fritz Huntsinger, the founder of Vetco; J.L. Huitt, president of Gulf Oil Exploration and Production; Wayne Glenn, one-time president of Conoco; and John Browne, who recently stepped down as BP's chief executive officer (CEO), to name but a few.

The following list of notables is by no means a comprehensive one of all the members responsible for important advancements or who are deserving of recognition, but one that highlights some of those who have received special attention over the years for their contributions, in the industry and beyond.

Michel T. Halbouty's name was synonymous with the petroleum industry for decades. He was active in SPE, AIME, and the American Association of Petroleum Geologists (AAPG) throughout his long and distinguished career, and he was recognized as one of the world's foremost geologists and petroleum engineers and an expert on exploration and production. The legendary wildcatter—he struck oil 6 weeks out of graduate school and was the first independent to explore in Alaska—received the society's Anthony F. Lucas Gold Medal and the DeGolyer Distinguished Service Medal, and he was an SPE Distinguished Member. He was among the first of SPE's Distinguished Lecturers. He died in 2004 at the age of 95.

As a boy, Halbouty carried ice water to roughnecks working the famous Spindletop oil field in Beaumont. He became a vocal proponent of US domestic oil and gas producers and, later, an energy adviser to US President Ronald Reagan. He

Michel Halbouty was honored at a testimonial dinner in Beaumont sponsored by the Spindletop Section in 1973. Shown, from left, are Halbouty; Jack Williams, president of Texas A&M University; General Seth McKee, commander-in-chief of the North American Air Defense Command; and Spindletop Section officer Pete Cokinos.



Michel Halbouty at his desk in Houston.

wrote 370 articles—including several for *JPT* through the years—and four books. In one of his last published articles, a guest editorial in the June 2002 *JPT,* he wrote of the oilman's need for dedication and persistence, qualities that marked his career throughout. Chairman and CEO of his own company, Michel T. Halbouty Energy, he received numerous other honors and awards in his career, including the AAPG Sidney Powers Medal, Legendary Geoscientist designation by the American Geological Institute, Distinguished Scientist of the Year by the Texas Academy of Sciences, election to the US National Academy of Engineering, and election to the Texas Science Hall of Fame. He also served as president of AAPG.

Erle P. Halliburton in 1920 founded the oil services giant that bears his name. The Tennessee native took a job in California with Perkins Oil Well Cementing Company, a pioneer in the field, in 1918. Later, he started his own company, New Method Oil Well Cementing Company, which reorganized in 1920 as Halliburton Oil Well Cementing Company and established headquarters in Duncan, Oklahoma. The next year Halliburton patented a "jet cement" mixer and soon had cementing business throughout the southwestern US.

The company incorporated in 1924, and Halliburton became its CEO. He established a Canadian operation 2 years later, and in 1940 expanded into South America. In 1948, its stock was listed on the New York Stock Exchange. A member of both AIME and SPE, Halliburton died in 1957, the year SPE was created. The company eventually purchased Otis Engineering in 1959 and then Brown & Root in 1962.

Jack H. Abernathy, who died in 1996, was a pioneer of drilling technology. He was Chairman of the Board and a vice president at Big Chief Drilling Company, a leading contract drilling firm throughout the US and Latin America. Abernathy oversaw the discovery-well drilling of several major oil and gas fields in Oklahoma. Big Chief set numerous drilling-depth records during his time with the company and was the first to use several drilling technologies, including oil-based drilling fluid, packed-hole drillstring assembly, and controlled natural drift. Abernathy was a chairman of the National Petroleum Council and a director and chairman of the International Association of Drilling Contractors.

Henri Doll was chairman of Schlumberger and a pioneer in wireline techniques. During his illustrious career, Doll received 70 patents for such advances as the dipmeter, induction and proximity log, and the latero-, micro-, and microlateral logs. He wrote or coauthored more than 30 papers that greatly advanced reserves discovery techniques.

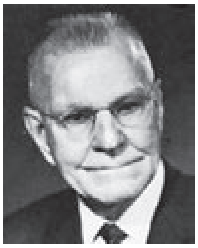
Doll was hired in 1926 by Conrad and Marcel Schlumberger as a research engineer to help design equipment used to apply electrical prospecting techniques to boreholes. A year later, with the help of two colleagues, he recorded the first electri-

Erle P. Halliburton, founder of the oil services company that bears his name (photo courtesy Halliburton).

Henri Doll, Schlumberger's chairman (photo courtesy Schlumberger).

cal log in the Pechelbronn field in Alsace, France. In 1940, he became head of Schlumberger Well Surveying Corporation in Houston. He then became director and in 1941 became chairman of the company. The Schlumberger-Doll Research Center in Connecticut was named in his honor.

Doll was a member of SPE and its predecessor organizations for 50 years. He was an SPE Distinguished Member and received the 1970 Anthony F. Lucas Gold Medal for his contributions to the industry. He was also a philanthropist and a benefactor of many cultural organizations. He died in 1991 at the age of 89.



Hubbert

M. King Hubbert gained great fame for his prediction of "peak oil," marking the height of oil production followed by irreversible decline, sometimes referred to as "Hubbert's Peak." He first became known in 1949 for his estimation of energy resources and their patterns of depletion. Hubbert worked as a geologist in Texas and Oklahoma for Amerada Petroleum in the late 1920s, taught geology and geophysics at Columbia University during the 1930s, and was a research geophysicist and consultant for Shell Oil and Shell Development companies for more than 20 years. A member of the US National Academy of Sciences, Hubbert's papers on the theory of groundwater motion and the mechanics of hydraulic fracturing are considered landmark studies. In 1956, he developed a curve—at the time, known as "Hubbert's Pimple"—that illustrated the cycle of US crude oil from startup to peak to rapid decline. Later, he applied the theory to global oil production.

Hubbert was a member of SPE and its predecessor organizations for more than 50 years; he was Program Chairman for the Gulf Coast Section during the 1940s and was a Distinguished Lecturer during 1963–64. He received the Anthony F. Lucas Gold Medal in 1971, and was both an SPE Distinguished Member and Honorary Member. He died in 1989 at the age of 86.

Archie

Gustave "Gus" Archie was a pioneer in the area of formation evaluation who discovered the fundamental quantitative relationships among porosity, electrical resistivity, and hydrocarbon saturation of rocks that laid the foundation for modern log interpretation. His paper "The Electrical Resistivity Log as an Aid in Determining Some Reservoir Characteristics" (*Transactions of AIME,* 1942), was a milestone in petroleum technology literature. Archie is credited with coining the term "petrophysics," and his fundamental formula is known throughout the industry as the "Archie Formula."

A long-time employee of Shell Development Company, Archie received the society's first Lester C. Uren Award in 1964 for his work, and he later received the Anthony F. Lucas Gold Medal. SPE awards an annual scholarship to outstanding undergraduate students in his name.

Arthur Lubinski, who died in 1996 at the age of 86, was a pioneer in the application of theoretical mechanics to a variety of petroleum activities. He was the founder of straight-hole drilling technology, and his "packed-hole concept" provided the foundation for many current controlled-drilling techniques. Born in Antwerp, Belgium, Lubinski worked for the French government before coming to the US in 1947. In 1950, he joined Standard Oil and Gas and focused his research on the use of applied mechanics in drilling and production and eventually shifted his interest to offshore projects. Lubinski held several patents, was an SPE Distinguished Lecturer in 1963–64, and received the 1976 Offshore Technology Conference (OTC) Distinguished Achievement Award and the 1988 SPE Drilling Engineering Award. He was an SPE Distinguished Member. Lubinski also was active in several other professional societies, and the American Society of Mechanical Engineers established an award in his name for the best paper presented at OTC.

Morris Muskat is credited with being the first to describe the fundamental aspects of reservoir dynamics. In the 1930s, he wrote the seminal book *The Flow of Homogenous Fluids Through Porous Media.* This book, together with his later publication, *Physical Principles of Oil Production* in 1949, laid a sound analytical foundation for reservoir engineering by combining fluid mechanics with phase behavior. He also published numerous technical papers in a variety of technical fields, including hydrodynamics, lubrication theory, and the mechanics of shaped charges.

Muskat was born in Latvia and joined Gulf R&D Company in 1929. He remained there working in various capacities until he was named Coordinator, Gulf Oil Corporation, in 1950. In 1961, he was promoted to Technical Adviser, Executive, Gulf Oil, a position he held until his retirement in 1971. Muskat received the Anthony F. Lucas Gold Medal in 1953 and the Lester C. Uren Award in 1969. He was an SPE Distinguished Member and a 1962–63 Distinguished Lecturer. He died in 1998 at the age of 91.

Ramey

Henry J. "Hank" Ramey was a department head and professor in the petroleum engineering department at Stanford University who gained an international reputation for his contribution to the design and interpretation of pressure transient testing of oil and gas wells to determine the properties and size of reservoirs. With the help of his students, Ramey is credited for much of the mathematical and practical development of modern well testing. He also was an innovator in the development of thermal oil recovery methods and received the US Department of Energy Award for Exceptional Public Service for his work that led to the development of the geothermal energy industry.

An SPE Distinguished Member, Ramey was very active in the society, serving as chairman of the 1965 Annual Meeting Reservoir Engineering Committee, the 1966 Monograph Committee, and the 1960 Transactions Editorial Review Committee. He also served on the SPE Board of Directors during 1972–75, and he served terms on SPE's Education and Accreditation, Lester C. Uren Award, Public Service Award, Western Regional Meeting Program, and Anthony F. Lucas Gold Award committees. He was 1969 chairman, 1967–69 program chairman, and 1966 treasurer of the SPE Golden Gate Section.

Ramey received the 1983 Anthony F. Lucas Gold Medal, the 1975 John Franklin Carll Award, the 1973 Lester C. Uren Award, and the 1959 Cedric K. Ferguson Medal, and he was an SPE Honorary Member. As a 1984 Distinguished Lecturer, he spoke on "Petroleum Engineering: A Way of Life." Upon his death in 1994 at the age of 67, SPE received an outpouring of correspondence from former colleagues and students, remarking on how he had touched their lives and affected their careers.

Karcher

John Clarence Karcher, a geophysicist, was born in 1894. While studying physics, he thought it might be possible to determine the depth of underlying strata by recording and timing the returning waves of energy from vibrations on the Earth's surface. Eventually he invented and commercialized the reflection seismograph, which would be used in the discovery of much of the world's oil reserves.

In 1919, he first applied for patents in reflection seismography. While he completed his doctorate, he joined two of his former professors in organizing Geological Engineering Company, the first company to commercialize the concept. On 4 June 1921, in the words engraved on a monument near Oklahoma City, they "proved the validity of the reflection seismograph as a useful tool in the search for oil."

When Everette DeGolyer heard of Karcher's experiments with the seismograph, he arranged a meeting with him in New York City that culminated in the organization of Geophysical Research Corporation as a subsidiary of Amerada with Karcher as vice president. In December 1928, Amerada drilled the first oil well in history in a structure found by a reflection seismograph. Karcher successfully found and mapped salt domes along the US Gulf Coast, and his work led to the first offshore use of seismic. In 1933, Karcher and DeGolyer were the first to map the deepseated Old Ocean dome in Texas, one of the largest discoveries of condensate ever made on the Gulf Coast. Karcher eventually left the company, with DeGolyer's blessing, to establish the world's first independent company to provide seismograph services, called Geophysical Service. In 1976, Karcher was awarded the Anthony F. Lucas Gold Medal. He died in 1978.

Abdullah Tariki of Saudi Arabia was the cofounder of OPEC. After receiving an MS degree in geology from the University of Texas at Austin in 1947—one of the first Saudis ever to earn a degree in America—Tariki returned to Saudi Arabia and became that country's first Minister of Petroleum. While in Texas, he had studied the Texas Railroad Commission's oil regulatory activities and became upset with the control over oil prices exerted by Western oil companies. He managed Saudi oil policy first as director general of petroleum and minerals beginning in 1955 and then as oil minister during 1960–62. Along with Juan Pablo Perez Alfonzo of Venezuela, Tariki helped to create the most powerful oil producers' organization in the world in 1960. He would later advise the Libyan government on oil policy in the early 1970s. He died in 1997 at the age of 80.

Olive Scott Petty was a pioneer in exploration geophysics. In 1925, he and his brother formed Petty Geophysical Engineering Company. Soon they developed the first displacement-sensitive seismograph and the first seismic system for mapping anticlines and deep-seated salt domes. They went on to develop several landmark patents in exploration geophysics, including many advances still used today. The company was purchased by Geosource in 1973 and merged with another division to form Petty-Ray Geophysical. The firm eventually became part of Western Geophysical. Petty, who died in 1994 at the age of 98, helped to found the Society of Exploration Geophysicists.

Ralph Emerson Davis is known as the "godfather of the natural gas industry." Born in 1884, Davis was a geologist, teacher, and a consultant who became the most sought-after expert on the evaluation of gas reserves and the determination of gas deliverability for the pipeline industry beginning in the 1920s. It once was estimated that three-fourths of the natural gas pipeline systems in the US and Canada were financed on the basis of his consulting firm's analyses. He died in 1968.

Alexander Deussen made significant contributions to the field of geology. In 1924, he directed the first seismographic survey of the US Gulf Coast Plain, and he later built one of the earliest laboratories devoted to the research and study of Gulf Coast sediments. After teaching at the University of Texas at Austin, Deussen worked for the United States Geological Survey and then Guffey Petroleum Company, which would become Gulf Oil. In 1916, he resigned from Guffey to begin a long career as a consulting geologist. Deussen, the second president of AAPG, died in 1959.

Wallace E. Pratt was a pioneer petroleum geologist. He joined Humble Oil & Refining in 1918 as the company's first geologist, and his studies led to the firm securing leases in the giant Mexi field in east Texas. Later, he would set up the company's first geophysics group. Pratt joined Standard Oil, Humble's parent firm, and became a director and vice president, a position he held until retiring in 1945. Pratt received the AIME Anthony F. Lucas Gold Medal in 1948 and was one of the founders of AAPG and a director of API for several years. He died in 1981 at the age of 96.

Offshore Pioneers

Several SPE members are credited with singular achievements in developing the offshore oil and gas industry.

Herbert Allen was an innovative engineer and former chairman and president of Cameron Iron Works. He received the OTC Distinguished Achievement Award in 1990 for pioneering achievements as an inventor and engineer in the development of well-control equipment for offshore drilling and production operations worldwide. He holds more than 300 patents covering assemblies for blowout preventers, pressure-relief valves, and chokes. During his career, he helped to develop valve actuators, pressure-relief valves and chokes, and tubing and casing hangers and seals. The American Society of Mechanical Engineers designates an award in his name.

Bruce Collipp and two coworkers invented the semisubmersible drilling rig. He and his colleagues' work in the 1950s and 1960s made possible the creation of a new generation of mobile drilling vessels that were capable of operating in deep water under harsh conditions. Collipp, who worked for Shell Oil for 33 years, received the Distinguished Achievement Award at the 2002 OTC for his contributions. He was elected to the US National Academy of Engineering in 1991 for "pioneering contributions to the semisubmersible offshore floating drilling platform and for continued leadership in the development of innovative ocean engineering."

Pieter Heerema first achieved prominence in the 1950s, when he pioneered the use of prestressed concrete pile design in Lake Maracaibo, Venezuela. In the early 1960s, the Amsterdam native became a leader in North Sea construction, helping to develop semisubmersible derrick and lay barges that revolutionized offshore construction by allowing for the design and installation of larger platforms. In 1962, in a partnership with Brown & Root, he built the world's first derrick ship, *Global Adventurer.* In 1978, his company introduced the world's first two semisubmersible crane vessels. He died in 1981 at the age of 73.

Dean McGee and his partner, US Senator Robert Kerr, founded the Kerr McGee Corporation, a landmark company in offshore industry history. The company built and operated the platform that produced oil from a structure out of sight of land in the Gulf of Mexico for the first time in 1947. The well helped to launch the offshore oil industry. McGee received the first SPE Public Service Award in 1984. He died in 1989.

Robert L. Suggs founded Petroleum Helicopters in 1949 and used his helicopters to support the work of seismic crews working offshore in the Gulf of Mexico and in Louisiana. Using technology that had emerged from World War II, Suggs offered improved transportation that helped the fledgling offshore industry by giving offshore companies a faster, safer, and more efficient way to transport workers and equipment. The company eventually became the world's largest and most experienced commercial helicopter operator. Suggs, who died in 1989, was posthumously elected into the Offshore Energy Center's Hall of Fame.

Politics and Public Figures

Some members made their mark in both oil and politics.


Clements

William P. "Bill" Clements was an offshore pioneer before he became a two-term governor of Texas. He founded Southeastern Drilling in 1947 as an onshore firm but then took his company offshore. The company grew from two rigs operating in 10 ft of water in 1954 to 50 rigs operating in depths of up to 15,000 ft by the mid-1980s and became the world's largest offshore driller. He served as US Deputy Secretary of Defense under Presidents Nixon and Ford in the 1970s. In 1979, Clements became the first Republican to serve as governor of Texas since the 19th century, and he later served a second term beginning in 1987. SPE awarded him its Public Service Award in 1987.

Dewey F. Bartlett was a US Senator, governor of Oklahoma, and state legislator in a political career that spanned 1963 to 1979. The oilman and rancher won a seat in the Oklahoma Senate in 1963 and served a term as that state's governor beginning in 1967. He was elected as a Republican to the US Senate in 1973, where he served until 1979, the year he died.

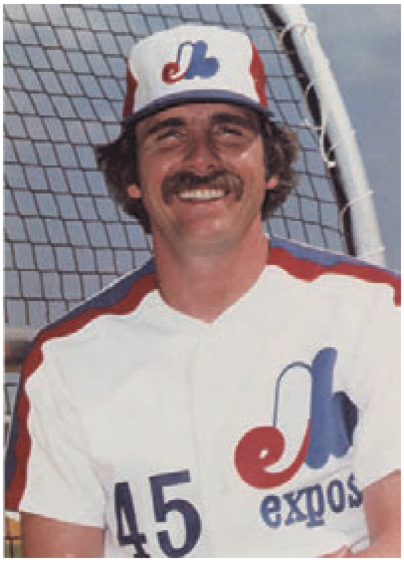


Photo courtesy Steve Rogers.

Not all of SPE's members are known for their connection to the industry. The best example is perhaps that of former major league baseball pitcher **Steve Rogers,** who was a star pitcher for the Montreal Expos in the 1970s and 1980s. Rogers was National League Rookie of the Year in 1973, the year he broke into the big leagues. He was a petroleum engineering graduate from the University of Tulsa and kept up with the profession, including membership in SPE, for several of his playing years. The five-time National League All-Star played 13 seasons and is the winningest pitcher in Montreal Expos history with 158 wins. After retirement, he took a position with the Major League Baseball Players Association. JPT

SPE Award Namesakes Were Leaders in the Industry

Erica Shillings, *JPT* Assistant Features Editor

SPE confers 18 honors and awards that recognize members' technical and professional excellence as well as their contributions to the society, the engineering profession, and their communities. Five awards have become synonymous with AIME and SPE and are named in honor of individuals who made singular contributions to the industry.

Anthony F. Lucas Gold Medal

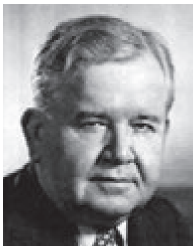
The Anthony F. Lucas Gold Medal, established by AIME in 1936, is awarded to individuals for distinguished achievement in improving the technique and practice of finding and producing petroleum. There have been 62 recipients of the award since its inception. The medal was named for Captain Anthony F. Lucas, who is associated with the famous Spindletop gusher near Beaumont, Texas, and was the first chairman of AIME's Oil and Gas Committee, the forerunner to what eventually would become SPE.

Often referred to as the "father of petroleum engineering," Lucas was born Antun Lucic on the coast of Dalmatia in 1855. He graduated from the Polytechnic Institute in Graz and entered the Austrian Naval Academy. He rose to the rank of second lieutenant but took a 6 months' leave of absence in 1879 to visit an uncle in Saginaw, Michigan. Lucas found employment in the lumber country and secured a second leave from his naval service. At the end of 1880, he decided to remain in the United States and changed his name to Anthony Francis Lucas. He married Caroline Weed Fitzgerald in 1887 and moved to Washington, DC. Their son, Anthony Fitzgerald Lucas, was born in 1892.

A mechanical and mining engineer, Lucas went from Colorado to Louisiana in search of gold, salt, and sulfur deposits. From 1893 to 1896, he supervised salt-mining operations in Louisiana for a New Orleans company. In drills at Anse la Butte, Belle Isle, and Grand Cote (Weeks Island), he found traces of salt deposits and oil characteristic of the salt domes of the Gulf of Mexico coast. He explored the salt dome structures in the southern states, and by the time he arrived in Beaumont, Lucas had an extensive knowledge of salt domes and sulfur deposits.

Pattillo Higgins was responsible for attracting Lucas to Beaumont. In 1899, Lucas answered an advertisement for a drilling contractor position placed by Higgins. Lucas was searching primarily for sulfur, but he also knew that there was a possibility that the Spindletop mound—a piercement-type salt dome similar to those along the Louisiana coastal region—contained oil. Lucas and Higgins got a lease/purchase agreement from the Gladys City Company for 663 acres south of Beaumont at Spindletop. In a separate agreement, Lucas retained a 90% interest for funding the search, and Higgins was given a 10% interest.

Although Lucas located traces of oil, he found drilling extremely difficult, and his light equipment collapsed after reaching a depth of 575 ft. With funds dwindling, Lucas looked toward John Galey and James Guffey for financial support. Galey, Guffey, and Lucas worked out an agreement for financing.


DeGolyer


Lucas


Uren

Drilling began on 27 October 1900. Lucas and his crew drilled through the hard sands and brought in the Spindletop oil field on 10 January 1901, essentially ushering in the modern oil industry. The Lucas gusher flowed at the rate of 80,000 to 100,000 BOPD. By 1902, as many as 285 wells were operating on Spindletop Hill and more than 600 oil companies had been chartered. Spindletop's population shot from 8,000 people in 1901 to 60,000 people in 1902.

Lucas, an engineer whose knowledge of geologic formations was far ahead of his time, died at his home in Washington, DC, on 2 September 1921.

Cedric K. Ferguson Medal

The AIME Petroleum Branch established the Cedric K. Ferguson Medal in 1954 to recognize significant contributions to the permanent technical literature of the profession by a young member. When the medal was established the recipient was required to be 33 and under; the age was recently changed to 35 and under. It was the first medal established by the Petroleum Branch and is named for Cedric K. Ferguson, an engineer from California who died at age 31. Since 1954, 58 medals have been awarded.

Ferguson died in 1953 of poliomyelitis, cutting short a promising career. He belonged to numerous organizations and was a natural leader in each, and he had gained both technical and professional success at the time of his death. Ferguson graduated from Stanford University and earned an MS degree from the University of California. When he was younger, Ferguson attended schools in Texas, Colorado, and New Mexico, as he traveled with his father who was a mining engineer and geologist. Ferguson joined the Oil Field Research Division of California Research Corporation in 1948, and from 1950 until his death, he was project leader of well-completion and drilling research with the company.

Ferguson was secretary of the Pacific Petroleum Chapter of the Petroleum Branch of AIME and was chairman of the AIME Junior Petroleum Group in southern California. He also was president of the Young Republicans Club of Orange County, California. When the medal was established, it was financed through funds donated by the Pacific Petroleum Chapter, California Research Corporation, and the Petroleum Branch.

John Franklin Carll Award

SPE President John Hammond, left, awards the first John Franklin Carll Award to Herbert Otis, chairman of Otis Engineering.

Established in 1956, the John Franklin Carll Award recognizes contributions of technical application and professionalism in petroleum development and recovery. The award honors John Franklin Carll, a pioneer in the Pennsylvania oil industry who is considered to be the first petroleum geologist and engineer. Since 1956, 51 medals have been awarded.

Carll, a civil engineer, was born in Bushwick (now Brooklyn), New York, on 7 May 1828. He received his education at Union Hall Academy and in 1846 assisted his father in farming. From 1849 to 1853, Carll worked with his brother-in-law, E.O. Crowell, in the editing and publication of the *Newark Daily* and weekly *Eagle.* In 1853, he moved to Flushing, where he practiced civil engineering and surveying.

In 1864, Carll settled in Pleasantville, Pennsylvania, and became interested in the development of oil. He became familiar with drilling and production methods while observing the different rock layers penetrated in drilling, and he collected records on numerous wells. Carll devised the static pressure sand pump, removable pump chamber, and adjustable sleeve for piston rods—significant developments in well operations. He gained fame as a geologist, and local oilmen would seek him out for information on drilling depths and locations.

In 1868, Carll joined a committee of oilmen who were collecting drilling information on Venango County. The committee tried to determine the relationship between the orientation of the producing rocks and the producing areas. E.O. Nettleton, a fellow committee member, collected data during 1868–69. He later gave all of his records to Carll.

In 1874, an act of the Pennsylvania Legislature ordered a Second Geological Survey of Pennsylvania to continue the work that was started during the First Survey of 1836–41. Carll was in charge of the geological survey in the oil districts of western Pennsylvania, where he compiled seven reports on oil and gas surveys that became models of conscientious investigation and scientific description. Carll's first report for the survey, Report I, was published in 1875 and emphasized the significance of the subsurface geologic structure and presented the first structure maps of subsurface formations published in the US. His second report was a list of logs for 1,654 wells in northwestern Pennsylvania. Many of the records found in Carll's second report were the data given to him by Nettleton. Report III, published in 1880, included the surface and subsurface geology of the oil regions in Butler, Clarion, McKean, Venango, and Warren counties. In 1883, Carll published his fourth volume, which contained 685 well records and a thorough geological survey of Warren County, including detailed geology by township.

Carll's work confirmed the theory that oil sands lie in lens-shaped masses, not in continuous belts, and that oil does not occur in underground pools or lakes but in pores of rock. He was the first person to suggest collecting drill cuttings as a way of associating them from well to well. Carll also invented the strip log and was able to demonstrate the correlation of some subsurface strata with rock formations exposed at the surface. His survey reports included discussions of rigs and tools as well as the importance for drillers to keep their own records. The well records Carll collected for his published reports are still used today.

DeGolyer Distinguished Service Medal

The DeGolyer Distinguished Service Medal was created in 1965 to recognize outstanding service to SPE, to the professions of engineering and geology, and to the petroleum industry. Named after Everette Lee DeGolyer, the medal recognizes individuals who display the genius and extraordinary ability of DeGolyer in his contributions to petroleum technology and to the organization of the industry. Over the years, the medal has been awarded to 43 recipients.

Recognized as "the father of applied geophysics," DeGolyer was a pioneer in applied geophysical exploration, and his name is commonly associated with the seismograph. DeGolyer was the most well-known petroleum geologist in the world in his day. He founded and headed a number of widely known petroleum-related companies, including Amerada Petroleum, Rycade Oil, Geophysical Research, Geophysical Services, Core Laboratories, and DeGolyer & MacNaughton. Extensively published, DeGolyer was particularly well-known for his seminal works on salt domes. He also gained fame for his dedication to public service and philanthropy.

After earning a BS degree in geology from the University of Oklahoma, DeGolyer was hired as chief geologist of Mexican Eagle Oil to head the exploration staff. In 1910, he selected the location for the Potrero del Llano No. 4 well in the Mexican Golden Lane, which produced more than 110,000 BOPD. DeGolyer also located the discovery well in the Los Naranjos field, which produced more than 1.24 billion bbl.

DeGolyer worked as chief geologist for Mexican Eagle until 1916, when he established his first consulting business. In 1919, he formed Amerada Petroleum. Under DeGolyer's control, the company became a world leader in the design, development, and application of reflection seismic. DeGolyer completed the first successful torsion-balance survey in the US and is credited with the first geophysical discovery of a producing oil field in the US.

DeGolyer retired from Amerada in 1932 after serving as president and chairman of the board and returned to consulting. In 1936, he and Lewis W. MacNaughton, a former Amerada colleague, established the consulting firm DeGolyer & MacNaughton, which specialized in third-party appraisals of oil and gas properties.

An organizer of the American Association of Petroleum Geologists (AAPG), DeGolyer served as its president in 1925 and was made an honorary member in 1944. The AAPG awarded him the Sidney Powers Memorial Medal in 1945. DeGolyer was also president of AIME in 1927 and received the Anthony F. Lucas Gold Medal in 1940. In 1951, he was elected to honorary membership in AIME. DeGolyer was Distinguished Professor of Geology at the University of Texas at Austin in 1940, and during World War II, he acted as director of conservation and assistant deputy administrator with the Petroleum Administration for War. DeGolyer received honorary degrees from Colorado School of Mines, Southern Methodist University, Tulane University, Washington University, Princeton University, Trinity College, and the University of Mexico. The University of Oklahoma, DeGolyer's alma mater, created the Distinguished Service Citation in his honor.

Lester C. Uren Award

The Lester C. Uren Award, established in 1963, acknowledges distinguished achievement in petroleum engineering technology by a member who made the contribution before age 45. The award also honors professional engineering achievement and commemorates Lester C. Uren, an internationally known engineering educator and author. Since 1963, 49 medals have been awarded.

Uren, a petroleum engineering educator, researcher, and author, is credited with establishing the first curriculum in the field of petroleum engineering in 1915. He was a professor at the University of California for more than 40 years. Uren combined the theoretical and practical aspects of petroleum engineering education in such a manner that his method became a trademark during his long teaching career. During the summers, he spent time in the oil fields of California to acquaint himself with the practical working conditions of the engineer.

Uren's research activities were basic to the understanding of the science of petroleum engineering. He published more than 160 technical articles on research, engineering applications, economics, and education in the field of petroleum engineering. In 1924, Uren authored the first basic textbook on petroleum production engineering, *A Text-Book of Petroleum Production Engineering*. A revised version of this work, which has grown to three volumes, is still used in many petroleum engineering schools and as a standard reference work in the libraries of oil companies and engineering offices.

One of the earliest research investigators in petroleum engineering, Uren supervised more than 100 theses on different phases of technology. He served as a member of research committees for AIME, AAPG, the American Petroleum Institute, and the National Research Council and conducted research and development work for Marland Oil, Henry L. Doherty and Company, Ranney Oil Mining, Standard Oil Development, and the US Bureau of Mines. JPT

Bold Decision To Launch OTC Brought Far-Reaching Results

Joel Parshall, *JPT* Features Editor

At the very beginning, its planners called it "a bold and significant step." Those were the words used by Joe Alford, executive secretary, SPE, in a May 1968 *JPT* article to describe "a new interdisciplinary meeting to be known as the Offshore Technology Conference" that would be held 1 year later, 19–21 May 1969, in the new Convention and Exhibit Center in downtown Houston. Nine major US engineering and scientific societies with a combined 370,000 members had agreed to sponsor the event. What the sponsors hoped to accomplish essentially is summarized in the following excerpt from the article:

"The new conference will provide a major forum of national importance and scope for the dissemination of technology related to offshore resources and environment. The total benefits and influence of the conference are now beyond prediction, but many knowledgeable persons feel that it will be of considerable value to the nation in our development of oceanography and resources from the oceans."

These were no small plans, but it is hard to believe that anyone among those original conference architects, no matter how visionary, foresaw how big, globally important, and even phenomenal that OTC would become. Yes, OTC is the way that most people would soon refer to it, but notably, the initials were not used in that first *JPT* article. They were used, however, by the time the conference preview article appeared the following April. From the beginning, OTC has been guided by a board of directors drawn from the sponsoring organizations (and later also from endorsing organizations). SPE has provided the principal management and staff resources to manage OTC yearly on behalf of the board.

The first conference drew 4,200 people, with 26 technical sessions and 125

Cars fill the parking lot at the Astrodome complex in Houston during the 1974 OTC.

technical papers presented, and 200 exhibitors occupying 38,500 square ft of exhibit space.

The very first presentation of the opening session, catalogued as OTC 1000, was "The Economics of Oil and Gas Operations Offshore U.S.A.," by Richard C. McCurdy, president of Shell Oil Company. Following this were the presentations "Our Nation and the Sea," by Julius Stratton, chairman of the Ford Foundation; "The Law Governing the Development of Undersea Mineral Resources," by Northcutt Ely of Ely and Duncan; and "Some Results of Deep Ocean Drilling," by Maurice Ewing, director of the Lamont Geological Observatory.

A partial list of the technical sessions includes

- Subsea Operations—How Legal, How Safe?
- Marine Mineral Exploration
- Positioning and Vessel Motion
- Completion and Drilling
- Geophysics
- Mooring
- Metallurgical Marine Structural and Operational Problems

Industry "in the Hole" Offshore US

Two highlights of the first OTC were mentioned in a short summary appearing in the June 1969 *JPT.* The first was McCurdy's opening address, in which the Shell president noted, "The oil industry still finds itself $7.5 million in the hole on offshore work in U.S. waters despite some significant successes in the Gulf Coast area." The second highlight cited was Ewing's account of "the successes of the coring project of the *Glomar Challenger.*"

One person with a special memory of that first OTC is Dennis Gregg, a now-retired Conoco chief engineer who served as SPE president in 1986 and has remained very active in the society through his work with the SPE Foundation.

"I've been to just about all the OTCs and was chairman during 1992–93, but I gave my one and only OTC paper—in fact my only SPE paper—at the very first Offshore Technology Conference in 1969," Gregg says.

Gregg coauthored the paper with Alan McClure of Conoco and J.A. Norton and R.E. Williams of J.E. Bowker Associates. "At the time, I was a project engineer on a project in Dubai," Gregg said. "We had discovered oil there and decided we would stay offshore with the production facilities. So we came up with a floating-storage concept using dedicated tankers. Our paper described this system. Part of the uniqueness, I think, was that nobody would live on the tankers." The tanker hulls were drained from the bottom, Gregg explained, and oil traveled through a large-diameter pipe to the platform, where deep well pumps loaded the oil onto market-bound tankers.

The storage system operated for some years before being replaced with three 500,000-bbl structures "that looked like upside-down champagne glasses and were piled to the ocean floor," Gregg said. "We called them *khazzans*, which is Arabic for storage, and they worked just marvelously. The original tankers—called *maajmas*—worked fine but rusted out pretty quickly in that Arabian Gulf atmosphere. Still, we really were pioneers in this, and the interesting thing is that this is the only unmanned floating storage I'm aware of ever installed anywhere. I still think it's a good idea."

Gregg admits he had no idea of how big OTC eventually would become, but acknowledged in retrospect that the timing was right for establishing the conference. "The offshore industry was about 15 years old, and everything our company was doing overseas, almost, was offshore," he noted.

At the conclusion of the first OTC, the sponsoring organizations voted unanimously to return to Houston for the second conference 3–6 May 1970. The 1970 OTC had been slated tentatively for New Orleans.

Attendance more than doubled in 1970 to 11,600, with technical papers increasing to 145 and the number of exhibitors growing to 269, requiring 50,000 square ft of space. A year later, OTC left the downtown convention facility for the Astrohall, several miles south of downtown, at the Astrodome complex.

The Organizations That Sponsor OTC

When the Offshore Technology Conference (OTC) was conceived and launched in the late 1960s, there were nine sponsoring organizations. That roster has since grown to 12 as a result of restructuring by which three constituent units of the American Institute of Mining, Metallurgical, and Petroleum Engineers became separately incorporated.

The original sponsors consisted of the following.

- The American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME)
  - Society of Petroleum Engineers (SPE) of AIME
  - Society of Mining Engineers (SME) of AIME
  - The Metallurgical Society (TMS) of AIME
- The American Association of Petroleum Geologists (AAPG)
- The American Institute of Chemical Engineers (AIChE)
- The American Society of Civil Engineers (ASCE)
- The American Society of Mechanical Engineers (ASME)
  - Petroleum Division
  - Underwater Technology Division
- The Institute of Electrical and Electronic Engineers (IEEE)
  - Aerospace and Electronics Systems Group
  - Communication Technology Group
  - Geoscience Electronics Group
- The Marine Technology Society (MTS)
- The Society of Exploration Geophysicists (SEG)
- The Society of Naval Architects and Marine Engineers (SNAME)

The sponsors, broadly speaking, have remained the same. However, SPE, SME, and TMS have each incorporated separately from AIME. Additionally, some sponsoring groups have changed names or have reorganized and renamed their constituent units that sponsor OTC.

The conference's 12 sponsors today consist of the following.

- AAPG
- AIChE
- AIME
- ASCE
- ASME International Petroleum Technology Institute
- IEEE Oceanic and Engineering Society
- MTS
- SEG
- The Society for Mining, Metallurgy, and Exploration (SME)
- SNAME
- SPE
- The Minerals, Metals, and Materials Society (TMS).

In addition, the conference has two endorsing organizations, the International Association of Drilling Contractors and the Petroleum Equipment Suppliers Association, and five supporting organizations: the American Petroleum Institute; the Independent Petroleum Association of America; the Institute of Marine Engineering, Science, and Technology; the International Marine Contractors Association; and the National Ocean Industries Association.

OTC attracted international media exposure. Here, reporters for a television station and Newsweek magazine interview the Duke of Kent in 1979.

Soon the conference began to grow rapidly. Attendance topped 15,000 in 1972, 22,000 in 1973, 32,000 in 1974, and 51,000 in 1975. By 1976, the number of exhibitors had grown to 1,500, and exhibit space occupied had expanded to 375,000 square ft. The ascent continued, as 65,000 people attended OTC in 1977 and nearly 80,000 in 1978, while technical papers reached a then-record level of 284. The following year, the number of exhibiting companies climbed to 2,000, requiring 450,000 square ft of space.

Reflecting Industry Growth

OTC's growth during the 1970s certainly reflected that of the industry, as surging oil demand from industrialized countries and a series of dramatic geopolitical events turned crude oil into a commodity even more highly prized than before. As OTC progressed, the exhibition grew so large that the buildings of the Astrodome Complex could no longer contain it. Some exhibits had to be moved into the parking lots. Attendance continued to boom—almost 87,000 in 1980, more than 100,000 in 1981, and 108,161 in 1982, which remains an all-time record. There were 2,500 exhibitors in 1982, the first time that level had been reached, and a record 631,000 square ft was needed to accommodate them. OTC that year brought an estimated USD 107.7 million of income into the City of Houston, the first (and only) time the conference generated more than USD 100 million of income to the city.

The year 1982 was a watershed for OTC, yet not remembered completely fondly. The swelling attendance in the early 1980s included some with little interest in petroleum technology, people who came just because the exhibition was big and in the news or were interested chiefly in the giveaway items at exhibit booths. To some the event was starting to look like a carnival. From 1975–80, the number of yearly technical papers was always well above 200. In 1981,

OTC exhibits annually attract thousands, including students, shown here at the 1978 event.

the number dropped to 184, and the following year it fell to 144—actually one less than the total papers presented in 1970, OTC's second year.

Attendance at the 1983 OTC fell precipitously to less than 59,000. By this time, world crude oil prices were entering a steep decline. It was no coincidence that many companies approached the OTC Board of Directors to discuss the burden of exhibiting at the conference when the industry was contracting and ask if the exhibition could be held every other year.

In response, the OTC board decided to hold only a technical conference in 1984, skipping the exhibition entirely until the following year. However, exhibiting companies resisted board requests to sign agreements not to exhibit at any competing 1984 event that might emerge in OTC's time slot. Each company, it seemed, was concerned its competitors might exhibit at such an event, forcing them to exhibit as well. This scenario is precisely what happened.

As Don Stacy, a then-OTC board member and 1983 SPE president noted, "Would you believe there were three OTCs that year (1984)—one in Dallas, one in Houston somewhere, and one in New Orleans?" The exhibitors, ironically, had a heavier burden than ever, and the OTC board quickly realized its mistake. "We said okay, we learned our lesson, and we're not skipping any more years," Stacy said. "We've held it every year since."

Wisely, OTC had held onto its lease dates at the Astrodome complex, so resuming the exhibition in 1985 proceeded smoothly—even as oil prices were free-falling toward USD 10/bbl from their USD 40/bbl highs a few years earlier. Attendance that year was more than 56,000, and technical papers rose to a healthier level of 230. While the number of exhibitors dropped from 2,500 in 1983 to 1,725, the exhibit space, at 431,000 square ft, was virtually the same as 2 years earlier.

Over the next 11 years, attendance was considerably lower, stabilizing in the 25,000–36,000 range, while the number of exhibitors and square footage of exhibit space were also substantially below 1985 levels. Exhibiting companies, however, focused increasingly on showcasing breakthrough technologies to maximize opportunities for an industry reinventing itself. Technical papers were well in excess of 200 every year and rose to 309 in 1996, a record at the time.

In the oil markets, modest price improvement brought relief from the rough days of the 1980s. This spurred technical innovation, with major stepouts into ultradeep water and some extraordinarily harsh seas. Projects like Heidrun in the North Sea, Mars in the Gulf of Mexico, and Hibernia off Newfoundland raised the bar for deepwater technology advances. OTC attendance moved above 40,000 in 1997 and surpassed 50,000 in 2003.

OTC on Smart Growth Trend

OTC also acquired a new home, moving in 2002 into the new Reliant Center at Reliant Park. With robust industry expansion and major investment in new technology, the conference is now on a smart growth trajectory. Attendance eclipsed 51,000 in 2005, with a record 324 technical papers presented and almost 2,100 exhibitors. Exhibit space moved above 400,000 square ft for the first time in 20 years.

In 2006, attendance increased 15% to more than 59,000. Following this, attendance climbed another 13% in 2007 to 67,155, the highest level in 25 years, with 275 technical papers presented and nearly 2,400 exhibitors from more than 30 countries. With almost 530,000 square ft of exhibit space needed—a level surpassed only in 1982—the exhibition expanded into adjacent Reliant Stadium.

Looking back at OTC over the years, Arlie Skov, 1991 SPE president, cited the society's conception of OTC and its decision to sponsor and manage it as one of the most "significant events that shaped and strengthened SPE."

"OTC was an event whose time obviously had come," said Don Stacy. "And SPE and the Board were smart enough to pull it together and get these other professional societies involved."

Today, OTC remains the world's foremost event for the development of offshore resources in the fields of drilling, exploration, production, and environmental protection. It ranks as one of the 10 largest meetings in attendance among US trade shows.

OTC attracts industry personnel and companies worldwide, drawn by the desire to see, learn about, and discuss the newest technology, and make and renew important contacts throughout the global industry. Companies find it a valuable setting for making business deals and a forum of choice for announcing mergers and acquisitions or introducing new products and services. The collaboration and dialogue of diverse disciplines, companies, organizations, and institutions across the offshore industry is nowhere more evident than at OTC.

Tellingly, a phrase used often all over the world when industry people part company, end a phone call, or sign off an email is simply this: "See you at OTC." **JPT**

Fifty Years of Change in the Petroleum Engineering Profession

Ron Lord, Contributing Writer

Without a doubt, the petroleum engineers of today are very different from those of yesteryear. They are trained differently, think differently, operate differently, and use a different tool kit from that of their predecessors. Some of the changes in the profession are obvious, such as the availability of a more sophisticated tool kit and the presence of women in every facet of the business. Other changes have been more subtle, including engineers' attitude toward their profession, improved communications skills, and the rise of information overload.

Women Join the Ranks

One of the most profound changes in petroleum engineering since 1957 has been the participation of female engineers in a career field that had been overwhelmingly male. Exceedingly rare 50 years ago, female engineers and managers are now common.

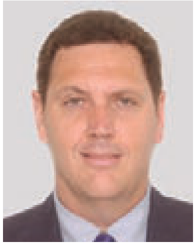
"Our industry is still underserved by the female half of society, but it is a far cry from the 1950s and before," said James Pappas, Global Technology Director for Devon Energy and SPE's Technical Director for Production and Operations. "Now more than ever, women are needed in the workforce because the industry has never been so short on engineers. To have excluded half of the population in the past from such an important career amounts to nothing less than a huge case of shortsightedness by the industry."

Many of the first wave of women entering the profession were themselves daughters of oilmen, who encouraged them to pursue careers in petroleum while simultaneously cautioning the young women that the oil patch could indeed be a difficult place for them to work and succeed. Some of the obstacles included the difficulty of accommodating both men and women on offshore rigs, and sometimes women were not welcome by the wives of men working aboard a drilling and production platform offshore.

"Equality legislation during the 1970s and early 1980s did much to open doors for women and other minorities in our profession," says C.O. (Doc) Stokley, vice president of R&D for TAM International and a 42-year veteran petroleum engineer. "The result has been a much smoother path for women and other minority engineers during the past several decades."

The Move to Teamwork

Depending on the culture of the company, some engineers during the 1950s and 1960s began to be exposed to multiple disciplines, such as drilling, completions, workover, fracturing, production, reservoir, and other areas in an effort to broaden their knowledge and experience. But other companies believed it was better for engineers to focus on a single discipline. By the end of the 1970s, the industry was a mix of



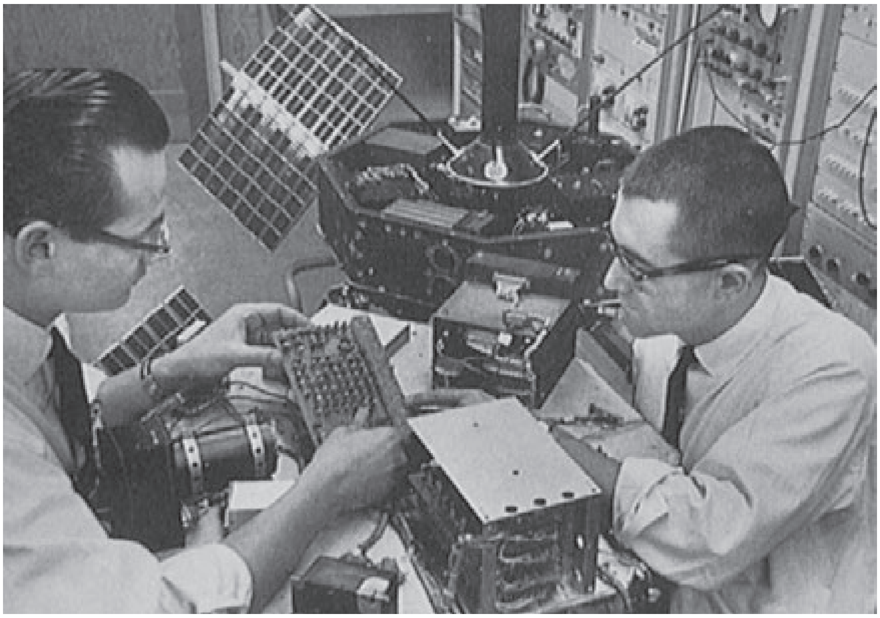
Pappas

Stokley

specialists and multidiscipline generalists. This period also brought closer together the exploration and production sides of the business.

During the 1980s, the industry moved toward assembling specialist engineers into multidisciplinary asset teams in an attempt to increase operational efficiency and cost-effectiveness. The teams usually were led by engineers with experience in multiple disciplines.

"Most of these guys gained their experience through frequent job transfers in the 1950s and 1960s," Stokley says. "They led these teams and were



Schlumberger Wireline engineers test electronic components for a NASA satellite in 1961.

successful. But, over the years, they began to retire or move into other areas, leaving the leadership roles to more specialized engineers. Due to this void of engineer generalists, the teams did not function as well.

"One of the big issues (today) has been a lack of engineers with multidiscipline training," Stokley added. "Today's engineers have made it clear that they do not favor being moved. Many resist due to issues such as spouses with careers who cannot move easily, family commitments, and other barriers to transfer. To compensate, companies have moved toward virtual-reality centers in which teams of specialized engineers work together to solve problems. These centers get all the engineers and information into a single room and allow problems to be solved in real time."

Pappas said that the integration of engineers into teams represents a huge stride toward improved efficiency. "Fifty years ago, companies were functionally structured with few areas of cross-communication at the engineering technical levels," he said. "About 20 years ago, the industry began to change to other organizational styles. Some newer styles are related to matrix structures, others deal with business units, and still others are hybridized. However, they all have at least one goal: to improve integration within the team, thereby improving overall effectiveness."

This evolution toward teamwork represents a distinct change from the past when seismic seldom spoke to production, which almost never mixed with drilling, which wanted nothing to do with reservoir engineering.

Impact of Computerized Tools

Another big difference in how engineering is practiced today is the increase in state-of-the-art tools developed as a result of the invention of the microchip and the subsequent development of computer technology.

"Information technologies, hardware, and software have changed the way petroleum engineering professionals work," said Alberto Sampaio de Almeida, Director of Reserves and Reservoirs for Petrobras and SPE Director of Reservoir Description and Dynamics.

One need not look far to see that influence—desktops, laptops, and handhelds have created a sea change in the way engineers go about their daily tasks. Slide rules still exist, but you rarely see them except on display, such as the one that sits in Stokley's office. Electronic tools are riding a technol-

Use of the desktop computer was commonplace by the 1980s.

Faith of the Engineer

The following pledge appeared many times in AIME and SPE publications over the years, including on the cover of JPT *in July 1965. It is credited to Michael Sullivan, an engineering graduate of the University of Michigan in 1929.*

"I am an Engineer. In my profession I take deep pride, but without vainglory; to it I owe solemn obligations that I am eager to fulfill.

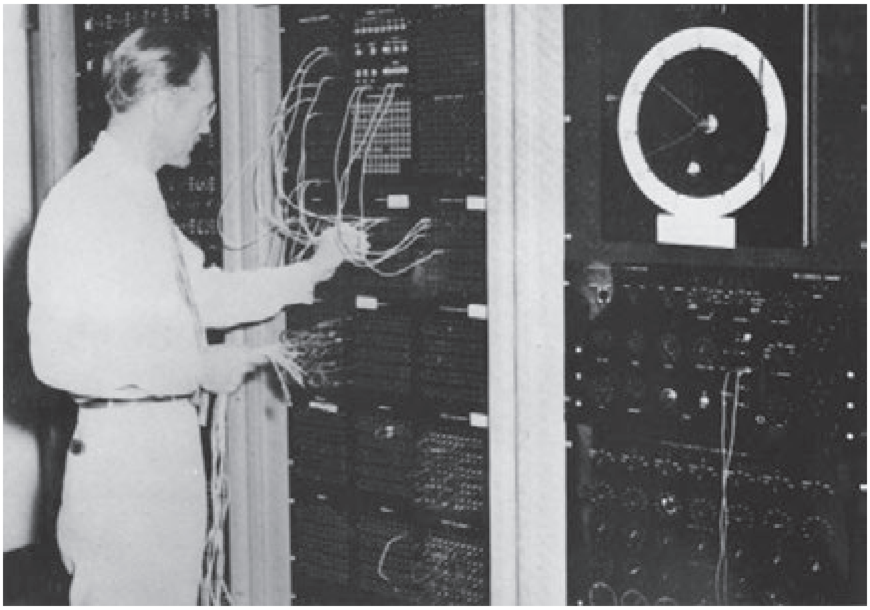
As an Engineer, I will participate in none but honest enterprise. To him that has engaged my services, as employer or client, I will give the utmost of performance and fidelity.

When needed, my skill and knowledge shall be given without reservation for the public good. From special capacity springs the obligation to use it well in the service of humanity: and I accept the challenge that this implies.

Jealous of the high repute of my calling, I will strive to protect the interests and the good name of any engineer that I know to be deserving; but I will not shrink, should duty dictate, from disclosing the truth regarding anyone that, by unscrupulous act, has shown himself unworthy of the profession.

Since the Age of Stone, human progress has been conditioned by the genius of my professional forebears. By them have been rendered usable to mankind Nature's vast resources of material and energy. By them have been vitalized and turned to practical account the principles of science and the revelations of technology. Except for this heritage of accumulated experience, my efforts would be feeble. I dedicate myself to the dissemination of engineering knowledge, and especially, to the instruction of younger members of my profession in all its arts and traditions.

To my fellows I pledge, in the same full measure I ask of them, integrity and fair dealing, tolerance and respect, and devotion to the standards and the dignity of our profession; with the consciousness, always, that our special expertness carries with it the obligation to serve humanity with complete sincerity."



The science of reservoir engineering has benefited greatly from new and more efficient technologies over the years.

Use of hand-held computer in the field in the 1980s.

ogy wave that long ago replaced slide rules and mechanical calculators. The use and reliance on computers over the past 5 decades has mandated that engineers possess a firm foundation in the application of computer technology and software. The availability of computers has changed the productivity of the engineering workforce, especially during the past 3 decades when the industry has encountered economic downturns.

"In many offices I worked in, we saw the manpower go down and the workload stay the same, and I think the only way to do that effectively is through computing, which has had a profound effect on our business," said David W. Schott, a senior reservoir engineer for BP. "For example, we used to run one history-match simulation overnight. Today, a reservoir engineer generates a 'cloud' of matches. He may run 10,000 history matches per year, which is fairly commonplace, and as many a 100,000 per year."

Engineers of the past were well versed in "rules of thumb" and possessed large doses of field experience complete with battle scars, but present-day engineers are armed with a computerized tool kit that they apply in an office environment.

"When I started working, engineers were expected to spend at least a year in the field," said Schott. "It was my introduction to a more diverse crowd of people. … I used to sit at the Motorola radio and talk to contractors and foremen, a humbling experience just trying to understand what they were saying to me. It seems that a lot of that is missing today. When I talk to new engineers, they tell me they would like to get out in the field more, but consolidations and office closures have centralized our offices more. There seem to be fewer engineers with hands-on field experience."

Pappas agrees. "Fewer of today's petroleum engineers have that much-needed field experience. While their book-learning skills are well served, many engineers lack that edge that comes from working in the fields, understanding the challenges associated with operations on the ground, and an appreciation of field personnel and their value."

Consolidations and Mergers

Over the past several decades, oil and gas industry professionals have had to adapt to the industry's changing conditions, including the occasional rash of mergers and consolidation. Engineers often have been asked to move from an office in the field to a regional office in a large city. Then, a few years later, they are asked to disperse to locations closer to the field. This brings about reassignments, upheaval in projects, and, in most cases, new working relationships. Even more upsetting has been the cyclical nature of the industry over the year as oil prices skyrocket, only to bottom years later and then rebound. Many times, as a result of a merger or sale, engineering personnel undergo stressful periods in which their projects are re-evaluated, rebudgeted, or rejected altogether to meet the goals and requirements of the newly formed company or new owners.

"I started working in 1981, and things were booming," Schott said. "I had nine offers to work coming out of college. It changed quickly, however, and it has been a long campaign of attrition with a few bright spots, such as in 1997 and the latest beginning in 2005. There were a lot more companies than there are now. Many of the people in the business and many of the household names are gone. We have seen the rise of national oil companies … while independent oil companies like Arco, Mobil, Amoco, Texaco, Phillips, and others have been dissolved."

Focus on the Bottom Line

Fifty years ago, engineers had little involvement with the profit/loss segment of the business. Engineering was done for its own sake, not the bottom line. Now, the emphasis has shifted much further toward the revenue side of the business. If a project does not somehow contribute to the bottom line, it generally does not get done regardless of the contribution it might make to the discipline or the industry. The same logic also applies to asset teams. The engineering membership of the team is expected to contribute to the overall profitability of the reservoir. Theoretical engineering is interesting, but if it results in an expense without corresponding revenue, it will not be tolerated for very long under today's oilpatch business standards.

Stokley remembers a completion engineering manager he had in south Louisiana years ago who told him, "If you aren't making some mistakes in your workover program, you aren't trying enough new ideas." Today, Stokley said, "Most probably, this logic would not be encountered, especially in a major oil and gas company."

Evolution of Communications

In communications, the E&P industry has undergone a wave of change. In the 1960s, communications were managed by clerical staff. Engineers had secretaries who handled most of the clerical chores such as typing, filing, and scheduling. Four decades later, engineers type their own emails and use high-speed printers and copiers to move information instantly to those who need it.

They manage their flow of information differently as well, says Pappas. "Years ago, the petroleum engineer physically journeyed to the field to obtain information or solve problems," he said. "Today, most of it arrives electronically via his or her computer or handheld device, or even by satellite. Whereas a petroleum engineer used to rely on letters, handwritten notes, and land-line phones, now he or she types an email message on a laptop computer and uses a cell phone for voice communication."

Another significant change that affected not only the industry is the internationalization of the oil business. US and UK engineers now work side by side with engineers from Asia, Africa, and Latin America. This change took place gradually but accelerated during the 1980s.

"Years ago, the only engineers considered credible for employment by international operators were American- or Canadian-trained engineers," says Stokley. "Around 1982, that resistance began to change. Now the oil field has evolved into a much more accepting arena for engineers trained in other countries, many of whom are top-notch. They are knowledgeable, well-schooled, enthusiastic, and willing to work anywhere in the world."

Information Overload

Perhaps without realizing it, the petroleum engineering profession has been subjected to a continually increasing flow of data and communication that, some say, is approaching information overload. Computers linked to the Internet simplify the ease in which multiple recipients located anywhere in the world can be copied on emails, presentations, engineering documentation, and numerous other communications. This is good when everyone remains informed, but it becomes overload when too much data compete for the attention of a single recipient.

Pappas recalls his experiences with information overload. "As a young engineer, one of the first problems I encountered involved information ... or the lack of it, to be specific. I distinctly remember my college professors warning that at some point we would not have all of the information needed to make an informed decision. For me, reality came swiftly. What does one do when there is no information to help guide decisions?

"My turnaround occurred sometime around 1990. I was sitting at my desk and realized that it would take an inordinate amount of time to wade through all of these data to decide which route to take. So I changed tactics: I prioritized data to convert it to useful information. I relied on my experience and judgment, and I made my decision based on all of this filtered information. But I'm still not sure which is worse—not having enough information or having too much of it." **JPT**

People Are the Thread That Hold This Industry Together

Iain Percival, Senior Adviser, Schlumberger Business Consulting

It is an honor to reflect on the changes I have observed in the business since I joined it (and SPE in Dallas while backpacking around the US) in 1973. So much in the oil and gas industry has changed since the summer of 1973, and then again, in some areas, it has not. For me, one constant in the business has been the people. However, the composition of the global workforce and the way people actually work has changed dramatically. Consequently, if you will bear with me, I will share with you my perspective on people in the business.

I entered the industry at the time of the hegemony of the "Seven Sister" international oil companies (Shell, BP, Exxon, Mobil, Texaco, Socal, and Gulf) staffed primarily by petrotechnical staff from Europe and North America. Today, only four of the original sisters remain as independent companies, and, according to an article in the *Financial Times* earlier this year, the "new seven sisters" are Saudi Aramco, Gazprom, China National Petroleum Corporation, the National Iranian Oil Company, Petroleos de Venezuela, Petrobras, and Petronas, staffed to large measure with national Earth scientists and engineers educated in local (national) universities.

I am struck by the progress made by a number of countries in growing successful and powerful national oil companies (NOCs). A case in point is in Malaysia with Petronas. This year is the 33rd anniversary of the founding of the company, exactly the length of time I spent working for Shell. I had many dealings with Petronas in the early 1980s while working for Shell in east Malaysia. At the time, its prime (but not only) responsibility was to oversee the work of the production-sharing contractors such as Shell. The company had modest staff numbers and modest premises but not so modest ambitions! Today Petronas is a truly integrated oil and gas company with a global reach, a workforce in excess of 30,000, present in more than 30 countries, and based in a building of "world wonder" proportions—the twin towers in Kuala Lumpur, one of the world's tallest buildings.

Fresh from graduate school and backpacking across the US in 1973, Iain Percival (right) wandered into SPE's headquarters in Dallas and became a member. At left, is Tom Sullivan, SPE Technical Services Manager and editor of JPT.

***Iain Percival,** SPE, retired as Chief Petroleum Engineer from the Royal Dutch Shell Group earlier this year after 33 years of service. In this position he was responsible for ensuring the availability of skills and capability at both individual and company level to deliver quality field development plans, reservoir management activities, and reserve replacement. Prior to this final job, he held positions in both the Corporate Centre and Operating Units covering global subsurface technical advice, technology development, petroleum/development engineering management, global new business opportunity evaluation, development geology, and petrophysical engineering. He is now a Senior Adviser for Schlumberger Business Consulting and consults with the Energy Centre of Robert Gordon University and the University of Aberdeen.*

Percival earned a BS degree in geology from the University of Aberdeen, an MS degree in petroleum engineering from Heriot-Watt University, and an MBA degree from Brunel University. He is a board member of the SPE Netherlands Section. Percival can be reached at iainpercival@fastmail.fm.

Many of us who have worked in the business over the past 30-odd years can take a genuine measure of satisfaction in our contributions to the development of the national staff who built these companies. Whether as members of operating or service companies, we have helped train and coach national staff and as such have contributed to in-country expertise. In the case of Malaysia, Oman, and Brunei, I can name individuals in senior positions whom I have personally encouraged and coached, and whom I now count as valued friends or acquaintances.

My experience from the countless meetings of technical professionals I have attended (company, SPE, American

Association of Petroleum Geologists) is the recurring theme of a shared pride in our business. I have worked in many parts of the world, with Shell Operating Unit staff, staff from NOCs, staff from coventurers, and staff from many service companies. Without exception, I have met people sharing a common bond of pride in their company, the oil and gas industry, and in making a major contribution to a nation's economic well-being. This feeling (although tempered with occasional frustration!) has been with me from the start. I have vivid recollections from 1974 of watching the launch of the BP Forties field jacket "Highland 1" from the purpose-built yard close to my home in the north of Scotland. I was home on my very first leave from my first Shell posting in Gabon as a new boy in the oil business to witness the event. At the age of 26, I was thrilled at seeing the completion of an important component of North Sea hydrocarbon production infrastructure by countrymen who, within a couple of years, had metamorphosed from welding broken agricultural machinery to being skilled builders of massive steel offshore structures.

The Biggest Changes

That positive feeling is present in the national staff of the many countries of the world where the oil business operates. More and more positions in companies, large and small, are filled with such national staff capable and confident in what they do and who do not take kindly to any inference that only Western Europeans or North Americans can do the job or that somehow they will not be able to understand or apply the technology. That recognition and understanding of such sentiment is critical to making a success of ongoing or new business development all over the globe, whether as operator, coventurer, or contractor. It is certainly much more important than it was 30 years ago and requires a different (broader) skill set in the current generation of technical professionals compared with what I needed in my formative years in this industry.

There has been a remarkable increase in the number of female geoscientists and engineers coming into the business. During my 4-month basic training course in The Hague, there was one solitary female petroleum engineer in the building and not one in my course. How this has changed. A look around almost any team dealing with exploration, development, engineering, well drilling, or production will record a substantial number of female faces. In fact, the basic Shell E&P introduction course for new graduates has been running at a level of up to 40% female participation for the period 2000–2005.

The technology deployed in the exploration, development, and production of hydrocarbons has had an impact beyond the wildest dreams of those like me who entered the business of subsurface E&P in 1973. The toolkit of the geologist and seismic interpreter at that time was one of light tables, tracing paper, HB lead pencils (many colored pencils!), erasers, paper (2D) seismic sections, scissors, and sticky tape for cutting wireline logs. His colleagues in petrophysical, reservoir, and production engineering were served by hand-held calculators (remember the excitement when programmable Texas Instruments and Hewlett-Packard calculators became available?). Technical work was done in discipline teams, and access to experts normally involved time-consuming travel and delay.

The technology deployed in the exploration, development, and production of hydrocarbons has had an impact beyond the wildest dreams of those like me who entered the business of subsurface E&P in 1973.

Unrivaled Technology

The working environment is now one of immense computing power, work stations, immersive (visualization) technology, "fly through" capability, simulation, integrated multidisciplinary teams, and instant global collaboration. Development technology has moved into a domain of water depths so challenging that the technology deployed and reliability required beats that of the aerospace industry. In my industry ambassador engagements with students in school or university, this ultrahigh-tech theme is one I use more and more, again with a sense of satisfaction in what our industry achieves.

My final reflection combines people and technology. The two, carefully matched and aligned, equate to individual and organizational capability. If the match is not right, the result is a foregone conclusion. When involved in technology and skill development at Shell, I frequently said the following: "The F-16 is a wonderful leading-edge fighting machine. However, in the hands of a glider pilot, it is not only useless, it is dangerous." In other words, the technology and skills required must match. Our business has an unenviable track record of "letting go" the very technical skills required just as new business challenges and emerging technologies need them on hand. Unfortunately, all too often over the past 30-plus years, the core skills required to find and produce hydrocarbons have been treated as a cost and not as an investment of strategic importance. It is my hope that the industry will not revert to past poor practice, thereby disenabling the industry in its drive to replace reserves and build production, disenchanting a generation of petroleum engineers and geoscientists and making the job of selling the industry as a career in schools and universities even more of a challenge.

I consider myself most fortunate to have worked in the industry and lived through the ups and downs of the past 34 years. In particular, it has been a privilege to work with the diverse and technically stimulating global community known as the Operating Units of Royal Dutch Shell and to rub shoulders with many, many members of SPE around the world. **JPT**

1980–89: Surviving Industry Turbulence

John Donnelly, *JPT* Editor

SPE made additional strides in internationalization and membership growth during the 1980s. Despite the free fall in oil prices that would mark a low point for the oil and gas industry during the decade—and lead to massive layoffs and restructurings—SPE not only survived, but in some ways thrived.

In 1980, membership rose 14% from the year before to 38,799. By now, a fifth of the society's membership resided outside the US and several regional meetings around the globe had developed. As membership and the diversity of members' technical interests grew, SPE was challenged to ensure that its meetings and publications were relevant to the specialist while appealing to a broad spectrum of disciplines. The scope of SPE's defined technical focus began to expand and include such interests as unconventional resources, geothermal energy, shale oil recovery, and facilities.

Ken Arnold, Senior Executive Vice President of AMEC Paragon and SPE's first Technical Director for Projects, Facilities, and Construction, was instrumental in getting SPE to offer more programs and services for facilities engineers. He chaired an ad hoc committee in the early 1980s in investigating SPE's relation to facilities engineering. "We presented to the SPE Board a plan outlining how we could provide more service to this group, with hopes of increasing its membership," Arnold said. "In those days, facilities engineering was not even considered a specialty; it was part of production operations. … One of the key recommendations that was implemented was the creation of a committee within SPE for facilities. It started to create programming for at least three or four sessions at each SPE Annual Technical Conference and Exhibition (ATCE), and that began to generate papers. Another thing we did was, when the *SPE Production Engineering* technical journal was first put together, we added a review chairperson and a technical editor committee for facilities topics to make sure that journal had facilities content."

Early in the decade, an ad hoc committee began to review the society's first Long-Range Plan, which had been adopted in 1976. It advised several changes that reflected the society's increased international presence and the importance and strength of local sections. The committee recommended adding director positions representing the Middle East, Asia Pacific, and South America, in addition to the one non-US director on the board from Europe. It proposed several other additions, including recommendations that

- Section financial procedures include annual budgets and audits
- The society offer more continuing education support to sections

1980

- SPE membership reaches 38,799.
- First variable-speed electrical submersible pump (Hughes-Centrilift).
- Iraq launches 8-year war against Iran.

1981

- US oil prices decontrolled.
- Areawide leasing in US GOM begins.
- DuPont acquires Conoco, initiating series of major industry mergers and acquisitions.
- First offshore horizontal well drilled (Elf).

• Sections establish their own newsletters
• Sections create annual section awards and plans for officer rotation
• SPE become more involved in intersociety activities
• Changes should be made to SPE election procedures, including allowing members, for the first time, to select SPE regional director nominees through regional nominating committees.

Technical Literature Expands

Technical literature diversified and increased during this period. Monographs were published on thermal recovery, waterflooding, gas well testing, and well logging. SPE produced its first Spanish-language monograph in 1981, a translation of F.F. Craig Jr.'s *The Reservoir Engineering Aspects of Waterflooding*. It published its first textbook in 1982, *Well Testing* by W. John Lee, a professor at Texas A&M University. The textbooks *Applied Drilling Engineering* and *Waterflooding* would follow later in the decade. Both *JPT* and *SPE Journal* expanded the breadth of their technical coverage to reflect member and industry interests. *JPT* in 1981 began publishing Distinguished Author Series articles, designed to give readers a way to stay abreast of key improvements in all branches of petroleum engineering technology. The first article in the series summarized significant developments in contemporary drilling practices.

The SPE Board adopted a new master publications plan that included revised editorial committee operating guidelines to promote expedited preparation and distribution of technical papers, textbooks, monographs, and continuing-education material. Along with this growing amount of technical literature came the challenge to capture and offer that material to members in a usable form. In 1981, SPE released the "SPE Technical Paper Microfiche Collection," giving the industry a single source for more than 8,000 technical papers, and began to work on a computerized database source for information retrieval. A year later, the society began offering a feature designed to locate information from

British Prime Minister Margaret Thatcher views exhibits at the 1985 Offshore Europe conference.

SPE's Ad Hoc Committee on Internationalization meets in New York City in 1985. From left are Edward Price, Aramco; Kenneth Robbins, Otis Engineering; Marvin Katz, Arco; Raymond Hollis, Dehli Petroleum; Brian Lavers, Shell UK; Norman Rubash, Amoco Canada; and Michael Prats, Shell Development.

SPE President Clyde Barton, far left, accompanies Wang Yaoting (center), chairman of the China Council for Promotion of International Trade, during the first conference in China sponsored by SPE and the Chinese Petroleum Society.

1982

• SPE publishes first textbook, *Well Testing* by W. John Lee.
• First SPE conference and exhibition held in China.
• First tubing-conveyed perforating run (Atlas Wireline Services).
• 3D seismic processing begins (Veritas).
• Oil-industry employment peaks at 1.65 million.
• OPEC introduces production quotas.
• International Law of the Sea Treaty negotiated.

databases identified with SPE's and other petroleum-related technical publications. The service enabled individuals to order literature searches at nominal cost by filling out a form published in *JPT* and mailing it in.

By mid-decade, *JPT* and *SPE Journal* were having difficulty publishing the amount of material that members wanted on subjects related to their jobs as well as keeping up with the number of technical papers that were being presented at SPE's new meetings and conferences around the world. In 1985, the SPE Board voted to expand the publications program—the first major expansion of periodicals since 1961—authorizing the publication of four new technical journals: *SPE Drilling Engineering, SPE Production Engineering, SPE Reservoir Engineering,* and *SPE Formation Evaluation.*

Intersociety Collaboration

SPE was expanding in other areas as well. Following on the success of the Offshore Technology Conference (OTC), the society began working more with other industry organizations and associations that shared common interests. In 1980, continuing an earlier effort on resources evaluation, SPE, the American Association of Petroleum Geologists, and the American Petroleum Institute unveiled a unified set of reserves definitions designed to be used by companies, government agencies, and other interested organizations worldwide. SPE's work with other organizations on this issue—including the World Petroleum Council, the United Nations, and the Society of Petroleum Evaluation Engineers, among others—continues today as it works toward creating a global standard for calculating reserves and resources. SPE also partnered with government, producing its first two meetings with the US Department of Energy, symposia on improved oil recovery and unconventional gas recovery.

A significant breakthrough occurred when, following extensive discussions, SPE, the Chinese Petroleum Society, and the China Council for Promotion of International Trade announced that they would conduct an international oil and gas conference and exhibition in Beijing. That event, held in 1982, attracted 150,000 Chinese engineers, managers, and technical specialists as well as 1,000 attendees from outside China and senior officials from the Chinese oil ministry. Technical sessions included 64 papers on such topics as production geology, drilling, geophysics, offshore operations, and pipelines. That meeting forged new links between SPE and industry groups in China. Two years later, in 1984, SPE signed an agreement with the Chinese Petroleum Society outlining areas of cooperation between the two on technical information dissemination and offering standing invitations to attend each other's technical meetings and to sponsor joint conferences.

SPE also linked up with the International Association of Drilling Contractors (IADC) for the first time to create the IADC/SPE Drilling Conference. The first conference, held in 1983 in New Orleans, attracted 1,500 people and brought together two different communities of drilling professionals—IADC had been the leader in developing drilling practices and hardware, while SPE had focused largely on developing technology to increase drilling efficiency. This conference partnership continues to this day, with the conference alternating between sites in the US and Europe and smaller joint events in Asia and the Middle East. Also in 1983, SPE sponsored and conducted the Offshore Europe conference in Aberdeen, another conference that continues to thrive to this day.

Other intersociety initiatives during the period included work with the Society of Exploration Geophysicists to create programming at SPE's Annual Meeting, launching a joint venture with the Society of Mining Engineers (SME) to conduct the first SPE/SME International Solution Mining Symposium, and working with the UK-based Institute of Petroleum and four other technical societies to put on the Europec conference.

"We were in the early stages of becoming truly international," recalls R. Lyn Arscott, who would serve as 1988 SPE president. "The China conference had become established,

1983

- First IADC/SPE Drilling Conference held in New Orleans.
- First guyed tower installed (Exxon).
- First quantitative LWD resistivity sensor (Halliburton).
- Demand for oil continues to decline.
- Subsalt drilling begins on Ship Shoal Block 366 in US GOM (Placid).
- International Convention on Marine Pollution (MARPOL 73/78) enters into force.

1984

- SPE is incorporated separately from AIME.
- Steerable drilling system introduced (Norton Christensen).
- Industry's first tension-leg platform (TLP) begins operation at Hutton field in UK (Conoco).
- Chevron acquires Gulf Oil.
- Saudi Arabia reduces oil output to support prices.

Tents dot the landscape during the 1983 Offshore Europe conference.

and we were nurturing that carefully. We had no regional offices at that time. The Offshore Europe conference was up and running, and we were able to finalize the financial structure for that, which has been a tremendous benefit to SPE ever since. We began getting things going in the Middle East, South America, Asia, and Africa. Things were just starting to take root."

SPE Steps Toward Independence

On 1 December 1984, SPE incorporated as a legal entity separate from AIME, as did the other three societies that were part of AIME. Although incorporation had little effect on the daily operations of the society, it signaled SPE's efforts to become even more international. "It's a happy separation for all parties," SPE President Kenneth Robbins of Otis Engineering said after the incorporation became official. "It's something that we've been working toward for many years without ever calling it that."

The SPE Long-Range Plan in effect had triggered this step. The mid-1970s plan had recommended that the society "adopt whatever organizational structure is required" to achieve its objectives. Many SPE leaders, going back to 1949 when the Petroleum Branch of AIME was formed, had argued that engineers needed to conduct their own affairs in accordance with the needs of their own profession. Several things had happened over the years that made SPE's separate structure possible, including SPE creating its own investment portfolio and the establishment of the SPE Foundation to help with fund-raising for particular projects. The creation of OTC also signaled the importance of SPE's autonomy. SPE had enough money in its fund to help finance the first installment, which proved highly successful.

1985

- Demand for mobile drilling units peaks at 530.
- Price of oil continues to plummet.
- E&P Forum [to become International Association of Oil and Gas Producers] releases its first Global E&P Industry Safety Performance Data report.

1986

- Four discipline-specific technical journals are launched: *SPE Drilling Engineering, SPE Production Engineering, SPE Formation Evaluation,* and *SPE Reservoir Engineering*.
- Oil prices bottom out at USD 9/bbl.
- Derrick barge lift capacity reaches 13,200 tons (McDermott).
- Chernobyl nuclear disaster.

Looking Back . . .

from the pages of JPT

"The United States is entering the 1980s facing the most severe technological and organizational challenge in its history: Can we produce enough energy in the years ahead to assure that our society will continue to grow and prosper?" **— January 1980**

"The oil embargo in 1973 and 1974 caused world oil prices to escalate rapidly. In response to that favorable climate, enrollment in petroleum engineering schools jumped dramatically beginning in the middle of the last decade, and the corresponding jump in graduates that occurred about 4 years later continues today." **— July 1980**

"Society dues for 1981 will increase as a result of the SPE Board's midyear action to adjust members' dues for the first time since 1949." **— August 1980**

"The 1980 SPE survey of job offers to petroleum engineering graduates provides continuing evidence of the high premium placed on petroleum engineering degrees by industry recruiters. The average 1980 salary accepted by a graduate with a BS degree is $2,013/month." **— November 1980**

"While the band plays 'Nearer My God to Thee' and senior management carefully rearranges the deck chairs, Gulf Oil begins to slide beneath the waves en route to oblivion. And the 'Seven Sisters' are now six." **— March 1984**

1980–89

The SPE Foundation's first major project was to help SPE build its own permanent headquarters in the Dallas area. Under the plan, the society paid rent to the foundation, which owned the building, with the money used to help fund nonrevenue-producing activities and programs.

Industry Changes

SPE was trying to keep abreast of changes that were transforming the industry. By the early 1980s, the demands on the petroleum engineer were increasing, which would affect the type of information and services that members needed from SPE. Regulatory compliance, in particular, was taking up an increasingly larger part of the engineer's day. Government price controls in the US on oil and gas required engineers to keep up with constantly changing regulations to determine the economics of drilling and production prospects. New environmental regulations covered both onshore and offshore facilities.

"In the mid- to late 1980s, there was a revolution going on, not only in the oil and gas industry, but in all industries because we were seeing an avalanche of regulation in the United States and Europe, and our industry simply had to adjust rapidly to this growing regulatory regime," says Arscott, who helped raise awareness of health, safety, and environmental (HSE) issues in SPE. "Some of the first steps were to establish management practices and principles and to educate our employees about how important this was.

"SPE played a very significant role in this," Arscott said. "I remember the first HSE Forum in 1989 where we decided to establish a committee on HSE and decided to organize the first HSE conference. The first US conference was held in 1991, and the first international conference was held later that year. SPE is now planning its ninth international HSE conference. We have held them in Europe, Asia, South America, the Middle East, and North America—so it has been a truly global effort."

The personal, or desktop, computer was now a mainstay in the industry. SPE created a Microcomputer Users' Group,

1987

- SPE obtains the rights to *Petroleum Production Handbook* and publishes a revision titled *Petroleum Engineering Handbook.*
- Demand for mobile drilling units drops to 275.

Chinese students tour exhibits during SPE's first China conference.

which grew to 2,500 members by the early 1980s and which supplemented commercial software with software applications written by the group. The group created SPENET, a communications network that offered access to programs, databases, and other facilities, including the Microcomputer Users' Group's bulletin board.

SPE also began to take advantage of the now-widespread availability of videocassette tape. Course offerings, through the Continuing Education Committee, were particularly useful for training staff, especially outside the US. Videocassette courses were offered in fundamentals of reservoir engineering, drilling fluids, production optimization, enhanced-oil-recovery fundamentals, and economic evaluation.

During the early 1980s, many local sections hosted "Community Relations Nights" to inform the public about

1988

- Forums are held in Europe for the first time.
- GOM exploratory tract leased in almost 11,000 ft of water (Kerr-McGee).
- Explosion of Piper Alpha platform in UK North Sea takes 167 lives.

"Starting salaries for petroleum engineers have risen faster than those for other engineers, escalating petroleum industry salaries for experienced engineers. These salaries and job opportunities led to increases of more than 600% in petroleum engineering enrollment, and more than 400% in the number of petroleum engineering graduates in the 10 years prior to mid-1982." **— January 1985**

"Imagine conducting your SPE committee business electronically, sending your technical review of an SPE paper to the society's electronic mailbox, authorizing bankcard charge payment of your SPE dues electronically, ordering a publication or registering for the Annual Meeting from your PC keyboard. The schedule for realizing these possibilities may not be predictable today, but if the acceptance and reliance on workstation computers continues to grow among members, the day will come. The trend is clearly moving in that direction." **— May 1985**

"Operators have disbanded teams, cleared out whole decades of experience levels on their staffs, stopped all but replacement hiring, issued golden parachutes, announced cutbacks, and trimmed future hiring projections to handle minimal needs into the hazy near future just past today's economic clouds. Survival and job prospects for the service and manufacturing sector are at bottom, if only because this just has to be the bottom." **— May 1985**

"SPE members have changed addresses more than 23,000 times from Jan. 1, 1988, through May 15, 1988, as a result of company relocations, mergers, consolidations, individuals changing employers, and internal restructuring. The rate of change suggests that the petroleum industry has not completed repositioning and restructuring." **— July 1988**

The Offshore Europe Program Committee works on the agenda for the 1985 conference.

energy issues. Most of the meetings were organized through SPE's Technical Information Committees (TICs) and received extensive media coverage. But SPE continued to resist some members' push that the society become more active in the public affairs arena. "I think almost all members would agree that they don't want the society to lobby, but some members see no danger in playing 'brinkmanship,'" 1982 SPE president Clyde Barton said at the time. "They want to define lobbying very carefully, to move very close but not actually lobby. Rather than play brinkmanship, I think we should stay away from that brink."

Instead, the TICs focused their attention on public education. A new program was created called "Visual Aids in Petroleum Exploration and Production," a manual of 35-mm slides with descriptions designed to assist members put together talks about the industry. SPE also created a Technical Information Service, a network of 30 experts in specific areas of petroleum technology who could respond to questions from government officials, the media, and special-interest groups. The goal was to give these organizations timely and accurate information on petroleum engineering topics. Committee members made a trip to Washington, DC, in 1985, visiting 18 associations and government committees to inform them of availability of the service.

The Industry Contracts

From an industry perspective, the 1980s are known for the steep drop in oil prices and the massive restructurings that took place. The decade was a time of USD 10/bbl oil, leveraged buyouts, mergers, bankruptcies, slashed budgets, early retirements, and joint ventures between competitors. Scores of professionals lost their jobs. The downturn would have an impact on SPE as well. The decade had begun with startling growth. The 14th annual OTC smashed records in 1982, with 108,161 attending the conference at Houston's Astrodomain complex, an event that featured 2,500 exhibitors from 24 countries. A year later, SPE's membership broke the 50,000 mark for the first time, even as the industry began to experience a contraction. A flood of new members had entered the industry and joined SPE during the boom of the late 1970s and, by the early 1980s, almost half of SPE's membership had less than 5 years' experience in the industry.

But after the roller-coaster 1970s, the industry was on the verge of restructuring with corporate raiders beginning to eye areas of weakness. In 1981, DuPont spent USD 7 billion to buy Conoco, then history's largest takeover. The upheaval continued with a rash of consolidations taking place, including Chevron's purchase of Gulf Oil, Texaco's buyout of Getty Oil, and Mobil Oil's purchase of Superior Oil. By the mid-1980s, prices were falling and the indus-

1989

- First SPE Asia Pacific Oil and Gas Conference and Exhibition is held.
- Tanker *Exxon Valdez* spills 11 million gallons of crude oil off Alaska.
- Platform removals outpace installations in US Gulf of Mexico.
- Berlin Wall torn down.

Attendees of SPE's first China event ask questions of industry experts during a technical session.

R. Lyn Arscott, 1988 SPE President, opens the 5th Middle East Oil Conference in Bahrain in 1987.

try was suffering. In 1984, OTC canceled its exhibition because of the industry climate, but went forward with the technical conference.

In 1986, a 4-year downtrend culminated in a free fall of oil prices. The collapse led to dramatic changes—the industry shifted from growth to economy; staff requirements were reduced further; E&P activity stalled in frontier and marginal provinces; enrollments in petroleum engineering declined; and many companies reorganized or just ceased to exist. The oil and gas industry was in survival mode. The supply and service sector was devastated, operators trimmed staffs and production projections, and individual engineers reassessed career options.

SPE had weathered the first industry downturn in the early 1980s well. Even as prices fell and the industry began to cut spending, SPE's membership continued to grow, although not at as rapid a pace, thanks to international growth. But this second downturn looked different, and SPE braced for the worst. The Board appointed an ad hoc committee in early 1986 to come up with an estimate of how SPE would be affected by what was happening in the industry. SPE had been building a reserve fund in case times got tough; times were now tough, but would the reserve fund be enough?

The committee was to give a 5-year estimate on how the steep drop in oil prices would impact the society's revenue stream and how it might affect SPE programs and services. The results were that SPE had to borrow heavily from its reserve fund to make ends meet. The committee advised that all programs be maintained, but that services would have to be cut. The SPE staff was reduced by 10%, the new bimonthly journals became quarterlies, Distinguished Lecturer expenses were trimmed, mailing costs on periodicals were tightened, and *JPT* began to be produced on cheaper paper stock.

Oil prices had dipped below USD 10/bbl. For the first time in more than 2 decades, SPE experienced a net loss in membership in 1986, and declining meeting attendance, publication advertising revenue, and book orders led to an operating loss of more than USD 1 million. Membership in 1986 fell 3.2 % from 1985 to 54,696. Student membership in the society had fallen from 4,000 3 years earlier to 2,300. In 1987 membership dropped another 6%.

Although SPE's finances were still recovering by the end of the decade, the society weathered its first real crisis in good stead. US membership had fallen, but international membership continued to rise. Overall membership, in fact, rose during the decade. New sections were formed in such important industry centers as Brazil, the UAE, Oman, the UK, and Australia. In September 1989, SPE held its first technical conference and exhibition in the Asia Pacific. The emergence of Australia's oil and gas industry in the early 1980s attracted engineers from all over the globe, and soon SPE membership in that country was building. "After the SPE sections took hold across the country in the early to middle 1980s, the recognition factor for SPE grew," says Thomas Gouldie, who moved to Australia as a petroleum engineer in 1981 and is now Operations Integrity Engineer with Santos in Adelaide.

An SPE ad hoc committee began examining SPE programs that historically had been confined to the US to make them more global in scope, such as honors and awards and several member services. The new international meetings, global membership growth, and SPE's work with other organizations to build a set of reserves definitions that could be used by companies and governments worldwide were giving the society true international stature. During the decade, SPE membership had grown 23%, from 38,799 in 1980 to 50,264 at the end of 1989. At the same time, non-US membership nearly doubled, from 7,876 in 1980 to 15,431 members in 1989. Non-US members now made up almost a third of total membership. **JPT**

SPE Foundation Supports, Augments Society Programs

Joel Parshall, *JPT* Features Editor

The SPE Foundation has a single purpose: to support and augment society programs through supplementing the normal funding capabilities of SPE. In carrying out its mission, the foundation helps to ensure excellence in SPE programs through a partnership among individuals, industry, and the society. The foundation is composed of all living past presidents of SPE and is directed by an executive committee comprising a president, past president, secretary, treasurer, and two vice presidents, as well as the sitting president and immediate past president of SPE.

Established in 1977 and legally incorporated as a nonprofit entity separate from SPE, the foundation raised the funds to build a permanent home for the society in Richardson, Texas. The Richardson office building was completed in 1984 and is owned by the SPE Foundation, which leases it to the society. Approximately 85% of the lease revenue is given back to SPE to support its programs. A major beneficiary is the Distinguished Lecturer program, which receives 50% of its yearly budget from the foundation. Voluntary contributions from SPE members help to support the foundation. While the foundation receives no funds from SPE members' annual dues, a dues-statement-checkoff option has facilitated contributions by enabling members to elect to contribute concurrently with their dues payments.

The foundation funds and administers the Gus Archie Memorial Scholarships, awarded to outstanding incoming college freshmen undertaking petroleum engineering curricula, and the Nico van Wingen Memorial Graduate Fellowships in Petroleum Engineering, awarded to SPE student chapter members at the PhD level who intend to pursue careers in academia.

When special SPE projects arise, the society can call upon the foundation to help fund them. During the 1990s, funds from the foundation helped to finance a society initiative to place all SPE technical papers on CD-ROMs. Then came the biggest project undertaken by the SPE Foundation since construction of the Richardson office—the highly successful effort to raise the funds needed to upgrade the spe.org website into a comprehensive knowledge portal connecting users online with the full spectrum of society, career, technical, educational, and industry resources available through SPE. Having committed USD 5 million of SPE funds to the project, the society turned to the foundation in 2000 to raise an equal amount to finance the balance of the initiative.

SPE Foundation members break ground for the new SPE headquarters in 1983.

"We were delighted to see this come along; this was just the kind of thing we had wanted to do," said Dennis Gregg, then immediate past president of the SPE Foundation and cochairperson of the fund-raising campaign along with Don Stacy, foundation president at the time.

In keeping with a foundation decision made at the outset, all funds solicitation was done by members of the SPE Foundation or the society. The foundation selected a campaign cabinet to carry out the funding drive and worked with a fund-raising consultant, who provided strategic advice.

"Dennis and I were ambivalent on hiring a consultant at first," Stacy said.

"Naturally, we felt like doing our own thing. But they really proved their worth in helping us to structure our approach and then follow it. At first, I had the idea—and maybe Dennis did, too—of something like a United Way campaign, where you go all out for 60 days and wind it up at the end of October. To be quite blunt, that was a ridiculous idea in an industry where it sometimes takes 6 weeks just to get an appointment and then another 6 or 8 weeks, perhaps longer, to get an answer to your request."

"The first thing we did was to solicit ourselves, all the former presidents; they all gave," Gregg said. "We followed that by soliciting the (then-) current SPE board, and they all gave, and then we approached former board members, who likewise gave. All of the money raised totaled close to a half-million dollars. So that was a real good start. But most importantly, it was effective when we approached companies. We had 'given at home.' "

The campaign cabinet decided which members would approach which companies, including major multinationals, midsize companies, independents, national oil companies, and service companies. The first large contribution, and biggest of the campaign, came from Chevron. "Once we got that, the train started leaving the station," Stacy said. Other pledges, some of them quite large, were received. With that momentum, the campaign soon passed its goal—raising a total of USD 6.5 million. The enhancements to spe.org have now been implemented, and SPE will continue to add features.

Looking ahead, the SPE Foundation is seeking to further development efforts on behalf of the society. The Omega Association, established by the foundation in 1999, recognizes people who have made provisions for a planned gift, or have contributed USD 10,000 or more to SPE through the foundation. An ad-hoc analysis of how the foundation might improve awareness among society members about individual giving opportunities was completed recently by a committee led by Trustee Bruce Bernard.

"At present, the foundation funds 50% of the annual cost of the Distinguished Lecturer program, which is probably one of the best-received programs that SPE offers its membership," says Roy Koerner, SPE Foundation president. "That program probably runs about USD 400,000 per year, and we would like to be able to fund 100% of it."

The foundation has retained the support and guidance of senior members who otherwise might have faded from the scene after retirement. As a result, the foundation has been able to provide substantial financial resources to SPE's various programs and work creatively as a partner with the SPE board to serve the society's members.

Additionally, a committee under the leadership of Arlie Skov, the foundation's immediate past president, is completing a long-range plan for the foundation that will be presented at its next board of trustees annual meeting, held in conjunction with the SPE Annual Technical Conference and Exhibition at Anaheim, California, in November.

"As we become increasingly global, we're looking at what this means for the foundation, which is chartered and incorporated in the United States," Skov said. "There are some legal requirements that may need to be met in various countries in order to give citizens there the opportunity to take full advantage of contributing to the foundation."

In addition, the foundation informally serves as a forum to discuss ideas that may translate later into SPE initiatives or help initiatives already being developed. Recently, the foundation discussed the impact that industry growth and resurgent demand for petroleum engineers is having on university petroleum engineering faculties, which is resulting in faculty shortages while student enrollments rise. The foundation executive committee expressed its concerns to the SPE board and volunteered foundation assistance that the board might find useful. A board initiative on this issue was already being developed, and to assist this effort, Gregg and other foundation trustees facilitated a series of meetings between SPE, the industry, and academia. A formal SPE initiative to mitigate the shortage has now been launched.

Another area the foundation has explored is ways in which the industry might improve its public image. A promising avenue the foundation identified is the opportunity for companies to use their expertise in drilling and maintaining wells to help provide safe drinking water, along with improved hygiene and sanitation, in developing countries where they operate. The foundation brought this idea to the SPE board's attention. This led to successive columns recently published in *JPT* by SPE President Abdul-Jaleel Al-Khalifa, foundation Trustee Lyn Arscott, and foundation President Koerner urging members and their employers to engage in voluntary service on behalf of society, including a discussion by Koerner of ongoing safe-drinking-water programs in which the industry could easily participate. An email link on spe.org has now been established to help interested members to learn more about these safe-water initiatives and to connect with their sponsoring agencies.

Looking back over the 30-year history of the SPE Foundation, Stacy said, "It has served its purpose well. The foundation has retained the support and guidance of senior members who otherwise might have faded from the scene after retirement. As a result, the foundation has been able to provide substantial financial resources to SPE's various programs and work creatively as a partner with the SPE board to serve the society's members." **JPT**

The Hidden Treasures Stored in SPE's Technical Paper Archive

Dennis Beliveau, SPE Review Chairman 1991–94, Executive Editor *SPE Reservoir Engineering* 1995–96

There I was, 21 years old, standing at the base of the tower and staring up 33 floors to the top of Shell Centre. Kind of symbolic—starting my career and visualizing the long climb ahead. Just another new graduate from the University of Saskatchewan working in Calgary as a reservoir engineer. I felt daunted by all the very smart and very experienced people around me. And, like all my young and eager friends, I too wanted to load up my resume with as much experience as possible, and as soon as possible. But how to do that? The big projects that we worked on as parts of a multidisciplinary team were exciting and great learning opportunities, but they developed over a long time, and time is something young folks are impatient about.

But as part of my normal work routine, I soon was exposed to the amazing treasure trove of SPE publications. I found that if you read a paper carefully, and followed its trail of references, and then followed the references in the references, you started to get a good perspective on the technical breadth and depth of our industry. If you read all the papers on a subtopic, it would lead you to another related topic, and so on. Even though Shell, for example, had an excellent library of technical materials and case histories, nothing could match the SPE paper archives. So I started to use the SPE library as my own personal "experience accelerator."

__Dennis Beliveau__ was a reservoir engineer with Shell for 22 years. He spent most of his Shell career in Calgary with Shell Canada, acting as Chief Reservoir Engineer from 1991–2001. In 2001, he left Shell to become an independent reservoir engineering consultant, providing services to clients around the world. His primary areas of activity and research have been in waterflooding and enhanced oil recovery, advanced reservoir characterization and simulation, reservoir surveillance, the use of horizontal wells, and the study of risk and uncertainty.

Beliveau was an SPE Technical Editor for 5 years and a Review Chairman for 4 years, culminating in his 2-year appointment as Executive Editor of SPE Reservoir Engineering *journal. Dennis also worked on and chaired committees for numerous international conferences, including acting as General Program Chairperson for the 1997 SPE Annual Technical Conference and Exhibition. He is widely published, including recognition in 1993 as a* Journal of Canadian Petroleum Technology *Distinguished Author, and was the recipient of the 1995 "Best Paper Award" from* JPT.

Beliveau was named an SPE Distinguished Member in 2000 and received the society's Reservoir Engineering Award in 2001. He was an intersociety Distinguished Lecturer for SPE and the American Association of Petroleum Geologists during 2002.

Getting into that mountain of SPE papers might appear an overwhelming task, if you think about it. The society has a library of almost 50,000 papers, which is why my advice to young engineers is *not* to think about it. But for argument's sake, let's say that about 20% of the papers pertain to your particular field of interest. At one paper per day, and allowing for weekends and vacations, it would take you only 40 years to get through the papers in your technical area (*"Forty years? Are you kidding me?"*) OK, say that only about 20% of the papers in your technical area are the ones you really need to read, but let's also remember that reading and properly digesting even two or three papers per week is a lot of work. So realistically, it might take you only 15 years of reading (*"Fifteen years?" "Yeah, that's right, kid, and unfortunately, another 20,000 papers will get published while you were reading, so don't expect to ever get finished. Ever hear of Sisyphus?"*).

Ergo, my advice to young people not to think about it when it comes to all of those technical papers in front of them; just get started on your SPE reading program. It will be a long and meandering journey with a few unexpected twists and turns, and it will take some time to get where you want to go. Like investing for retirement, those who start sooner and gradually chip away at things will find it easier to reach their longer-term goals.

But is it fair to ask how one can possibly find the time for all of this reading? Personally, I tried to make it a part of my job as much as possible, but I also read on my own time and admit that it did cut into the amount of fiction I normally enjoyed. However, when we were going to school, no one complained too much about the extra hours on evenings or weekends that were necessary for us to accomplish our goals. So why do we expect it to be any easier as well-paid professional engineers? Putting in extra time on the side to polish their game is something all professional athletes do; why should it be different for an engineer, other than the fact that our careers are longer than those of most athletes?

Obviously, getting some extracurricular technical information under your belt will increase your personal confidence level at work. After I became more comfortable with the breadth and depth of my technical knowledge, I volunteered as a Technical Editor for *SPE Reservoir Engineering*. By dint of more hard work than brilliance, I was fortunate to later spend some time as a Review Chairman and Executive Editor, as well as to do some work on program committees. All of this gave me a much better perspective on the abstract-submission and paper-selection processes as well

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Technical Papers Have Been the Backbone of SPE's Mission

Dennis Denney, *JPT* Technology Editor

In 1957, tail fins were big on the popular, if not all, cars. A 1957 Plymouth Belvedere was placed in an underground vault as part of a time capsule in Tulsa (they could have used better seal technology). A color TV was rare, and it had a round picture tube. Even most movies were still in black and white. Oil companies still constructed new derricks to drill new wells; the drawworks were moved, but the derricks usually stayed over the wellhead. Drilling rigs that could be moved from location to location were just beginning to be used. And SPE became an independent organization.

I would not be a part of the industry officially for another 11 years, but my father already had spent several years with a big oilwell cementing company, so I knew what it was like to be in the oil patch. He joined the Panhandle Section of SPE in 1958 and transferred to the Amarillo Petroleum Section when it was formed in 1964. New technology was improving exploration and production. My father was excited about new types of well logs that could do more than just measure the self-potential and natural gamma radiation of the formations. He also was excited about technology that had moved from military uses during World War II to casing-perforation technology—jet perforating. I even got to take sample jet-perforating guns to school for science class show and tell. (I would not recommend trying that today.) Technology was improving the industry, and SPE was at the forefront of sharing that knowledge.

SPE's mission is "To collect, disseminate, and exchange technical knowledge concerning the exploration, development, and production of oil and gas resources, and related technologies for the public benefit; and to provide opportunities for professionals to enhance their technical and professional competence." *JPT* has been a main link in the dissemination and exchange of technical knowledge among petroleum engineers for more than 50 years. Before the Internet existed, *JPT* was the only link for many engineers and the main link for many more.

SPE's online electronic library, the eLibrary, contains 150 papers that were written in 1958, the first full calendar year that SPE existed as an independent society. *JPT* published 86 papers in 1958. In 2006, the latest full calendar year, there were 2,251 papers added to the eLibrary. From 1958 through June 2007, 45,450 papers were made part of the permanent record of technical papers available to members and to the public through SPE. With the help of many industry experts over the years, SPE and *JPT* have presented important advancements in technology to engineers and other scientists.

An early endeavor in preparing this article was to develop a list of SPE's "most important basic papers." But in many aspects, the basics were developed years before 1957. One reason that SPE became an independent society was that the oil and gas industry's technology had grown beyond its infancy, and researchers had begun looking at the details of how and why certain technologies worked and why others did not. The demand for petroleum was growing, and the easy-to-find resources were becoming more scarce. Better technology was being developed and shared with the industry through SPE. The society built on the technology foundation that was laid during the first half of the 20th century and even earlier. As new technologies evolved, those advances were shared through SPE papers.

SPE's First Reprint Series Booklets

Booklet Number	Title	Year Published	Copies Sold to 1970
1	Well Logging	1958	5,660
2	Waterflooding	1960	6,200
3	Oil and Gas Property Evaluation and Reserve Estimates	1960	7,100
4	Field Case Histories, Oil Reservoirs	1962	2,800
5	Well Completions	1962	3,200
6	Drilling	1962	3,525
7	Thermal Recovery Processes	1965	2,300
8	Miscible Processes	1966	1,400
9	Pressure Analysis	1968	2,100

SPE's Reprint Series

For one measure of the importance of SPE papers, take a look at the SPE Reprint Series publications. SPE brought together volunteer groups of experts who collected the most important papers on various industry engineering topics for publications. These collections of papers formed the basis of the evolution of technologies that are taught and used today. Reprint Series No. 1, *Well Logging*, was published in 1958 and contained 14 papers covering topics such as induction logging, micrologs, nuclear logging, and dipmeters. Just a dozen years later, so many advancements had been made in the kinds of logging tools available and in interpretation that Reprint Series No.

1 was updated. The last hardcopy in the reprint series is SPE Reprint Series No. 58, *Offshore Multiphase Production Operations,* published in 2004. Beginning in 2006, and demonstrating the electronic-communication evolution, Reprint Series No. 59, *Rejuvenation of Marginal Offshore Fields,* and No. 60, *Advances in Reservoir Characterization,* were published as CD-ROM versions only, as will be the several reprint series volumes that are currently in the works. Universities frequently used groups of SPE papers and the reprint series publications in classroom instruction to supplement petroleum engineering textbooks. Some classes even used collections of SPE papers in place of textbooks.

SPE has been a leader in technology transfer from its beginning. Think CO_2 sequestration and cleaning up the environment are new to SPE? Check the eLibrary and get a copy of paper SPE 912-G, "Miscible Displacements of Reservoir Oil Using Flue Gas," by Koch and Hutchinson, published in 1958. If you pull up the list of all papers for 1958, you will find papers on topics that are still being investigated and written about today: the use of high-speed computers, material balance, miscible drive, in-situ combustion, hydraulic fracturing (improving flow capacity and formation-sand control), economics and profitability, simultaneous drilling, detergent flooding, shaped-charge perforating, fracturing by vibration, gas injection in Venezuela, and numerical analysis.

Shale oil in 1958? Paper SPE 1019-G describes how shale oil could be competitive with domestic petroleum. Sharing knowledge was an important topic in 1958: See paper SPE 999-G, "Mobilizing 'Know-How' Solves World Oil Crises," by C. Marvin Case. Offshore topics were scarce before 1959 when paper SPE 1289-G, "Offshore Gulf of Mexico Drilling From a Floating Vessel," by H.H. Rushing and W.W. Poimboeuf Jr. was presented. Imagine: drilling in water depths greater than 200 ft, from a floating vessel (a converted ex-Navy YF class) designed to withstand 100-mile/hr winds.

Although the early SPE may not have been considered a "drillers" society, peer-reviewed papers published in *JPT* show that there was a diverse and very active group of people investigating the underlying physics of operational problems associated with the influence of rock stresses on wellbore stability (computers have made analysis easier, and more-complex models are now possible), pore-pressure prediction from log data and the use of drilling parameters (it is just now that we can do it in real time with logging-while-drilling technology), differential wellbore pressure on rate of penetration (i.e., chip hold-down effect), behavior of non-Newtonian drilling fluids (now more sophisticated as a result of raw computing power), swab-surge pressures, and effects of doglegs on drillstring fatigue and fatigue damage to drillstrings.

In many aspects, the basics were developed years before 1957. One reason that SPE became an independent society was that the oil and gas industry's technology had grown beyond its infancy, and researchers had begun looking at the details of how and why certain technologies worked and why others did not.

Laying the Groundwork

SPE Reprint Series No. 6, *Drilling,* published in 1962, contains 31 papers covering rock properties, drill bits, drilling fluids, hydraulics, and air drilling, as well as more general topics (including dogleg holes and small-diameter drilling). These papers, along with the 30 papers in SPE Reprint Series No. 6a published in 1973, laid the groundwork for research that led to the seminal papers in the early 1980s. H.A. Kendall and W.C. Goins wrote about jet-bit hydraulics, J.G. Savins about psuedoplastic flow in pipes and annuli, C.E. Williams and G.H. Bruce on hole cleaning with drilling mud, and D.J. Weintritt and R.G. Hughes about high-temperature drilling fluid. R.A. Bobo discussed solids control, and H.D. Outmans reported on differential sticking of drill collars. A. Lubinski outlined limits of rotary-drilled doglegs, and C.N. Bowers wrote about casing-string design.

Making well completions more reliable and productive has been a goal of many authors. "Displacement Mechanics of Primary Cementing" was presented by R.H. McLane, C.W. Manry, and W.W. Whitaker in 1966. In 1961, A. Lubinski presented a simple method to prevent buckling of tubing set in a packer. Perforating in high-temperature wells was addressed by W.T. Bell and G.A. Auberlinder, and the effect of perforating on productivity was studied by M.H. Harris. A 1957 paper by M. King Hubbert and D.G. Willis described the mechanics of hydraulic fracturing and is still used today as a reference. Acidizing techniques and effects were presented by authors such as A.N. Barron, A.R. Hendrickson, and D.R. Wieland and many others. Sand consolidation and control were the subjects of papers by J.L. Rike and D.H. Schwartz, respectively.

Multiphase flow is an important part of today's offshore production technology. In 1973, H.D. Beggs and J.P. Brill studied and reported on multiphase flow in inclined pipes (paper SPE 4007), complementing the 1960s works of Kermit E. Brown. The 1975 Reprint Series No. 12 *Artificial Lift* included papers on sucker-rod pumps by Snyder and Bossert, Gibbs, Lubinski, and others. Gas lift was discussed by Espanol, Holmes, and Brown; Beggs and Brill; and Vogel. Hydraulic pumps were the subject of papers by Coberly, Brown, Nolen, and others. Electrical submersible pumps were studied by Parker, O'Neil, and Khamis.

Early SPE papers on property evaluation and reserves estimates were written by J.J. Arps, M. Muskat and M.O.

Taylor, R.J. Schilthuis, G.W. Tracy, D. Havlena, A.S. Odeh, J.M. Campbell, D.B. Hertz, and J.M. Ryan, to name just a few. Specific topics included reservoir energy, estimating reserves, material balance, decline curves, reservoir simulation, risk analysis, uncertainty, and statistical analysis. Paper SPE 870-G, "Methods for Calculating Profitabilities" by F. Brons and M.W. McGarry Jr. (1957), details incorporating production decline into the calculation. SPE's important work in establishing industry standards for calculating reserves continues to this day.

SPE Reprint Series No. 3 *Oil and Gas Property Evaluation and Reserve Estimates,* originally published in 1960 and updated in 1970, contains an extensive list of papers on assessing uncertainty and risk. A 1961 paper (SPE 218 by W.M. Campbell and F.J. Schuh) illustrates how the number of ventures influences success. Others discuss the application of probability and statistics to interpretations and decisions. One interesting 1965 paper (SPE 1256-PA), "Limitations of Statistical Methods for Predicting Petroleum and Natural Gas Reserves and Availability," by J.M. Ryan, illustrates the diverse viewpoints of industry experts regarding the value of different reserves-estimating methods, particularly those of M. King Hubbert and C.L. Moore (replies from both are included). A reply from V.E. McKelvey reads, in part, "The problem is extremely difficult, but its complexities can be reduced by simplifying the objectives. Instead of seeking a crystal-ball reading of ultimate production—which, in essence, is an attempt not to appraise petroleum resources, but to predict instead the result of the human decisions and achievements that determine how much will be found, how much will be recovered, how much will be obtained more economically from synthetic sources, and even how badly oil is needed—we need to know how much oil is in the ground, how it is distributed, and how much it is likely to cost to find and recover under given economic and technological conditions." More than 40 years after Ryan's paper was published, defining hydrocarbon reserves and resources and the best method to determine the amount of oil and gas reserves, both in the reservoir and recoverable, stir some of the longest and liveliest discussions in the industry.

Classic Papers

Some of SPE's seminal papers date back to when it was an adjunct of AIME. The 1949 publication by A.F. van Everdingen and W. Hurst on Laplace transform solutions for reservoir flow is a hallmark paper for well testing. In 1954, a classic paper titled "A Method for Determination of Average Pressure in a Bounded Reservoir" by C.S. Mathews, F. Brons, and P. Hazebroek was published, forming the basis of expanded studies of reserves-calculation methods. Others are more recent. R. Al-Hussainy, H.J. Ramey Jr., and P.B. Crawford introduced real-gas pseudopressure in 1965. Slider, Carter and Tracey, Havlena and Odeh, Stone, Fetkovich, Agarwal, Vogel, and Gringarten presented many other important papers. Where would reservoir engineers be without paper SPE 4629, "Decline Curve Analysis Using Type Curves," by M.J. Fetkovich?

The 1960 Reprint Series No. 2, *Waterflooding,* presented the importance and value of waterflood technology, which, according to the foreword, had its first deliberate application in Pennsylvania in 1896. This publication included landmark papers by Buckley and Leverett; Muskat and Wycoff; Stiles; Dyes, Caudle, and Erickson; Hazebroek; and many others.

The problem of producing heavy and extra heavy oil led to thermal recovery methods. J.W. Marx, and R.H. Langenheim, in their 1959 paper "Reservoir Heating by Hot Fluid Injection," SPE 1266-G, presented a method for estimating thermal invasion rates, cumulative heated area, and theoretical economic limits for sustained hot-fluid injection at a constant rate into an idealized reservoir. H.J. Ramey Jr., in his 1962 paper SPE 96-PA, "Wellbore Heat Transmission," presented an approximate solution to the wellbore heat-transmission problem involved in injection of hot or cold fluids. A. Satter investigated taking into account the effect of condensation, which is of practical significance when considering steam injection, in the 1965 paper SPE 1071-PA, "Heat Losses During Flow of Steam Down a Wellbore." G. Mandl and C.W. Volek, in "Heat and Mass Transport in Steam Drive Processes," 1967 paper SPE 1896-MS, presented an approximate description for the steam-zone growth developed by making use of upper and lower bounds for the exact solution of the problem. Coalbed methane has been a source of energy and hazard for centuries. But it was not until 1967 that J. Cervik discussed the transport of gas through a coalbed in Paper SPE 1973-MS. This topic became popular in the 1980s.

Early papers on digital simulation/numerical analysis included "A Method for General Reservoir Behavior Simulation on Digital Computers" by J.W. Sheldon, C.D. Harris, and D. Bavly in 1960 (paper SPE 1521-G) and "Construction of Models that Simulate Oil Reservoirs" by R.J. Wygal (paper SPE 534-PA) in 1963. It is difficult to remember (or imagine, for some readers) the dinosaur computers that were used 40 years ago and how long it took to get answers from them. Modeling on the computer required more planning and much more patience than today. Computers took hours for simple runs and days or weeks for complicated problems. Computer-modeling projects required budget approval before starting. And the answers were checked with slide rules, just to make sure that the formulas were programmed correctly. Then, the graphs and maps had to be drawn by hand from the hardcopy printout of the numerical answers.

Technology has evolved severalfold in the last 50 years. SPE has chronicled the advances and kept the industry's engineers in touch with the advancing frontiers. Whether moving into more-difficult environments or keeping the environment safe and clean, SPE technical papers have provided the guidance that the industry's practitioners have needed. More than 45,000 papers have been added to SPE's library since the society's inception in 1957, and they cover research and practices for every technology used in the industry. **JPT**

Drilling in 2032—Back to the Future

John Thorogood, SPE Technical Director, Drilling and Completions, 2001–04

Studying the evolution of drilling technology with the benefit of hindsight reveals many surprises. Things never turn out as foreseen; our predictions are rarely accurate. Progress appears random. Novel developments appear out of the blue. This article explores some examples of technology evolution and considers its implications for the future.

We Have the Technology We Deserve

Looking at the cyclical booms and busts of the drilling industry over the last 35 years, activity has gone from full speed ahead to full stop on several occasions. We have witnessed a withdrawal by most majors and government from the basic research that gave us the technologies we now enjoy. Innovation is now mainly confined to the service sector, but is thereby constrained by the demands of market need. Although oil-company and service-sector support for academia is growing, fundamental research is lacking, and what is done resembles technical service work. The lack of investment makes faculty positions unattractive to qualified professionals, to the detriment of teaching quality and future research.

As our workforce has matured, engineering has ceased to be analytic and has instead become heavily experience-based. In this environment, the new generation of engineers cannot develop the vital discipline of analytic rigor and problem solving. Complex problems are "solved" using sophisticated software tools, but the users can struggle to describe the engineering principles of the codes they employ. Answers emerge through a consensus of opinion-driven work groups. The spark of investigative creativity is hard to discern in an industry dominated by routine factory engineering.

The understanding behind novel developments, such as casing drilling, evolves empirically rather than from systematic research. Opinions abound, but because there are no peer-reviewed papers describing the science of why it works, nobody knows what opportunities the industry is foregoing to push limits further, or to solve other seemingly intractable problems.

Necessity is the mother of invention. Lord Browne, then head of BP's Exploration arm, rejected the idea of a field development involving an artificial island in the middle of a recreation area. Faced with the stimulus of having to do something dramatically different, the organization pulled together disparate but well-understood strands of drilling technology and demonstrated that, counter to the prevailing wisdom, drilling extended-reach wells to horizontal displacements of 10 km or more was feasible. The Wytch Farm project was approved. The rest is history.

Oil India Ltd. steam rig drilling near Duliajan, Assam, India, in December 1973.

__John Thorogood,__ recently retired from BP after 34 years, was Chief Drilling Engineer for the Rosneft-BP joint venture based in Yuzhno-Sakhalinsk, Russia. He project-managed BP deepwater exploration operations in the Faroe Islands, the UK, and in Norway during 1996–2001 and developed techniques for project management and associated risk-assessment practices. Thorogood has experience in drilling operations and technology in many parts of the world and is the author of more than 40 papers on directional drilling, surveying, and deepwater operations. He earned BA and PhD degrees from the University of Cambridge and is a member of the UK Institution of Mechanical Engineers. Thorogood has served on the SPE Board of Directors as Technical Director, Drilling and Completions.

There Is Nothing New in the Oil Field

As a young engineer proposing new ideas, it was demoralizing to be told by one's seniors that they had seen it all before. However, in one sense, they were right. There is nothing new in the oil field. The oil field is littered with visionary false starts. Recent history abounds with radical innovations that were previously tried out and failed because the concepts were too far ahead of their time.

Rotary drilling used fishtail drag bits before the invention of the roller-cone bit in 1909. Similar fixed-cutter bits could be found in 1930s editions of the *Composite Catalog* and, with the addition of tungsten carbide cutters, were still on sale in the 1960s. They could be highly effective in very soft formations. Yet, by the 1970s, they were almost unheard of. It took the development of the polycrystalline diamond compact cutter, the introduction of oil-based mud, and an improved understanding of drillstring dynamics before the technology took off.

Automation of rigs with extensive use of hydraulics and mechanical handling systems was tried in the 1960s and 1970s, with dire results. It took the direction of safety regulators and the development of fifth-generation rigs that simply could not function without such systems to drive technology to acceptable levels of reliability and efficiency.

Remote operations centers were tried in the late 1970s, but they foundered because of immature computer technology and a failure to appreciate their social and organizational consequences. Their renaissance is driven by the increasing complexity of wells, scarcity of expert staff, and a need to remove people from the rigsite.

These examples show that even the most radical developments have their roots in something that may have been attempted years before. It is an intriguing challenge to look back at other failed innovations, understand why they were unsuccessful, and try to work out what it might take to make the breakthrough.

The Future Will Surprise Us

As a new graduate in 1973, I recall a petroleum engineer telling me how wells were cased and perforated. Rather self-consciously, he remarked how it would be much better if we could drill down to the formation and then simply turn the well horizontally to maximize exposure of the reservoir. We all laughed at him, because it was obviously quite impossible to do.

Fast forward to an SPE Annual Technical Conference and Exhibition meeting in Dallas 20 years later with word of mouth running round the conference, Did we want to hear something interesting? Over to a nearby hotel, a large ballroom, a stage with a table, and half a dozen people seated there. In front of them was a small schoolroom easel with a diagram too small to see.

The chairman announced, "We drilled a 1,258 ft short radius lateral with coiled tubing the other day, any questions?" After a moment of stunned silence, the room erupted with questions that lasted for 2 hours. Although apparently radical, every element was based on proven incremental developments in downhole drilling systems. The achievement was putting the pieces together, then going out and doing it.

Consider the evolution of extended-reach drilling. Faced with relentless pressures on cost, performance, and reserves recovery, we drill wells now that we could not have imagined 15 or even 10 years ago. The result has been transformational, but the progression has been logical and orderly, incremental and evolutionary and achieved by continuously pushing the limits.

What We Need Tomorrow Exists Today

Looking back on how innovations happened, one sees that many of the key components already existed. What was lacking was the catalyst that brought them together. Apart from business necessity, it is crucial to have a culture in which innovation can flourish. It is not enough for individuals to be creative; they must operate in a climate that actively fosters innovation. The recent stream of innovations emerging from Norway is evidence of what can be achieved through a national determination to be a technical leader, a long tradition of solid technical innovation, and well-funded research institutes.

Many incidents of nonproductive time can be traced to inattention, lack of skill, or simple misunderstanding of surface indications by the driller. Almost all other industries involving complex processes moved away from manual control many years ago. In aviation, autopilots have been around since the 1940s. Airbus aircraft have featured envelope protection since the 1980s. A computer, programmed with the airplane's flight control laws, compares the pilot's demands to the state of the aircraft to ensure that the airplane remains within its safe flight envelope at all times.

Fifth-generation DP drillship, the Seadrill West Navigator, drilling offshore Norway in the summer of 2000.

This well-established technology is now becoming available on drilling rigs. A game-changing Norwegian innovation based on 20 years of research and modeling safeguards the drilling process from the weakness of manual control. Envelope protection is provided by algorithms that calculate maximum pipe speeds, accelerations, and pump start schedules that are integrated into the drilling machinery control systems.

This is another example of evolution. It is oversimplifying things to assert that the drilling industry is "x" years behind another industry. What has happened is that only now are the necessary elements converging to make such innovations possible.

NASA is a long way toward developing systems for unmanned drilling operations on Mars. It does not seem unreasonable, therefore, to assume that we could, if we really wanted, within 25 years have unmanned systems drilling wells on the seabed at lower cost, with simpler well designs, in greater safety, and dispensing with the costly fifth-generation leviathans that today we deem to be the only way of getting the job done.

A transformation does not need grandiose high-risk projects, nor does it always require revolution. It will occur naturally as a result of evolution. Compare a 2007 model car with its 1982 counterpart: They both have the same number of wheels and the same power and transmission fundamentals. The later model is recognizably an evolution of the older but with dramatically improved performance, efficiency, and, in many cases, safety.

The prerequisite is a climate of incessant innovation. While it is inevitable that some innovations will not live up to their expectations, what is worse than making an attempt that does not succeed is failing to try in the first place.

We cannot predict what drilling in 2032 will look like. What we can say, though, is that progress toward it will be orderly, will be incremental, and will involve technologies that are already proven outside the oil industry. When we get there, it will not seem radical, but the difference will be huge. Most importantly, though, we have to keep looking and creating, and we must have an absolute belief in the future. **JPT**

Technological Breakthroughs Advanced Upstream E&P's Evolution

Ron Lord, Contributing Writer

Throughout the history of the petroleum business, advancements in technology have transformed the upstream sector of the industry. Between the early 1900s and mid-1950s, the rotary rig, roller-cone bit, blowout preventer, electric well log, and walking beam pump were invented, just to name a few. All of these inventions, as well as others not cited above, were responsible for quantum leaps that led to huge changes in the way the industry evolved.

Of the numerous technologies invented or developed since SPE came into its own 50 years ago, many have continued that evolution of technology, often changing the business by making it easier, faster, more efficient, and more cost-effective to find and produce hydrocarbons. Many of these breakthroughs and incremental changes resulted from either the direct or indirect work of members of SPE.

Of all the inventions and technologies developed since the mid-1950s, industry veterans surveyed for this article unanimously agreed that the computer has had the most overall and lasting impact on the industry. The subsequent invention of the microprocessor and integrated circuit paved the way for further development of computer technology, thereby opening the door for additional advancements in communication technology, including both wired and wireless.

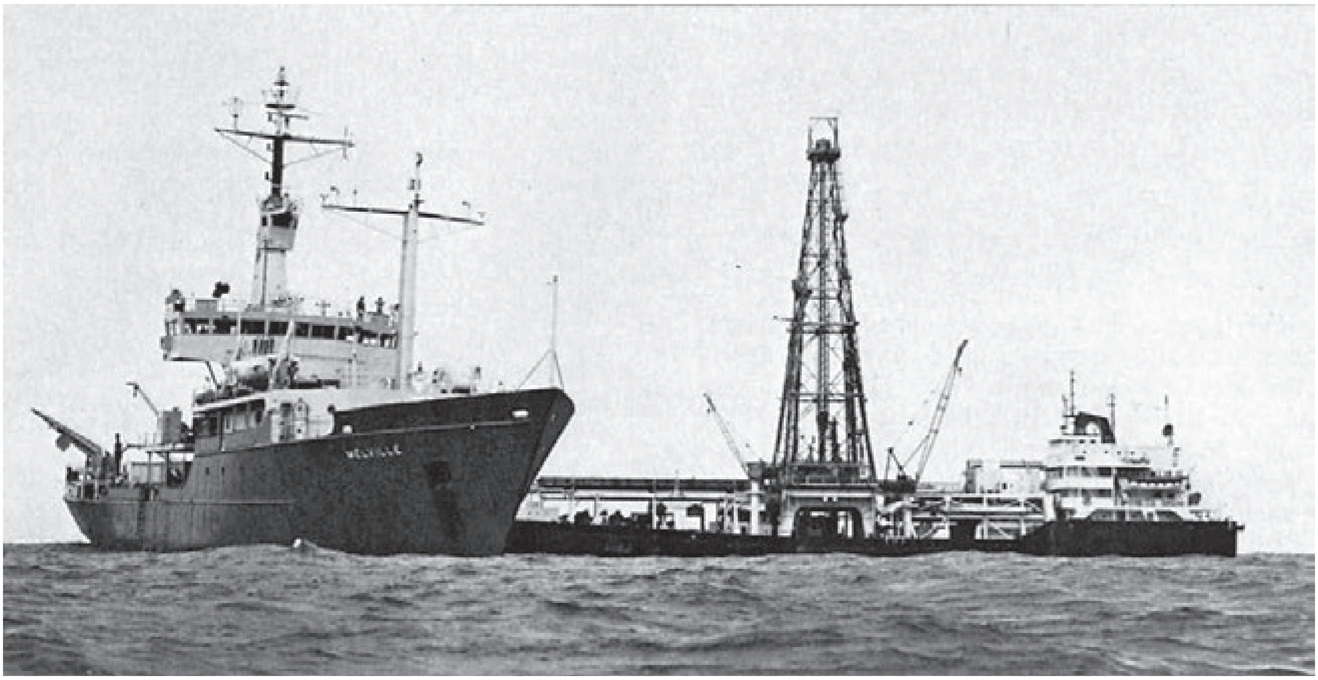
Today, it seems almost impossible to imagine an energy industry (or any other industry, for that matter) without computers. During the past 50 years, they have evolved into the energy industry's workhorse, transforming every facet of the business, from seismic acquisition and interpretation through drilling simulation and drill-bit design to completion design and execution.

Reservoir planning, management, and production depend on computers, as do offshore rig and platform design. Production facilities are controlled and managed from remote locations using computer software and communications hardware. Administratively, computers help manage every facet of energy companies' accounting, inventory, payroll, and related functions. Seemingly, computers are everywhere, performing tasks that get the job done faster, cheaper, and more efficiently.

Early Computers Adopted Eagerly

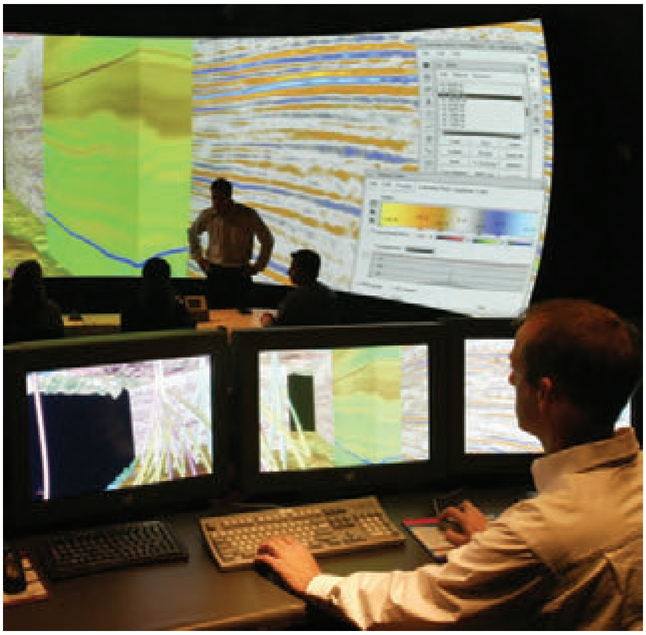
Engineers eagerly adopted the first computers as they saw the potential of devices that could crunch numbers quickly. One of the areas in which the computer enjoyed early influence was in reservoir simulation, a discipline that requires large volumes of mathematical calculations.

Although nothing more than electromechanical calculating machines, early computers were much faster than the widely used mechanical calculators of the period. Those who used the first computers remember them as crude



The drillship* Glomar Challenger*, right, and research vessel* Melville *conduct ultradeepwater research in the early 1980s.

Donald J. Peaceman, left, uses one of Humble's early computers in the early 1960s.



Use of visualization centers became widespread in the late 1990s.

and rudimentary, but better than alternatives available at the time.

"Our job (in reservoir simulation) was to model the flow of gas through the porous rock of a field," recalled Donald J. Peaceman, a retired ExxonMobil researcher and industry consultant. "We had nothing that you could call a computer, but we did have access to some accounting machines that the accounting department would let us use at night.

"In 1955 we significantly increased our computing capacity when we acquired a Bendix G-15," Peaceman continued. "This (computer) had vacuum-tube electronics, but its storage was almost completely on a magnetic drum. Within the next few years, we obtained IBM's first widely used scientific computer, the 704. It was a binary machine, with built-in floating-point hardware. Its central memory was magnetic core, and its secondary storage was magnetic tape."

Mass production and reliability improvements in computers provided the impetus for data acquisition such as the industry had never seen before. During the decades that followed, computing power increased. This, in turn, allowed the creation of bigger, geologically more-realistic models that required greater data input. This demand was met by increasingly complex and efficient simulation programs with easy-to-use data preparation and results-analysis packages.

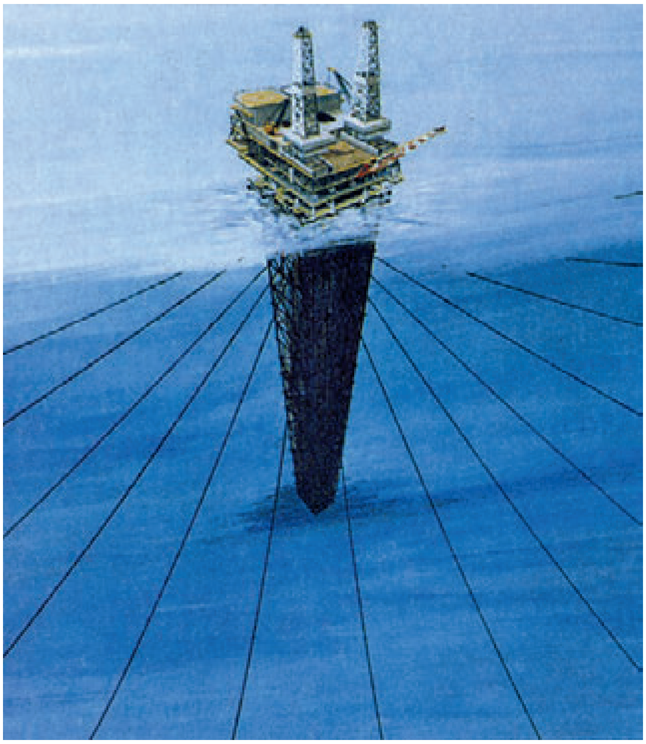
The impact of computer technology is expressly exhibited in E&P operations, where the integration of reservoir information and production variables has brought significant advances and opportunities for improved reservoir management practices.

A Third Dimension for Seismic

Another influential technological achievement during the past half-century was 3D seismic. Back in 1967, the completion of a seismic survey in an oil field near Houston initiated a seismic revolution when it was revealed that the survey was accomplished using three dimensions of seismic rather than the usual two. While the concept of the 3D seismic survey had existed for decades, the ability to implement the concept was restricted by the efficiency and accuracy of data acquisition and the cost and computing power necessary to condense, process, display, and interpret the data.

The development of a third dimension was revolutionary because now the subsurface could be depicted on a rectangular grid that provided the interpreter with detailed information about the full subsurface volume. The images from the technology provided clearer and more accurate information than those from 2D, and any desired cross-section could be extracted from the volume for display and analysis, including vertical sections along any desired zigzag path.

Later on, time-lapse seismic emerged. Better known as 4D seismic, this technology consists of a series of 3D seismic surveys that are repeated over a period of time to enable the monitoring of reservoirs (e.g., fluid movement, temperature and pressure changes, and subsidence) and how they change throughout their productive lifespans. This 4D seismic technology has been applied widely in the offshore arena.

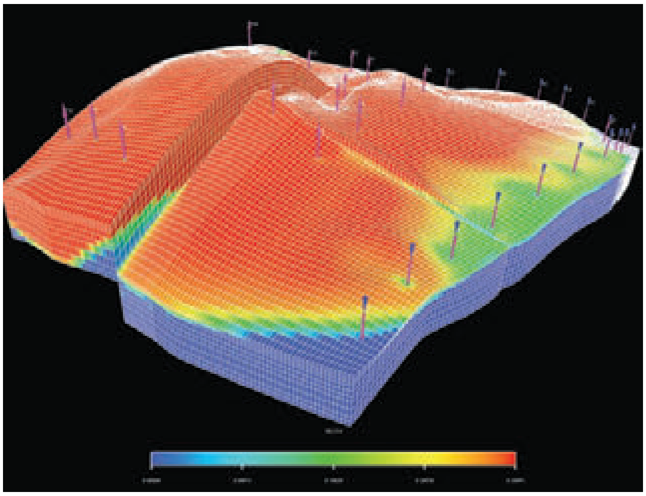


Exxon's Lena guyed tower was the second-deepest platform in the world and the tallest in 1983.

DFS 9000, the first-generation GSI-TI digital seismic field system. (Photo courtesy Texas Instruments)

"The advent of 3D seismic and other computer-simulation devices opened new areas of opportunity in subsalt and deep water, and the technology revitalized drilling in old basins," said John C. Mihm, retired senior vice president of technology for ConocoPhillips and SPE's Technical Director of Projects, Facilities, and Construction. "Also, 3D-visualization tools made a significant contribution to reducing finding and development costs and tying reservoir engineering and geology together in order to provide much more cost-effective exploration."

Seismic analysis has greatly advanced as well. Before the development of 3D seismic, the exploration success rate was one out of every seven wildcats. Today, the success rate is one out of every three.



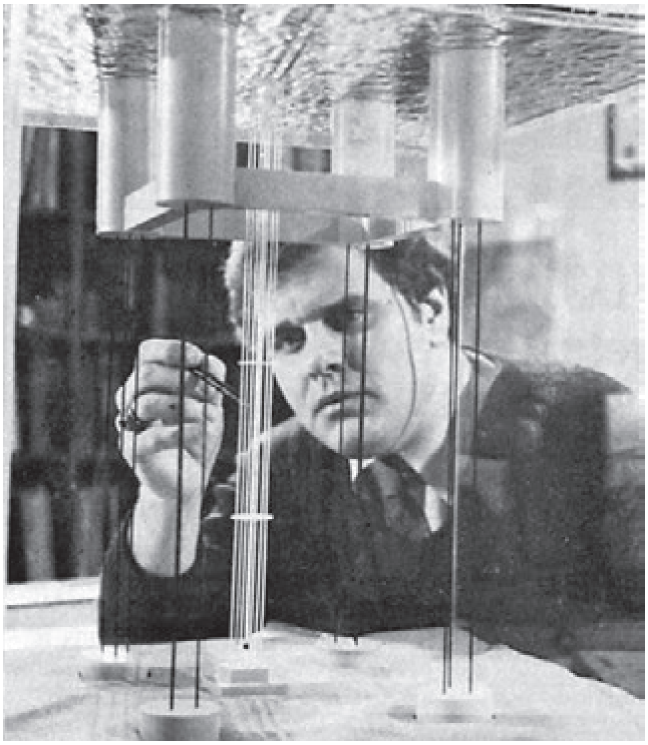
ECLIPSE reservoir simulation software was commercialized by Schlumberger in 1981.

Evaluating the Formation

Two of the most influential drilling technologies developed are logging while drilling (LWD) and measurement while drilling (MWD). Both provide wellbore-directional surveys, petrophysical well logs, and drilling information in real-time while drilling is under way. LWD refers to petrophysical measurements, similar to openhole wireline logs, and MWD refers to measurements acquired downhole that specifically describe directional surveying and drilling-related measurements.

These technologies have evoked huge changes in oil and gas well-drilling methodologies; however, the key that enabled them was a collection of survey and measurement tools developed and refined over a 50-year period. In a sense, LWD and MWD represent the application of numerous data-gathering tools that had their beginnings rooted in a need to know more about the formation being drilled.

At the turn of the century, oil-industry pioneers began to search for ways to obtain this information. This led to the development of core sampling and mud-analysis logging of



A researcher studies a laboratory platform model in 1984.

Conoco's Hutton tension leg platform, deployed northeast Shetland Islands in the North Sea in 1985.

wellbore cuttings in the 1920s. Later, formation evaluation knowledge took a giant leap forward with the creation of electric logs in the 1920s, followed by resistivity logs in the 1930s and induction logs in the 1940s.

It was not until the 1960s that the next big advancement in well-logging technology occurred with the invention of the formation-density log, which uses a gamma ray source and detector to measure the bulk densities of formations in situ. A decade later, the dual laterolog logging tool was introduced. This tool can produce useful resistivity measurements even when true formation resistivity and mud resistivity are high.

Then, in the 1980s, advancements in electronics miniaturization and computer hardware and software enabled the rapid development of new wireline technologies. In quick succession, various logging and measurement tools emerged, including sonic logs, pressure-transient testers, and drillstem and formation testers. Today, the use of LWD and MWD in drilling operations is routine, and most of the original logging and testing tools and techniques have been refined. In some cases, they have been reinvented to perform the logging and testing functions required for today's formation-evaluation tasks. The technology is leading to bigger, better, and more cost-effective discoveries.

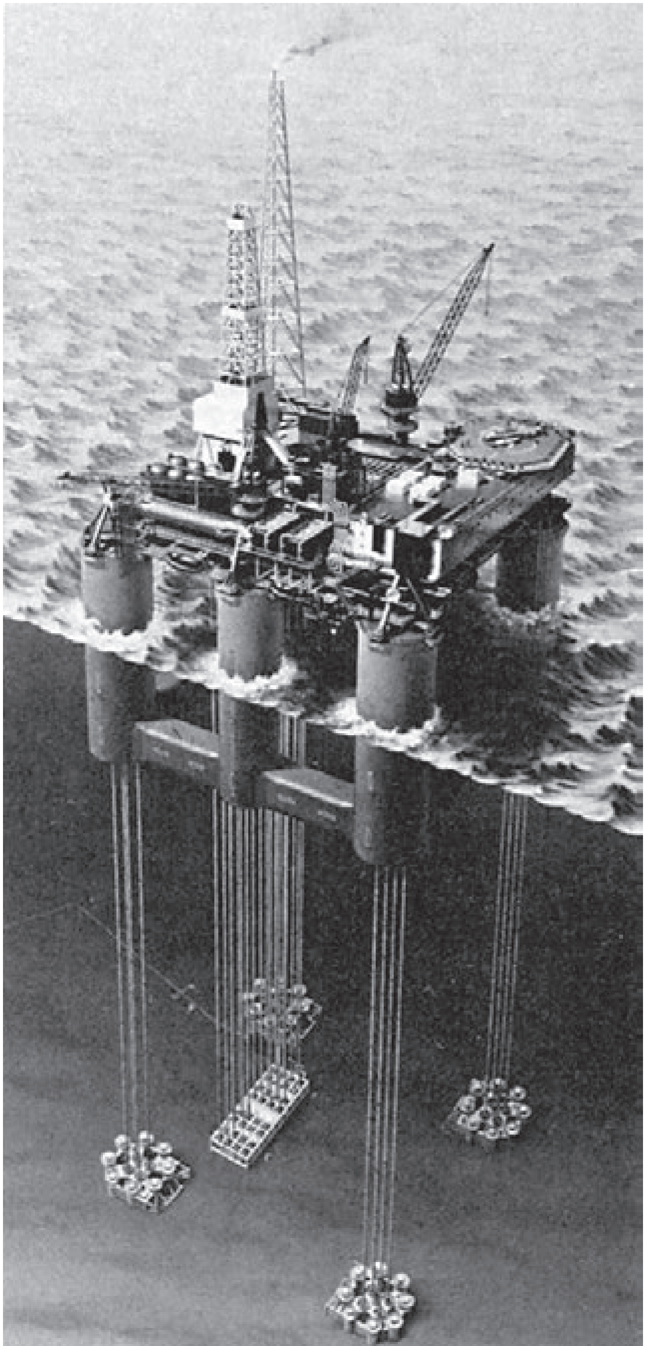
Increased Contact With the Pay Zone

Once discoveries are made, operators must exploit the well's pay zones. This goal has been greatly advanced by the development of horizontal-well technology. According to historians, the first horizontal wells were drilled in the early 1940s by John Eastman and John Zublin. In an effort to drill 20- to 30-ft-radius and horizontal laterals of 100 to 500 ft in the same formation around the wellbore, Eastman and Zublin developed short-radius drilling tools to accomplish their goal. Typically, between four and eight laterals were achieved when they applied the tools, thus enhancing production by as much as 15- to 20-fold. Despite this achievement, the industry did not rapidly embrace the new technique.

All that changed in 1977 when Alan Barnes, an oil-company engineer, ignited a renaissance in horizontal-well development in North America. Barnes kicked off the renaissance by accident when he extolled the virtues of the Eastman/Zublin short-radius drilling technique to persuade his supervisors to drill 12 wells horizontally in the Empire Abo reef in New Mexico. Shortly thereafter, the wells were drilled successfully, and their success led the company to look for other applications. This, in turn, led to the later development of "medium radius" (20°/100 ft) horizontal drilling.

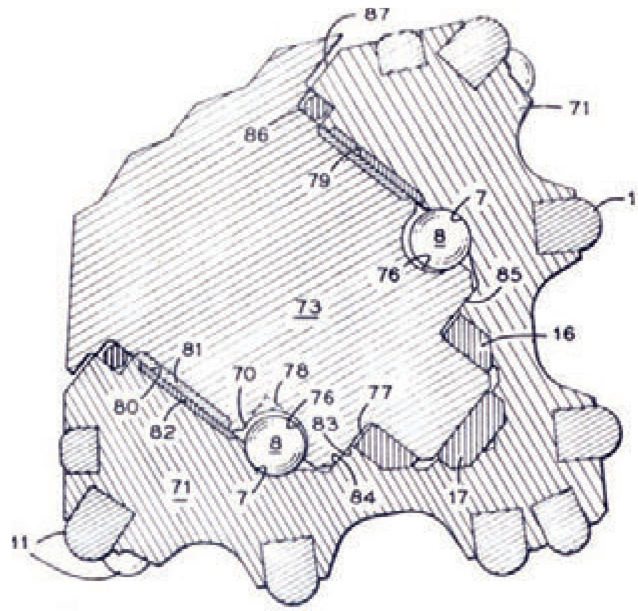
Soon, interest in drilling wells horizontally increased, and the 1990s eventually became known as "the decade of the horizontal well." During the period, more than 3,000 horizontal wells were drilled in the US alone, and numerous technological advancements aided the growth of horizontal-well-drilling technology and techniques.

Today, horizontal wells have become a preferred method of recovering oil and gas from reservoirs in which these



Shell's Auger tension leg platform (TLP) established several records in 1993 and 1994, including first application of deepwater J-lay and steel catenary risers, water depth record for an offshore platform (872 m), and first TLP with full drilling capability.

fluids occupy strata that are horizontal, or nearly so. When compared with vertical wells, they offer much greater contact area with the productive pay zone. While the cost factor for a horizontal well may be as much as two or three times that



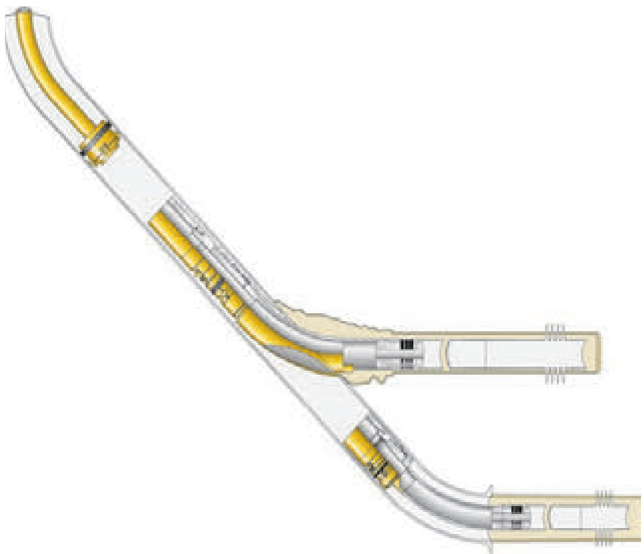
The o-ring sealed journal bearing bit was introduced in 1969 by Hughes Tool. The first practical, positively sealed journal bearing rock bit retained lubricant and kept out drilling mud, increasing bearing life by up to 40%.

of a vertical well, the production factor can be enhanced as much as 15 or 20 times, making horizontal drilling a very attractive technique to oil and gas operators.

Drilling Directionally

In horizontal drilling, control of the well trajectory is paramount because contact with the pay zone must be maximized. To accomplish this task, directional-drilling technology is used to guide the bit to the target zone. Only 20 years ago, such precision could increase the cost of a well substantially because of the continual tripping and surveying required to determine the path of the bit. However, advancements in directional drilling over the past 2 decades greatly increased the cost-efficiency of these wells. A good example is two wells drilled more than 20 years apart under the Corpus Christi, Texas, airport.

In 1982, a well was drilled directionally 11,000 ft to intersect a 300- to 400-ft target zone under the airport. The well used the latest technology at the time and was very successful. It cost the operator USD 1.3 million. In 2005, 23 years later, an almost identical well was directionally drilled under the same airport to 11,000 ft to intersect a smaller 50-ft target zone. But this time, all the technical advancements of the past 2 decades, including a rotary steerable system along with MWD and LWD technology, were applied. Again the well was successful; however, the well's cost did not increase despite its increased complexity and the impact of economic inflation. The advancements in directional drilling control technology kept the well's cost near USD 1.3 million.



In a multilateral completion, one or more laterals are drilled from the main bore, saving drilling and completion time and expense. The most advanced Level 6 multilateral system is the Formation Junction system, which was developed and patented by Baker Oil Tools using Marathon Oil's Mara-Split downhole template technology.

Accelerated Early Production Offshore

Another technology that greatly affected the industry was the development of subsea completion systems, which allow offshore operators to get wells on production early, thereby establishing a revenue stream without having to wait on the design and construction of a production platform.

The first subsea-wellhead completion was installed in 1961 in West Cameron Block 192 in 55 ft (16 m) of water in the Gulf of Mexico. During the years that followed, the technology evolved into a major component of offshore early-production schemes. Of the 68 subsea completions installed in the 1970s, virtually all were in US waters.

Today, the use of subsea completion systems by operators is commonplace. Subsea production activity has increased in all parts of the world, driven by rising crude prices, as operators develop offshore projects and invest in production facilities in an attempt to satisfy the world's continually growing demand for hydrocarbons.

Coiled Pipe

Following its introduction in the 1970s, coiled-pipe technology, better known in the industry as coiled tubing (CT), seemed too good to be true. It was simple and straightforward to use, could perform a wide range of tasks, and, because of its operational efficiency, could substantially reduce overall well costs.

However, for years, operators would only use it for specialty jobs. In its early period of development, the technology was plagued by safety and reliability issues. CT had an Achilles' heel—it could not withstand the repeated bending cycles and high-tensile loads encountered during jobs. Welds necessary to make the continuous tubing strings often failed, sometimes with catastrophic consequences, and the equipment failures sometimes required expensive fishing expeditions. Operators soon lost confidence in the technology.

The 1980s brought technical improvements in pipe, pipe-welding techniques, pipe sizes, and CT modeling. Driven by a need for CT's benefits, these advances improved the reliability of effectiveness of coiled tubing. Soon the confidence of operators in the technology was restored. Much of the credit for restoring operators' belief in the technology can be attributed to the publication of technical papers and articles in *JPT* and to papers delivered at SPE meetings. By the 1990s, a renaissance in CT technology was well under way, and CT was being applied to an expanding list of tasks, including acid and fracturing treatments, tool conveyance, drilling, artificial lift, well completions, and logging.

Fewer Strings, Lower Cost

Another young technology that has greatly influenced well completions is expandable tubulars. Developed in the late 1990s, ET systems use a cone to permanently expand the diameter of the pipe to a larger size through the application of hydraulic pressure across the cone or by mechanically pulling or pushing the cone through the pipe. As the cone moves, it deforms the pipe's steel beyond its elastic limit and into its plastic region, meanwhile maintaining stresses below the ultimate yield limit of the steel.

The potential benefits of expandable-tubular technology are significant. It can conserve the size of the hole, hydraulically isolate selected zones, or maximize the well's lifespan. When conventional casing is employed, each new casing string set in the hole reduces the internal diameter of the hole as much as 20%. Thus, a well requiring multiple casing strings must either start with a very-large-diameter surface casing or end with a small-diameter production casing, or both. This increases the cost and may limit the ultimate production capacity of a deep well. Expandable tubulars avoid this decrease in well diameter, thereby avoiding the cost of installing multiple strings that may limit the ultimate production capacity of a deep well. In addition, expandable tubulars can help simplify drilling through high-pressure zones, enabling the continued use of conventional logging tools at greater depths.

The Next 50 Years

These are but some of the technologies developed during the past 50 years that have advanced the petroleum industry's worldwide quest for oil and gas. To be sure, other technologies not mentioned here have affected the industry positively, but the above-mentioned advances are the ones cited most by those who lived and worked through the period.

What does the future hold? It is almost certain that more and better technologies will be developed and applied, thereby ensuring that new oil and gas discoveries will be produced better, more efficiently, and more cost-effectively than ever before. **JPT**

GUEST COLUMN

1984 and Beyond: The Advent of Horizontal Wells

Vik Rao, Senior Vice President and Chief Technology Officer, Halliburton

The single most important productivity improvement in the history of the petroleum business may have been the implementation of horizontal wells. The engineering and economic challenges its early innovators faced were steep, but rapid advances between 1984 and 1994 progressively broke down the challenges. A Shell executive once confided to me that, in the early days of that period, one needed permission to plan horizontal wells, but by the late 1990s, one needed permission not to plan one. That is the hallmark of a "disruptive technology"—at first it is viewed with suspicion and elicits risk avoidance, but after industry acceptance, the technology becomes the norm and deviations from it are viewed with disapproval by the very people who questioned the technology in the first place.

In the late 1970s, Teleco perfected the technique to measure well position and direction while drilling. Then it and others added important lithology-marker technology in the form of natural gamma and resistivity measurement. The early days of measurement while drilling (MWD) were marked by low reliability, but the industry persevered because of the cost savings in not having to stop to make openhole position measurements. Positioning in 3D space was now available on the fly.

The First Reports

Horizontal wells were still a curiosity. Then, in the early 1980s, reports started trickling in of directional drillers trying something really different. They were making radical angular changes using a nonrotating drillstring, with a motor for propulsion and a bent sub for angle build. But instead of following convention, which called for pulling the string and drilling the new section without the bent sub and motor, they drilled ahead with the assembly, this time rotating the string and providing motive power by the rotary and the motor. The bent sub in a rotary mode held angle, and the steerable system was born.

Groundwork for Advancement

I still remember reading the first such report—I thought the authors were nuts! Bent sub flopping around: What would that do to the hole shape, and what about stressing the string? Well, as it turned out, these were tractable issues and one more brick was in the wall to enable efficient angled drilling. Note that, once again, the advance was to eliminate a rig-time hog. The significance was that the early horizontal wells cost roughly 2.7 times as much as conventional wells, and while well productivity was higher, reduction in well cost was an important objective in those days of decision silos that separated drilling and reservoir actions. There are some who believe, and I can be counted among them, that horizontal wells were a trigger for sustained integrated decision making, although clearly the shift to asset units, which occurred during the same time period, was a significant driver. Decisions about wells were made now not by functional units, but by asset teams made up of representatives from the functional units. These events, together with the key advent of formation evaluation while drilling (FEWD), laid the groundwork for this significant advance.

In October 1985, two young Shell petrophysicists, Andy Greif and Craig Koopersmith, published a paper titled "Petrophysical Evaluation of Thinly Bedded Reservoirs in High Angle/Displacement Development Wells with the NL Recorded Lithology Logging System" in a relatively obscure forum (*The Tenth Formation Evaluation Symposium, Canadian Well Logging Society, October 1985*). The impact, however, was far from obscure. An MWD tool had made resistivity measurement of a quality that eliminated openhole wireline logs on the final 12 wells of the 24-well program on the Cougar Platform in the Gulf of Mexico. In this particular case, wireline logs of the time were incapable of detecting and evaluating the thinly bedded turbidite deposits. So, not only were they an effective substitute, but they were better. The previously passed-over B sand was now a prolific producer. The specialized application drove these young men to make the effort to seriously consider the new technology and, ultimately, to take the risk to eliminate the conventional crutch. Today, elimination of wireline logs in favor of FEWD is common.

The success of the electromagnetic wave resistivity sensor spawned concerted activity in the industry, and the first quantitative porosity sensor appeared in 1987. By the end of the decade, the NL Industries (Halliburton today) offering was augmented by Schlumberger, and the FEWD industry

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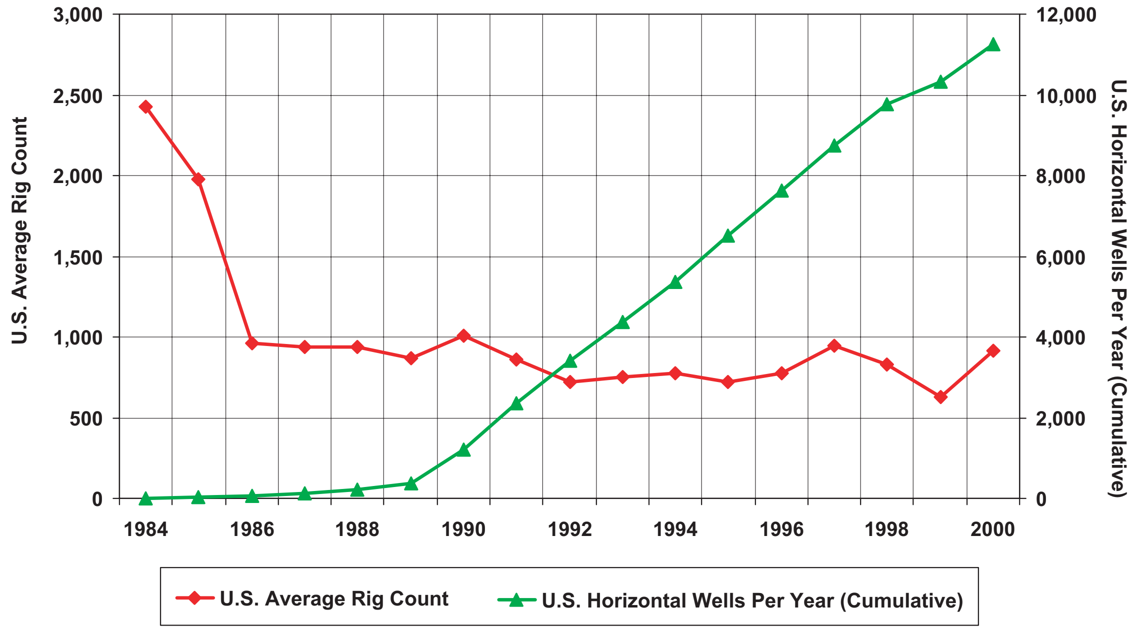

Fig. 1—The explosive growth of horizontal wells.

was now in full stride. A footnote to this episode is that in general, the petrophysical community became progressively comfortable with accepting a lower-quality log and forming new judgments regarding fitness for purpose. With some singular exceptions, such as the EWR application in turbidites, logs in logging while drilling (LWD), as it came to be known, were not as accurate as the wireline. This was particularly the case for porosity and density sensing. But, once again, the elimination of rig time was a key factor in the rationalization, and likely also the asset unit-based "common good" mentality. Also important was the fact that these were early measurements, prior to fluid invasion, and left time to make reservoir decisions. To misquote Mick Jagger, time was on their side.

The Austin Chalk

The technology table had been set. One could now drill a horizontal well using MWD for positioning on the fly, an important attribute for precise placement, a steerable assembly to obtain the needed trajectory and make course corrections on the fly without pulling the string, and then, finally, the ability to evaluate the reservoir adequately without using wireline logs. The logs were especially costly in a high-angle setting because of the nonviability of true wireline-conveyed systems at hole inclinations much greater than 50°.

The first modern horizontal wells are generally credited as being drilled by Elf Aquitane in Lacq Superieur on land and in Rospo Mare offshore during 1980 to 1983. But a basically conservative industry needed one more push to drive wide-scale acceptance. This was the Austin Chalk play. Independent oil companies operating in this Texas area noted that the naturally occurring fractures were particularly amenable to production enhancement by intersection by horizontal wells. The first such well was drilled in 1985, and, over the next decade, there was explosive growth. By 1990, about 1,500 horizontal wells had been drilled; by 2000, there were between 12,000 and 20,000 **(Fig. 1),** and small companies became big companies in very short time.

In the early 1990s, a US Department of Energy survey showed that costs for horizontal wells were averaging only about 17% more than conventional wells, and that the productivity increases were between two- and seven-fold. Curiously, though, the quantitative formation evaluation impetus was a small factor, although LWD still remained a key enabler for horizontal-well exploitation of more conventional reservoirs. But, unquestionably, the Austin Chalk allowed the industry to cut its teeth on debugging and optimizing the technique of horizontal-well drilling. This factor, of compelling economics of a special kind, was not unlike the situation at Cougar for wireline replacement, and once again underlined one of the litmus tests for disruptive technology: It often finds a foothold in niche situations, but then blossoms to become the norm in other.

An intriguing feature of this period was that at the same time major advances in drilling were being made, the drilling industry itself was under pressure. Massive personnel cutbacks were occurring, and overall drilling activity was in decline. There was a dramatic rise in horizontal-well activity, but a drop in the rig count. Also of interest was the drop in development and lifting costs per BOE in the same period, as cataloged by the Energy Information Administration **(Fig. 2).** This near-halving of lifting costs is at least partly attributable to horizontal wells, even though they were in the minority of total wells drilled. There is also support for the hypothesis that horizontal wells, together with asset decision making, contributed to a shift from cost/foot thinking in drilling to cost/barrel thinking. This period also saw the practical realization of 3D-seismic interpretation, which increased certainty regarding the location of sweet spots in the reservoir

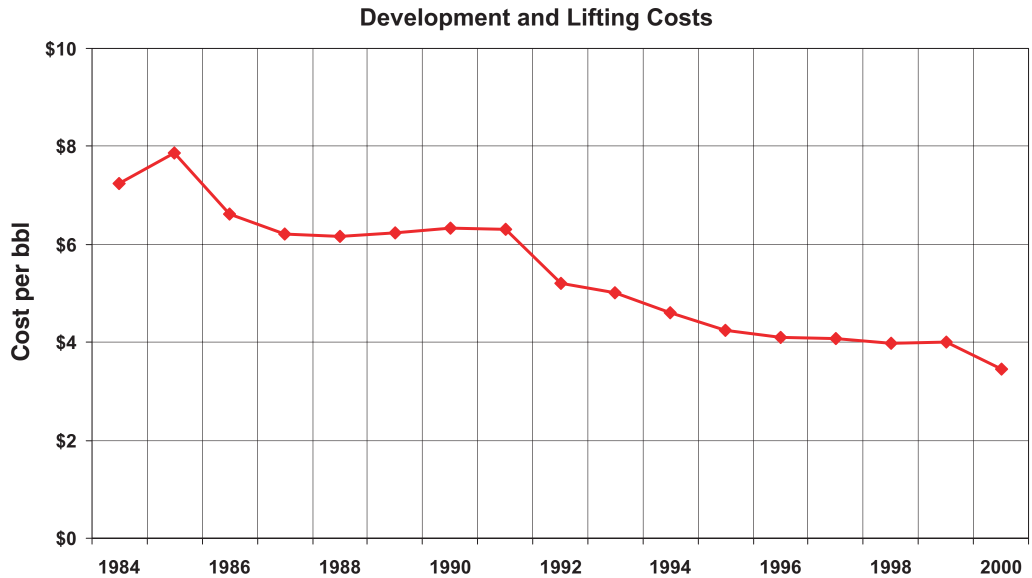

Fig. 2—Developing and lifting costs fell sharply during the period.

and provided a firmer basis for the increased productivity likely from a horizontal well.

Decisions Closer to the Field

Major changes also occurred in the industry during this time. Oil companies underwent restructuring, in many cases with the formation of asset units, as noted earlier, thus shifting decisions closer to the field. Most firms drastically reduced R&D spending, and the onus for development activity progressively shifted to the service companies, which did not materially pick up the R&D spending slack until the mid-1990s **(Fig. 3).** This eventually led to an exacerbation of an industry problem: the slow uptake of technology compared with other industries.

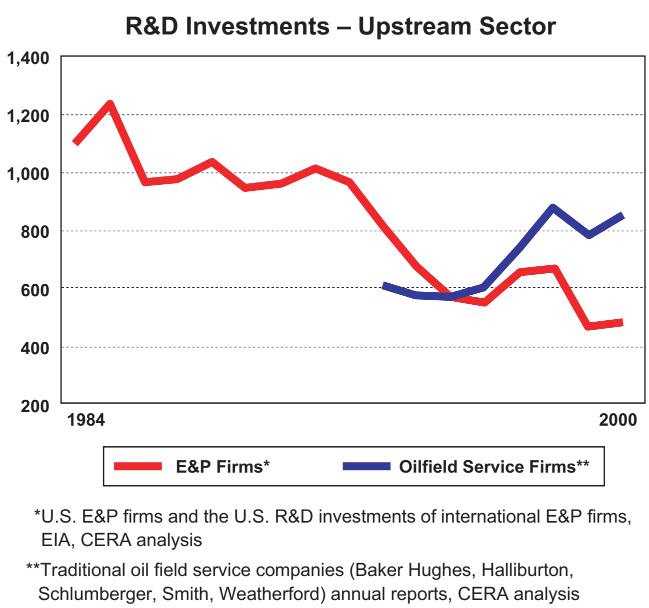

Fig. 3—The shift in R&D spending.

Some have theorized that the shift resulted in "information asymmetry." In the original concept in economics, theorized by Nobel Laureate George Ackerlof, this results when the buyer has less information or understanding than the seller and, as a consequence, devalues the offering. An everyday example is the "lemon discount." If the seller of a used car shares little information about the car, the buyer will assume it is a "lemon" and discount its value. In our industry, the most manifest result is likely risk aversion—the developers having less understanding of the precise need and the user less proficiency in the technology. This hypothesis was discussed and developed at an Applied Technology Workshop (SPE 98511, Rao and Rodriguez).

Causality is difficult to establish in most walks of life. The circumstantial evidence supports the theory that horizontal wells, arguably the single biggest productivity-enhancing technique in the business of developing and lifting hydrocarbons, were enabled by a series of events acting in concert between the mid-1980s and mid-1990s. It began with 3D-seismic interpretation coming into its own, with associated reservoir simulations identifying the high potential of horizontal wells. Steerable drilling systems, enabled by improved motors and the advent of MWD, reduced the cost of horizontal wells. Quantitative LWD permitted hydrocarbon saturations to be estimated in time for completion decisions. These were the technology underpinnings to change.

Asset-decision-making framework, introduced at the same time, was a significant factor at a behavioral level. Finally, compelling economics were a driver for risk taking. This could lead one to conclude that disruptive technologies require a convergence of three factors: the right combination of enabling technologies, compelling economics that highlighted a niche play at first, and industry risk takers and/or a new organizational dynamic. This period that began in 1984 seems to have experienced this unique combination of circumstances, ushering in a brave new world of lower lifting costs. **JPT**

The Future Technology Challenge—Perfecting the Digital Wellbore

Ali Daneshy, Director, Petroleum Engineering Program, University of Houston

The healthy financial state of the oil and gas industry is causing a gradual and welcome change of focus from cost to improved recovery. After a quarter century of cost containment and technology downsizing, this change of direction will go a long way toward securing a healthier future for our industry. In fact, in the face of limited oil and gas resources, application of new technology is the only answer.

Manifestations of the change in direction are numerous and widespread. From horizontal holes with multiple fractures for production of tight gas in the Barnett Shale to intelligent downhole flow regulators in the South Shaybah oil field in Saudi Arabia, the industry is showing a renewed enthusiasm in its search for more production and higher overall recoveries. The success of these moves is bound to convince even the late adopters among us that technology is still a more powerful key to operational and reservoir management success than cost worries.

Another challenge facing the industry is a shortage of technically trained and competent manpower to explore, develop, and produce oil and gas from reservoirs located in remote and often harsh environments. Shortage of manpower mandates significantly more effective use of existing resources. This contradicts spending long traveling hours, or sitting at the wellsite waiting for something to happen. Besides, the next generation of technical people will be much less willing to spend time away from their families and much more dependent on immediate access to their computers and data sources. The complexity of problems often necessitates multiple technical skills and instant access to highly specialized computational capabilities. With the incredible advances in communication technology, people expect immediate answers. A new generation of operational systems needs to be developed to accommodate these expectations.

There have been numerous technical discussions regarding what the industry calls e-fields, i-fields, digital fields, or just intelligent fields. The scope of these projects is usually very broad and covers ambitious goals, including automatic, real-time, remotely controlled operations and intervention with minimal human involvement.

The next generation of technologies for higher recoveries will have to include better methods of enhancing the efficiency of drilling, completion, and production services performed in the wellbore, as well as tracking the movement of fluids within a producing reservoir. These will result in a substantial reduction of risk and associated waste, better execution of services, more-robust choices, and preparation of realistic and achievable plans and more effective and efficient utilization of all available resources. An option long considered attractive by experts is intelligent/digital wellbores. This is meant to include wellbores with sensors and data and power transmission capabilities that would allow monitoring and controlling operations within it, as well as surveying its surroundings. In essence, the wellbore is transformed into a complex plant in which its operations are monitored and controlled mechanically and electronically for integrity and efficiency. In this scenario, the wellbore becomes an important node in the intelligent field. Because the wellbore is our only gateway into the reservoir, the efficiency of its operations becomes our first step toward increasing the recovery of reservoir fluids.

An early realization of benefits of digital wellbores is the gains made in drilling through use of MWD, LWD, and their real-time remote monitoring and analysis. Drilling data from multiple wells is collected and transmitted in real-time to monitoring computerized centers. Experts from oil and gas, service, and consulting companies located in different parts of the world may monitor and analyze this data and track the well path around the clock. Deviations from plan are recognized and corrective action is decided and instantly transmitted to wellsite with minimum waste of time, equipment use, and materials. In addition to more-accurate well trajectories, this also has resulted in substantial savings in the costs of drilling operations. These capabilities have been a key element in our success in drilling and completion of complex well architectures and the production gains made possible through their application. There is no doubt that similar benefits can be gained from application of the technology to other operations. One major difference in the application of digital wellbores between drilling and completion/production operations is the duration of these operations. While drilling can last several weeks, completion and production

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operations take many years. The systems put in place for the latter will therefore have to be operational for much longer times. This will pose significant challenges that will have to be overcome in the future.

The realization of digital wellbores for completion and production operations will require enhancements in several existing technologies. Among these are:

Sensors. At present, we are able to measure pressure, temperature, flow rate (two- and three-phase), P- and S-wave arrivals, resistivity, magnetism, gravity and gamma ray fields, viscosity, density, deformation, ground tilt, etc. Individually or through various combinations, these measurements can make it possible to monitor the status of the wellbore, as well as track fluid flow in the reservoir. A digital wellbore can have multiple control centers at different depths where these variables are measured and transmitted to the surface. For instance, downhole measurement of the pressure and/or temperature is extremely valuable during the cementing operations and can allow us to monitor the location of cement in the annulus and its setting progress.

Simultaneous monitoring of sonic velocity will allow real-time downhole measurement of cement compressive-strength development and avoid the guesswork about when the cement is set and the well is ready for resumption of other operations. Fracturing experts have long been pressing for downhole pressure measurement to monitor and determine fracturing progress. When downhole seismic and ground-tilt measurements are added to the collected data stream, the possibilities become enormously more attractive and intriguing, among them real-time determination of 3D fracture geometry. This will take the guesswork out of our present stimulation operations. The same will be true for many other services that are performed within the wellbore. For example, downhole seismic will make it possible to hear sand production and pinpoint its location within the wellbore long before it has become a safety problem at the surface.

Multiple monitoring of pressure within the wellbore will allow accurate determination of occurrence, intensity, and location of water flow and make it possible to reduce production of unwanted water. Pressure and temperature measurements in the injection well will allow us to determine real-time distribution of injected fluid with depth. This will lead to avoidance of enormous volumes of excessive fluid [water or enhanced-oil-recovery (EOR) chemicals] being injected into the reservoirs and recirculated within the high-permeability streaks with minimal contribution to added oil recovery.

Measurement of time-elapsed seismic and resistivity data is often cited as a means for determination of fluid movement inside the reservoir. The same information may be obtainable from changes in gravity or gamma ray signals. P- and S-wave arrival times and intensity can be used in conjunction with logging while drilling for geosteering and locating the bit position within the reservoir. This technology will lead to enormous benefits in geosteering of horizontal and multilateral wells. Changes in arrival times may indicate fluid movement within the reservoir and be used for mapping oil/water interface in EOR operations. Many recovery operations such as steamflooding and thermal-recovery methods are already benefiting from downhole temperature measurements. The intriguing feature of these techniques is that they do not require accurate absolute measurements. For most of them, especially those related to monitoring fluid movement in the reservoir, we can infer change from changes in data. This relaxes sensor requirements and simplifies data analysis.

The biggest challenge in the use of downhole sensors is their long-term reliability. High pressures and temperatures combined with highly corrosive and erosive fluids place tremendous demands on sensors. Nevertheless, the general feeling among industry experts is that these challenges are not insurmountable and that robust, fit-for-purpose sensors are just a few years away from availability.

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Casing. Closeness of sensors to the interior of the wellbore adds to their sensitivity. At the same time, these sensors need to be protected from the wellbore fluid environment and the variety of tools that enter the wellbore or reside permanently inside it. High-speed transmission of signals to the surface will enable their use for real-time operations. Availability of downhole power will also make the sensor system much more versatile. All these features may require a new generation of casing material and installation techniques. Throughout its history, the oil and gas industry has depended on steel and its various alloys as its sole material for casings. Together with its strength, steel is also subject to corrosion and degradation with time. Although other materials such as aluminum, fiberglass and graphite composites have occasionally been considered for casing material, these have not gained the minimum industry acceptance to allow further development of their potential. Among these,

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Reminiscences From an Oil Patch Veteran

Richard Bateman, Consultant and author

My first contact with SPE came almost 40 years ago. My supervisor gave me a form to fill out and told me that I was joining SPE and that there would be a lunch meeting in about half an hour at a local steakhouse. People didn't waste time back then. I cannot for the life of me remember who gave the talk or what the subject matter was, but I do remember that the steaks were delicious. I was immediately captivated with what SPE had to offer; surely the way to an engineer's heart is through his digestive tract.

It never occurred to me to ask when SPE had its start. It just seemed like so many other things in the oil patch, to have been there forever. But, in fact, the society was still then in its infancy; the SPE membership number I was given was 9878.

As time went by and the limits to my expense account grew, so, too, did my contacts with SPE. Soon I began to participate in the Annual Technical Conference and Exhibitions (ATCEs). Thereafter followed paper submissions, local section committee involvement, and relations with SPE Presidents. It is interesting that one President hired me, another gave me career advice and, as a result, I resigned from the company the first one had hired me to work with. Later, history repeated itself and another SPE President hired me, and there are yet two more who still correspond with me. They must get lonely, I figure.

Some of my SPE-related activities were memorable, others better forgotten. Giving a talk with a 35-mm slide show to the Cairo chapter in the 1970s during a power outage was, let us say, challenging. Manning a booth at the height of the boom in the early 1980s was hair-raising.

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Being a local section program chairman in Latin America in the 1990s exposed me to the vicissitudes of international travel and attendant language barriers. Witnessing recent ATCE ceremonies in the new millennium that are raised to the level of the Oscars has been nothing short of breathtaking.

The Benefits of Travel

Apart from these yearly gatherings, our society is well known for the multitude of learned papers that are written and presented by their authors in *JPT* (and sister publications) and at SPE conferences all over the globe. In the case of an international conference, the author gains a free trip to some exotic spot, his employer gains recognition as a good oil patch citizen (encouraging innovation), and the organizers of the conference manage to fill another 20-minute slot in their timetable. Indeed, if one put one's mind to it, one could spend the entire year globe-trotting, trying to keep up with the innumerable conferences, symposia, forums, and the like that are promoted in the name of science and technology and also, dare I say, excuses for getting the lads together for a beer bust in great cities dotted round the globe.

A number of technical-paper-related anecdotes spring to mind. One paper in particular merits special mention. The author had made a study of an anticlinal structure beneath which lay vast deposits of oil. His claim to fame was that he had managed to identify this geologic feature by the use of a special filter (through which he had been able to photograph the whole area from an airplane) and map the outlines of the subsurface structure. He gave some of his magic away by explaining how this method had worked. According to his theory, there were salt-water seeps at surface around the perimeter of the structural anticline that trapped the precious hydrocarbons. Local farmers had allowed their sheep to graze the land, and where these animals had encountered the saline seeps, they had drunk the water (unwisely). The grass, suitably fertilized, grew greener and more abundantly in these locations and thus showed up nicely on his aerial photographs. After the applause died down the audience lost no time in giving the work a new and more descriptive title.

Before the advent of PowerPoint and projectors that hooked to one's USB port, we all used 35-mm slide projectors for paper presentations. I will never forget the unfortunate speaker (I believe he was French, although what befell him could have happened to anyone) whose first slide came up flipped left for right so that, unless one was Leonardo da Vinci, it was difficult, if not impossible, to read. He asked for, and was given, a timeout and with the help of an assistant flipped all the slides in the carousel and then restarted his talk. Now the first slide came out upside down, but at least the words read left to right. After a second session of slide flipping, during which the audience became restless, the lights were once more lowered and a hush fell over the gathered cognoscenti and, sure enough, the first slide was now upside down *and* backwards, at which point the author retired the paper and left the room not to be seen again for quite some time.

Since my first involvement with SPE until the present, our industry has passed through a number of boom and bust cycles. Attendance at ATCEs and local section meetings has mirrored these cycles. I can remember occasions when one could hardly walk down the aisles in the exhibit areas or find a seat in the auditoriums at the height of a boom. Then, on other occasions, during the busts, I recall finding the exhibits area almost devoid of activity (other than that of the unemployed peddling their resumes) and equally finding the movers and shakers reading their technical jewels to almost empty rooms. We seem to have trouble maintaining an even keel but, at the end of the day, what one remembers most are the multinational, multicultural friendships formed over the years and the chances at each successive SPE get-together to renew and refresh the bonds. These are the things that matter most, and they seem to me to get better all the time. I hope I will be around for the 75th anniversary and that most of my friends will be there to greet me too! **JPT**

Daneshy Guest Column

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graphite composite pipes deserve special attention. Such casings are fabricated by weaving thin graphite lines, much like cloth is woven with cotton and plastic strings. The advantage of composite casings is that one can weave sensors and copper and fiber-optic lines into their fabric and have these buried within the body of the pipe, thus protecting them from wear and wellbore fluids. Once installed in the wellbore, the casing receives the data in addition to protecting the well. The technology for fabricating graphite composite pipes with above features already exists, and simple composite pipes are already in use by the oil and gas industry. Pipes with embedded copper and fiber-optic lines have already been fabricated at laboratory scale. The main concern with graphite pipes is their wear resistance and ability to tolerate the rough environment of the wellbore operations. In the end, the digital wellbore may need a different completion scheme than present practices. Protection of the wellbore sensors requires use of less force for equipment installation. But a side benefit of the digital wellbore is that equipment operations can be directly monitored and verified, thus reducing the force level needed to mitigate operational risk.

Downhole Power and Robotics. Availability of downhole power will make it possible to conduct many of the wellbore operations remotely and with much less surface equipment. For instance, one can visualize a downhole robot that is capable of opening or closing downhole valves, setting packers, inspecting different tools, and performing many of the operations that are presently controlled and performed by using wireline or coiled tubing. The use of robots was investigated by the industry several years ago, but it was abandoned because of lack of support.

Data Management and Analysis. With the large volumes of data being transmitted to the surface, the digital wellbore will need special algorithms for storage, display, and analysis of the data. Fortunately, most of this technology is now readily available within the oil and gas industry.

Many of the algorithms needed for interpretation of the data need to be developed specifically for this purpose. Although the required core technologies already exist, their use for these applications is new. However, this task is less demanding than some of the other challenges. Like many other technologies, once the enabling technology is in place, the supporting systems will be developed with time and in accordance with the demands of the market.

Organization. Perhaps the biggest challenge facing the digital wellbore is the organization and sponsorship of implementing it. The task requires the integration of many diverse pieces into a cohesive system that can support and be supported by existing technologies and services. At first glance, the technology appears to fit the domain occupied by service companies. But the system is too large to be undertaken by any single service company, or for that matter even an E&P company. Furthermore, the system needs an actual operational prototype even during the development phase. For this and many other reasons, the best approach is an industry collaborative effort, funded and directed by main industry players, similar to other initiatives. An important role of the collaborative effort will be establishment of industry standards for transmission, collection, and management of the enormous volume of data that digital wellbores will generate.

The digital wellbore could play an important role in taking the industry to the next level of oil and gas operations in the future. The cost and time spent for its development will be worth the benefits it offers in more-efficient operations, as well as in its ability to track fluid movement inside the reservoir. In its initial stages, the technology will be suited mainly for prolific reservoirs where production gains can offset high costs of digital-wellbore development and installation. In the long run, as oil and gas prices rise because of resource scarcity, their use may spread to lower-productivity wells. **JPT**

1990–2007: Toward the Future

John Donnelly, *JPT* Editor

During the 1990s, SPE took significant steps to ensure that it remained valuable to the practicing petroleum professional. It became truly international, continuing the mission that had begun more than 2 decades earlier; it opened offices outside the US and broadened board representation to enhance global member needs and services; it expanded programming to keep up with demographic and technological changes sweeping the industry; and it entered the electronic age, streamlining internal processes and giving the industry a powerful and effective Web tool.

The next decade and a half would see SPE broadening its presence on the ground throughout the world. In 1990, the SPE Board voted to open an office in London to coordinate activities in Europe, Africa, the Middle East, and India. At the end of 1981, SPE had 3,837 members, excluding students, in these regions—just under 10% of total membership. But by year-end 1990, membership in those regions had almost tripled and now represented 21.5% of total membership. During the same period, membership in the US had declined more than 5%. An office in Kuala Lumpur would open in 1995 to improve member services in the growing Asia region, and an office in Dubai to bolster Middle East activities would follow in 2003. This year, SPE will open an office in Russia.

That international trend was borne out in total membership growth as well. Overall membership grew by a third in the 1980s, despite the severe industry contraction, thanks to non-US growth. Total membership rose from 38,799 in 1980 to 51,586 at the end of 1990. Non-US membership more than doubled, from 7,876 in 1980 to 17,127 at the end of 1990. Members residing in countries other than the US now represented a third of total membership, and international growth would continue in the new decade. Eight new sections from seven countries and five new student chapters received charters in 1990, for example, putting the total number of countries with SPE sections or student chapters at 41. Among the new sections formed were ones in Mexico, Germany, Nigeria, Congo, and Bombay, India. New student chapters were formed in the United Arab Emirates and Yugoslavia. International growth was increasingly reflected in the makeup of SPE programs and services.

But perhaps the most symbolic event representing this trend came in 1991, when the society's Nominating Committee

1990

- Membership totals 51,586.
- Mica prospect on Mississippi Canyon Block 211 in US GOM is first subsalt discovery (Exxon).
- Iraq invades Kuwait.

1991

- SPE office opens in London.
- 3D seismic model processed at supercomputer workstation.
- First guidelineless subsea tree installed (Petrobras).
- US and allied forces drive Iraqi troops out of Kuwait.
- Collapse of Soviet Union and opening of Eastern Europe.

selected Jacques Bosio to become 1993 SPE President. Bosio, an executive with Elf Aquitaine Production in Paris, would become SPE's first non-US president.

"SPE was perceived as 100% US at one time, but it was opening new sections every year outside the US and appeared to be going in that direction," recalls Bosio, who had helped establish the SPE France Section in the early 1980s. "Fortunately, some presidents before me, such as Orville Gaither and Kenneth Robbins, had vision and realized that the center of gravity of the oil business was moving east.

"The idea of a non-US President would be a symbol, and I think it worked," Bosio says. "When our members opened up their *JPT* one month, they found out that they had proof that SPE was going international, since the least you can say about a Frenchman is that he is a true foreigner! It was a sign of a clear evolution."

The Board of Directors created a Task Force on Cultural Diversity to learn how to better adapt to countries and cultures around the world. New sections soon would open in places such as Beijing, a decade after the first SPE China conference there, and in Russia, with the Tver and Moscow sections, after the fall of the Soviet Union. In the first 6 years of the 1990s, SPE added more than 40 sections outside the US, and student chapters now were located in more than 20 countries.

Internationalization of Publications, Events

Publications also became more international. At the beginning of the decade, SPE publications had 250 volunteer reviewers representing 16 different countries, and three of the nine peer-reviewed journal Review Chairs resided outside the US. Conferences and meetings would follow the trend. SPE had had a presence in Latin America for more than 30 years by 1990 but had never held a society-wide event there. But in 1990, it held its first international petroleum conference in Latin America in Rio de Janeiro, the SPE Latin American Petroleum Engineering

1992

- SPE Forums held in Asia Pacific for the first time.
- Russia/CIS countries provide new oil and gas investment opportunities.

Valery Isaakovich Graifer addresses the first SPE Russian Oil and Gas Technical Conference in 2006.

H.E.I.B Sudjana, Indonesia's Minister of Energy and Mines, cuts the ribbon to open the 1994 SPE International Conference on Health, Safety, and the Environment in Jakarta.

R. Lyn Arscott, center, 1988 SPE President, chats with Dick Cheney, former Halliburton Chairman and CEO and now US Vice President, at the 1995 ATCE in Dallas.

Conference. In 1994, the first conference in Mexico was held, in Veracruz.

Activity in Asia was also picking up. The first SPE Asia Pacific Oil and Gas Conference and Exhibition was held in 1993 in Singapore, and an international conference and exhibition took place in Vietnam 2 years later. In the space of one month—March 1995—SPE hosted meetings in Ho Chi Minh City; Bakersfield, California; Bahrain; Denver; Kuala Lumpur; Dallas; and Houston, adding more than 360 papers to the society's literature collection. Today, such a schedule might be commonplace; back then, it was unprecedented.

At the end of the decade, the Board of Directors restructured again to reflect the changing face of membership. An additional director position was added, bringing the total to 21, and the regional structure was altered. SPE now had seven regions in North America and seven outside North America.

Broader Technical Scope

Demographics was not the only area in which SPE would adapt to reflect industry and membership trends. The oil and gas business had undergone enormous upheaval in the 1980s, and large-scale restructuring was still taking place. Operators re-evaluated their roles and began to focus more on the bottom line. As a result, much of the industry's major R&D work was now ceded to the service companies. The spread of cross-functional "asset teams" enhanced cooperation among engineers, geologists, and geophysicists. Natural gas was becoming more prominent. Plays in deeper water grabbed attention, and new international arenas were opening up to foreign investment. Large operators sold off numerous properties, many in North America, to focus on potentially lucrative areas around the world. This helped spawn a new breed of independents that would build their portfolios on the castoffs of the majors. By the mid-1990s, SPE's largest membership segment was employees who worked for smaller oil companies worldwide, with the second-largest constituency being people who worked for large and small service companies.

The society's technical scope would expand along with the industry's, as one-time "related areas" became core concerns. Horizontal drilling and 3D seismic became mainstream subjects, along with the new "hot technologies" born from Arctic and deepwater exploration and from nontraditional areas such as coalbed methane. The "information age" and the "knowledge economy" led SPE to put more of a spotlight on computer applications and information systems in its programming and publications. And every sector of the industry was paying more attention to health, safety, and the environment (HSE) issues.

The latest Long-Range Plan examined SPE's evolving role in technology dissemination, and concluded that the society needed to aggressively cover every technology directly related to the production of energy through wellbores, as well as offer broader coverage of activities that depended on the same principles of fluid flow through porous media, including such areas as groundwater assessment and waste disposal.

The 1990s saw Boards that were intent on ensuring that SPE maintained its relevance and importance to industry professionals. SPE created Applied Technology Workshops to provide time-constrained members with short events focused on practical applications, formed Technical Interest Groups so members could transcend geographic borders and communicate efficiently with members holding common interests, and began an initiative to capture all SPE technical papers electronically.

In November 1991, SPE held its first International Conference on HSE in Oil and Gas Exploration and Production in The Hague. The 245-paper program carried the theme "Meeting Our Global Responsibility." For the first time at a major conference, SPE integrated medical scientists and practitioners, ecologists, environmental scientists, wastewater experts, government representatives, and public-interest groups into its traditional engineering world. Two-thirds of the participants were not SPE members. Besides building bridges, the conference engaged the environmental

1993

- Jacques Bosio becomes SPE's first non-US president.
- Installation of first multilateral valves (Sperry, Canada).
- First subsea electrical submersible pump (ESP) installed (Schlumberger).
- Auger TLP in US Gulf of Mexico is first floating production facility (Shell).

1994

- SPE Forums held in the Middle East for the first time.
- Multilateral Completion System introduced (Baker Oil Tools).
- Subsea completion in Brazil's Campos Basin surpasses 1,000-m water depth (Petrobras).
- First 4D seismic performed (CGG).
- International Law of the Sea Treaty enacted by UN.

community on a technical basis, in contrast to the often-emotional debate that swirled around these topics in the general media.

Also in 1991, an ad hoc Facilities Engineering Committee conducted a study that found that while SPE had expanded beyond its historic focus on reservoir engineering to encompass a fuller range of petroleum technology, surface-facilities engineering continued to play a minor role in society programs and content. The committee's chairperson was Ken Arnold, who would be instrumental in broadening SPE's coverage of this sector and in the next decade would become the first Technical Director for Facilities and Construction.

Women were playing a much bigger role in the oil and gas industry, and in 1998, DeAnn Craig became the society's first female president. "When I first started in this industry, I was working on an offshore exploration project, and an engineer in my position needed to go offshore during well testing. But I was not allowed because there were no accommodations for women," recalls Craig. "When I was president of SPE, there were a few facilities that I could not enter because I was a female. But there are so many women in the industry now in all positions. The attitude now is that it is the norm to have women in the industry."

The Electronic SPE

SPE's global presence was allowing it to capture more technology at every level and the number of technical papers was expanding rapidly. Like many businesses and organizations, SPE was struggling in the early 1990s to adapt to the dawn of the electronic age. Its corporate computer system needed upgrading and it wanted to provide members with an electronic database of papers and other material.

In 1990, the Board approved a plan to archive all SPE papers on a computer database and produce a CD-ROM to enable members to retrieve data from the society regardless of their locations. In early 1993, SPE's Electronic Publishing Committee issued the eagerly awaited CD-ROM SPE MasterDisc. The disc was a collection of the first page

SPE's Mission, Vision, and Values

Mission

To collect, disseminate, and exchange technical knowledge concerning the exploration, development and production of oil and gas resources, and related technologies for the public benefit; and to provide opportunities for professionals to enhance their technical and professional competence.

Vision

To be a society of professional excellence, providing its members the highest quality lifelong learning, and continuous personal and professional growth.

Values

- Excellence
- Integrity
- Professionalism
- Life-long learning
- Diversity
- Volunteerism
- Innovation
- Social responsibility

Executive Directors of SPE and its Predecessors

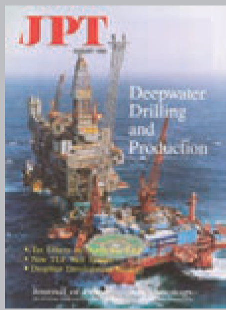
William H. Strang	1945–1950
Joe B. Alford	1950–1968
David L. Riley	1968–1979
Dan K. Adamson	1979–2001
Mark A. Rubin	2001–present

1995

- SPE office opens in Kuala Lumpur.
- SPE.org goes live.
- Oil demand edges upward.
- Highly integrated "triple combo" logging platform introduced (Schlumberger).
- Venezuela approves law allowing foreign participation in oil E&P.

1996

- SPE Forums held in South America for the first time.
- First SPE Applied Technology Workshops held in Europe and the US.
- First through-tubing multilateral intervention.
- Deepwater Girassol field discovered off Angola (Elf).
- First commercial sonic imaging job (Schlumberger).
- First Spar production facility installed at Neptune field in US Gulf of Mexico (Oryx).



Looking Back . . .
from the pages of JPT

"Shell Oil Co. plans to develop its Auger field oil and gas discovery with a tension leg platform in a record water depth of 2,860 ft. The Auger TLP will be the first in the Gulf of Mexico to support a drilling rig and complete production facilities."
— February 1990

"The biggest revelation to most of the attendees [at the 1990 IADC/SPE Drilling Conference] was the continued explosive growth of horizontal drilling. While horizontal wells represented less than 1% of all wells drilled in 1989, the growth rate has been almost 250% per year over the last 3 years."
— May 1990

"For many decades, committees and staff members working on these [SPE] publications have generated a tremendous volume of documents in the course of acquiring, reviewing, and publishing technical manuscripts. These activities have produced mountainous quantities of correspondence, 3×5 cards, penciled-in batch-control charts, three-hole-punched binder sheets, hand-scrawled ledger-book entries, and endless ranks of manila folders. ... The phased development of the new program, called the Technical Papers Tracking System, will not eliminate peripheral paperwork. But it will improve the efficiency of committees and may open new possibilities for future paperless publishing options." **— June 1992**

"When one considers that Russia's oil production has declined from 10.38 million STB/D in 1990 to an estimated 8 million STB/D in 1992, help is needed; otherwise, Russia will become an oil importer sometime in 1994." **— September 1992**

"With the opening of a branch office in Europe, SPE has taken into account that the center of gravity of the oil business is not in Texas anymore. It's somewhere in the Atlantic."
— October 1992

"Geologists and engineers are eschewing standard mapping and plotting techniques in favor of 3D visualization. Workstation-based 3D visualization of reservoir simulation data enables an immense amount of information to be analyzed quickly and efficiently." **— November 1993**

"Many major oil companies have separated their staffs into asset teams and continue to divest properties to raise capital for exploring in immature basins that have become available. Many new independents are emerging with the purchase of assets from majors and from large independents who purchased their properties during the last round of divestiture. The change continues." **— February 1994**

1990–2007

of about 20,000 SPE papers—an electronic index to papers from the early 1950s through 1991. Instead of thumbing through old volumes of *Transactions, JPT*, journals, or conference proceedings, members could search for information from their own computers, although they still had to order the complete paper by mail. This was the first step in a new future for the society's technical literature.

In 1994, SPE took another step, announcing that members who had access to the Internet could now contact SPE headquarters by email, and it acquired the domain name "spe.org." SPE's home page on the Internet went live in 1995.

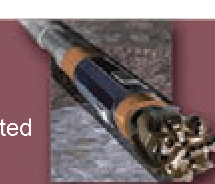
By 1998, the MasterDisc would contain every paper published by the society since 1951; after 1998, technical papers were added in real time on the website, giving members access to the entire technical paper library.

"The society's primary objectives have been to collect, store, and disseminate information," says long-time member W. John Lee, professor and holder of the L.F. Peterson Endowed Chair in the Harold Vance Department of Petroleum Engineering at Texas A&M University. "We do this so much more effectively now, and [deliver it] to so many more people, than when I joined SPE that there is simply no comparison between then and now."

All of this was expensive, but by the late 1990s SPE's finances had regained strength. The oil-price collapse of the mid-1980s and the subsequent industry downsizing took a financial toll on the society. Membership and programs were largely unaffected, but industry participation in exhibitions and advertising revenue declined, and membership dues still covered only a small part of the society's income. In the decade following the oil-price collapse of 1986, only five times did SPE have a positive operating balance, according to an article in the May 1997 *JPT*.

Oil prices fluctuated between USD 18/bbl and USD 22/bbl for most of the decade, but in the late 1990s, oil prices began to quickly head south and neared USD 10/bbl in 1998. Another round of sweeping mergers took place. Mergers and buyouts occurred over the next few years

1997



- Rotary Closed Loop Drilling System inaugurated (INTEQ).
- First intelligent well completed at Snorre field, Norway (Saga and PES).
- Brazil ends oil monopoly and frees oil prices from state control.
- Mahogany field on Ship Shoal Block 349 in US GOM becomes first commercial subsalt development (Phillips).
- Kyoto Protocol to the United Nations Framework Convention on Climate Change negotiated.

involving some of the biggest names in the business, as BP bought out both Amoco and Arco and Exxon took over Mobil. It was becoming clear that fewer employees would be required to do more throughout the industry. Professional societies worried that volunteer and participation time would be cut to a minimum. SPE, the Society of Exploration Geophysicists, and the American Association of Petroleum Geologists pledged to work together and respond to the changing needs of the industry and began to look for ways to integrate programming.

Before the 1990s, SPE's relationships with other technical societies had been handled on an ad hoc basis. The society had worked with other organizations on reserves classification and had partnered with other groups on conferences. But in 1994, the Board approved a formal policy outlining how SPE should handle dealings with other technical societies, following the impetus of the industry to create cross-functional and cross-discipline synergies. The new policy spelled out that SPE should form alliances with other societies as needed to provide its membership with the technology they needed to perform their jobs better.

SPE had always maintained a clear focus on what was relevant to its members, but with the industry undergoing such radical and rapid change, it decided to thoroughly take the temperature of member needs and wants, launching a detailed study at the end of the decade. The Member Needs Survey, which included focus groups and survey responses from members in more than 50 countries, found that members favored expanded electronic services through the website, increased participation from younger members and industry management, and continued work on becoming a truly international organization. Younger members in particular wanted more online, electronic enhancements. Members noted that they increasingly had less time for volunteer activities, and members in developing countries said they found the society's dues to be a burden. All of this would inform Board directives over the next few years as the society, now past the 40-year mark, entered a new century.

1998

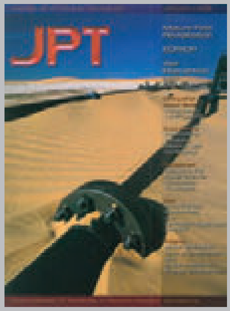
- DeAnn Craig becomes SPE's first female president.
- BP and Amoco merge.
- Extended-reach well drilled beyond 10 km on Wytch Farm (BP).
- First new-generation data visualization center (Veritas).
- Hugo Chavez elected president of Venezuela, ends oil privatization, begins expanding state control.

"The petroleum industry, much like other industries, has been trying to maintain or decrease levels of employment and compensation to maintain fiscal fitness. The 1994 SPE Salary Survey mirrored the trend, reflecting a slight decrease in salary. The average SPE member now makes $68,523/year." **— May 1994**

"Amid low oil prices and downsizing, the marriage of the petroleum engineer and the computer is no longer a casual coexistence. The typical petroleum engineer is called on daily to spend more time at the keyboard to perform tasks from writing computer code to word processing to developing algorithms for engineering applications. A recent industry survey indicated that not only do petroleum engineers consider themselves to be PC literate, they do most of their work on personal computers." **— June 1994**

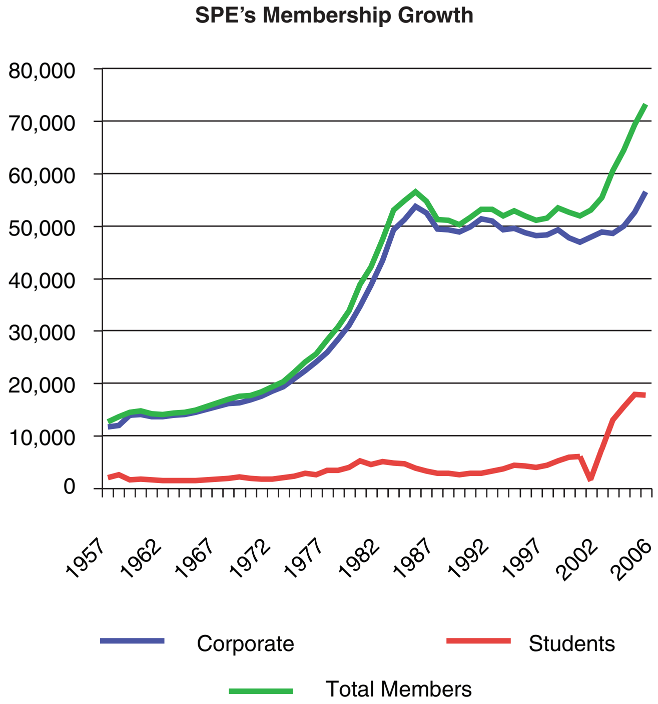
"Major corporations in the oil and gas industry have spent hundreds of millions of dollars to create new organizational structures, with the justification that productivity will increase. They have abandoned the traditional top-down execution in favor of lean management, teamwork, and cross-functional goals." **—August 1994**

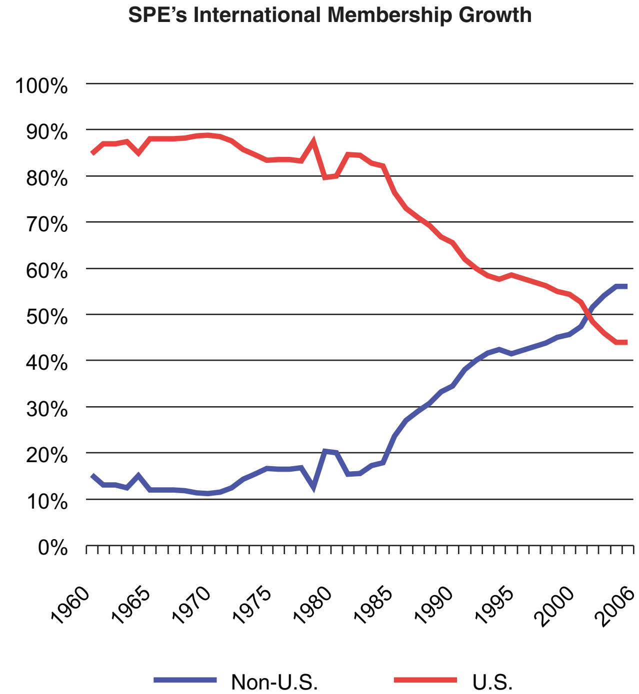
"Venezuela is opening its doors this year to full-fledged E&P by foreign companies for the first time since the country's hydrocarbon industry was nationalized 2 decades ago. Profit-sharing contracts on 10 big blocks are expected to go on offer at international auction in the third quarter." **— July 1995**



"The industry must concentrate on finding and developing major sources of new supply, significantly improve on efficiency gains of recent years, meet new environmental demands, and cope with political uncertainty. As a result of 10 to 15 years of oil company layoffs and corporate downsizing, companies must successfully develop the skills and structure to focus on their core competencies, use joint ventures or outsourcing, and manage inventories to reduce costs while retaining the ability to meet demand requirements." **— March 1997**

"Those who have ridden the oil industry roller coaster long enough can remember the announcements: BP takes over Sohio, Chevron acquires Gulf Oil, Mobil buys Superior Oil, and so on. The shock factor of the announcements on a scale of 1 to 10, where 10 is a screamer, was probably between 4 and 5. The shock factor of the service company mergers over the last few years was maybe 3 to 4. But the BP/Amoco deal is a strong 8 to 9 by anyone's standards, in or out of the oil industry." **— October 1998**





To a New Century

SPE began the 21st century reaching out to new members in new ways. The Board had decided to greatly enhance the society's electronic presence, planning expenditures of up to USD 10 million to upgrade the website. The SPE Foundation, made up of former SPE presidents, later would step up to raise more than USD 6.6 million from personal and corporate contributions in just over a year for the project. The goal was to make spe.org the industry's "portal of choice" for technical and industry-related information as well as a main focal point for members to interact with SPE and each other.

The first upgrade debuted in 2001, and two redesigns have taken place since then, including one earlier this year. The website has enhanced internationalization by allowing members around the globe instant access to information as well as offering them the ability to contact like-minded people in the industry through professional networks, Technical Interest Groups, and other formats.

Two major changes in society and board structure took place in 2001. In September 2001, Mark Rubin, previously Upstream General Manager at the American Petroleum Institute in Washington, DC, became the society's fifth executive director. He replaced the retiring Dan Adamson, who had headed the staff management team since March 1979. Meanwhile, the board approved changes in the society's governance structure to add six technical directors to the Board, in the areas of drilling and completions; facilities and construction; HSE; management and information; production and operations; and reservoir description and dynamics. Ken Arnold and John Thorogood would become the first two technical directors, in facilities and construction and drilling and completions, respectively.

1999

- *JPT* celebrates its 50th anniversary.
- Discovery of giant Thunder Horse field in US GOM (BP).
- Dual-activity drillship introduced (Transocean).
- Exxon and Mobil merge.
- Total and Petrofina merge. Combined company then merges with Elf.

2000

- SPE membership totals 51,918.
- BP acquires Arco.
- First marine seismic acquisition using single-sensor, calibrated sources and steerable streamers (WesternGeco).

1957 vs. 2007

	1957	2007
World Population	2.9 billion	6.6 billion
Worldwide Petroleum Resources (BOE)	990 billion	4.03 trillion
Yearly Crude and Liquids Production (bbl)	7.29 billion	29.42 billion
Daily Crude and Liquids Production (bbl)	19.96 million	80.6 million
Yearly Natural Gas Production (ft^3)	13.35 trillion	110.9 trillion
Daily Natural Gas Production (ft^3)	36.57 billion	303.7 billion
Average Price of Oil (Arabian Light, USD/bbl)	1.90	61.56
Motor Vehicles Registered Worldwide	108.3 million	862.4 million
Approximate Starting Pay For Petroleum Engineers (USD)	6,500	75,000

Sources: IHS Energy, Ward's Automotive, Forbes

The industry's demographic and staffing challenges have been the impetus for several major society initiatives over the past several years. Programs targeting those under the age of 35 have led to the formation of young professionals groups around the world, special activities at major SPE conferences, and a magazine dedicated to that group's interests, titled *The Way Ahead,* which debuted in 2005. Another magazine, titled *Talent & Technology,* published its first issue in 2007 and focused on the industry's technical talent shortage and other related issues. That brought the number of periodicals published by SPE to eight.

SPE's groundbreaking work on establishing reserves and resources definitions, which had begun in the 1960s, progressed, as its Oil and Gas Reserves Committee, working with the American Association of Petroleum Geologists, the World Petroleum Council, and the Society of Petroleum Evaluation Engineers, in 2007 completed revised definitions and auditing information for oil and gas resources. The project gained momentum toward becoming an industry standard.

Toward the Future

In the new century, internationalization has continued. In September 2004, the society adopted a business structure centered around the establishment of the Society of Petroleum Engineers Stichting, a not-for-profit headquartered in The Netherlands, to streamline what had become a very complex organization and to provide more efficient support to members everywhere.

New international conferences have been established—the International Petroleum Technology Conference debuted in

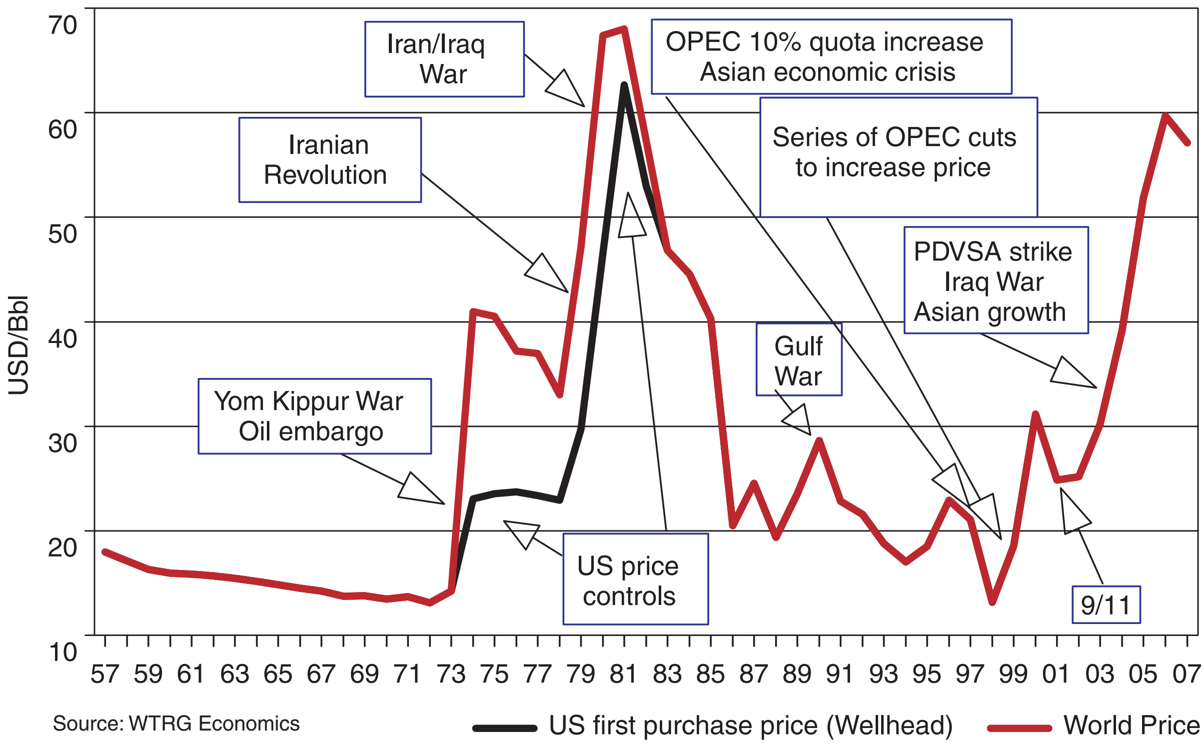
2001

- First 15,000-psi working-pressure subsea christmas tree installed (Cameron).
- Chevron and Texaco merge.
- Enron stock price collapses, leading to company bankruptcy, upheaval among energy marketers, and tightened corporate regulation.
- September 11 attack destroys World Trade Center.
- US invades Afghanistan, driving Taliban regime from power.

2002

- Extended-reach well at 31,000 ft measured depth in Hibernia field is world's longest completed at its true vertical depth of 13,000 ft (ExxonMobil).
- Conoco (by now separated from DuPont) merges with Phillips.
- International Association of Oil and Gas Producers releases first Global E&P Industry Environmental Performance Data report.

Crude Oil Prices 1957–2007 (2006 Dollars)



Doha, Qatar, in 2005, and the first SPE Russian Oil and Gas Technical Conference and Exhibition was held in Moscow in 2006. The SPE Annual Technical Conference and Exhibition will be held outside the US for the first time in 2010 in Florence, Italy.

Total membership had reached a new high at 73,235 by the close of 2006. Professional (nonstudent) membership increased 8% in 2006 to a record 56,496, beating the previous high mark of 53,733 in 1985. Student membership was at 16,739. SPE now has professional members in 113 countries and student members in 87 countries.

As SPE completes its first 5 decades, it truly has become a transnational technical and professional society serving members across the demographic spectrum who are engaged in the exploration, development, production, and midstream segments of the oil, gas, and related industries. The changes that have swept society, the industry, and the association during the past 50 years have been enormous—years not without challenges, but not without significant accomplishments either. Through it all, SPE has strived to maintain its value, its usefulness, and its relevance to the practicing petroleum professional worldwide. It now looks forward to the next 50.

2003

- SPE office opens in Dubai.
- World drilling water-depth record set by 10,111-ft Toledo well at Alaminos Canyon block 951 in US GOM (Chevron/Transocean).
- Na Kika in US GOM is world's first semisubmersible host facility (Shell).

- US and allied forces invade Iraq, overthrowing regime of Saddam Hussein.

2004

- High-performance water-based mud introduced (Baker Hughes Drilling Fluids).

- Oil production in UK North Sea declines 10%.
- US oil imports climb to record 11.3 million BOPD, while Chinese demand soars.
- Tsunami kills tens of thousands along Asian and African coasts.

The "Electronic" SPE Enhances Society's International Reach

Jack Rash, SPE Senior Web Content Editor

As an organization dedicated to the dissemination of technical information, SPE and the Worldwide Web have become near-perfect partners. Creating that relationship, however, has been a decade-long process, requiring a multimillion-dollar investment. The most recent redesign of SPE.org, for instance, launched 19 May, was begun more than 2 years ago, cost USD 3.25 million, and involved more than 12 person-years of effort.

In the Beginning

Before the Internet, the Society's only vehicles for delivering both technical information and Society news were "snail mail," telexes, and SPE's monthly and bimonthly publications (*JPT* and *SPE Journal*). SPE first capitalized on the digital revolution in 1992 with the release of the SPE MasterDisc—a single CD-ROM containing a simple index of SPE papers published since 1951. Copies of individual technical papers still had to be ordered by mail or telephone, and could take days to deliver.

SPE's first website was launched in 1995 and contained primarily a list of meetings and minimal information about SPE programs and activities. It was an information-only site with no functionality for ordering technical papers or registering for meetings. On 15 February 1998, the first Web-based SPE electronic library, which came to be known as the eLibrary, was launched without much fanfare. Only the first page of papers from 1951 to 1998 was available online. You still had to wait for the full paper to be emailed or snail-mailed to you once you purchased the paper.

That same year, members of the SPE Board of Directors asked the staff to research what it would take to create a fully functional website and eLibrary where members and customers could download full-length technical papers, find news about their section, collaborate with colleagues online, and see a calendar of meetings and conferences being presented in coming months. The answer came back: USD 10 million over 10 years.

It was a fairly accurate estimate, because in a little less than 10 years, and something less than USD 10 million, SPE has indeed created a website that does all of the above and then some.

An early version of SPE's archive.

Today's SPE.org

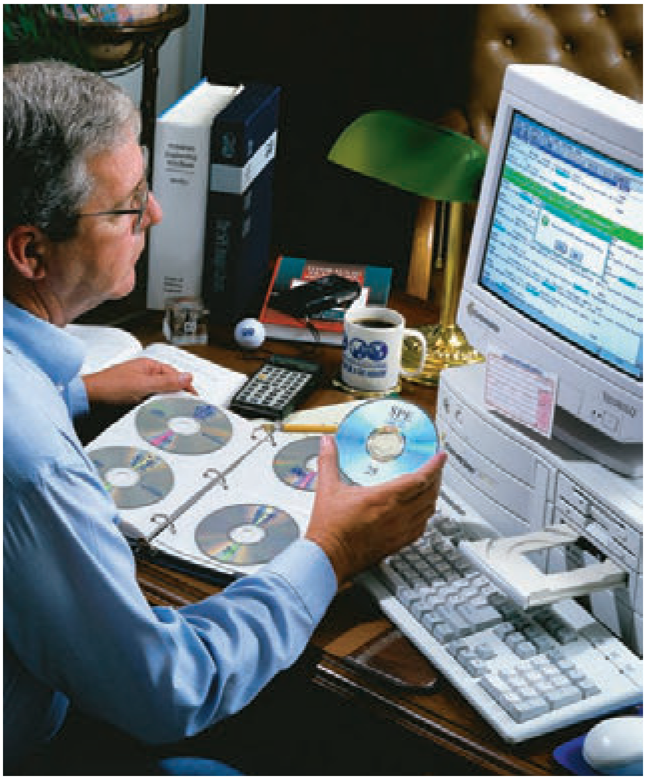
SPE.org has been touted as the most used website in the E&P industry, receiving an average of 2.5 million page views and 150,000 unique visitors monthly. Members and guests can collaborate online and do a host of other activities that previously were not possible. The eLibrary now contains more than 46,000 full-length technical papers dating back to 1918, with plans to go back even further into the earliest technical history of the E&P industry. The eLibrary is fully searchable, using a sophisticated concept-based search engine that also indexes more than 700 industry-related websites.

2005

- First issue of *The Way Ahead*, a magazine for young professionals, published.
- Major enhancements to eLibrary launched.
- First International Petroleum Technology Conference held in Doha, Qatar.
- Kyoto Protocol enters into force.
- Hurricanes Katrina and Rita smash US Gulf Coast, knocking out significant production facilities for months.

2006

- Membership hits all-time high at 73,235.
- First SPE Russian Oil and Gas conference held in Moscow.
- Successful extended test of Jack well in 7,000 ft of water in GOM (Chevron).



"SPE.org was seen by the Board of Directors as the vehicle to allow SPE to truly serve all its members," says Steve Holditch, 2002 SPE President. "Once the project was properly scoped and a cost estimate was derived to build SPE.org, the Board approached the SPE Foundation with a proposal to help."

The Foundation, an organization of former SPE presidents, stepped up to raise more than USD 6.6 million from personal and corporate contributions in just over a year. Former SPE presidents Don Stacy (1983) and Dennis Gregg (1986) chaired the fund-raising effort.

2007

- First issue of *Talent & Technology* published.
- Independence Hub platform in Gulf of Mexico (8,000 ft) sets water depth records for installations of flowline, steel-catenary riser, suction piles, and future subsea tie-in (Anadarko).
- Price of Arabian Light crude averages more than USD 61/bbl.

The first oversight of SPE's modern website and electronic publishing operations was entrusted to an ad hoc committee made up of Board members Bill Kemp, chairman, Mike Black, and Ian Phillips. This group helped develop the first SPE.org business plan, as well as its data use and privacy policies. This eSPE Committee gave way to the SPE.org Advisory Committee, which continued to provide oversight through the launch of the first "modern" version of SPE.org in 2001. This committee was chaired by Phillips.

"The Board at the time comprised many senior people from across the oil and gas industry who had had generally bad experiences with information-technology developments," recalls Phillips. "This made the scrutiny and the skepticism of the proposed SPE.org intense.

"The SPE.org vision was simple but enormously bold—to be the oil industry portal of choice, the place where petroleum professionals would routinely come for their technical knowledge, to search the rapidly growing internet for oil-related information, and be the place where members interacted with SPE. Before that, SPE had a wide mixture of dated 'legacy' systems and very limited Web presence."

Enhancing SPE's International Reach

A major concern when the website was launched was member access, recalls Phillips. "Members in North America and Europe could reasonably be expected to have high-capacity broadband access, but a 'digital divide' meant that members in Africa and Asia were initially disadvantaged. A major leap of faith was required to anticipate the growing and improving access in these regions, and to develop a service that would not work for many members on day one."

But the launch of the electronic SPE, clearly one of the society's most ambitious projects, has allowed it to serve its members internationally "more thoroughly and more effectively than any other measure that SPE has taken," he says.

SPE.org was redesigned twice between 2001 and 2007, each time adding new features and functionalities such as the ability to pay dues, purchase books, and submit paper proposals online. Launch of the new site in 2007 has increased the flexibility of SPE to modify the site as things change without the need to start from scratch. The technology suite used is comparable to that used by large commercial corporations and gives members and guests more options to share information and opinions. It also makes SPE.org better able to respond to the technology expectations of the society's younger members.

Among the new features of SPE.org are home page "portlets" that allow logged-in members and guests to monitor and quickly access certain business activities with SPE such as dues payments, journal subscriptions, and section and discipline affiliations. Other portlets allow bookmarking of favorite or most referenced pages on SPE.org, and a "My Saved Searches" function saves time by saving a search for running again in the future to locate updated information. In the future, members also will be able to access features such as My Committees, My TIGs, and My SPE Papers. **JPT**

It's the End of the World as We Know It (and I Feel Fine)

Stuart Ferguson, Chief Technology Officer, Weatherford International

Maybe I am just getting old. Or spending too much time in the company of grumpy people. Or both. Nevertheless, it seems to me that I spend an increasing amount of time discussing, in a suitably serious and concerned fashion, the challenges facing the oil industry. The topics are appropriately weighty, such as how the industry will meet the growing energy demands of the world economy against a backdrop of increasing constraints.

In the shorter term, in my mind at least, reserves seem not to be the issue. The concern is more about producing, on a daily basis, the volumes of oil needed to fuel the world. And doing this while decline rates are increasing because of poorer-quality reservoirs needing more productive wells to pull forward as much oil as possible—and furthermore, getting this production from reservoirs located in increasingly inhospitable places. Even if we do manage to produce and burn all of this oil, the planet may drown, somewhat ironically, because of global warming. Whether this is true or not, there is a perception that environmental concerns are increasingly important and, in many developed countries at least, this is constraining the industry. Beyond regulatory issues, the misplaced perception of the industry as a major polluter further tarnishes an already fairly blackened image. Consequently, the industry struggles to attract adequate talent in many of its traditional recruiting grounds.

In line with this tendency toward weighty issues, this past summer I attended the SPE Executive Summit on Talent and Technology. What happened at the event will have been described elsewhere, and is not the subject of this article. However, at the conference I bumped into a former colleague with whom I had worked in the early 1990s. We spent a few minutes reminiscing and, after we had parted company, the rejuvenation of some of these memories provided me with a lot of food for thought.

__Stuart Ferguson,__ SPE, is Chief Technology Officer for Weatherford International and has been a Senior Vice President of the company since September 2002. Prior to this, he held a number of positions within Weatherford's completions business, eventually becoming Division President. Before joining Weatherford, Ferguson served as Marketing Director for UK-based Expro International and as Technical Services Director for Petroline Wellsystems, which Weatherford acquired in 1999. Ferguson joined the industry with BP in 1987 and spent 6 years as a petroleum engineer.

At the time I worked as a petroleum engineer in BP's Northern Fields group in the UK. Many of the fields in this group were already old and tired, and those that were not were pretty difficult, at least by the standards of the time. However, the combination of the challenges of operating these fields, together with the nature of the people working on them, produced a culture of innovation that both inspired me and strongly influenced my subsequent career. My immediate boss at the time—better described as my mentor—never grew tired of telling me that most production technology issues could be solved by nothing more than "schoolboy physics" and a little lateral thinking. In reality, I worked as part of an integrated team of engineers and chemists in which technical rigor was expected—failing in this aspect could lead to public humiliation—and innovation was both encouraged and supported. Some of the systems we designed were bizarre (an inverted gas lift completion including a sausage-shaped bubble maker); some were futuristic (a supersonic gas-powered jet pump—one of my pet projects, and a resounding failure); but most were creative, and practical, solutions to accelerating and maximizing oil recovery.

Work with Purpose

The important point is that it was precisely because there were so many issues to tackle that the job was so rewarding. But more than this, like most unenforced hard work with a clear purpose, it was great fun. When I look at the range of production engineering issues that I was tackling at the time, they were those typically associated with mature, conventional oil and gas production (e.g., remedial well completions, corrosion and scale control, artificial lift, and water and gas plant debottlenecking). And yet the opportunities were not limiting at all—there was great variety and always more to do than the hours in the day allowed.

Somewhere along the way in the last few years, I had forgotten too much of what it felt like to be a new engineer in the industry, and I cannot believe that I was very different from many graduates joining the industry today. Maybe I was relatively naïve (in fact, there is no "maybe" about it) as I joined the industry partly because of a romantic idea of a wild frontier, but mostly because of the huge scale of the engineering projects and the global nature of the business. However, the industry of today has such a broad range of challenges that it makes so much of what I first worked on seem trivial by comparison. From the exploitation of unconventional resources to the development of ultradeepwater fields, the struggle to deliver commercial production rates has never been so fierce. Add to this the "new age"

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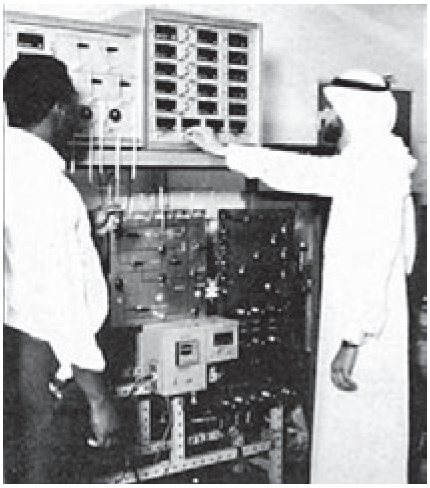
As the Industry Has Changed, So Has Petroleum Engineering Education

Jerry Greenberg, Contributing Writer

Petroleum industry technologies have advanced significantly since the birth of SPE 50 years ago. The industry today is drilling wells 6 or 7 miles long, and nearly as deep. Offshore, operators are "routinely" drilling and completing wells in 7,000 to 10,000 ft of water, using state-of-the-art drillships that were not available to the industry just a few years ago. Robust electronics measure downhole temperature, pressure, and other parameters as wells become "smarter" than ever before. The industry is learning to mine data and, even better, learning how to use the data better to construct optimally performing wells.

And although the basic structure of the courses offered for bachelor and master's degrees in petroleum engineering has not changed dramatically during the past 50 years, curricula have kept pace with the evolving technology and the changes in the profession. In addition, students are expected to learn much of the new technology post-graduate on the job or in specialized short courses offered by the industry rather than just by a textbook course at the university level. Several universities now offer distance-education programs, providing engineers already working in the field a means to continue their educations toward a master's degree, and engineers also can take several courses toward a PhD degree in a distance-education program.



King Fahd University students conduct PVT studies in 1992.

Lee

Horne

Currie

Many changes have occurred in the teaching of petroleum engineering over the decades. "One thing that was essential 50 years ago for most petroleum engineering and, arguably, most other engineering curricula, is that they were more concerned with technology and nuts and bolts," said W. John Lee, who has been a petroleum engineering professor at Texas A&M University for 30 years and holds the L.F. Peterson Endowed Chair at the school. "Today, they are much more concerned with the fundamentals and the applications of what I would call engineering science to solve engineering problems."

For example, Lee said, most engineers 50 years ago took such courses as surveying, machine shop, and welding, "hands-on courses that all engineers took. Today, that is all gone. Engineers now concentrate on just the fundamental math and science."

Part of the reason is the computer technology available that, of course, was not available or widely used decades ago. However, Lee emphasized that the move toward the sort of curriculum concentrating on math and science fundamentals began before computers took over.

"Now there is a need to develop and use mathematical models for everything," he said. "To understand the mathematical models you have to understand the basic physics and, in turn, have some understanding of the math that is involved in solving the equations of the physics models. That was beyond our capability for the most part 50 years ago. We could not begin to think about solving some of the problems. The arithmetic was just too horrendous, so we used very simple assumptions and approximations."

Roland Horne, professor of energy resources engineering at Stanford University who also has been teaching for the past 30 years, says that the advent of computers has shaped curricula. But the underlying industry technology is not that much different from what it was three decades ago, he added. "Some of the things we teach (today) did not exist 30 years ago, such as reservoir stimulation, but others are quite similar," he said. "The increased use of computers is important in the training of subject (matter)."

Muhammed Armani, a petroleum engineering professor at Texas A&M University in Qatar, believes computers have had an impact on many areas of study, not just petroleum engineering. "Some of the other fields like electrical engineering or computer sciences have gone through more changes than we have seen," he said.

Relying Too Much on Computers

But there can be a downside to computer use that detracts from understanding the fundamentals. "The biggest change is emphasis on the use of computers in daily engineering activities by students as well as companies," said Ali Daneshy, director of petroleum engineering at the University of Houston. "While this has had a very positive impact on speed and accuracy of computations, it has taken away from the fundamentals and basic research. Students (sometimes) have little understanding of fundamentals. What they are doing is spending a lot of time developing computer programs and fine-tuning computer methods where, in my opinion, what we need to do is spend more time on better understanding the fundamentals.

"Every time [the students] get a problem, instead of trying to find out what is happening, their first inclination is to run to a computer program," he added.

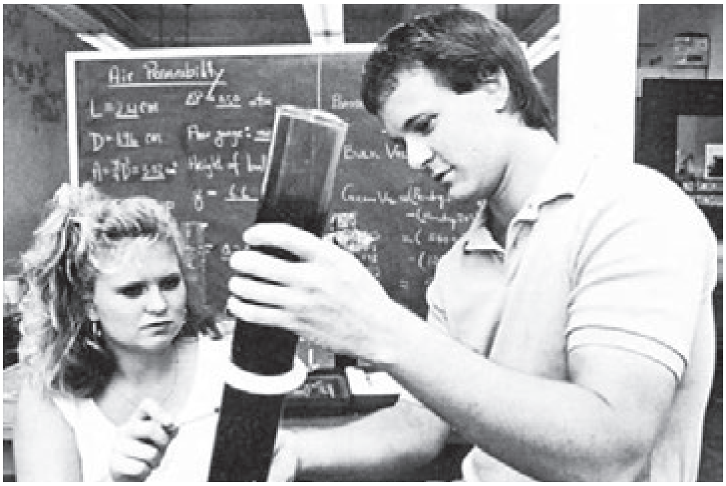
Noting some of the ways petroleum engineering is taught today compared with in the 1960s, 1970s, and 1980s, Craig Van Kirk, who was head of Colorado School of Mines' petroleum engineering department for 27 years, said that there are more practical examples presented in the classroom today than in prior decades. Economics plays a more prominent role in the classroom as well, as does an integrated, multidisciplinary team role.

"Field problems, drilling problems, and reservoir studies are taught," Van Kirk said. "I see more economics these days, from fracturing jobs to drilling to reservoirs, waterfloods, everything that a petroleum engineer will do, there is more of an economic connection taught today than in past decades. The financial consequences, if you will."

Real-World Situations

Students at the Colorado School of Mines are given two to three projects each year, to answer questions such as whether to drill, should an old oil field be converted to waterflood, or determining the fair market value of existing production. Always, Van Kirk said, the students are working on the economics of the projects.

The projects and the data are real-world situations, with the information provided by operators, which include real data sets from seismic to geologic interpretations, production data, and pressure data. These projects also provide a basis for multidisciplinary teams that would include students pursuing petroleum engineering, geology, and geophysics. The school developed a required course in the three disciplines at the undergraduate level about 20 years ago. A similar course is offered at the graduate level.



Mississippi State SPE student chapter members prepare crude oil samples for testing in 1992.

Van Kirk also sees a negative to the popularity of computers. "Too many young people all over the world, and too many teachers, are happy to punch a computer and let it spew out its results without the [students] taking the time to judge its reasonableness nor understanding how to judge the reasonableness," he said.

"Those of us who teach petroleum engineering have to understand that and account for that in how we teach and what we teach," Van Kirk added. "We have to force the students to think with logic and evidence so they can either prove the computer is right or wrong. You need at least one or two other perspectives so you can say, this answer is physically impossible, or it is possible and it might be true.

"[Students] are better prepared with computers but less prepared in other things such as logic, evidence, proof, and when to be confident," he continued. "Students today tend to be overconfident in the number that comes out of a computer and they should not be."

Peter Currie, a petroleum engineering professor at Delft University in The Netherlands, says the impact of numerical methods can be both good and bad. "There is great danger for the understanding of students if they are allowed to use 'black box' simulators that give quick answers even for someone who does not understand the input parameters," he said. "On the other hand, the ability to numerically simulate complex situations relatively easily can give enormous insight, which previously was afforded only by looking laboriously at many special cases."

Currie notes several big changes in petroleum engineering programs since SPE began. One is the more scientific approach to all topics, reflecting the research advances made in the past 50 years. Another change is "the availability of better textbooks reflecting those advances," he said. And another significant change is an increasing emphasis on integration of disciplines. "We insist on our petroleum engineering students being well-grounded in geology and geophysics, reflecting the way the industry should work," he said.

"In our case, students can specialize in geophysics, reservoir geology, petroleum engineering, or resource engineering," he added. "There is still a strong effort to give a well-rounded degree, so for us, a degree in petroleum engineering inevitably includes a lot of geology and geophysics."

Another change in Delft's petroleum engineering curriculum compared with years ago is the increasing emphasis on the financial and economic aspect of oil production and how these are influenced by the uncertainty of geological and petroleum engineering predictions. "An understanding of decision making and risk analysis is essential," Currie said.

Other universities also have made major changes in curriculum. Students at Stanford now can pursue a degree that is called energy resources engineering, the result of the university revamping its curriculum totally in the past year. The energy resources engineering degree is partly petroleum engineering and partly other forms of energy engineering, such as geothermal, wind, solar, and other alternative and renewable energy sources.

Students Have Changed

Students and their perception of the industry also have changed over the decades. Many international students attend US universities to take advantage of engineering curricula, including many from Middle East countries, which is one of the big changes in petroleum engineering education, says Daneshy. "There are more international students than before, and US students are now less inclined toward petroleum engineering," he said.

The main reason is the industry's image, which is much better outside the US, he said. The cyclical nature of the industry also has taken its toll.

One Middle East country has recognized that many students from the region attend US universities and has made an effort to accommodate students in its own country. Qatar has invited several US-based universities to establish campuses in the country to offer undergraduate and graduate degrees, including Texas A&M University.

One difference between today's graduates compared with previous generations is commitment. "I do not think that students feel 100% attached to the job," said Zuleima Karpyn, assistant professor of petroleum and natural gas engineering at Pennsylvania State University. "They leave school with a sense of mobility, that they can change jobs with much more flexibility than they had years ago.

"They think of a job as an opportunity for [several years] and that they can change their professional life throughout their career," she said. "They will still be within petroleum engineering but perhaps in different areas or with different companies."

Industry Partnerships

Relationships with the industry always have been important for universities, and that has affected curricula as well. In 2003, the University of Southern California (USC) established a master's degree program in smart-oilfield technology, the first master's degree program of its kind. That same year, Chevron established the Center for Interactive Smart Oil Field Technologies (SOFT) at USC. Iraj Ershaghi, a chemical engineering professor at the school, was instrumental in developing the program, which includes four courses taught by a combination of petroleum engineering, computer science, and electrical engineering faculty.

The Chevron-funded center at the school is in its fourth year. Chevron provides R&D funding to the center, which focuses on the R&D of integrated technologies targeted to the operations of instrumented, intelligent oil and gas fields. The four SOFT courses were established to create an MS degree program that integrates information technology and petroleum engineering.

Technology has had a big impact on how students learn. Several universities now offer distance education in which students can access lectures, either live or video, through the Internet to complete advanced engineering degrees, including petroleum, electrical, and chemical. USC began its Distance Education Network in 1972. The program, originally dubbed Instructional Television, initially used microwave technology to transmit engineering courses throughout southern California, primarily to accommodate employees of the region's large aerospace industry. It began using satellite technology in 1999 and launched its online delivery system in 2002, which offered 12 graduate engineering degrees entirely through the Internet. Other universities have similar distance learning programs that use the Internet. Texas A&M has approximately 70 distance learning students enrolled, a significant fraction of the 200 or so graduate students enrolled in the engineering department. "It has been growing steadily over the years and has proved to be a great program," Lee said. **JPT**

The Challenge for the E&P Industry—A New Wave of Innovation

Keith K. Millheim, Senior Technical Editor and *JPT* Columnist 1990–2000

Almost 20 years ago, I wrote a paper titled "The New Engineering Paradigm and the Emergence of Investigative Engineering" and presented it at the 1988 SPE Annual Technical Conference and Exhibition in Houston. Later, in August 1989, the paper was printed as an article in *JPT.* When the article first came out, it created quite a stir. And, as I mentioned in the article, I did not expect everyone to agree with a lot of what I had to say. Many did not. The article was composed to stimulate the thinking of how we engineers really function in an organization and to introduce the concept of *investigative engineering.*

Over the years, I have had some conversations and correspondence about the article, but, with the flow of time, the interest in the topic seemed to wane. That is not unexpected, because the shelf life of most articles is short. However, a longtime colleague of mine who works for a major oil company recently sent me an email saying that he raised the article from the archives and explained the relevance it had in some discussions with his management about engineering. The email tweaked my interest in the subject again, and I reread the article for the first time in years. Then I asked myself: How much truth was captured 20 years ago? Or was there any truth in the article at all?

Now I must point out, if you are going to get the most from what I am going to say, I suggest you read the original article (SPE 18103, available in SPE's online eLibrary), especially if you are passionate about your engineering career, the way your company practices engineering, and whether the engineering paradigm of the 1980s is still the norm or has morphed into something else. The importance of the distinction of what the current engineering paradigm is or is not relates to how we, as a practicing community of engineers and scientists, meet the challenges of the future to find and produce oil and gas for the world.

__Keith K. Millheim__ is the main principal in Strategic Worldwide, which is engaged in solving E&P technology challenges for the arctic, deepwater, and exploration drilling. He retired from Anadarko Petroleum at the beginning of 2007. He joined Anadarko as the Manager of Operations Technology in December 2000. Later he became the company's only Distinguished Engineering Adviser. Two of his main focus areas were arctic and deepwater technologies, and he was responsible for numerous patents for these technologies.

For most of his 40-plus-year career, Millheim has worked in the private sector as an engineer, a technology and operations manager, and consultant for some of the largest E&P companies around the world. During that time, he established a strong reputation in the research and development of cutting-edge operational techniques. From 1994 to 1998, Millheim was a Director for the Drilling and Production Institute, Mining University Leoben, and the Director of the Mewbourne Petroleum Engineering School, University of Oklahoma.

Millheim earned a PhD degree in mining engineering from the University of Leoben, Austria, as well as an MS degree in petroleum engineering from the University of Oklahoma. He is a member of the National Academy of Engineers and has authored nearly 50 articles and papers for various trade and technical publications. In addition, he has held leadership positions as a member of numerous professional organizations, most notably SPE.

A Common Goal

Whether you are a petroleum, mechanical, chemical, electrical, civil, or industrial engineer, or a physicist or chemist, once you enter the world of oil and gas exploration and production, you have a common goal: Find and produce oil and gas in the most cost-effective, safe, and prudent way. This is a yearly multibillion-dollar venture with thousands of professionals worldwide.

If you boil down the three critical factors for civilization through time, humans have been concerned about food, water, and energy. In the last hundred years, few wars were fought over food and water. However, in the last hundred years, it seems a lot of wars have had a heavy energy influence. If you have read *The Prize* by Daniel Yergin, you will get the flavor of this.

So what is the future of energy supply and demand? Can we meet demand and alleviate the possible shortfall of oil production? Can natural gas really become the transition energy of significance? Will there be more wars fought over energy? Big, big questions with no easy answers. It will take billions, if not trillions, of dollars; more trained professionals than we now have in the industry; and a lot more innovation than is currently happening if we expect to keep up with worldwide energy demand. More of the same paradigms will not cut it much longer!

There is no doubt that the oil and gas resources are in the ground to keep us going for a long, long time. The big problem is that most of the resources are technically challenged either by location, depth, depth of water, tight rocks, pressure and temperature, or heavy oil, or are just plain uneconomical with today's conventional approaches. We keep extrapolating what worked in the past: more rigs, bigger rigs, offshore behemoths to drill in deeper waters, floating production storage and offloading vessels the size of supertankers. More and bigger continue to dominate our conventional paradigms. Many resources both onshore and offshore, even with the high oil and gas prices, stay undeveloped because conventional technology is still uneconomical.

But the truth is coming faster than we would like. Each year, more and more companies will report falling production with no chance of reversing the trend, other than a quick fix of buying or merging with another company. It is just a matter of time—and a lack of new thinking.

The Need for New Thinking

Today, we are faced with the biggest need, ever, for new ideas, new approaches, new paradigms, individuals to challenge the conventional if we have any hope of meeting the future world demand. More money or people will not solve the problem—investigative, brave minds will. At a time when we need a league of creative, risk-taking professionals, including management, to move us into the next wave of innovations and new paradigms, we as an industry are probably at our lowest capacity to mount such an endeavor.

Sure, we have extended water depth, horizontal reach, and actual drilling depth. Great accomplishments, ones to be proud of, all made possible by good scientists and engineers. But these are extrapolations and enhancements, not major breakthroughs that cause major change such as waterflooding, enhanced oil recovery, hydraulic fracturing, horizontal drilling, 3D seismic, and measurement while drilling and logging while drilling. Thirty years from now, what will the scribes refer to as the breakthroughs we made entering the new era of global oil and gas demand?

Over my 40-year career, I have been fortunate to have been involved with some great investigative minds who challenged conventional wisdom. It was in their blood. Just as important, the organizations they worked for encouraged the magic of discovery and created an environment where such people could make their contributions. And contributions they did make, major ones, ones that propelled our industry to where it is today. But something happened along the way, starting in the early 1990s, which I will call the purge of E&P research.

Research was out, and technology was in. Let the service companies and contractors do the R&D. Give them enough money, and everything will be all right. According to all the management gurus, this was a needed fix to focus the engineering talent on the real business of finding and producing oil and gas. However, there is a systems thinking archetype referred to as *the fix that failed.* You fix an immediate problem, but the unexpected consequence that shows up much later is a bigger problem. What we have now is the consequence of downplaying research and the value of the investigative mind. We are in now in a drought of innovative capacity to make the next wave of innovation.

A Commodity-Based Business

It is interesting if you stand back and reflect on what happened after World War II. The world needed oil, and the various companies responded and put together the greatest aggregation of oil and gas scientists the world has ever seen. No one questioned their value; the assumption was that they were as needed as the pumper or driller in the field. But as the vicissitudes of oil prices took its toll, a new wave of conservative nontechnically-oriented management started treating the E&P industry as a commodity-based business. Now we are faced with the biggest technological challenges in the history of our business without the technological juggernaut we had in the past.

Who is going to step up and lead the new era of innovation for the oil and gas business? I know some companies already have discovered what they lost and are trying to rebuild their R&D capacity. But are these the same companies making space for the investigative engineer who will offer a different entrée of technology? For it is this creative spark that leads the way to major change. Who will be the bold managers who defy the common dogma and encourage and support rebels of conventionality?

There is an old saying that you cannot lead a band if you are 2 miles out in front. All you managers must be nodding your heads at this conventional wisdom. Well, how about another way of looking at the same problem, and have the band walk faster? Then, just maybe, the band can catch up with the bandleader. **JPT**

Ferguson Guest Column

(From Page 140)

issues, such as the growing view of the need to capture, store, and, even better, reuse carbon dioxide, and the array of opportunities becomes almost mind-boggling. Surely few other industries offer such engineering riches. We owe it to ourselves to do more to get the message across to school kids and college students that the oil industry can offer outstanding rewards, and on many levels.

I do well to remember how long it used to take to research problems—I used to wait for days or weeks to receive articles that I requested from libraries—and yet still how incomplete the study would seem at the end of these efforts. Today, often in minutes, I can get access to far better quality of information. I struggle to think what will be possible in 10 years' time in the area of knowledge management, but I am sure that our ability to be productive and efficient will have been hugely enhanced.

Despite the growing cynicism that too often goes hand in hand with experience, I still view the oil industry in a very positive light. Although the industry image is tarnished in some societies, I still feel part of a noble cause. Maybe this view is too romantic, but I would have no hesitation in encouraging my children to join. Indeed, I think the opportunities for engineering graduates today are far greater than when I joined, and I expect that trend to continue for a good while. My favorite cliché is that "necessity is the mother of invention," and I think there is going to be a whole load of invention during the next few decades. **JPT**

Sections Have Brought the Society to Members Where They Live

Erica Shillings, *JPT* Assistant Features Editor

SPE's success can be monitored not only by its growth in membership but by its growth in the number of local sections. SPE sections have been the backbone of the society, providing meetings, conferences, dinners, training classes, and other professional and social programs and activities for members. The primary mission of local sections is to distribute information through regular meetings and educational programs. Through the years, sections have provided members in a geographic area an opportunity to exchange technical information, network with peers, support student chapters, and engage in activities that benefit their communities.

Sections encourage the next generation of engineers through paper contests and scholarships. Many sections have provided career guidance programs, science fairs, and career days, as well as supplied secondary schools with movies and guest speakers to increase awareness about the oil and gas industry and career opportunities.

The First Sections

SPE has more than 160 sections in 65 countries across the globe with members in 114 countries, but some of those sections actually predate SPE. Before SPE split from the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME), some members involved in the petroleum profession had formed local sections to discuss common interests. SPE carried this practice forward after it left AIME, realizing that sections could enhance networking and local programming in a way that a large organization by itself could not. Sections allowed SPE to take the society along with its programs and services to members wherever they lived. That philosophy later helped SPE to expand internationally.

While SPE is turning 50 years old this year, the Mid-Continent Section celebrated its 50th anniversary in 1967. SPE's oldest section, which is based in Tulsa, was founded on 28 December 1917 and was the 15th local section formed under AIME, and, until 1935, was the only section with a predominantly petroleum membership. When the section was established, AIME had a total membership of 6,500, of which approximately 800 were interested primarily in petroleum production. Today, the Mid-Continent Section alone has more than 800 members. The section membership is a mix of employees who work for major oil and gas companies, independent producers, drilling contractors, well service and gas transmission firms, equipment suppliers, universities, government agencies, and consultancies.

The Gulf Coast Section, founded in 1935, is now SPE's largest, with 12,597 members. The section is extremely active in the Houston area, offering members opportunities to attend conferences, study groups, dinners, forums, luncheons, seminars, and workshops. Members participate in community services that educate students about the oil and gas industry, and the section provides numerous scholarships, internships, science fairs, recruiting fairs, Offshore Technology Conference tours, and National Engineers Week activities. In response to the outstanding effort performed by Gulf Coast members, the section has won the SPE President's Award for Section Excellence 9 years in a row. The section has made great contributions to SPE International; at least six SPE Presidents have been Gulf Coast Section members.

When the Petroleum Branch of AIME was created in 1949, nine of AIME's local sections were predominantly petroleum in membership out of 22 sections. In areas where all three of AIME's fields were represented—mining, metallurgy, and petroleum—petroleum programming often got less attention. In the early 1950s, it became apparent that the petroleum engineering profession and the society were facing a period of substantial growth, which led to the formation of a number of new local sections. In 1952, a decision was made to actively establish new local sections of AIME where possible in members' home areas. The West Central Texas Section in

The first section officers of the newly formed Aberdeen Section in 1974 were C.C. Seidensticker, left, of Mobil North Sea, and H.D. Farmer, right, of Oil Base Ltd. In the center is SPE Assistant General Manager Doug Ducate.

The first Lagos Section meeting in 1973.

Abilene, Texas, was formed in September 1952 as the first new section under this plan. The section recently disestablished in 2006. By 1957, when SPE of AIME was formed, more than 30 petroleum local sections were in existence.

Several of the sections that predate the official formation of SPE had been around for years before 1957. The East Texas Section was formed in April 1940 and, at that time, included the areas of north Texas, Fort Worth, and Dallas. Meetings rotated among the various towns near the great East Texas oil field: Kilgore, Gladewater, and Longview. The North Texas Section split from the East Texas Section in 1945 and grew rapidly; by 1957, it had more than 300 members. Later, the Fort Worth and Dallas sections would be spun off from the North Texas Section, and the Lou-Ark Section would be formed out of the East Texas Section.

Other prominent sections also came to life in the 1950s. The Spindletop Section formed in October 1955 as a subsection of the Gulf Coast Section in Houston. Its membership continued to increase, and, in January 1956, it became a separate section. By 1957, average attendance was 70 members per meeting. However, the section disbanded in 1999. The Canadian Institute of Mining (CIM)-AIME Petroleum Engineering Section formed in December 1955 and was open to all members of CIM and AIME. The section had 154 members at the end of 1956; 68 were AIME members, 63 were CIM members, and 23 held joint memberships. It disbanded in 1971 and then was re-established in 1989.

Sections in 1957

In SPE's first year, five new sections were established: the Caracas Petroleum Section in Venezuela; the California Coastal Section in Ventura, California; the Four Corners Petroleum Section in Farmington, New Mexico; the Roswell Petroleum Section in southeastern New Mexico; and the Snyder Local Section in west Texas.

The Caracas Petroleum Section was Venezuela's third section and included the state of Miranda and the federal district of the Republic of Venezuela. This territory was released to the new section by the Eastern Venezuela Section. The Western Venezuelan Section, established in 1956, covered the Maracaibo region. The Eastern Venezuela Section, which was established in 1954, was not only SPE's first South American section, but its first non-US section as well. The Eastern Venezuela Section disbanded in 1974 but was re-established in 1991. The oldest continuously active South American section is the Caracas Petroleum Section.

The California Coastal Section functioned as a subsection of the Southern California Petroleum Section before being officially recognized. The Four Corners Petroleum Section covered several areas in four US states: Sandoval, Rio Arriba, San Juan, and McKinley in New Mexico; La Plata, Montezuma, Archuleto, and Dolores in Colorado; San Juan, Utah; and

The Argentina Petroleum Section was formed in 1977. Shown at its first organizational meeting are, from left, David Riley, SPE Executive Director; former SPE President C.A. Hutchinson Jr. of Arco; John Emery, Section Chairman, Halliburton Argentina; Alex Eussler, Bridas; Mirta Cordoba de Galacho, YPF; Oscar Secco, Amoco Argentina; Enrique Nastri, Astra; and Ricardo Fernandez, Kobe Argentina.

SPE's sections have performed significant work educating students about energy. Here, Michael Mana of the Southwest Oklahoma Section gives a "Magic Suitcase" presentation to students in 1993.

Apache and Navajo, Arizona. The Roswell Petroleum Section disbanded in 1971 but was re-established in 1982. The Snyder Section covered the Texas counties of Scurry, Fisher, Mitchell, Garza, and Kent. The Snyder Section disbanded in 1992.

International Development

As SPE's membership increased internationally, members outside the US began to see a need for more networking and technical programming. The Saudi Arabia Section, based in Dhahran, formed in January 1959, making it the first Middle East section. The section has played a major role in SPE professional membership growth in the Middle East region. While the section started small with a membership of 67, it now totals more than 1,100 members.

Also in 1959, the first Asian section was established in Sumatra, Indonesia. The AIME Board approved the Sumatra Section in response to a request from 25 members who lived in the area. The section disbanded in 1962 but was re-established in 1998.

The first European section was established in June 1960 in The Hague. The 1970s saw big growth in European section activity, with sections established in London in 1971 and in Aberdeen and Stavanger in 1974. The first SPE section on the African continent was established in Lagos, Nigeria, in March 1973. At the time, more than half of the Lagos Section was made up of Nigerian nationals. The decision to expand to

Section Anniversaries

This year not only marks SPE's 50th anniversary but is an anniversary year for many local sections. Those milestones include:

90 Years
- Mid-Continent (Tulsa)

60 Years
- Oklahoma City

50 Years
- California Coastal (Ventura)
- Caracas Petroleum
- Four Corners Petroleum (Farmington, New Mexico)

40 Years
- Colombian (Bogota)
- Pittsburgh Petroleum

30 Years
- Argentine Petroleum (Buenos Aires)
- Western Wyoming (Rock Springs)

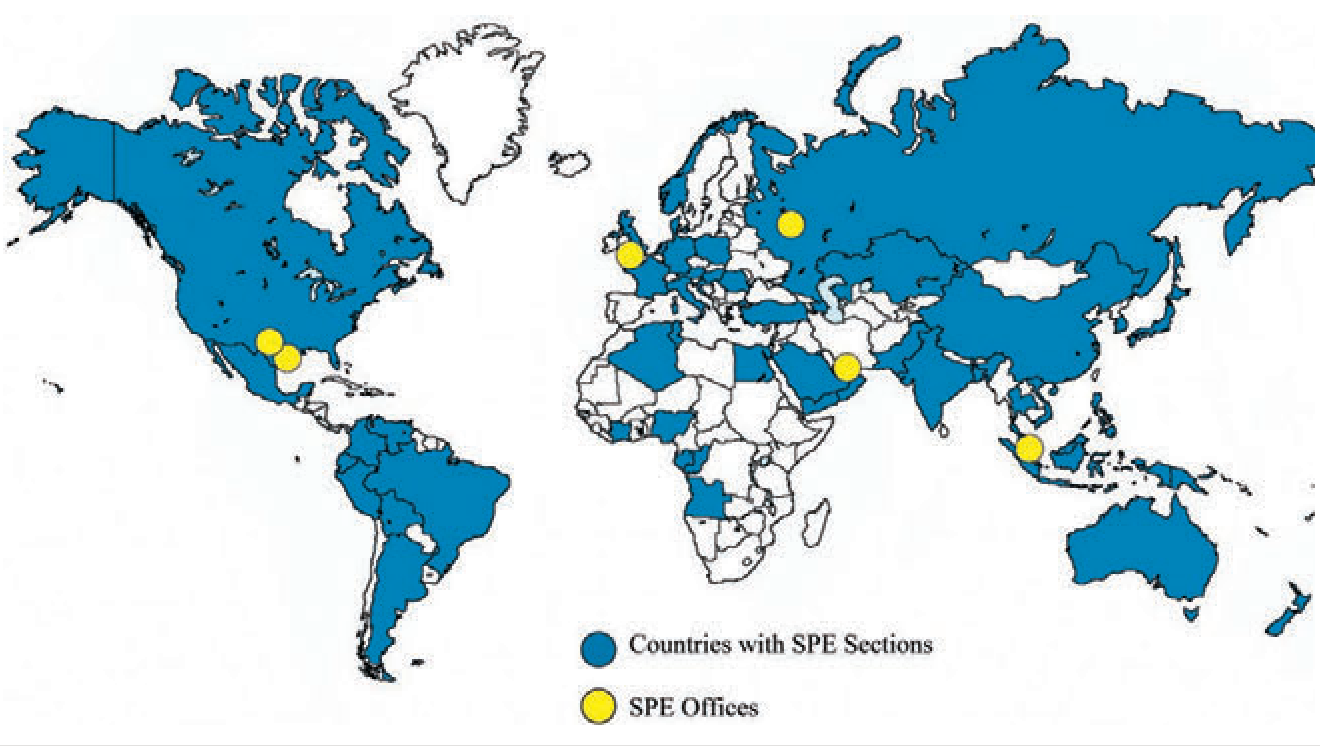
25 Years
- Qatar
- Roswell
- South Australian (Adelaide)

20 Years
- Pakistan
- Port Harcourt, Nigeria
- Turkey
- Warri, Nigeria

Africa was brought about by the 1971 SPE ad hoc committee that studied the society's potential international expansion. Several areas were targeted as in need of a local professional petroleum organization, including Lagos; Jakarta; Abadan, Iran; and Port of Spain, Trinidad.

In June 1982, the first Australian section formed in Adelaide, Australia. With the success of the South Australian Section, sections in Perth, Melbourne, Brisbane, and Darwin soon followed.

SPE continues its growth with sections that are in the process of establishment. These sections include Grand Junction, Colorado, which covers the Western Slope area; Chennai, India; Chad, Africa; and Seattle, Washington, which contains the Pacific Northwest area. Sections that are waiting on pending approval are Bangalore, India; Ghana, Africa; Belgrade, Serbia; Almaty, Kazakhstan; Yangon, Myanmar; Baghdad, Iraq; Mauritania, Africa; and Taiwan. **JPT**



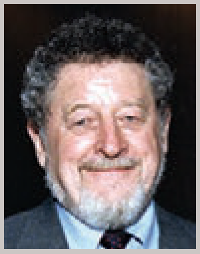
SPE's REGIONAL REPRESENTATION (members, excluding students)

- Africa—1,317
- Central & Southeast North America—4,521
- Gulf Coast North America—13,134
- Mid Continent North America—2,365
- Middle East—5,920
- North Sea—6,360
- Northeastern North America—1,587
- Northern Asia Pacific—3,364
- Rocky Mountain North America—5,593
- South America & Caribbean—1,980
- South Central & Eastern Europe—2,919
- Southern Asia Pacific—2,315
- Southwestern North America—2,212
- Western North America—2,223

In My Opinion…

Joseph E. Warren, Senior Technical Editor 1982–84, and *JPT* Columnist 1985–96

There is an old French proverb that roughly translates as follows: "The more it changes, the more it is the same." Fifty years ago when SPE was born, the US was still the world's dominant crude-oil producer—the giant oil fields of the Middle East were in the midst of development, and international oil prices were based on Gulf Coast prices less the cost of transport. But even then, industry and government strategists already were considering alternatives such as oil shale (intensely competitively bidding for acreage in Colorado), tight-gas formations (Project Plowshare promised nuclear stimulation), tar sands (an experimental plant at Bitumont, Alberta, ultimately spawned Suncor), and coal (the legacy of Fischer-Tropsch). ...*"All great truths begin as blasphemies," George Bernard Shaw.* ... Then, in the 1970s, OPEC was able to increase oil prices significantly through nationalization, and the US became a net oil importer. As a consequence of the rise in prices, the development of productive capacity in the North Sea, west Africa, and the deeper waters of the Gulf of Mexico was economically justified. Oil shale, tar sands, tight gas, and coal were on life support until the "gasoline shortage" of 1979–80, when they enjoyed a brief resuscitation that lasted about 3 years. ... *"Experience is the name everyone gives their mistakes," Oscar Wilde.* ... More recently, world energy demand has risen faster than supply, reaching a state of unstable equilibrium (demand of 84 million BOPD and supply of 87 million BOPD) that can be upset by unrest in any significant exporting country as perceived by the NYMEX traders, and prices have followed upward. As a result, tar-sand production has grown rapidly in Canada and Venezuela (despite being energy-intensive and environmentally suspect), and tight-gas production (including that from fractured shales and coal beds) has boomed. However, oil shale has remained dormant, and coal has been a non-starter. ...*"Man will occasionally stumble over the truth, but most of the time he will pick himself up and continue on," Winston Churchill.* … Now, because the US is importing more than 50% of the oil it consumes and imports of refined products also are increasing, the incumbent masters in Washington, DC—while admitting addiction to oil—have belatedly recognized the uncertainty associated with US energy supply [e.g., Putin (Gazprom vs. the European Union and total control of production and transport, Chavez (second round of nationalization in Venezuela, including the Orinoco Tar Belt, and unfettered political power at home and in other parts of South America), and Morales (third round of nationalization in Bolivia without the resources, human and financial, needed to operate)]. These situations—plus Nigeria, Iraq, and Iran—have fueled their feeling of insecurity; therefore, they have begun to preach, once again, "energy independence" and have gratuitously attempted to equate that to climate change for political reasons. Both goals could be achieved by raising the tax on gasoline (currently, 18% in the US and 65% in Europe) to curb demand and by instituting a carbon tax and/or legislating an emissions trading system (ETS is in place for the EU's five dirtiest industries) to cut greenhouse-gas emissions. Instead of ensuring that the polluter pays, they have proposed to toughen the 1975 fuel-economy regulations (to provide, over 10 years, what many Japanese/Korean vehicles deliver now) and have chosen to throw money at pet technologies—many of which are definitely ungreen. For instance, ethanol (because of the relative penalty of USD 1.05/gal on imports from Brazil, volume is limited; the process-product energy balance is null; the consumers of agricultural products are paying the price—the cost of popcorn has risen 40% in the past few months—but corn farmers vote), nuclear power (security and radioactive-waste disposal present real problems in addition to bureaucratic licensing delays), hydrogen (albeit the cleanest fuel,



***Joseph E. Warren** wrote the popular* JPT *column "In My Opinion…" from 1985 through 1996. A technical consultant with more than 50 years of experience in the oil and gas industry, is a Distinguished Member of SPE and a recipient of the Anthony F. Lucas Gold Medal. He specializes in reservoir management, petroeconomics, planning, and international operations. He previously worked for Gulf Oil Corporation, serving as technical adviser to several operating companies and to the corporation on strategic planning. Warren joined Gulf in 1956 and retired in 1983. During a 1970–75 hiatus from Gulf, he was Senior Vice President of operations with Santa Fe International Corporation. During his career, he was General Superintendent of Reservoir Development for Kuwait Oil Company and Director of Exploration and Production Research for Gulf Oil. With Santa Fe, he played a dominant role in the discovery and development of the Thistle field in the UK North Sea. Warren has written more than 60 technical papers and served on many SPE committees. He was Senior Technical Editor and Chairperson of the Editorial Review Committee during 1982–84. As an SPE Distinguished Lecturer, he discussed operations research in 1972 and upstream decisions in 1986. Warren received the Lucas Gold Medal in 1984 for distinguished achievement in improving the technique and practice of finding and producing petroleum. He was elected to the US National Academy of Engineering in 1993. He is a graduate of the University of Pittsburgh and earned a PhD degree in petroleum engineering from Pennsylvania State University.*

its principal feedstock is natural gas and it poses a metallurgical dilemma), coal (requires huge capital investments and a supply of hydrogen for desulfurization to yield another hydrocarbon—but there are a lot of voters in coal states), and wind/solar (intermittent and diffused sources that require standalone infrastructure to compensate for downtime (in Germany, wind turbines average 11% online time). … *"Technological progress is like an ax in the hands of a pathological criminal," Albert Einstein.* … Although legislators are loath to offend their constituents or the muscular automobile and oil lobbies, the time has come to establish an overall target for emissions, and it cannot be done without some pain or sacrifice. First, increase the tax on gasoline to dampen demand (an additional tax of USD 1.00/gal would at least pay part of the interest on the US national debt; USD 2.00–3.00/gal would be required to cover all of the debt-service costs). Next, tax carbon emissions and/or institute carbon-offsetting regulations; consider rewarding carbon-dioxide sequestration; and encourage truly green alternatives such as solar, wind, geothermal, tidal, and wave sources (demand "smart meters" that provide hourly prices when intermittent power is used). To quote Amory Lovins, "Saving fuel costs less than buying it," so emphasis should be on efficiency for automobiles (advanced composite materials—Boeing's 787—for lighter vehicles), appliances (better design and materials), and housing (improved design, such as solar roofs, and insulation). Energy efficiency ratchets up and does not come down if fuel prices fall, similar to hotel rates in London. … *"It is better to know some of the questions than all of the answers," James Thurber.* … In conclusion, in another 50 years, the world's economy will probably remain dependent on, hopefully, cleaner hydrocarbon fuel—oil will not "run out"—unless there is some magical technological breakthrough such as nuclear fusion. On the other hand, if we do not recognize and solve our problems, rising sea levels may diminish both population and demand. ... *"Maybe this world is another planet's hell," Aldous Huxley.* **JPT**

Technology To Meet the Challenge of Future Energy Supplies

Donald L. Paul, Vice President and Chief Technology Officer, Chevron Corporation

The past 50 years of our industry has spanned an incredible period of change in the global economy, technology, and the role of energy. The energy supply system requires large, sustained, long-term investments in technology, resource development, and infrastructure to deliver reliable and affordable supplies of energy on an immense global scale. Our industry has continuously delivered on this critical mission.

In the decades ahead, however, there will be increasing challenges to the capacity of the traditional oil and gas supply system to meet the level of expected growth in global energy demand arising from increasing populations and expanding economic prosperity.* The scale and time frame of the energy system will require a multidimensional approach to meeting the future supply challenge. There is simply no "silver bullet" as some might wish, and all elements of the solution involve a combination of increasingly complex technical, economic, political, and environmental factors. Fortunately, there is a very large energy resource base and many corresponding opportunities for increasing supply, including

- Increasing the performance of current producing assets
- Improving the capital investment performance for new developments
- Finding and developing major new producing frontiers
- Expanding and diversifying the energy resource base.

In parallel, the industry will also need to meet two new challenges that will broadly impact many aspects of energy:

- Delivering solutions for carbon management
- Developing the next generation of energy professionals.

Technology in the Critical Path

At the core of capturing these opportunities and meeting the challenges is the expanded application and integration of technology at scale. Many in-place technologies will continue to undergo steady advances to have important cumulative impacts on performance. In addition, significant shifts in the technology base are poised to arise from major advances in fundamental technologies.

Next-Generation Seismic Imaging and Reservoir Simulation. The industry has been notably successful in riding the exponential growth curve of information technology. E&P technologies are among the most computationally demanding and data intensive of all industrial technical applications, led by seismic imaging and reservoir simulation. The combination of new seismic measurements, such as wide-azimuth multicomponent recording and cost-effective cluster computing, is already providing unprecedented subsalt images. As the newest generation of advanced scientific computers is installed for government and university research, the stage is set for commercially viable deployments in a decade or less. Combined with the commensurate 100-fold leap in transfer rates and data volumes, broad new classes of imaging and modeling applications will become commercially practical. Increasing recoveries from developed reservoirs, reducing capital risk, and finding the next major producing trends will all depend on continued advancement in these major industry technologies.

Next-Generation Geological and Geophysical (G&G) Interpretation Systems. Seismic interpretation was one of the first industrial applications of 3D-visualization technology. Over the intervening 25 years, the industry has continued to develop and deploy systems of increasing sophistication. Continuously incorporating advances in information technologies, today's G&G interpreta-

Donald L. Paul *is Vice President and Chief Technology Officer of Chevron, responsible for Chevron's three technology companies: Energy Technology, Information Technology, and Technology Ventures. In this role, he manages the research, development, and integrated application of technology throughout the company's worldwide business activities. Paul is a member of Chevron's Strategy and Planning Committee and Management Committee.*

Previously, Paul served as Vice President of Technology and Environmental Affairs for Chevron, a position he assumed in 1996. Paul joined the company in 1975 at Chevron's research facility in La Habra, California. During his 31-year career, he has held a variety of positions of increasing responsibility in both business and technology management, including President of Chevron Petroleum Technology and President of Chevron Canada Resources, the Canadian oil and gas subsidiary of Chevron.

Paul was a member of the National Research Council of the US National Academy of Science during 2002–04 and served on the 1997 Presidential Panel on Federal Energy R&D. Since March 2006, he has served as the supply team leader on the National Petroleum Council's major study on the future of oil and gas to 2030, which was officially presented to the US Secretary of Energy in July.

Paul is a graduate of the Massachusetts Institute of Technology, with a BS degree in applied mathematics, an MS degree in geology and geophysics, and a PhD in geophysics.

**For a comprehensive view of the global energy system to 2030, please visit the National Petroleum Council website at www.npc.org to access an online version of the recently completed study titled "Facing the Hard Truths About Energy." The final printed and CD versions will be available in October.*

tion systems yield increasingly integrated and realistic digital representations of the subsurface to support exploration, drilling, and production decisions. However, the growing complexity of these systems, combined with the explosion of data volumes, points to the need to develop and deploy a new generation of tools. Advanced human interfaces, data management, and search technologies have been enabled by large consumer, commercial, and defense markets. When combined with more-advanced representations for geological processes and Earth models, these technologies create the platform for a new generation of G&G interpretation to support businesses from frontier exploration to producing from unconventional reservoirs.

Oilfield Automation and Optimization. Over the past several years, the technology framework known as the "digital oil field/e-field/i-field" has moved from research concept to early field application. Highly instrumented wells and surface facilities, combined with advancing network and control technologies, have set the stage for true field automation. Integration with real-time simulation provides the basis for a level of optimization and control paralleling the advancements made in downstream refining and processing applications. True oilfield automation and optimization can provide an essential technology lever to meet the increasing economic pressures for operating cost reductions for mature producing assets and improved capital performance for major project developments.

Application of Robotics for Deepwater and Arctic Production. The advancement of remotely controlled and operated systems has been essential for success in deepwater drilling and production. In controlled manufacturing environments, the use of sophisticated robotics has expanded rapidly with the merging of digital technology into materials and mechanical systems. However, the sheer physical scale and extremely harsh operating environments of oil and gas production have remained challenges to extensive application. Major research programs, some building on defense and security applications, are aimed at breaking through these limitations. Self-managing wells and seafloor production systems will be essential to pursue the promise of major new reserves from ultradeep water and the offshore Arctic.

In-situ Formation-Alteration Technologies. Production from unconventional reservoirs and conversion of unconventional hydrocarbons will be essential components of the supply system to meeting growing energy demand over the next several decades. The rapid growth of the industry in these areas is a classic example of resource opportunity driving technology advancement. The applications of large-scale fracturing technology and thermal recovery methods are prominent demonstrations of physically altering formations and reservoir conditions to yield production. Much more is in store as major new resources await expanded application of in-situ technologies. Economic oil-shale development, for example, will require a new level of capability to mechanically and chemically alter the hydrocarbon-bearing formations. Creating "subsurface factories" will require a new combination of monitoring, control, and prediction technologies. Several research programs are under way to bring precision mechanical and chemical alteration capabilities to the field. Major advances are likely years away from large-scale commercial deployment, but the size of the resource opportunity should sustain the advancement.

Carbon Capture and Sequestration (CCS) Technology. Carbon management has emerged as a new element of the energy system. While the geopolitical frameworks remain dynamic, the importance of coal-based power and the increasing production and processing of heavier hydrocarbons will almost certainly require CCS at scale as an element of policy implementation. Many of the technology components required to create and implement a CCS infrastructure exist in the industry today, including CO_2-injection and reservoir-management technologies used in enhanced oil recovery. Improved capture technologies for power plants, hydrogen production units, and other major stationary sources are also under development. What is yet to be established, however, is the validation of an economically practical implementation of an integrated source-to-reservoir infrastructure.

A Final Thought: The Next Generation of Energy Professionals

The combination of opportunity and technology positions the industry to meet the supply challenges of the future, but only if a well-educated and experienced workforce is in place to develop and operate the energy system. Given the global scale of the energy supply challenge and the multi-decade time frames for major energy developments, it is essential that the transition from the "big crew change" be aggressively managed to produce the next generation of the energy workforce. Two important opportunities include the following.

Expanding the Role of Universities in Energy Technology. Energy is now on the "A-list" at every major university, with new and expanding initiatives, research programs, and educational emphasis. Industry has significantly ramped up university R&D expenditures and student funding over the past 3 years. Major alliances and research centers are under development, and universities have become essential partners in developing next-generation technologies for energy. Enhanced educational programs to meet the future business and technology requirements are also appearing, including the creation of new "hybrid" degree options that blend historically distinct engineering disciplines, such as combining petroleum engineering with computer science for oilfield automation and with chemical engineering for unconventional-resource development.

The key to building and maintaining these new relationships will be the industry's long-term commitment to funding, sustained hiring, and much more effective commercialization of successful research programs.

Creating New Opportunities for the Retiring Workforce. As we build out the base of new talent coming into our industry, we also need to retain access to the immense knowledge and experience base of the current energy workforce. In the energy business, success requires the combination of talent, technology, and experience. We can more-effectively manage the demographic transition by creating more diverse opportunities for professionals to match their personal ambitions in "retirement" with ongoing business, technical, and mentoring opportunities. Individual companies have already constructed such mechanisms for their retired professionals, and professional societies can clearly play an expanded role. **JPT**

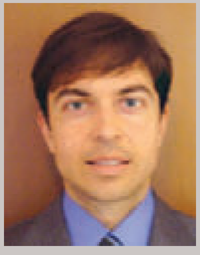
Why Our Approach to Sustainability Is Unsustainable

Thomas Bruni, Production Manager, Eni Iran; first editor of *The Way Ahead*

You may advocate peak oil theory or rather see yourself among its detractors, but irrespective of your views on the subject, you will unmistakably agree that resources and reserves are finite, thus making our industry nonsustainable by definition. Although these premises might lure us into the vicious circle of "We will not try to fix something that cannot be fixed in the first place," the oil and gas industry should aim higher and avoid receding into isolation from one of the most potent issues driving today's (and likely tomorrow's) big business—sustainability and its multiple declinations.

The underlying popular fronts have long grown to coalesce into a critical mass that has made its presence felt to a number of socioeconomic constituencies, including investors. The corporate world naturally followed suit, and organizations have adopted sustainability as one of the key elements of their strategies and, in some cases, as a core value.

The Dow Jones Sustainability World Index (DJSI) includes the top 10% of the biggest 2,500 companies worldwide based on long-term economic, environmental, and social criteria. One often-assumed mantra that must be quickly dismissed is the equivalence of sustainability and the environment. While the association may have been true when these ideas were first born, the broader concept of sustainability has developed into a more systemic and companywide scheme. This index, for example, evaluates corporations based on several criteria, including climate-change strategy, energy consumption, human resources development, knowledge management, stakeholder relations, and corporate governance, as well as more financially conventional metrics such as returns to investors, customer management, and business models. Ideally, all decisions and actions and their consequences should "meet the needs of the present without compromising the ability of future generations to meet their own needs," according to the United Nations' *Report of the World Commission on Environment and Development*.



Thomas Bruni *is Production Manager for Eni Iran at the Darquain Field in western Iran. He previously was responsible for Eni Iran's nonoperated assets. Before that, he worked in petroleum and production engineering posts in Algeria, The Netherlands, and Italy. Bruni has been actively involved in SPE's efforts to reach out to young professionals and was the first editor-in-chief of the magazine* The Way Ahead. *He is a recipient of the 2007 SPE Young Member Outstanding Service Award. Bruni is a chemical engineer by background, earned a degree at Politecnico di Milano, and recently received an MBA degree from the Universita` di Bologna. He can be reached at thomas.bruni@gmail.com.*

Our oil and gas sector, which represents approximately 20% of the world's economy, makes up only 8.8% of the sustainability index, and, while some worthy exceptions do stand out (e.g., BP and Total), the overall presence is not satisfying (the classification is size-biased, so a very green but minute oil and gas company would go undetected).

According to a recent survey in SPE's magazine for young professionals, *The Way Ahead*, this trend is transparent to younger members. Young professionals see their companies inactive regarding climate change and underinvesting in alternative energy. Widespread discomfort among young professionals is such that up to one-third of respondents in the survey said they would consider moving to the renewable energy sector as good for their career security.

SPE reflects the industry's passive posture on sustainability and has not positioned itself as an early adopter either. Associations for mechanical engineers, chemical engineers, and civil engineers, to name a few, all have extensive programs covering sustainability issues, including events and courses. The American Institute of Chemical Engineers has gone so far as to establish a dedicated Institute for Sustainability, the essential purpose of which is to create the conditions for all players (academia, industry, government) to collaborate and champion sustainable solutions. Our society has a responsibility to improve the public's perception of our industry's stance on these issues as well as raise awareness among its own ranks.

Organizations are viscous entities, and change causes friction and resistance, but that comfort-zone syndrome can be defeated through a genuine innovation-welcoming attitude. What DJSI-leading organizations have done to turn purpose into actionable plans is to create sustainability ownership through dedicated committees and directorate positions. Sustainability can be promoted from the bottom up by adopting it as a discussion topic at events worldwide and as a metric for rating technical papers and granting awards.

Constructive discussion on provocative questions such as "Should sustainability make its way to SPE's mission statement and values?" should be instigated. In fact, the aforementioned survey reveals that an overwhelming majority of young professionals (80%) favors the incorporation of renewables into SPE's technical-discipline portfolio.

While young professionals may lag behind their fellow members in hard skills and experience, they seem to be well ahead of the curve in other areas such as recognizing the importance of sustainability and like topics. SPE need not look further than in its own ranks to find the constituency that can own and lead the necessary game-changing efforts. Were we to turn a blind eye to these issues, what we might be missing could be the ultimate solution of how to ensure that our industry and SPE are sustainable endeavors. **JPT**

SPE Scholarships Help Individuals Pursue Their Dreams

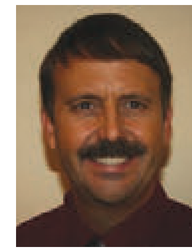
Erica Shillings, *JPT* Assistant Features Editor

SPE has helped many college students obtain their degrees over the years by providing financial assistance. In 1974, the SPE Board of Directors approved creation of the SPE Section Scholarship Support Program to help fill the growing demand for petroleum engineering graduates. Sections were encouraged to offer scholarships to students entering a petroleum-related field of study. The assistance, with preference given to incoming freshmen, would support petroleum engineering curriculum in colleges, supply engineers to the industry, and recognize academic excellence. Since the program began, SPE has benefited numerous students with aid. Interviews with past scholarship winners show how the aid affected their educations and their careers.

Kevin Lacy, Head of Discipline for Drilling and Completions in the Western Hemisphere for BP, Houston, says his SPE scholarship made his petroleum engineering career possible. During the 1978–79 school year, Lacy received a USD 1,000 scholarship from the SPE Mid-Continent Section. He graduated in 1980 with a BS degree in petroleum engineering from the University of Tulsa. Over the years, Lacy has found ways to give back to his university and community. He remained in close contact with the school and its petroleum engineering department, serving on its Industry Advisory Board for many years. "In the industry downturn in the early 1990s, I led an effort on behalf of the board to establish a scholarship endowment in the name of Kermit Brown, and I believe we collected close to USD 400,000 in donations," Lacy said. Brown was a faculty member and petroleum engineering department chairman at the University of Tulsa for many years. Lacy also helped to establish the Center for Research Excellence in Fluid Flow at the university, which brings in more than USD 500,000 in annual research funding.

Lacy

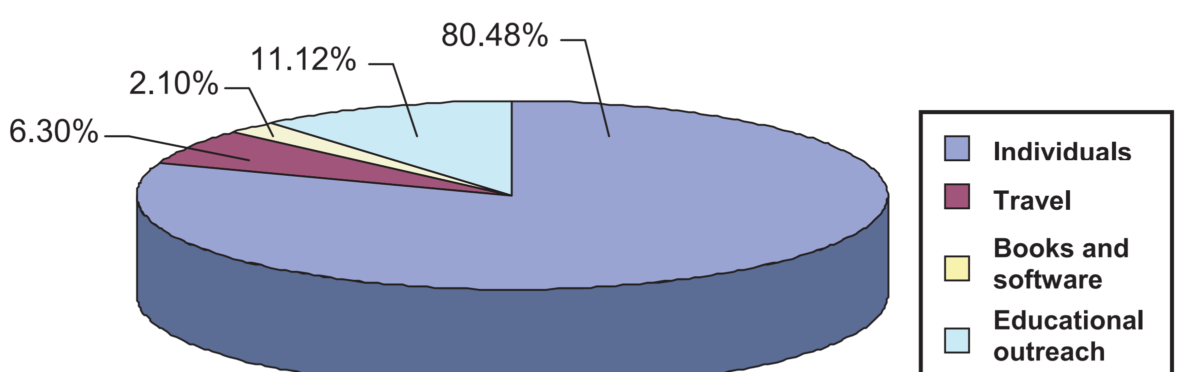
Lawson



Stephens

Because Lacy felt so strongly about the benefits that he received from his education and his parents' support to attend college, he created a USD 100,000 scholarship endowment in his parents' name at the University of Tulsa. "It is intended to go to any qualified prospective engineering student from my home county (Rogers County, Oklahoma) who would otherwise not attend Tulsa because of the cost. In essence, I wanted to create a permanent opportunity for someone much like I had been given," Lacy said. "I think the SPE USD 1,000 investment in me has had a good

SPE Section Scholarships 2006–07



In 2006–07, sections gave 80.48% for individual student scholarships, 11.12% for educational outreach (science fairs, teacher training, and Engineering Week programs), 6.30% to help pay for student travel to SPE section, regional, and international meetings, and 2.10% for purchasing books or software for chapters and universities.

return. That money along with other scholarship funds made the difference in starting my career in the industry, as I came from a very modest-income family."

The Hobbs Petroleum Section awarded a scholarship during 1988–89 to Jesse Lawson, who, at the time, was a petroleum engineering senior at the New Mexico Institute of Mining and Technology. Lawson transferred there after attending classes at New Mexico Junior College, where he earned the school's first Outstanding Achievement Award in Petroleum Technology. When Lawson received his USD 1,000 scholarship, he already had worked in Permian Basin oil fields for more than 14 years. "The scholarship helped me fulfill my dream of becoming a petroleum engineer," he said.

Lawson earned a BS degree in petroleum engineering from New Mexico Tech in 1991 and now works as a senior reservoir engineer for Concho Resources in Midland, Texas. Lawson continues to participate in SPE activities. "I was last year's section chairman for the SPE Permian Basin Section. I attended the 2006 Annual Technical Conference and Exhibition in San Antonio to receive the President's Award for Section Excellence for the Permian Basin Section," Lawson said.

Another New Mexico Tech student awarded a scholarship was Rodney Stephens, who received USD 1,000 from the Four Corners Section during 1988–89. At that time, Stephens was SPE Student Chapter President. He earned a BS degree in petroleum engineering from New Mexico Tech in 1989. Stephens, an employee of BP, works in Egypt as the Subsurface Team Leader for the North Section of the Gulf of Suez Petroleum Company. The firm is a joint venture between BP and Egyptian General Petroleum Company. Stephens' scholarship allowed him to concentrate more on school by reducing the amount of time he spent at work. "I attended 4 years of night school to obtain an AS degree in petroleum technology. Scholarships in general allowed me to quit my full-time job after obtaining the AS degree and go back to school full time to finish out my engineering degree," he said. "I still worked on campus at the Petroleum Recovery Research Center, but it was not enough to make ends meet. It took the combination of my wife working full time at the school, the work I could get in while attending school, and scholarships." He has written multiple SPE papers and twice was chairperson of the SPE/ICoTA Coiled Tubing and Well Intervention Conference and Exhibition.

Cynthia Miller, Manager with DCP Midstream in Houston, received

Lacy graduates from the University of Tulsa in May 1980.

an SPE scholarship for USD 300 from the Pittsburgh Petroleum Section in 1978–79. She earned a BS degree in petroleum and natural gas engineering from Pennsylvania State University. When Miller was in college, she was paying her own way through school and held a full-time job. She was able to pay for books and fees with her scholarship. "Every little bit of financial aid was crucial. I could not have completed school without aid," Miller said. Asked if she would have a different career if she had not received financial assistance, Miller said, "I had more than one scholarship for petroleum engineering. If I did not have that aid, I would have gone to another department—say, electrical engineering—to get financial assistance to get my BS degree."

The SPE Section Scholarship Support Program continues to raise money and supply scholarships. Section support for 2006–07 scholarships and educational outreach programs totaled more than USD 950,000, with 73 sections participating. Money raised for students like Lacy, Lawson, Stephens, and Miller helps them to pursue their degrees and opportunities to succeed in the oil and gas industry. **JPT**

Sections Celebrate SPE's 50th

The Abu Dhabi Section celebrated SPE's 50th anniversary in June. Cutting the cake, from left, are Abbas Al-Hayek, Umm Shaif Reservoir Development; Ahmed Saqr Al Suwaidi, ADMA-OPCO; Ali Al Hasan, SPE Middle East Regional Director; Ali Al Jarwan, ADMA-OPCO and SPE Middle East Regional Director 2003–06; Fareed Al Sayed Abdulla, ADCO; Kasem Qayoumi, ZADCO; Ali Al-Muhairi, Zakum Reservoir Development; and Shawkat Ghedan, Abu Dhabi Section Chairman.

Bill Arnold, President, Dubai Petroleum, and Razik Sheikh, 2006–07 Northern Emirates Section Chairperson, cut the cake at a 50th anniversary celebration hosted by the Northern Emirates Section in March in Dubai.

Abdul-Jaleel Al-Khalifa, 2007 SPE President, cuts the first piece of the 50th anniversary cake at the Regional Awards Luncheon during the SPE Middle East Oil & Gas Show and Conference in March in Manama, Bahrain.

In addition to SPE's 50th anniversary, the South Australian Section celebrated its 25th anniversary in June. Pictured from left are: Tom Gouldie, Santos; Jeremy Meyer, JRS Petroleum Research; Matt Butler; Keith Boyle, Santos; Andrew Young, Anzon Australia and past SPE President; Ray Hollis, R.W. Hollis Pty.; and Rod Bresnehan, Innamincka Petroleum.

Bernard Avignon of Total E&P Congo proposes a 50th anniversary toast during the Congo Section's anniversary event in May.

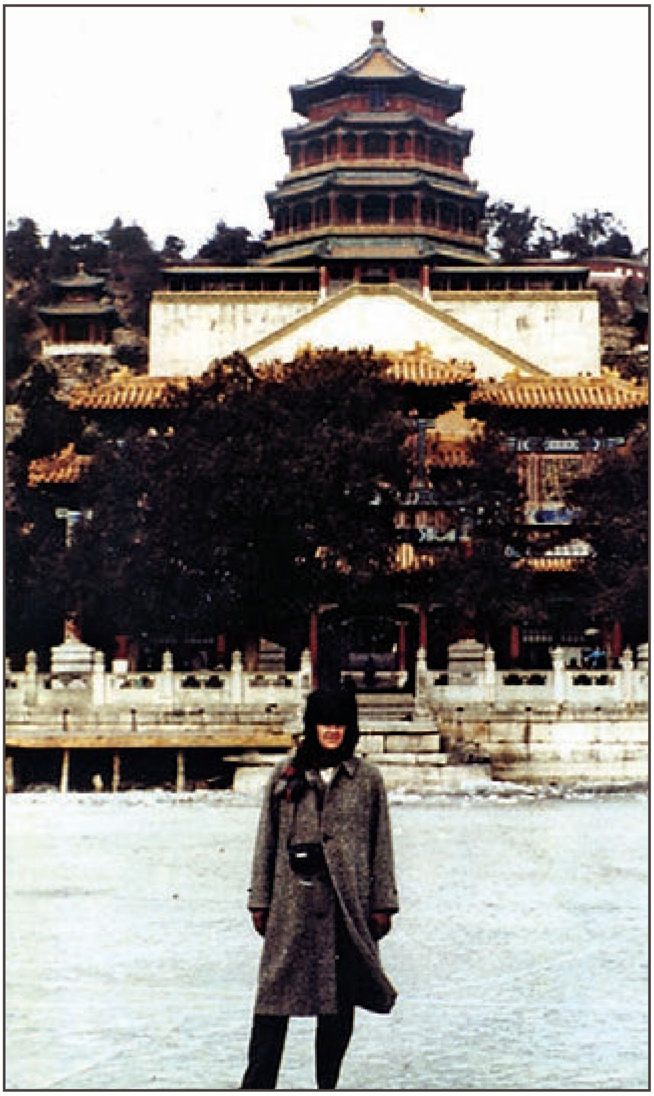
Oklahoma City Section members celebrate SPE's 50th and the section's 60th anniversary at the Oklahoma History Center in May.

SPE Presidents Travel the World

One of the most important jobs of an SPE President is traveling the world to meet with the society's members, sections, and student chapters, and to make appearances at conferences and public events. In between the business meetings, presentations, and speeches, there are some more relaxed moments.

Abdul-Jaleel Al-Khalifa, 2007 SPE President, is presented with a white hat by the Deputy Mayor of Calgary, Craig Burrows, at the Canadian Section Awards Banquet on 22 June 2007. The white hat has been a symbol of Calgary's hospitality since 1950.

SPE Presidents Clyde Barton, Jim Jorden, T. Don Stacy, and Arlen Edgar and their wives pose with famed musician Pete Fountain at the 1983 Annual Technical Conference and Exhibition in New Orleans.



Arlen Edgar poses in front of Beijing's Summer Palace in February 1981.

Native Texan Steve Holditch rides in the Mesquite Rodeo during a break from a Board meeting in 2002.

Giovanni Paccaloni, 2005 SPE President, tours the Shaanxi Provincial Museum in Xian, China.

Abdul-Jaleel Al-Khalifa, 2007 SPE President, and past presidents Eve Sprunt, Giovanni Paccaloni, Kate Baker, and Andrew Young share some time at SPE's first International Petroleum Technology Conference in November 2005 in Doha, Qatar.

Scott Hickman in the Saudi Arabian desert in March 1997.

Campbell Guest Column

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The Pull of Internationalism

Overseas exploration and exploitation started to become a significant factor for large reserves that could be produced at low cost. SPE members scattered throughout the globe to support this activity. Alford had become executive director of AIME and was replaced by David Riley and his assistant Dan Adamson at SPE. How could SPE continue to serve its members worldwide from the traditional office in Dallas, Texas? Riley and Adamson began to address the myriad of problems, but Riley unfortunately died early in the effort. Adamson took over the reins with a vision of developing a truly international society. Today, that vision is a reality, but the road was rocky at times. As SPE grew, it became ever more difficult to publish papers in a timely fashion. There also was the cost of supplying the publications to worldwide locations at an affordable cost. These and a myriad of other barriers had to be surmounted. Adamson's perseverance, plus the support of many members, resulted in the structure we see today.

Concurrent with all of the logistical problems, technology continued to race ahead. The use of fracturing expanded into the alternative use of horizontal drilling, and methods were developed to recover hydrocarbon fluids from deep reservoirs under deep ocean waters. Electronic, digital devices now permit us to do things that were impossible just a few years ago, and there are new tools and strategies that support our activities. SPE may be 50 years old, but it still possesses the vitality of the youngster it once was.

As one of the old guys, I am impressed by what I see. The names and faces have changed, but the "beat goes on," like the Energizer bunny. SPE has continued to supply the critical communication tools to underpin the efforts of those who develop technology and those who use it. Happy 50th Birthday, SPE. **JPT**

Beliveau Guest Column

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as the review and publication processes. It was a fascinating dynamic, balancing the desires of the authors, the workloads of technical editors, the ever-looming publication deadlines requiring a certain number of pages for print, the desire to build a coherent journal issue with a bit of a theme if possible, and, yes, even the hope to help build a small part of our petroleum engineering legacy.

Someone asked recently about the "most ground-breaking" papers published by SPE. This is a very difficult question, as there are so many in the numerous nooks and crannies of our business. Each part of the society, whether it is drilling or production operations or reservoir engineering or something else, is underpinned by a very firm foundation of technical papers. As petroleum engineers, we do stand on the shoulders of giants, and we should savor the vantage point. Because what we see is that there is much territory yet to explore. **JPT**