

# ANNUAL REPORT

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SOCIETY OF EXPLORATION  
— GEOPHYSICISTS —

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# REPORTS OF BOARD MEMBERS



## REPORTS OF SEG BOARD MEMBERS

**PRESIDENT**

MAURICE NESSIM

Time flies when you are having fun and also when you are doing something important and challenging with people you truly like and respect. This is the kind of year 2021 was for me as president of SEG. Below is a review of the organization's key activities and accomplishments.

**FACING THE FUTURE WITH RESILIENCE**

SEG experienced a year of change and transformation in 2021. The challenges we faced in the energy industry and within our organization were daunting. Plunging oil prices due to oversupply and the collapse in demand due to the pandemic left us with record-setting decreases in exploration and production spending. This inevitably led to lower investment in geophysics. In fact, oil-and-gas exploration has declined by 70% since 2013, and technology spending is down 66% over the same time period. Sadly, this market downturn has resulted in an exodus of industry talent through layoffs, resignations, and retirements. We also are seeing a decline in geoscience enrollment in universities around the world.

We are at a crossroads defined not only by these challenges but also by the inevitable structural changes facing a global economy that is increasingly focused on decarbonization and renewable resources. However, all is not dire. Oil

and gas will remain a significant part of the world's energy supply for years to come; energy companies have a lot of cash; and geophysicists have talent, resilience, and ideas.

The good news is that SEG chose to bravely face the future by evolving our thinking, transforming our skills to fit today's needs, and establishing six strategic pillars that guided our initiatives in 2021 and will continue to guide them in the years ahead. I am pleased to report that these pillars are not empty words but dynamic north stars for everything we have worked on and accomplished this year. A task force, led by a former president or member of the Board, has been established for each pillar. The task forces have worked actively on plans and projects to support the pillars. Here are a few highlights of their activities and accomplishments.

**SIX KEY STRATEGIC PILLARS**

**Innovation.** SEG will embrace the future and the changes it brings. We will challenge everything about how we have operated. We will invent new ways to stay relevant and true to our leadership position in accelerating innovation in geoscience. To build on our traditional strength in the application of geophysics for oil, gas, and minerals exploration, we created three task forces to identify opportunities for use of geophysical methods in medicine, civil engineering, and planetary exploration. The Planetary Exploration Task Force has looked at seismographs deployed on the Moon and Mars; geophysical measurements such as geodesy, laser ranging, and LiDAR; gravity, electromagnetics, and heat flow; as well as research opportunities to develop new geophysical sensors for space exploration. The Medical Applications Task Force is exploring how subsalt seismic

and elastic full-waveform imaging, as well as time-lapse seismic imaging and inversion from 3D multimode rendering and time-lapse visualization, could greatly improve medical imaging and diagnostics. The Civil Engineering/Near-Surface Task Force is looking at how we could deploy innovative technology to find new water supplies and to support infrastructure. There is great interest in all of these areas from the SEG membership and practitioners of the disciplines with which we are seeking to find synergy.

**Digitalization.** SEG will lead the inevitable transformation from physical to digital to accelerate resource discovery. The Digital Transformation Task Force has been formed to analyze how we can play an even more significant role in digital data and knowledge transfer. One of the most significant accomplishments in this area has been the launch of EVOLVE. The program is a digital in-the-cloud learning experience that allows students around the globe to collaborate in global multidisciplinary teams, using actual data to solve real-world exploration and carbon-capture problems. Graduates of EVOLVE are ready to step into the jobs of the future, already having experience in this new way of working. In addition, we are looking at virtual business markets and knowledge services. We have established the Machine Learning Committee, and we are actively working on Energy in Data and SEAM artificial intelligence data projects.

**Preservation.** SEG will lead the application of geophysics in decarbonization and other environmental sustainability efforts. It is absolutely possible to be both benefactors and stewards of the earth. With an expanded perspective and new ways of thinking, geoscientists will play an essential and unique role in leading decarbonization

## REPORTS OF SEG BOARD MEMBERS

solutions, environmentally focused work, and infrastructure developments. Two task forces have been working on these issues including the Geothermal Task Force and Carbon Solutions Task Force. One of our major accomplishments this year has been in support of this pillar. The Geophysical Sustainability Atlas, featured in the January 2021 issue of *The Leading Edge*, is an exhaustive and insightful tracking of geophysical activities to each of the United Nations Sustainable Development Goals. It has put SEG on the global radar as a preservation partner.

**Collaboration.** SEG recognizes that our power is greatest when we work cooperatively with other entities aligned in related and similar pursuits. There is no better example of the value of collaboration than IMAGE '21. This is the first conference covered by a five-year agreement with the American Association of Petroleum Geologists (AAPG), under which our organizations will hold joint multidisciplinary annual meetings. The meeting in Denver in September was a tremendous success.

The opportunity for SEG to join the Society of Petroleum Engineers (SPE) and AAPG merger also is a viable chance for further collaboration. We made and delivered on three promises relative to this potential merger. First, we established a task force to report to the Board their recommendations regarding participation in the merger. Their recommendation was that we explore the opportunity further.

Second, we conducted a membership-wide survey to understand where our members stood on the issue. The results were that nearly half (48.78%) of the members were in favor of the merger, 34.8% were against, and 17.05% wanted

more information. In the same survey, we asked members whether they thought the three organizations should hold a joint annual meeting with or without the merger. To that question, 68.04% said yes, 18.79% said no, and 13.16% were unsure. We also received many comments that perhaps we should look at other merger and collaboration opportunities.

Finally, the Board looked at all of these pieces of data and decided it would seriously consider the opportunity to join the SPE/AAPG merger and also explore opportunities with other groups. This merger “exploration and discovery” is under way now and proceeding with our primary evaluation criteria being whether a union of organizations would benefit SEG members.

**Representation.** SEG promotes diversity, equity, and inclusion in the institutions it serves and with which it collaborates. SEG also must transform its systems and processes to build power, empowerment, and engagement in order to serve as a model for the communities it serves. This important, future-focused work is being done by the Justice, Equity, Diversity, and Inclusion Committee. We look forward to the progressive recommendations this committee will bring to the organization.

**Contribution.** SEG is purpose driven. Respect for and service to the needs of the world’s most challenged people are essential elements of the practice of geophysics, which has the potential to tremendously expand its contribution. Through Geoscientists *without* Borders® (GWB) and the Sustainability Committee, we are looking at ways to deploy our unparalleled understanding of the earth in humanitarian as well as commercial pursuits. With the world’s population expected to reach more than 9 billion in

2050 and with a commensurate increase in demand for food, fuel, raw materials, water, and safety, our challenge is not just to continue to power the world but also to help save it.

## BUILDING A STRONG ORGANIZATIONAL FOUNDATION

All of these activities and accomplishments have been made possible because the work is being done on a strong organizational foundation. This year, after many decades of talking about it, we moved SEG headquarters to Houston, Texas, which is the heart and hub of not only the oil-and-gas industry but also a major center for medicine, academia, digital transformation, space exploration, and initiatives focused on environmental stewardship. This relocation has given us exposure to talent and partners we didn’t have before. We have stabilized our finances, developed new revenue streams, and built a strong and competent staff. We have been able to bring in a new executive director, Jim White, who is not only a seasoned leader but also a long-time SEG member and accomplished geophysicist. We have an excellent Board continuing to lead our task forces. We also have a new president, Anna Shaughnessy, who is bringing great skill and enthusiasm to continuing the work we began during the previous year.

## A FINAL WORD

I would like to end on a personal note. Leading this respected organization has been a lifelong dream of mine. I am grateful for this opportunity to express my appreciation to the Board of Directors, Foundation, professional staff, and all of the members who were so engaged and supportive during my tenure as president. In the year ahead, I will be honored to serve as past president on the Board,

## REPORTS OF SEG BOARD MEMBERS

take the leadership for next year's annual meeting, head the Medical Applications Task Force, and serve as the Board liaison for GWB.

I encourage all of you to stay positive, look at the opportunities ahead of us as an industry, and willingly, and with great curiosity, expand your skillset to meet and face the future. 🏛️



## REPORTS OF SEG BOARD MEMBERS

**PRESIDENT-ELECT**

ANNA SHAUGHNESSY

SEG established a three-year term (president-elect, president, and past president) for the SEG leadership position in 2012. The idea behind this was to enhance continuity from one year to the next and ensure that the incoming president would have significant background and experience as they stepped into the role. The past president role was established to provide guidance in the year after presidency. This three-president-sequence system has proven quite important because the complexity of leading SEG has increased over the years.

My year serving SEG as president-elect has been an invaluable learning experience that brought me up to date on the details of our Society's programs, staff, finances, membership, challenges, and opportunities, all of which are important topics to know to lead an organization.

However, 2020–2021 was a year of great transformation, not just for SEG, but for the global economy and society. It became very clear to me that this transformation would continue in the period 2021–2022, and I needed to understand the changing landscape on many different fronts, not just within geophysics.

The energy transition and shift from fossil fuels to renewables has continued

to influence the oil-and-gas industry and its geophysicists. Many of our colleagues have lost their jobs and are working on transitioning to new or related applications of geophysics. The ongoing pandemic has lasted much longer than we hoped and has forced us to truly embrace virtual meetings and conferences. The one notable exception was our joint annual meeting with the American Association of Petroleum Geologists (AAPG), IMAGE '21, which was held in Denver in September 2021. While SEG has been quite successful implementing virtual meetings of all types, this new modality has impacted our revenue stream significantly. The announcement that AAPG and the Society of Petroleum Engineers (SPE) planned to merge was yet another significant change to our familiar landscape and will influence the future of SEG. It is clear that SEG needs to evaluate the current evolving scenario, opportunities ahead, and how we want to position ourselves for the future to provide valuable and meaningful support to our members, especially to our young members.

Diversity and inclusion for science societies was brought to the forefront in 2020. I had the privilege to lead two task forces initiated by then-President Rick Miller, which resulted in the Justice, Equity, Diversity, and Inclusion (JEDI) Committee. The committee was approved by the SEG Board of Directors in July 2021. The goal of the committee is to ensure SEG becomes a more inclusive and inviting society to our diverse and global membership. It is my desire to facilitate participation in committees and leadership positions for those who have not traditionally had that opportunity and to build a pipeline of strong, bright, young leaders to guide us in the future.

Early in 2020, I was invited to coauthor an article on how geophysics contributes to the 17 United Nations Sustainable Development Goals (SDGs). Accepting this offer provided me with a deep dive into the importance of these goals and how geophysicists can make an impact toward a sustainable world. In particular, it afforded me an opportunity to learn more about near-surface geophysical applications, which are major contributors to environmental and humanitarian efforts. The Near-Surface Geophysics Technical Section is one of the fastest growing groups within SEG that we clearly plan to embrace and support. "The Geophysical Sustainability Atlas: Mapping geophysics to the UN Sustainable Development Goals," was published in the January 2021 issue of *The Leading Edge*. It has become a communications piece that we all can use to explain to peers in the geosciences and beyond how geophysicists make a difference.

In summary, my year as president-elect has been a time for engaging profoundly in SEG and raising my knowledge of what our Society does in new arenas such as near surface, carbon solutions, geothermal, mining, and smart cities. It also has afforded me an opportunity to learn about many other topics that are influencing SEG such as the energy transition, climate change, society collaborations, and changes in member demographics. I have had the opportunity to grow my network of experts that I can call upon for advice and to discuss opportunities ahead. Possibly most important of all, I have realized this has been an extraordinary preparation year to serve you as president of SEG. ■■■

## REPORTS OF SEG BOARD MEMBERS

**PAST PRESIDENT**

RICK MILLER

SEG has admirably served its members and promoted applied geophysics for more than 90 years. The last two years have been fraught with challenges and obstacles. This includes the economic impact of the pandemic, energy transition, move of the headquarters to Houston, fourth executive director since January 2019, trend toward hybrid meetings, and SEG's path beyond mergers.

I have now completed my fifth and final year as a member of the SEG Board of Directors, and it has been one of the most rewarding and enjoyable professional experiences of my career. I had the privilege to serve under four presidents (Dave Monk, Bob Hardage, Rob Stewart, and Maurice Nessim), each with unique styles, focus, and executive talents that were inspirational and educational. My time serving SEG has met all of my expectations, and I will continue to provide any help I can to Anna Shaughnessy and Ken Tubman as they tackle some of the biggest decisions SEG will face as a Society.

SEG staff are some of the most talented and dedicated of any professional society that I have associated with and that treasure needs to be protected and nurtured in spite of ominous economic challenges. It has been a privilege to work with such a

dedicated group of consummate professionals with a passion and dedication to promoting applied geophysics.

SEG will not be the same in five years as it is today or was five years ago. Our profession and business are in transition. With deep roots in oil-and-gas exploration, applied geophysics and the accurate practice of our science has been a primary focus of our Society for almost a century. These upcoming transitions will be beyond incremental; future changes will be difficult and stressful. However, the Society is at a point where we have the capacity and desire to serve our traditional community of applied geophysicists while being bold, reaching out to support underserved communities of geophysical professionals, growing the number of applied-geophysics practitioners, and promoting the profession.

My role during 2021 was to support President Maurice Nessim's efforts to reshape the strategic focus of the organization and move from a cycle of strategic planning to a path with implementation of strategic objectives. It was a very challenging year, but considering the many holes in the ship that needed plugging, we are floating high in the water under our own power. That is a great accomplishment considering the apparent status (taking on water) of our peer societies.

In 2021, SEG held its first hybrid annual meeting. It also was the first joint annual meeting with the American Association of Petroleum Geologists since 1955. The meeting proved highly successful in spite of the massive obstacles imposed by the pandemic, which forced the 2020 annual meeting to go fully virtual. As the Board liaison to the Annual Meeting Steering Committee, I want to applaud

the outstanding work of the committee in spite of a consistently and dramatically changing playing field. Under Julie Shemeta's steadfast leadership, her team did an outstanding job of nimbly adapting to every challenge. It was their efforts with the support of SEG staff that was instrumental in pulling off a technical success.

Although at times the future of our profession can appear a bit hazy, as the fog burns off, we will see that the horizon is bright for applied geophysics. SEG will be both relevant and influential in the future of exploration for all of the unknown geotreasures on, within, and above the earth. ■■■■

## REPORTS OF SEG BOARD MEMBERS

**FIRST VICE PRESIDENT**

SCOTT SINGLETON

In 2021, as first vice president, my primary activity was heading up the newly formed Carbon Solutions Task Force. I also participated as a member of the Annual Meeting Task Force and Digital Transformation Task Force. I was Board liaison for the Gravity and Magnetics Committee. In addition, I represented SEG as one of the technical cochairs for the Unconventional Resources Technology Conference (URTeC).

The Carbon Solutions Task Force is a part of the third pillar in the six Strategic Pillars for SEG. This pillar is named “preservation,” and its purpose is to lead the application of geophysics in decarbonization and other environmental sustainability efforts. The objective of the task force is to form a collaborative association of academics, oil-and-gas operators, service companies, and governmental/regulatory authorities. It also includes the involvement of numerous professional societies, initially consisting of SEG, American Association of Petroleum Geologists (AAPG), and Society of Petroleum Engineers (SPE), whose collective expertise would be more effective

in a collaborative entity. This entity would educate about carbon solutions, be an outlet for leading-edge research, and form a community of like-minded professionals to network and communicate with each other. The primary outlet for the task force was envisioned to be an international conference on carbon solutions, the first of which would be held in the first quarter of 2022. The task force would also host workshops and other events as needed throughout the year or advertise the workshops of other entities such as the SEG Research Committee, new SEAM CO<sub>2</sub> project, and SPE CCUS Technical Section. Details of the achievements of this task force can be found in the Carbon Solutions Task Force report on page 71.

I participated in the Annual Meeting Task Force and was a member of the Outsourcing Subcommittee. Our responsibility was to search out and investigate companies that potentially could produce the entire annual meeting. We investigated several companies and ended up recommending DMG Events out of Dubai. The company was originally recommended by President Maurice Nessim because they produce ADIPEC, which many people in the Middle East are familiar with due to the large all-encompassing nature of the conference.

I joined the Digital Transformation Task Force in 2020 and participated until I rolled off of the Board in September 2021. The task force heard presentations from various vendors of IT and communication-centered software. The task force will continue to develop in 2022.

The Gravity and Magnetics Committee, of which I was the Board liaison, is one of the larger and more active SEG committees. The chair, Irina Filina of the University of Nebraska, has done a wonderful job keeping the committee focused and active. One of the committee’s main efforts each year is contributing to the annual meeting. Filina rolled off as committee chair at the annual meeting and was replaced by Marianne Rauch.

Finally, I have represented SEG for the past three years as one of the technical cochairs of URTeC. Each of the sponsoring societies (SPE, AAPG, and SEG) is represented by one of the cochairs of the technical program. In 2021, the conference moved to a hybrid format, and the in-person component was at the George R. Brown Convention Center in Houston. It had less attendance than which we are accustomed, although those who did attend were thrilled to talk with industry friends face-to-face because we were one of the first in-person conferences to be held during this time. I will continue as the SEG technical cochair in 2022. ■■■

## REPORTS OF SEG BOARD MEMBERS

**SECOND VICE PRESIDENT**

BRUCE SHANG

My term as the second vice president started in October 2020. I was Board liaison for SEG Global Inc. and the China Advisory Committee. I became the liaison for the Development and Production Committee and Offshore Technology Conference (OTC) Asia Subcommittee later in the year. I also worked on the Regional Annual Meetings Task Force and Business of Applied Geoscience Organization Committee.

SEG Global Inc. (SGI) is the SEG subsidiary established to promote and expand the global impact of applied geophysics around the world. The scope of SGI's business interest has been concentrated in China with oversight of the China office. Overcoming the challenges of the pandemic, the SEG China office made great efforts and successfully organized more than a dozen workshops and events. Membership drive and local website content continued to improve to attract more members and provide more member services. The SGI Board and China office staff greatly supported

the Regional Annual Meetings Task Force and SEG China BAGS session.

The China Advisory Committee normally is composed of 25–30 members from academia and industry, with technical experts and senior executives from universities, research centers, and state, local, and international companies. The committee met quarterly to provide advice on SEG China strategies, operations, and programs such as technical programs and membership activities. The committee also provided feedback to the SEG Board of Directors regarding SEG's future direction. Some new initiative suggestions included local publications, competitions and awards, student training, and carbon capture, utilization, and storage and interdisciplinary programs.

The Development and Production Committee continues to promote the latest technologies to improve reservoir characterization, primarily through workshops during SEG annual meetings. During a recent meeting, the committee realigned members for future events and discussed future plans. They are preparing a list of committee members recommended for SEG courses and lectures on quantitative interpretation and reservoir monitoring. The committee is planning one or two workshops for 2022.

The OTC Asia Subcommittee's primary function is to support OTC Asia on behalf of SEG. The committee has established the conference program and secured 68 exhibitors/sponsors for OTC Asia 2022.

In support of the SEG Strategic Pillars, the Regional Annual Meetings Task Force proposed a strategic global collaboration model involving regional expansion of parallel annual meetings outside North America. China was chosen to be the first pilot of parallel annual meetings for several reasons including the large number of annual meeting abstracts received (30%–40% of total) and large number of practicing geophysicists in the region. I worked with Baishali Roy in leading the task force, which included Board members, SEG staff, and SEG members. A lot of work was done in stakeholder communication, sponsorship solicitation, logistics planning, etc. Because of timing, event conflicts, and other reasons, it was determined that a parallel meeting could not be timely executed by the SEG annual meeting time. The SEG Board subsequently decided to focus on a China BAGS session as a pilot to go through the potential challenges for a future large-scale regional meeting. The China BAGS session was successfully implemented with live participation from both Denver and Chengdu, China, as well as on the website. Many lessons were learned including the impact of time differences, session IT platform versus conference IT platform compatibility issues, etc. The task force compiled lessons learned and future suggestions. ■■■■

REPORTS OF SEG BOARD MEMBERS



**TREASURER**  
PETE CRAMER

Take a bow if at the start of 2021 you correctly predicted oil prices above US\$80/bbl, natural gas prices in Europe increasing by 400%, chip shortages, and the Delta variant.

We faced similar challenges while trying to set a realistic budget in early 2021. At that time, we had no idea what our annual meeting would look like, and we faced significant cancellation penalties with our hotels if we did not hold an in-person event. Our partner events, from which we normally receive significant revenue sharing, were equally uncertain.

Against that backdrop, the Board of Directors made the difficult decision to adopt a budget that envisioned further staff and program reductions and committed us to several strategic investments for our future. As Maurice Nessim phrased it, it would have been easy to adopt a going-out-business budget. Instead, we took a calculated risk that we could afford to lose money if necessary and continued to move forward on our Strategic Pillars. The budget, as approved, was not expected to break even with anticipated revenues, but we approved it and hoped for the best.

Fortunately, some good things happened. We received a Paycheck Protection Program loan from the U.S. government.

This loan allowed us to eliminate the need to reduce staff. Later in the year, we applied to have the loan fully forgiven and received that approval in record time, thanks to the hard work of SEG’s finance staff. We had another strong year of investment returns for our long-term portfolio. We agreed to create a joint annual meeting with the American Association of Petroleum Geologists (AAPG) in order to share expenses and better align with the needs of many of our sponsors. With more than 6000 attendees (virtual and in person) and 160 exhibitors, results from the inaugural IMAGE ’21 exceeded our expectations. We also were able to establish a new headquarters office in Houston, begin the process of making long-overdue upgrades to our IT systems, and lay groundwork for an overhaul of our website and other systems, which when completed next year will significantly streamline our internal workflows and enhance our user experiences online. As I write this, we are estimating that our operating loss for this year will be approximately \$1 million before investment gains are factored in.

Our long-term portfolio has almost doubled in value since the start of 2020, even after covering last year’s early losses (Figure 1). We benefited from the sale of our former office building in Tulsa and from a greater than 40% gain from investment results in our portfolio from the start of 2020 through November 2021. Our financial advisors at Morgan Stanley and Finance Committee led by past treasurer Dan Ebrom deserve a great deal of credit for steering us through the challenges of the last two years and delivering stellar investment results. These results allowed us to establish a “rainy-day” fund for short-term emergencies and work toward securing a pledged line of credit from Morgan Stanley. These two items will allow future Board members the flexibility to manage short-term challenges without needing to take funds from our long-term portfolio.

This brings us to the present. Commodity prices are at multiyear highs, and activity is expanding in many areas including traditional oil and gas along with mining,

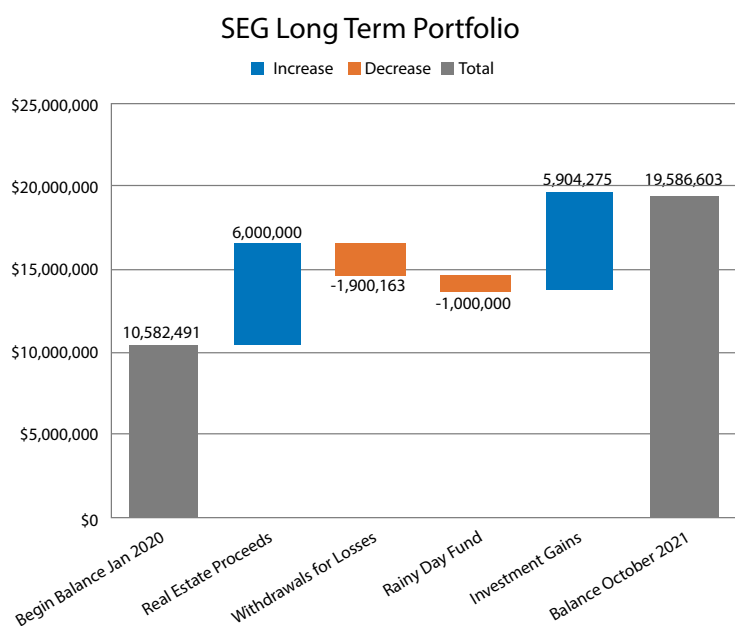


Figure 1. Data relating to the SEG long-term portfolio.

REPORTS OF SEG BOARD MEMBERS

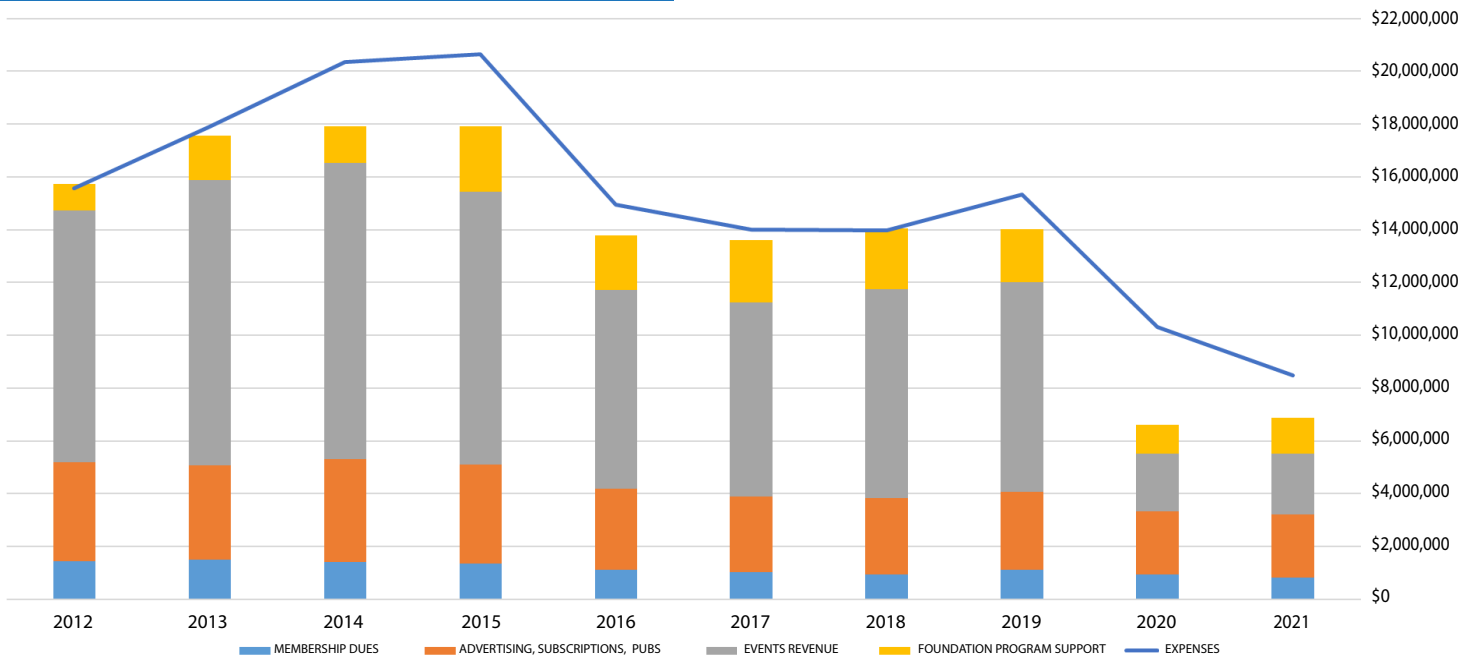


Figure 2. SEG operating revenue.

geothermal, water, and others. It would be easy to be happily optimistic and allow that enthusiasm to lead the budgeting process, but we are exercising caution, given everything we have been through in the last two years. While our current financial picture is strong, we cannot continue to lose money. As Figure 2 clearly shows, all of the various components of our revenue have been declining for several years or longer. We have worked to keep expenses in line with the changing environment. We have gotten by mainly through the good fortune of having had strong investment returns for the past several years, but as we all know, stock markets do not go straight up forever. IIII

## REPORTS OF SEG BOARD MEMBERS



## VICE PRESIDENT, PUBLICATIONS

### BAISHALI ROY

It has been my honor to serve as the vice president, publications for SEG during 2019–2021. SEG Bylaws charge the vice president, publications with oversight of SEG publication and technical dissemination activities, ensuring that all such activities are aligned with SEG’s mission, goals, and policies and that the publications achieve the highest standards for technical and scientific integrity. SEG publications staff continue to play a very strong role in the efficient management of all publications matters.

In this position, I served as Board liaison for all of the Society’s publications boards and committees. These include the editorial boards for *GEOPHYSICS*, *The Leading Edge*, and *Interpretation*; the Books Editorial Board; and the Translations, Reviews, and Community Content committees. These boards and committees plus the Technical Program Committee are represented on the Publications Committee. The reports of all of these boards and committees describe in detail how each advanced SEG publications during the last year.

Journal publications remain strong. Our three main journals — *GEOPHYSICS*, *Interpretation*, and *The Leading Edge* — continue to grow in submissions, and the CiteScore ratings of all three and the

Journal Impact Factor ratings of the first two continue to be strong. The SEG Wiki pages continue to get more views around the world.

As vice president, publications, I dealt with resolving issues between authors and editors according to the Ethical Guidelines for SEG Publications. As a result, we reviewed and approved updates to publications ethics punitive-action procedures. The changes will bring more clarity to the process of punishing individuals who flagrantly violate ethical standards in the publication process. Risks associated with publications ethics transgressions and related punitive action can be lowered with these strengthened procedures. More clarity was brought to the process that enables editors who bring cases to the attention of the vice president, publications to appeal the vice president’s decisions to the full Publications Committee. As stated in the revision, “The goal of punitive action shall be to preserve the integrity of SEG publications and prevent further unethical behavior through example as well as through prohibition.”

The SEG Publications Committee also gained Board approval for an update to the Society’s preprint policy, thereby enabling SEG to accelerate the pace of innovation in applied geophysics and other sciences. By ceasing to regard preprint posting as prior publication that would eliminate work from publication consideration, the Society removed a publication barrier for authors who find it essential to disseminate their initial research reports on preprint servers. While relaxing rules for preprint posting, SEG has declared no endorsement of any preprint, protecting its reputation for high-quality knowledge transfer advanced through peer review.

Intellectual property rights concerns associated with SEG publication of work originating as openly licensed preprints have been evaluated, and the policy mitigates those by requiring that authors retain copyright and the ability to transfer it with any preprint posting of material submitted for SEG publication.

Highlights from 2021 activities and improvements to Policies and Procedures include the following.

- Editorial leadership changes
  - A Board-approved change was made in the *GEOPHYSICS* editorial leadership structure to ensure more continuities and ease of responsibility and to allow faster succession. At the start of the 2021 *GEOPHYSICS* editorial cycle (1 August), the senior *GEOPHYSICS* Editorial Board moved into a new three-person structure of senior assistant editor to editor-in-chief (EIC) to past editor, with individuals progressing by spending one year in each position. With that said, John Etgen has taken the role of *GEOPHYSICS* EIC, Arthur Cheng has taken the role of senior assistant editor, and Jeffrey Shragge will have a double role as the past editor and as vice president, publications after being elected in 2021. Based on the developed editorial team selection criteria and feedback, Etgen invited three new assistant editors including Mrinal Sen, Sergio Chávez-Pérez, and Yang Liu, all of which accepted.
  - Changes in the *Interpretation* Editorial Board included Balazs Nemeth and Kurt Marfurt transitioning out of the EIC and deputy editor roles, respectively. Vsevelod (Seva) Egorov began serving in August as

## REPORTS OF SEG BOARD MEMBERS

- EIC, and Brad Wallet began as deputy editor. Both are three-year terms. Vikram Jayaram and Sumit Verma were added to the *Interpretation* Editorial Board as associate editors. Hongliu Zeng left the board after many years of service and was commended by Nemeth for his dedication to the journal.
- *The Leading Edge* Editorial Board will continue to be led by Yongyi Li for one more year. New editorial board members include Neils Grobbe (University of Hawaii) and Heather Bedle (University of Oklahoma).
  - Publications achievements
    - GEOPHYSICS received its highest Journal Impact Factor to date at 2.928, *The Leading Edge* achieved a record CiteScore of 3.7, and *Interpretation* reached 1378 total citations and growing — an increase of 25.7% from last year. Latest results affirm the relevance, timeliness, and impact of published articles, as well as the value journals provide to research communities. Visit the SEG Library to view current metrics for the journals.
    - Seismic Soundoff had the best first quarter in its history, with a total of 7845 downloads and 14,069 downloads in the first half of 2021. January and February set records for the most downloads to date in one month. The podcast also secured sponsorship for all of 2021, split between TGS and CGG. The podcast is listened to daily and receives downloads from more than 50 countries monthly.
  - SEG is now offering companies the opportunity to reach target audiences with branded podcast episodes — Seismic Soundoff Marketplace. Companies determine interviewees and subject coverage, and SEG provides resources to develop episodes and distribute them through its network.
  - SEG published two books in 2021 including *Understanding Amplitudes: Basic Seismic Analysis for Rock Properties* by Michael Buriannyk and *Land Seismic Case Studies for Near-Surface Modeling and Subsurface Structural Imaging* by Öz Yilmaz. Serguei Goussev's *Gravity and Magnetic Encyclopedic Dictionary* is nearing completion, and several other manuscripts are in development (topics include machine learning, seismic attributes, and forensic data processing).
  - The Online Publications team began work with Atypon Systems to add the Microsoft Field of Study taxonomy and autotagging services to content in the SEG Library.
  - The Reviews Committee continues to contribute two reviews to each issue of *The Leading Edge*. More than 15 are awaiting publication.
  - On the Technical Standard Committee's initiative, SEG entered into an MOU with The Open Group OSDU Forum, under which committee members will participate in a workgroup that is developing recommendations for seismic-data management on the OSDU platform and elsewhere in the cloud.
  - The Translations Committee continues its quality and consistency review of the Spanish-translated terms from Sheriff's *Encyclopedic Dictionary* in the SEG Wiki. *Digital Imaging and Deconvolution* has been added to the SEG Wiki.

### ANNUAL MEETING AND STRATEGIC REGIONAL EXPANSION

In January 2021, SEG President Maurice Nessim introduced the six Strategic Pillars to guide our Society in how it engages stakeholders to power applied geophysics in pursuit of solutions to many of the world's greatest challenges. These pillars are innovation, digitalization, preservation, collaboration, representation, and contribution. SEG's Strategic Pillars incorporate, build on, and give focus to elements of the Society's strategy adopted by the SEG Board last year. These include expanding global presence, diversifying knowledge-exchange channels, increasing diversity in applications of geophysics, and engaging early-career professionals.

Focusing on the collaboration pillar, one of the avenues for global collaboration is to build mutually beneficial relationships with regional stakeholders, sister societies, and SEG members through strategic regional expansion of our annual meeting, the primary annual event to share knowledge and innovations for applied geophysics. The expansion concept also is aligned with the digitalization, representation, contribution, and innovation pillars. I served as a chair for the Regional Annual Meeting Expansion Task Force.

SEG's annual meeting is designed to bring together members from around the globe to discuss common threads of geophysics, among numerous disciplines, through an annual event that also recognizes the top leaders and innovators in

## REPORTS OF SEG BOARD MEMBERS

geophysics. This is accomplished through business-to-business forums, technical education, and networking through individual meetings with a goal of fostering business-development opportunities for all members and stakeholders of SEG.

In 2020, SEG's flagship event was threatened by the pandemic trends that suggested we could expect restricted international travel and reduced attendance at large international events, limiting SEG's ability to serve its global communities, particularly in the Middle East, Asia, and Latin America regions. The pandemic lessons and SEG's strategic move toward global expansion and diversification were the seeds for considering the SEG annual meeting regional expansion model.

Goals for a regional expansion model include:

- Produce a successful and profitable SEG annual meeting while expanding SEG's global reach.
- Implement new technology options for exhibition-floor management and onsite/virtual registration to improve efficiencies and reduce expenses.

- Engage and work with relevant SEG regional offices and Regional Advisory Committees to meet goals and objectives of expansion in areas including China, Kuala Lumpur, the Middle East, and Latin America.

- Grow SEG membership globally.
- Grow the SEG brand globally. Partner with local and sister societies such as the American Association of Petroleum Geologists (AAPG), Society of Petroleum Engineers (SPE), and European Association of Geoscientists and Engineers.

- Create opportunities for new business development globally through close collaboration with major corporate stakeholders.

- Connect the world of applied geophysics (not just a tag line).

- Leverage current pandemic crisis shift to virtual meetings to expand this concept for the SEG annual meeting.

- Possible expansion models include (1) a concurrent (with a North American annual meeting) and hybrid delivery

(both virtual and in person) as well as a (2) separate regional annual meeting (not concurrent with a North American annual meeting). Feedback from regional markets suggests that SEG regional events must have an in-person component. However, all virtual events would have a lower entry cost and could be hosted concurrently with SEG's traditional North American in-person event if logistics do not provide a challenge.

Following the May 2021 decision to hold the joint SEG–AAPG annual meeting (IMAGE '21), the Regional Annual Meeting Task Force concluded its activities and provided a recommendation to SEG to continue to build the parallel (or independent) regional annual meeting expansion concepts with partners (SEG/AAPG/SPE/others) and leverage the Joint Annual Meeting and Joint Events Team. ■■■

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**CHAIR OF THE COUNCIL**

GUSTAVO CARSTENS

The pandemic affected all of us in a drastic way by altering habits, work conditions, and normal life. However, it also was the trigger for alternatives, new ideas, and other ways to conduct business. At SEG, we were (and still are) facing the same situation, and all of the volunteers and staff made every possible effort to keep the Society healthy.

During this last year, the Council met four times. Three of the meetings were virtual. The fourth, at IMAGE '21 in Denver, was hybrid, with some participants in the room at the convention center and many others attending remotely via Zoom.

The first meeting took place on 19 January. Bylaws changes were presented for approval. They related to the relocation of the SEG headquarters from Tulsa to Houston and a modification of Article XIV to align the Bylaws with the laws of the State of Oklahoma. The modifications were not approved at the time. We also opened the nomination

period for the election of the new chair of the Council.

The second meeting was held on 7 April. The two items not approved in the previous meeting were presented again with modifications and more support in the recommendations. An amendment was presented to separate both proposals for voting purposes. It was accepted, and the motion to move the headquarters to Houston was approved. However, the modification of Article XIV failed.

At the next meeting on 30 June, the Annual Report was approved. There was also a report from the Council Procedures Task Force, which is working on the update of the Council sections of the Policies and Procedures Manual. This entailed intensive discussions, several suggestions, and more work for the task force to present a final document during the next meeting. The election period for the new chair still was open, and there was a suggestion for the current chair to participate.

The final meeting of the period was held on 26 September during IMAGE '21. After reports from the SEG president and chair of the Council, the modification of Article XIV was presented again to the Council. This time, a lawyer shared all of the legal aspects involved and, after some discussion, the modification was approved. The final version of the Council sections of the Policies and Procedures Manual also was presented by the leader of the task

force. There were brief discussions on some minor aspects, and the document was approved. Finally, the outgoing chair introduced the incoming chair, Allen Bertagne, who will be running the Council for the next three years.

This is the end of my period as chair of the Council, and I want to thank everybody for their support during this time. Council members have been very active and involved in all activities, contributing to a fructiferous period.

I would like to share special gratitude to the SEG staff. Without their daily commitment and hard work, it will be impossible to accomplish our goals. Many thanks to all of them. 🙏

## REPORTS OF SEG BOARD MEMBERS

**DIRECTOR AT LARGE**

MARIA ANGELA CAPELLO

I am stepping down from the SEG Board of Directors following IMAGE '21. I have served SEG as director at large for three years. I have had the privilege of serving our membership during one of the most problematic and unusual periods of our profession. This included the pandemic, downward turn of the global economy, massive layoffs, accelerated energy-transition framework, and changes in the outlook of professional societies that triggered an analysis of our own future and sustainability.

I would like to express my appreciation for the level of compromise, commitment, and collaboration I enjoyed from my peers. This includes individual SEG members, staff, and executive directors along with individuals I served alongside on the Board and committees. I also thank the presidents I worked with during this time including Nancy House, Rob Stewart, Rick Miller, Maurice Nessim, and Anna Shaughnessy. They are all models of leadership in their own style.

This was a year of accomplishments for every committee for which I served as Board liaison. I would like to highlight that the Membership Committee engaged in a profound analysis of the gaps in membership. SEG saw a decrease in membership this year of roughly 10% (from 15,484 in

2020 to 13,574 as of 7 September 2021), although in financial terms, the revenues from membership dues were higher than expected. The issue of a declining membership remains a worrisome aspect of our Society that has triggered actions from the Board.

The Women's Network Committee (WNC) developed numerous activities and continued to shine light on opportunities and gaps for women in geophysics and geosciences across the globe. They did this by giving women a podium to share their knowledge through free and open public monthly webinars, with an average of 300 registrants. For the first time, WNC established Student Communities, with more than 50 student leaders from more than 15 countries. They had a very active and inspirational presence on social media, with monthly sessions hosted by leaders of academia and different sectors of applied geophysics. A panel was organized to celebrate 8 March, the International Women's Day. At IMAGE '21, a screening of the documentary "Picture a Scientist" was organized in conjunction with the American Association of Petroleum Geologists. It highlighted the gaps still present for women working in science research. WNC increased its newsletter subscribers by 300% to more than 3000. With a very active presence on LinkedIn, Twitter, Facebook, YouTube, and Instagram, WNC has a community of followers that exceeds 4500 individuals. WNC is a role model committee for the empowerment of underrepresented groups of any kind in professional societies.

This also was a successful year for the Development and Production Committee. At the 2020 SEG Annual Meeting, the committee organized a postconvention workshop titled "4D under complex overburden: Are we there yet?" Ali Tura

served as Distinguished Lecturer for the third and fourth quarters by presenting "Recent advances in seismic reservoir characterization and monitoring." Additionally, David Johnston taught the course, "Practical applications of time-lapse seismic data" in October 2021. The committee is in the process of reviewing how to further increase the value it provides to SEG members interested in these topics.

The Oil and Gas Reserves Committee advanced this year, expanding its membership and reformulating its activities to a greater scope, visibility, and outreach. Its primary activity was actively participating in the inclusion of geophysics in the renewed *Guidelines for Application of the Petroleum Resources Management System* (PRMS-AG). The new version is expected in mid-2022. In particular, they proposed a revision of chapter 3 of the PRMS, "Seismic applications," among other chapters. The committee presented two papers at IMAGE '21 about the role of geophysics and the committee in the management of reserves/resources and its relation to sustainability. They are now engaged in formulating workshops, webinars, and additional collaboration workflows.

This also was the year of launching the Sustainability Committee, which I chair. We developed our roadmap, with a membership that represents all regions of the world. The first activities were two webinars and a roundtable to raise awareness about how sustainability can and should be ingrained in all segments, applications, and goals of geophysics. I am proud of the endorsement given by the Board of Directors and chairs of other committees, because this signifies a deep compromise of geophysicists with noble goals inherent to long-term preservation of the environment while developing society

## REPORTS OF SEG BOARD MEMBERS

and humanity standards of life following the 17 Sustainable Development Goals.

In this period, I also led the initiative known as “Members in Transition” for SEG. The program is intended to support our members who are out in the workforce, recently graduated, and searching for their first job. It also supports those experiencing a change of jobs, layoff, retirement, entrepreneurship, or other transitional loops.

The year saw the exponential expansion of the utilization of the Geophysical Sustainability Atlas. The atlas was published in *The Leading Edge* in January

2021 and endorsed by SEG as an open-access publication. It is used by many organizations to promote the pivotal role geophysicists have in advancing each of the Sustainable Development Goals. The mapping exercise of matching the geophysical techniques to each of the goals that I led alongside of Anna Shaughnessy and Emer Caslin has created a platform of understanding, collaboration, and inspiration for geophysicists. I constantly receive enthusiastic feedback about how this approach changed or revitalized their own look at opportunities for contributions to the society at large and all industrial sectors. It has been for many an eye-opener and

motivation to do more in terms of sustainability and comprehension of the ultimate purpose of the profession.

My three years as director at large have been wonderful, motivating, passionate, inspirational, and undeniably busy. My passion for volunteering has grown, my network in the geophysics realm grew even more, and I will miss having an active leadership role in my cherished SEG. I am beginning a new journey as director of the SEG Foundation, and I am sure and remain hopeful that I will keep working with many of you in this new capacity. Thanks to each one of you! 🙏

## REPORTS OF SEG BOARD MEMBERS

**DIRECTOR AT LARGE**

SHERIF HANAFY

I started my second year as a director at large in September 2021. This is my first time to join the SEG Board of Directors, and it has been a great experience. Before joining the Board, I served as a member of several SEG committees such as the Distinguished Lecturer, Continuing Education, and Research committees. However, the experience on the Board is richer and different in many ways.

SEG is a global organization and has members from all over the world. Hence, it is crucial to have representatives from different geographical regions on the Board. I am honored to be one of the representatives and to transfer the voice of the members from the Middle East and North Africa to the Board.

I am working as a faculty member at a university located in Saudi Arabia and am the coordinator of the accreditation committee at that university. Part of my duties for the committee is to seek accreditation for the geophysics and geology programs in international accreditation associations such as ABET. I found that the geophysics

program does not have program criteria in ABET while the geology program does. Consequences to the absence of program criteria are that (1) universities seeking accreditation need to go through extra steps to gain acceptance of evaluation before starting the actual process and (2) there is a decrease in the quality of the program in some universities. Hence, I contacted ABET to discuss how SEG can help set up geophysical program criteria. This would save time for universities around the world seeking ABET accreditation and standardize the geophysical program among different universities.

The pandemic changed many things in our world including the implementation of travel restrictions, which increases the dependence on online education, conferences, and workshops. SEG, as well as other societies, faced hard times due to these changes. Some societies decided to merge, which will make them stronger in facing such problems. We are still looking at our options and which way we should go for the benefit of SEG and our members. I am working with the Board to reach an optimum choice. Although I am not a member of the task force studying the choices, I am discussing the topic with geoscientists in my region to transfer their point of view to the task-force team.

I am looking forward to another two years on the Board to serve the SEG members and provide as much help as I can to navigate SEG to safety in these challenging times. ■■■■

## REPORTS OF SEG BOARD MEMBERS

**DIRECTOR AT LARGE**

BRANDY HAWKINS

During my first term as director at large, I was the Board liaison for several committees including the Emerging Professionals International Committee, Committee on University and Student Programs, Field Camps Committee, Scholarships Committee, and Travel Grants Committee. I participated as a member of the SEG Foundation Audit Committee, Denver Annual Meeting Task Force, and Carbon Solutions Task Force.

It is an incredible time to be a part of supporting SEG and its members by being on the Board. This year, we navigated continued pandemic protocols while looking toward the future of what best meets the needs of our Society. All of the committees I worked with focused to maintain the quality of SEG programs and implement new ideas during the challenging year.

The Emerging Professionals International Committee has focused on retention and engagement of early-career professionals since 2014. In 2021, aside from focusing on regional networking events, the committee established an Instagram channel (@seg\_epic) and appointed a social manager to create new networking opportunities for emerging professionals. The specific goals of the channel are to engage with the SEG community, promote SEG events, and share insights about the activities

of early-career volunteers. Chair of the committee, Aurelian Roeser, worked on new ways to engage with early-career professionals.

The Committee on University and Student Programs is one of our most active committees and is focused on continuing to build better connections with student chapters. Early in the year, the first virtual meeting was held between student chapters and committee members. A student chapter Slack channel for each district was created to expedite communication. The committee also gathered the opinions of its members to determine the type of content for future student webinars/meetings and confirmed their commitment for 2022.

The Field Camps Committee saw applications for funding decrease by 11% in 2021 compared to 2020. Out of the 32 applications received, 16 were awarded. A total of US\$88,165 was awarded out of the \$303,084 requested. The committee worked closely with the Health, Safety, Security, and Environment Committee during the pandemic to ensure necessary safety resources and protocols were in place for all field camp awardees.

During 2021, the Scholarships Committee managed the application process for the 2021–2022 academic year. The committee evaluated 330 applications and granted 89 student scholarships, totaling \$386,974. Committee members also are serving as advisors to each of the recipients for the 2021–2022 academic year, helping them learn more about career opportunities in geophysics and connecting them with valuable resources to enhance their education and prepare for their careers.

The Travel Grants Committee saw many changes during 2021. The award process and delivery versus years prior was impacted due to the pandemic. The

Student Leadership Symposium was conducted virtually, with 53 participants awarded out of 60 applicants. The Technical Program Travel Grant was given to all 31 applicants, which provided registration to the annual meeting. The SEG/ExxonMobil Student Education program came to an end after many years of student and industry participation. The legacy and opportunity brought to hundreds of students will ripple well beyond the conclusion of this program.

Being a part of the Denver Annual Meeting Task Force was a unique experience because this was the first hybrid (virtual and in-person) annual meeting that SEG ever held. The task force was able to use the experience of the previous year as a completely virtual event to help plan the integration of a hybrid experience. During our planning, the International Meeting for Applied Geoscience and Energy (IMAGE) was created — a collaborative event between SEG and the American Association of Petroleum Geologists. This new annual meeting represents the amazing opportunity to combine technical programs between the two societies to deliver great content to the geoscience community. This was a tremendous task that will continue to be refined moving forward that I am confident will show great reward.

In summary, I have seen the dedication of so many people to the success and future of SEG. Our Society is evolving as the world around us shifts and the needs of our members change. I am proud to be a part of this great Society and intend to remain committed to our future. Thank you for trusting me to support you. I look forward to receiving any feedback or ideas that you may have. ■■■

## REPORTS OF SEG BOARD MEMBERS

**DIRECTOR AT LARGE**

DAVID E. LUMLEY

In 2021, I completed my third and final year as director at large on the SEG Board of Directors. Prior to this term, I served as first vice president on the 2008–2009 Executive Committee. The committee created the current Board of Directors format of governance and established formal collaboration with the American Geophysical Union (AGU). In that first term, we had to manage the global financial crisis that hit us hard in September 2008. I was hoping that my second term on the Board would be much smoother sailing, but in March 2020 we were hit with the global pandemic and economic crisis.

It has been an honor to contribute my business and financial experience (earned as a senior project manager in a US\$200 billion corporation and as a founder and CEO of a geophysical technology company) to help stabilize and manage SEG's finances in order to navigate through both crises. In 2020–2021, I worked with President Maurice Nessim, Past President Rick Miller, fellow colleagues on the Board, various task force members, the Finance Committee, Executive Director Jim White, and senior staff. Together we managed to avert a major financial disaster by quickly converting the 2020 Annual Meeting to a virtual event and IMAGE '21 to a hybrid event. Although there were lessons learned and room for improvement, I

think everyone involved did an amazing job to pull this off successfully. I am a firm believer in the 80-20 rule, and by this measure our collective efforts were a huge success. We are never going back to the way things were before the pandemic.

Unfortunately in 2020, as part of the financial actions required to survive, SEG had to implement a reduction in payroll, which led to the loss of several long-term and loyal staff members who will be sadly missed going forward. We thank them for their service. However, we are by no means out of the rapids. The year 2022 may be shaping up to be an even more challenging financial year than 2020 or 2021. With new President Anna Shaughnessy, the SEG Board is working hard and fast to reposition SEG with a more stable business model, especially to reduce our financial dependence on the net revenues of a single large annual meeting that can be at risk of sudden cancellation at any time. This includes considering new collaborations and partnerships with sister societies and refocusing SEG's mission and vision of applied geophysics. It is my time to step down from the Board, but I will make myself available for advice and brainstorming should the 2022 Board wish to seek additional perspectives.

Many of us see an additional challenge and major threat looming over the Society. SEG is arguably the world's premier nonprofit scientific organization representing applied geophysics. SEG always has drawn the majority of its membership and funding sources from the petroleum-energy industry, with additional smaller but equally important and increasing representation from minerals, groundwater, environmental, geotechnical engineering, and other applied-geophysics sectors. Many of us

see that the petroleum industry is undergoing fundamental structural changes and may have entered a gradual but irreversible decline curve.

Although the energy industry always will be at the forefront of cutting-edge applied geophysics, especially to meet Net Zero 2050 clean-energy challenges, the opportunities for future employment and funding may continue to decrease in the petroleum sector. The challenge for SEG will be whether to meet these fundamental changes by (1) reducing and refocusing its programs and activities in proportion to declining petroleum-industry membership and funding, (2) partnering more closely or merging with other professional societies to maintain critical mass, or (3) growing its membership by expanding in more diverse areas of applied geophysics such as clean energy, environment, water, agriculture, urban infrastructure, climate-change mitigation, etc. It is in this context that I decided to run for the Board in 2018 to see if I could help pivot SEG to new directions while simultaneously preserving our core expertise in applied geophysics for sustainable natural resources. You can read my views on this in the February 2019, March 2020, and March 2021 issues of *The Leading Edge*. Also, listen to my March 2020 Seismic Soundoff episode on geophysics and sustainability and June 2021 episode on addressing grand challenges with geophysics.

In addition to my strategic objectives as director at large outlined earlier, I also served as the Board liaison for several SEG entities including the Geoscientists *without* Borders® (GWB) Committee; AGU-SEG Collaboration Committee, which I helped establish with John Bradford a decade ago; Distinguished Lecturer (DL) Committee; Distinguished Instructor

## REPORTS OF SEG BOARD MEMBERS

(DISC) Committee; Continuing Education (CE) Committee; EVOLVE exploration training program; and Emerging Professionals International Committee (EPIC). These committees represent some of the best ongoing and new flagship programs for SEG.

GWB is SEG's highest-profile and most successful outreach program. Started more than a decade ago by Schlumberger and Craig Beasley after the deadly 2004 Indian Ocean earthquake and tsunami, it is focused on humanitarian geophysics. GWB funds numerous projects every year around the world to use applied geophysics to help less-fortunate people find water, assess geohazards and other humanitarian applications, and donate geophysical equipment to local communities and train them in their use. Cengiz Esmersoy, the new GWB chair, recently led a strategic task force to plan the next 5–10 years for GWB. I was happy to work with Esmersoy and the GWB Task Force in an advisory capacity.

The AGU-SEG Collaboration Committee was formed more than a decade ago via a formal Memorandum of Understanding between AGU (fundamental geophysics) and SEG (applied geophysics) to cooperate more closely. This committee has been very productive and typically hosts a major integrated workshop each year, plus several other initiatives. The next major AGU-SEG research workshops will be on the topics of near-surface full-waveform inversion and geophysics in convergent margins. Both combine the best in SEG imaging and inversion methods with the best in AGU near-surface critical zone, plate tectonics, and earthquake seismology.

The DL and DISC are two of our brightest flagship programs. Because of their

similar but different objectives, I recommended and they agreed to meet regularly to more closely coordinate processes and lessons learned regarding nominations, travel, programs, funding, etc. Both programs have experienced significant decreases in funding provided by the petroleum sector. These committees are working well to adapt to their new conditions, especially by converting to fully virtual lecturer and instructor tours, with larger attendee numbers than ever. I was happy to assist in developing new delivery methods and funding opportunities for them.

The CE Committee continues to be essential to our membership. Geophysicists often state that SEG's professional-education courses and workshops are among the highest-value benefits of being an SEG member. As a university professor, I am very aware that there are dramatic changes going on today in the way people want educational courses to be marketed and delivered, and this is no different for SEG members. I was happy to assist in updating SEG's educational courses, programs, and online delivery methods.

Mike Forrest and Allen Bertagne enthusiastically lead the EVOLVE Program. It would take a full paragraph to expand the EVOLVE acronym. Instead, I can simply say that its main purpose is to provide emerging professionals (EPs) and students with hands-on boot camps to learn oil-and-gas exploration techniques using real seismic, log, core, production, and other data types. This program originally started a few years ago with Forrest's vision to improve the practical training of exploration geophysics students so they could better hit the ground running when hired by oil and gas companies. A new spinoff version, EVOLVE PRO, aspires to replace the in-house training programs

that most companies once provided to new hires but can no longer afford to do alone. I am happy to continue to offer advice to Forrest and Bertagne (although they certainly don't need it) on how to turn their idea into a self-funded revenue-generating business, which in turn will help fund the more charitable student-program aspects of EVOLVE.

Last, but not least, EPIC represents SEG's EPs (less than 10 years of professional experience in applied geophysics). EPIC is doing a great job of attracting and retaining SEG EPs, including expanding professional networks, contacts, programs, and activities customized for SEG members. I worked closely with EPIC, the Committee on Nominations, and others to help EPs establish greater presence and opportunities for contribution at the SEG committee and Board levels. EPs are the future of SEG, and if we can harness their youth and energy, the future will remain very bright indeed. ■■■

## REPORTS OF SEG BOARD MEMBERS

**DIRECTOR AT LARGE**

KURT J. MARFURT

For most of 2021, I served as the Board liaison of the Mining Committee with Glenn Chubak as chair, Sarah Devriese as vice chair, and Jijia Sun as technical chair. The Mining Committee holds a Biannual Mining Summit during the SEG annual meeting. IMAGE '21 was hybrid due to pandemic and travel restrictions. This led to a relatively smaller number of participants appearing in person.

With the shift to renewables, the mining industry is heating up. There are significant increases in consumption forecasted for copper, nickel, cobalt, lithium, and rare earth elements. For this reason, the geophysical mining community is more optimistic about the future than their colleagues in the hydrocarbon community. Even with this optimism, the financial contribution of the mining industry to SEG is relatively small. There is significant concern that the economic pressures could force SEG to “double down” on hydrocarbons to the detriment of mining. I am happy to report that representatives of the mining community are fully engaged with Ken Tubman’s Strategic Options Task Force, evaluating options for a restructured SEG organization.

The hybrid format of IMAGE '21 was a topic of discussion in the Mining Committee. Members missed catching

up in person with their colleagues and even more so with the students who see the growing mining sector as their career goal. However, an equal number see distinct advantages of hybrid/virtual meetings. This includes reduced travel time, reduced expenses, increased participation from those with hassles obtaining visas, and the ability to cover more than one important meeting a year. They also mention joy in seeing former mentors, professors, and other members join who normally would not attend but want to keep up with the latest advances. To me, the high point of IMAGE '21 was a special session on the Business of Mining Geophysics organized by Ana Curcio, Paul Cunningham, and Sergio Chávez-Pérez. The session provided insight into the demands and potential of our profession as our society moves away from hydrocarbons toward renewables. As of September, mining geophysicist Ana Curcio has replaced me as the Board liaison of the committee.

The SEG Europe Regional Advisory Committee is very active, meeting regularly each month. Unlike many of us, they long ago mastered holding committee meetings, workshops, and webinars over Zoom and other portals. Chaired for most of 2021 by Aurelian Roeser, they constructed tutorial videos and held multiple well-attended workshops and webinars on topics including carbon capture and storage, net-zero emissions, machine learning, and digitalization. In November 2021, they joined forces with the Eurasia Regional Advisory Committee to hold the 5<sup>th</sup> SEG Virtual Student Conference. Given the contraction of geoscience departments across North America, I think we would do well to band together and emulate our brothers and sisters in Europe to augment our academic programs.

The EVOLVE Technical Committee, led by Jenny Thompson, has completed its fourth year, with the final candidates for 2022 being formalized by 31 December. Helped heavily by EVOLVE volunteers and Annabella Betancourt, I had the pleasure of reporting on their progress in the September 2021 issue of *The Leading Edge*.

As of September 2021, I am the new liaison for the Passive Seismic Committee chaired by David Diller. The scientific future for passive seismic is bright, with important growth in applications in monitoring the effects of geothermal energy development, lithium saline solution extraction, carbon sequestration and storage, as well as smart cities and urban geoscience. However, almost 90% of the money has come from monitoring the hydraulic fracturing of shale resource plays. The result is a community of geophysicists that is problem rich and resource poor, struggling to deal with the shrinking investment in the extraction of hydrocarbons.

I am also the new liaison for the Continuing Education Committee chaired by John Fernando. SEG can field about 40 different classes on topics including near-surface geophysics, electromagnetics, seismic acquisition and processing, etc. However, enrollment has declined with the switch from in person to virtual format. Several changes have been undertaken to address Zoom fatigue. The initial change was to offer the typical two 8-hour day course as four 4-hour sessions. Most, if not all, of future courses also will break the week up into four 4-hour sessions held Monday, Tuesday, Thursday, and Friday. Distance learning has its advantages and disadvantages. Obviously, the travel costs are eliminated. Travel time also is eliminated, with many

## REPORTS OF SEG BOARD MEMBERS

participants able to further piece their work commitments around the times of a virtual course.

This decrease in cost and time is reflected in an increase in contracts (company-specific) from six in 2019 to nine in 2021. Courses offered since September 2020 have been recorded, allowing them to be offered on-demand. The offering provided disappointing subscriptions in 2020, though recently they appear to be catching on. The advantage of an on-demand course is that a more experienced geoscientist can step out of portions they have mastered or will not use and focus on course components that are more fit to their needs.

The lack of interaction between the instructor and participants is the biggest disadvantage. When taught internationally, internet constraints and/or participants' desire for privacy often result in the instructor presenting to black rectangles with names in them. Unless the instructor knows one or more participants they can call on, the interaction is impacted. Several instructors have experimented with courses that are more hands-on. Whereas a traditional course may have exercises that involve coloring in seismic horizons or hand contouring a map, access via the required PC to Zoom or Teams provides access to simple computer software, such as Excel or Python

that can be used in exercises. I expect these kinds of hands-on courses to grow in the future, but it will require a great deal of effort and creativity on the part of the instructor.

Finally, I am the new liaison for the Gravity and Magnetism Committee, chaired by Marianne Rauch. The committee organized technical sessions, a luncheon, and two day-long workshops at IMAGE '21. They also contribute the regular Meter Reader column to *The Leading Edge* on potential fields. As drone technology has advanced, magnetism and electromagnetics have become more commonly used by the near-surface geophysics community, both within SEG and sister societies. The committee also provides workshops for students and interacts regularly with colleagues at the American Geophysical Union. ■■■

## REPORTS OF SEG BOARD MEMBERS

**DIRECTOR AT LARGE**

TAD SMITH

This past year saw life return to some semblance of normal, although I suspect we all realize that the new normal is quite a bit different than the old normal. For me, the SEG activity that best symbolizes the new normal was IMAGE '21 in Denver. Joining forces with the American Association of Petroleum Geologists (AAPG) and offering a hybrid in-person/virtual meeting was truly unprecedented, and it took an immense amount of effort to pull it off. A physical injury prevented me from being there, but I heard it was a great success. Although I was not on any of the organizing committees, I saw how hard the army of staff and volunteers worked to make this happen. It truly was a remarkable undertaking, and they all deserve our deepest respect and gratitude. I have no doubt that hybrid meetings and virtual presentations are here to stay, and that this will be the new normal.

One aspect of SEG life that does not change is the annual selection of candidates for office. In October 2020, I assumed responsibility as chair of the SEG Committee on Nominations. This committee is responsible for selecting the future leaders of SEG, so it is something every member of the committee

takes very seriously. From October to February 2021, we met every other week (at minimum) to identify a top-tier slate of candidates for the 2021 Board election. In February, I was proud to present to President Maurice Nessim a slate of candidates that I think represents the best of the SEG membership. The election results were announced in early August 2021, and the new Board members are now digging in and working hard for the continued success of SEG.

The year 2021 also saw my continued engagement as the Board liaison for the Near-Surface Geophysics Technical Section (NSTS) and the Honorary Lecture and Distinguished Lecture series (HL/DL). At the annual meeting in late September, I transitioned these responsibilities to two new Board members. NSTS continues to be a growth engine for SEG, and the HL/DL committees continue to find outstanding speakers that represent the best of our global and technical diversity.

In summary, 2021 has been another challenging year, but life is slowly returning to a new normal. We have some big issues on our plate at the time of this writing, but I can assure you that the Board is working hard and diligently to address these challenges and ensure the continued success and growth of SEG far into the future. As always, I encourage you to contact me or any of my fellow Board members if you have any questions or issues you would like to discuss. ■■■■

# REPORTS OF COMMITTEES



## REPORTS OF COMMITTEES

**ADVISORY**

ROB STEWART, CHAIR  
MAURICE NESSIM, PRESIDENT

The mandate of the Advisory Committee is to provide counsel and review to the SEG Board on items of its own initiative as well as those submitted to it by the Board. The committee can also act as an ombudsman for members to the Board. This committee is comprised of the past five SEG presidents (Rick Miller, Rob Stewart, Nancy House, Bill Abriel, and John Bradford). It is called upon to provide experience and historical perspective to concerns or crises that may arise during a presidential term. It also serves as a forum for the president while providing perspective, discussion, and advice.

In 2021, the committee members met over a number of matters of consideration. As with many associations, the ongoing pandemic has presented challenges for the SEG membership and meetings. This has been an aspect of continuing impact, and SEG has tried to mitigate the effects in a variety of ways. We are witnessing a changing energy environment and industry, with current reduced employment and support. As a result, we are highlighting the possibility of mergers or consolidation in our related associations. The ramifications for SEG have been active topics along with our responses and initiatives.

SEG has a distinguished history of geophysical contributions over the last 91 years. SEG also has relationships with societies such as the American Association of Petroleum Geologists, European Association of Geoscientists and Engineers, American Geophysical Union, and the Environmental and Engineering Geophysical Society.

Exploring various levels of collaboration or linkage is an important and ongoing subject. The view of our profession's future is undergoing continuous consideration and is reflected in the establishment of task forces to envision possible directions for the Society. These matters have been key components of the Advisory Committee and Board-related discussions. ■■■

**AGU-SEG COLLABORATION**

DALE BIRD, SEG COCHAIR

The AGU-SEG Collaboration Committee (ASCC) was established as part of an alliance MOU executed by the two societies in 2010. ASCC was “charged with considering and making recommendations to the respective organizations regarding areas of cooperation, such as joint workshops or programs and continuing education courses.”

AGU and SEG provide complementary support for geophysical sciences, with SEG focusing on methodology development in applied geophysics and AGU primarily supporting geophysics as applied to broader scientific questions. ASCC identified the following areas of overlap between the two communities: active and passive seismology, gravity and magnetics, electrical and electromagnetic methods, near-surface geophysics, geothermal exploration, and basin analysis.

ASCC meets four times per year, of which two meetings are usually in person at the major annual meetings of each organization.

**COMMITTEE MEMBERS**

- Dale Bird, SEG cochair  
Bird Geophysical and University of Houston
- Kisa Mwakanyamale, AGU cochair  
Illinois State Geological Survey
- Jonathan Ajo-Franklin  
Rice University
- José Arce  
Arce Geofísicos
- Esben Auken  
Aarhus University
- Anne Becel  
Lamont-Doherty Earth Observatory
- Michael Behm  
University of Oklahoma
- Xavier Comas  
Florida Atlantic University
- Kennedy Doro  
University of Toledo
- Victoria Forlini  
American Geophysical Union
- John Goff  
University of Texas
- Felix Herrmann  
Georgia Tech
- Lianjie Huang  
Los Alamos National Laboratory
- Kristina Keating  
Rutgers University at Newark
- Anja Klotzsche  
Forschungszentrum Jülich
- John Lane  
United States Geological Survey
- Joel Le Calvez  
University of Texas
- Yongyi Li  
Shaw
- Yunyue (Elita) Li  
National University of Singapore
- John Louie  
University of Nevada at Las Vegas
- David Lumley  
University of Texas at Dallas
- Alex Martinez  
ExxonMobil

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- Dylan Mikesell  
Boise State University
- Sarah Morton Rupert  
University of Kansas
- Dimitrios Ntarlagiannis  
Rutgers University at Newark
- Louise Pellerin  
Green Geophysics
- Aizebeokhai Ahzegbobor Philips  
Covenant University
- Martha Savage  
Victoria University of Wellington
- Colin Sayers  
University of Houston
- Josh Sellars  
Seequent
- Christopher Sherman  
Lawrence Livermore National  
Laboratory
- Catherine Truffert  
IRIS Instruments
- Georgios Tsoflias  
University of Kansas
- Suzan van der Lee  
Northwestern University
- Laurie Whitesell  
Society of Exploration Geophysicists
- Huang Xingguo  
University of Bergen
- Chi Zhang  
University of Kansas
- Rui Zhang  
University of Louisiana at Lafayette
- Tieyuan Zhu  
Penn State University

SEG support was provided by Staff Liaison Laurie Whitesell and Board Liaison David Lumley. AGU support was provided by Victoria Forlini.

In 2011, an MOU approved by SEG and AGU executives established a framework for joint meetings and collaboration between the two organizations. Joint workshops include the following.

- 2012 — Hydrogeophysics was held 8–11 July 2012 at Boise State University.
- 2013 — Cryosphere Geophysics: Understanding a Changing Climate with Subsurface Imaging was held 6–8 January 2013 at Boise State University.
- 2014 — Advances in Active + Passive Full-wavefield Seismic Imaging: From Reservoirs to Plate Tectonics was held 22–24 July 2014 in Vancouver.
- 2015 — Potential Field and Electromagnetic Methods Applied to Basin Studies was held 25–27 August 2015 in Colorado.
- 2016 — Upper Crust Physics of Rocks was held 11–13 July 2016 in Hawaii.
- 2017 — Hydrogeophysics was held 24–27 July 2017 in California.
- 2018 — Induced Seismicity was canceled prior to initiation of planning due to saturation of the market with respect to the topic.
- 2019 — Airborne Geophysics was held 11–13 June 2019 in Florida.
- 2020 — Advances in Distributed Acoustic Arrays was originally planned for 12–16 July 2020. Due to the pandemic, it was postponed and held as a virtual meeting 8–10 February 2021.
- 2021 — Near-surface Imaging with Full-waveform Inversion: Theory and Applications was held virtually every other Tuesday from 21 September 2021 to 19 October 2021. It was held live 2 November 2021.

- 2022 — Geophysics in Convergent Margins is planned for 12–14 July 2022 at the University of Washington.
- 2023 — Urban Geophysics is currently being planned.

A goal of ASCC is to hold joint sessions at the major annual meetings of each organization. The special session on hydrogeophysics at the SEG annual meeting has been held since 2012. At the AGU Fall Meeting, a joint technical session on exploration geophysics has been held since 2015. The conveners of the session are Kennedy Doro and Lu Anja Stefan.

In 2021, a joint special section on hydrogeophysics, including 12 papers, was published in *GEOPHYSICS*. All members of AGU and SEG have access to the papers. The editors for this special section were Adam Mangel, Andrew Parsekian, Kristina Keating, James Irving, and Philippe Leroy.

Two important collaborations were initiated this year. First, the committee is working toward establishing a Distinguished Lecture that David Lumley will lead. Second, the committee is supporting the National Science Foundation's (NSF) establishment of the Near-Surface Geophysics Center. NSF is planning a 2021 AGU Fall Meeting Town Hall and a 2022 workshop.

Finalization and approval of committee governance and policies and procedures is scheduled for 2022. ■■■

## REPORTS OF COMMITTEES

**ANNUAL MEETING STEERING**

JULIE SHEMETA, SEG GENERAL CHAIR  
SUE JACKSON, SEG VICE CHAIR

A ground-breaking combined geoscience meeting, the International Meeting for Applied Geoscience and Energy (IMAGE), was introduced in 2021. For the first time since the 1950s, SEG joined together with the American Association of Petroleum Geologists (AAPG) and its affiliate the Society for Sedimentary Geology (SEPM) to host the annual meeting as a joint event. Combining resources for the meeting enabled the societies to offer a new and exciting event with an unprecedented range of technical content and learnings.

In 2020, SEG and AAPG annual meetings were completely virtual. In 2021, with continued pandemic concerns, the AAPG and SEG executive boards made the decision to offer the new joint meeting as a hybrid event. SEG and AAPG staff, organizing committees, and volunteer stakeholders were asked to bring their programs together with both in-person and online content.

**HOW IT UNFOLDED**

In early 2021, initial plans for SEG's Annual Meeting Steering Committee focused on mapping different aspects and details of the meeting organization, exploring online platform options, and budgeting for a virtual meeting but planning optimistically for a hybrid event. Efforts were made to consider a parallel meeting in China for 2021, spearheaded by a sub-committee of the Annual Meeting Task Force. The discussions lasted through early 2021. In March, all of that was superseded with the announcement that our annual meeting would be held jointly with AAPG. AAPG's May annual meeting in Denver was rescheduled and replaced by the new IMAGE '21 combined meeting,

to be held during the time booked for the SEG annual meeting at the end of September in Denver. Communications immediately began between AAPG staff and committee chairs and the SEG Annual Meeting Steering Committee. A subgroup from AAPG and SEG meeting committees met twice a week to review meeting schedules and practices, with the goal of compromising or merging similar events when it made sense. Understandably, there were hundreds of joint and parallel decisions to be made in the coming months. Because both societies had separately organized their technical programs, we were not able to merge any technical sessions together. For 2022, a succinct description of roles and responsibilities for SEG's Annual Meeting Task Force and the Annual Meeting Steering Committee would prevent overlapping meetings and confusion over decision-making authority for IMAGE.

In early May, the Joint Events Team (JET) was formed, which included SEG and AAPG meeting staff departments. Roles and responsibilities were clearly defined, and we augmented our individual steering committee monthly meetings with joint team meetings, so leadership from both societies could review progress together and track the many components. In some cases, we were able to combine events such as the opening session and presidents' reception to reduce expenses.

The digital platform provider InEvent was selected after both SEG and AAPG evaluated several providers. InEvent was also the platform for the Unconventional Resources Technology Conference (URTeC) in late July, and the assumption was that we would be able to work out any wrinkles prior to IMAGE '21 in September. That proved to not be the case, and the digital provider's ability to

manage issues during the program was not adequate. The online platform was one of the most challenging aspects of the hybrid event.

With the rise in the Delta variant and international and company-wide travel restrictions, meeting registration numbers remained low in the third quarter. This was despite robust marketing campaigns by both AAPG and SEG and strong local support from the Rocky Mountain Association of Geologists and Denver Geophysical Society. In the two weeks prior to IMAGE '21, registrations dramatically increased to a level that more closely matched predictions, with a total of more than 5100 registrations, split almost evenly for online (2919) and in person (2216) (Table 1). Unfortunately, many planned field trips associated with the event did not draw enough registrations to justify them by the deadline, and ultimately there was just one SEG field trip to Dinosaur Ridge, which was a great success thanks to the efforts of Laura Wray and staff assistance. The golf tournament was held at Arrowhead Golf Course, and due to the valiant fundraising and organizational efforts of the chairs, Mary Sue Purcell and Lynn Peyton, it was a well-organized and well-received event.

The meeting started well, with an excellent opening talk at the opening session by Kirsten Siebach of NASA's Mars program. This was a new meeting feature for SEG attendees. The in-person exhibition hall combined the AAPG and SEG exhibitors and provided opportunities for much needed networking among colleagues. The All-convention Exhibition and Icebreaker Reception was well attended. Exhibitors appreciated the opportunity to visit with clients and potential clients in person and found value in their in-person presence. Exhibitors reported that

## REPORTS OF COMMITTEES

there was little interest generated from the virtual component of their exhibit information. The opening plenary session “The future of oil and gas,” featuring Daniel Yergin and led by AAPG’s meeting chair Steve Sonnenberg, was excellent. However, there were many overlapping panels and topics with AAPG during the rest of the meeting (Table 2). Next year’s meeting will have the advantage of combined planning to avoid this conundrum. Another new event to the SEG attendees was the All-convention Luncheon, featuring a virtual talk by the Smithsonian’s Kirk Johnson. Table 1 summarizes key aspects of IMAGE ’21. Table 2 is a summary of the panels.

For SEG, the technical program had fewer submissions than in 2020. However,

combining with AAPG’s sessions, the technical program represented a broad and robust range of topics, with more than 1200 presentations held in person and virtually. As part of the submission process for the hybrid venue, authors were asked for online/in-person status, along with a permission agreement to broadcast and record. Efforts were made to put virtual talks at the end of combined technical sessions. A flurry of last-minute speakers switching from in-person status to online prior to the meeting created an enormous scheduling challenge for staff and coordinators.

**IMAGE ’21 METRICS**

Ultimately, IMAGE ’21 is viewed as a success as the first-ever joint annual meeting with SEG and AAPG. The AAPG executive

meeting committee was a pleasure to work with and made the organization of the meeting a wonderful experience. Postevent feedback from attendees, speakers, and workshop coordinators is mixed. The strong technical program and featured panel sessions were among the most positive reviews. Technical glitches and the limited capability of the platform detracted from the online experience, including speaker access for some post-convention workshops. Juggling in-person and online speaker order within individual sessions to accommodate last-minute changes represented a new challenge with the hybrid format. Lessons learned include recommendations for closer premeeting coordination with the production provider, session leaders, and staff for hybrid-meeting logistics.

Table 1. Preliminary IMAGE ’21 metrics.

<b>Attendees</b>	5135	2919 online (57%) and 2216 in person (43%) Students: 386 online and 206 in person
<b>Attendee job titles</b>		Profession breakdown: geophysicist, geologist, executive management/manager, consultant, marketing and sales, professor/academic, research and development, young professional, and other
<b>Countries</b>	93	Top 10 in person: United States, Canada, Saudi Arabia, China, United Kingdom, Nigeria, France, Brazil, Colombia, and Australia Top 10 virtual: United States, France, Netherlands, Finland, United Kingdom, Austria, Canada, China, Brazil, and Germany
<b>Exhibitors</b>	144 in person 102 virtual	
<b>Sponsors</b>	43	
<b>SEG abstracts</b>	709	149 technical sessions (75 oral and 74 poster)
<b>AAPG abstracts</b>	662	123 technical sessions (84 oral and 39 poster)
<b>Postconvention workshops</b>	14	
<b>Courses and workshops</b>	5	
<b>Lunch keynote presentations</b>	5	All-convention Luncheon: “Digging Snowmastodon: Discovering an Ice Age world in the Colorado Rockies;” Division of Professional Affairs Luncheon: “Cultivating bravery and redefining expectations;” AAPG Women’s Network and SEG Women’s Network Luncheon: “Picture a Scientist documentary screening and panel discussion;” Division of Environmental Geosciences and Energy Minerals Division Luncheon: “Can critical thinking survive the 21 <sup>st</sup> Century;” and SEG Gravity and Magnetics Luncheon: “Exploring for meteorites in Antarctica”
<b>Panel sessions</b>	23	17 hybrid (live studio) and 6 online
<b>Applied Science Education program speakers</b>	1	“Moon rocks: Apollo’s legacy of lunar exploration” by Carolyn Crow, University of Colorado Boulder
<b>Plenary session keynote</b>	1	“Energy independence” by Daniel Yergin, IHS Markit
<b>Opening session</b>	1	“Exploring Mars with Curiosity and Perseverance” by Kirsten Siebach, Rice University
<b>Featured panel session</b>	1	“The future of oil and gas” with five panelists

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A comprehensive list of learnings was compiled following IMAGE '21 to assist the 2022 committees. IMAGE is a new meeting, and both SEG and AAPG will need to rethink the content to reflect a true combined meeting and not just an AAPG meeting with SEG next door. AAPG's potential merger with the Society of Petroleum Engineers (SPE) will add another level of complexity to IMAGE '22. We also suggest that committee member roles be reviewed carefully and consideration be made to expunge extraneous committee roles.

### IMAGE '21 STEERING COMMITTEE AND STAFF

We are extremely grateful for the dedication and effort of the members of the combined steering committees and the opportunity to work together in breaking new ground to host a combined meeting. As cochairs, our personal opinions are that strong collaboration is imperative. Our collaboration between SEG and AAPG individual committees was stellar and a very positive experience. Our sincerest gratitude goes out to the many volunteers serving on both meeting

committees from both societies. We particularly thank the SEG and AAPG staff members who worked endlessly to juggle the many pieces of this large and complex event. ■■■■

Table 2. IMAGE '21 panels and plenary sessions.

Organization	Initial type	Panel title
SEG	Live studio	The business of geoscience in China's unconventional E&P and smart city applications
SEG	In person	Best of URTeC
AAPG	Live studio	Featured panel: The future of oil and gas
SEG	Live studio	An introduction to DAS: Using fiber optics for geoscience applications
AAPG	Live studio	From petroleum industry to energy industry: Global young professionals' perspectives on a sustainable future
AAPG	Live studio	Exploration of the Santos Basin, Brazil
SEG	Live studio	Government and global energy policies and their impacts on the geophysical aspects of subsurface management
SEG	Live studio	Centennial session: Passing the wisdom of the past to the young minds of the future
AAPG	Live studio	Geothermal energy and technologies for the environment
SEG	Live studio	The business of geophysics in the changing energy marketplace
AAPG	Live studio	New technology and new ways of doing business
AAPG	Live studio	Imaging technologies and the future
AAPG	Live studio	Tribute to Dr. Haun
SEG	Live studio	Business of mining geophysics
SEG	Live studio	Geoscience opportunities beyond oil and gas
AAPG	Live studio	What's new in energy minerals
SEG	Live studio	Perspectives on energy tech entrepreneurship
AAPG	Zoom special	Discoveries and developments in the Black Sea
AAPG/SEG	Zoom special	AAPGWN and SEGWN special session: Resilience: Tapping into our passions in order to persevere
AAPG	Zoom special	Overview of Chinese petroleum basins
AAPG	Zoom special	Energy transition: Oil and gas in the crosshairs
AAPG	Zoom special	AAPGWN special session: Achieving gender, ethnic, and racial equality in professional geoscience organizations
AAPG	Zoom special	Innovative training in a virtual world

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**ANNUAL MEETING TECHNICAL PROGRAM**

BRYCE SWINFORD, CHAIR

In late 2020, the Annual Meeting Technical Program Committee began collaborating and planning for the annual meeting. The success of the committee is due to the tireless effort of the 32 volunteers who served as key contacts, 274 session chairs, and 934 abstract reviewers, along with SEG Board Liaison Rick Miller and SEG Staff Liaisons Terri Duncan and Jenny Cole.

The technical program of IMAGE '21 was the first to appear in a hybrid in-person/virtual format. This presented technical and logistical challenges. However, it was ultimately embraced as the best option to deliver the high-quality depth of programming that the membership of SEG has come to expect. Special consideration was given to the technical program so temporal overlap between AAPG themes and SEG topics was minimized, allowing the members of both societies to fully experience the content.

As in the preceding two years, the 2021 committee chair served as the 2020 committee cochair. This arrangement of continuity is a component of the success of the committee and is recommended to continue as a standard operating procedure.

This year, 974 authors submitted their work for potential inclusion in the technical program. The technical program included 28 general sessions (an increase of two from the year prior), nine special sessions, and 14 postconvention workshops. Sergio Chávez-Pérez again graciously served as the postconvention workshop chair.

General session topics included:

- “Acquisition and survey design” led by Mike Yates
- “Anisotropy” led by Heloise Lynn
- “AVO and seismic inversion” led by Norbert van de Coevering
- “Borehole geophysics” led by Kristoffer Walker and Adam Donald
- “Distributed acoustic sensing” led by Andres Chavarria
- “EM exploration and reservoir surveillance” led by Kris MacLennan
- “Full-waveform inversion” led by Yi Shen and Wenyi Hu
- “Geophysics for the future” led by Ellie Ardakani and Hendratta Ali
- “Gravity and magnetics” led by Chuck Campbell
- “Induced seismicity” led by Timothy Brown
- “Interpretation” led by Bo Zhang
- “Machine learning and data analytics: Theory and special applications” led by Sudipta Sarkar
- “Mining” led by Jiajia Sun
- “Multicomponent seismic” led by Chip Story
- “Multiphysics data integration” led by Lin Liang
- “Near surface” led by Catherine Truffert
- “Passive seismic” led by Mirko van der Baan
- “Reservoir characterization” led by Laurie Weston
- “Rock physics” led by Ronny Hoffmann
- “Seismic modeling” led by Brian Fuller
- “Seismic processing: Multiples, noise, and regularization” led by Zhimei Yan and Fred Melo
- “Seismic processing: Migration” led by Bin Wang
- “Seismic processing: Emerging technologies” led by Mike Varner
- “Seismic theory” led by Gokay Bozkurt
- “Seismic velocity estimation” led by Ettore Biondi
- “Sustainability” led by Maria Angela Capello
- “Time lapse” led by Kurang Mehta
- “Vertical seismic profile” led by Yingping Li

The two new general session topics for 2021, “Geophysicists for the future” and “Sustainability,” acknowledge the shift in focus that our discipline is currently experiencing. Focusing the machine learning and data analytics (MLDA) topic on theory and special applications demonstrates how deeply entrenched the topic has become in the field in a very short time. This focus enabled abstracts demonstrating case studies and applications of MLDA in other topics to be rerouted. This allowed many topics to construct sessions focused

## REPORTS OF COMMITTEES

on utilization of MLDA within the discrete topics.

In total, the technical program included 709 accepted abstracts spread between 75 oral sessions and 74 poster sessions. The forward shift in the technical program start time allowed for additional oral sessions compared to previous years. The overall rejection rate was 27%. The oral session acceptance rate was 43%, and the poster acceptance rate was 30%. Five oral session topics had rejection rates of 60% or greater due to the high number of submissions.

Due to the hybrid format, all presenters were required to submit prerecorded presentations, so the virtual audience could experience the in-person content and the in-person audience could seamlessly enjoy the virtual component. Most content stayed available on the virtual platform until 15 November 2021. Combined with AAPG views, the virtual content had 48,425 total views on the technical-session pages.

Special sessions are a critical component of the technical program, in which topics of particular interest and relevance are given an opportunity for a greater depth of discussion. A focus this year was on opportunities for geophysicists and the utilization of geophysical knowledge outside of the traditional energy industry. In addition to the continuing “Recent advances and the road ahead” session, committees and organizers invited speakers for seven more special sessions. Special sessions included the following.

- “Global session: Asia Pacific” led by David Campagna and Darrell Kramer
- “Applications for archaeology, void, and target detection” led by Blair Schneider

- “Geophysics in support of characterization and reclamation of former industrial sites” led by Lee Slater and Christine Downs

- “Geoscientists *without* Borders®” led by Cengiz Esmersoy

- “Machine learning/artificial intelligence for seismic processing” led by Marianne Rauch

- “New instrumentation (marine, drones, EM, etc.)” led by Catherine Truffert

- “Recent advances and the road ahead: Geophysics for new energy applications” led by Sergio Chávez-Pérez, Aria Abubakar, and Partha Routh

- “SEG/AGU hydrogeophysics” led by Morgan Sander-Ohlhoeft and Laurie Whitesell

- “Urban geophysics and geophysics for sustainable urban development” led by Arthur Cheng and Iga Pawelec

Postconvention workshops are where new ideas and technologies are debated, dissected, and refined so they can reach mainstream geophysics. For example, the transition of the topic of full-waveform inversion from a workshop-only to a general-session topic led to the second highest number of topical abstract submissions in just a few years. Due to pandemic-related challenges, all of the postconvention workshops were held virtually, with the virtual platform page for the workshops receiving 4343 views. Proposals sourced from the Research Committee, Development and Production Committee, and Near-Surface Geophysics Technical Section, as well as collaborative efforts between the aforementioned and the Mining Committee

and Gravity and Magnetics Committee were presented in the postconvention workshops. Postconvention workshops included the following.

- “Anisotropy and microseismics: In memory of Vladimir Grechka and his contributions to applied seismology”

- “Distributed fiber-optic sensing in applied geophysics”

- “Filling in the gaps: The role of multiphysics to understand geologic and mineral systems”

- “Grand challenges for applied geophysics”

- “Machine learning versus conventional approaches/workflows in applied geophysics — Challenges, values, and where we are heading”

- “Magnetic method for near-surface and mining applications: In memory of Afif Saad”

- “The role of geophysics for carbon capture, usage, and storage, part 1: From exploration to reservoir characterization in saline aquifers or depleted oil and gas fields” and “Part 2: How to design and implement a smart monitoring plan”

- “3D computer geologic modeling for geophysicists and how to integrate geologic and geophysical computer earth modeling”

- “Geophysical challenges in presalt carbonates”

- “Geophysical methods and application for sustainable cities”

## REPORTS OF COMMITTEES

The hybrid format of IMAGE '21 presented unique challenges. We are exceptionally grateful for the patience and effort of the general session key contacts and their session chairs. They revisited the technical program multiple times as the Annual Meeting Technical Program Committee responded to the rapidly changing pandemic situation. This committee considers the challenges experienced as opportunities to improve and maintain relevance to our membership, now and in the future. ■■■

**AUDIT**

MARIA ANGELA CAPELLO, CHAIR

The Audit Committee is a standing committee of the Board of Directors. Its primary function is to assist the Board in fulfilling its oversight responsibilities, specifically in the Society's finance and accounting procedures. The committee is tasked with reviewing the independence and performance of the Society's auditors.

The committee is made up of three nonexecutive SEG Board members. In 2020–2021, the committee members were Brandy Hawkins, Kurt Marfurt, and myself.

In January 2021, I met with the audit firm HoganTaylor LLP and our managing director of finance and accounting to discuss their process and expectations for the 2020 audit. HoganTaylor has audited SEG for multiple years, so there is an established relationship with the SEG staff. This proved to be valuable as the pandemic continued into 2021, forcing a second year of executing the audit remotely. I am pleased to say that the staff continued to do an excellent job in managing the challenges brought on by the pandemic.

The Audit Committee interviewed the independent auditors and thoroughly reviewed the 2020 financials in May 2021. The 2020 audited financials were accepted by the Board of Directors in July 2021.

SEG has continued to face significant budgetary challenges directly associated with the pandemic and downturn in the industry and has expended considerable effort in managing the budget during the year. In spite of the budgetary challenges, SEG's balance sheet remains strong. ■■■

**BOOKS EDITORIAL BOARD**

LIANJI HUANG, CHAIR

The Books Editorial Board solicits and considers applied-geophysics proposals and manuscripts from authors and editors, weighing both the technical merits and marketability when judging whether to encourage development into SEG books and other special publications. Board members also act as managing editors for accepted proposals. The following books were published in calendar year 2021.

- *Land Seismic Case Studies for Near-surface Modeling and Subsurface Imaging* by Öz Yilmaz
- *Understanding Amplitudes: Basic Seismic Analysis for Rock Properties* by Michael Burianyk

With publication expected in 2022, work continues on the following books.

- *Gravity and Magnetic Encyclopedic Dictionary* by Serguei Goussev

- *Machine Learning for Science and Engineering: Volume I — Fundamentals* by Andreas Rueger and Herman Jaramillo

- *Practical Machine Learning Methods in Geosciences* by Gerard T. Schuster, with labs by Yuqing Chen, Shi Yongxiang, Shihang Feng, Zhaolun Liu, Zongcai Feng, Yunsong Huang, and Tushar Gautam

- *Forensic Data Processing* (2021 Distinguished Instructor Series) by Joe Dellinger

- *Distributed Acoustic Sensing for Seismic Measurements: What Geophysicists and Engineers Need to Know* (2022 Distinguished Instructor Series) by Mark Willis

The books SEG publishes are essential resources for students, researchers, and practitioners working in applied geophysics. ■■■

## REPORTS OF COMMITTEES

**BYLAWS**

EDITH MILLER, CHAIR

The Bylaws Committee is tasked with reviewing all proposals from the membership and Board that require amendments to the Bylaws. In addition, the committee reviews all new or amended Bylaws of sections and student chapters.

This year, the Bylaws Committee received two requests from the Board for review. The first request concerned proposed amendments to the Table of Contents, Article I, and Article XIV of the SEG Bylaws that would enable SEG to declare its Houston office as the headquarters of the Society. The amendments would result in SEG continuing to be incorporated in Oklahoma while being able to establish its headquarters anywhere. As this turned out to be insufficiently specific, language was added that explicitly designates Houston as the location of the Society's principal office. The Board, Council, and Voting members approved the adjustments.

The second request concerned a simplification of language of Article XIV regarding indemnification. The newly proposed and more simply worded language provides indemnification to the extent allowable under Oklahoma law and removes obscurity, which had resulted in an earlier rejection of changes by the Council. The Council approved the new wording. A ballot of Voting members on the measure was scheduled to conclude in January 2022.

The 2021 Bylaws Committee members were Edith Miller (chair), Joseph Reilly, Kim Guyer, Wenjie Dong, and Laura Swafford. ■■■

**COMPENSATION**

MAURICE NESSIM, SEG PRESIDENT

The Compensation Committee is tasked with reviewing the performance of the executive director and recommending salary adjustments based on that review. The committee also reviews the executive director's goals for the coming year.

The committee met several times during 2021 and completed the tasks as defined in the SEG Bylaws and Policies and Procedures. ■■■

**CONTINUING EDUCATION**

JOHN FERNANDO, CHAIR

The Continuing Education (CE) Committee provides a curriculum of quality professional courses to the exploration-geophysics community. To ensure that the current and emerging needs and standards of the community are met, the committee is dedicated to developing a high-value, needs-based curriculum while adopting delivery approaches consistent with best practices.

**CE ACTIVITIES**

Due to pandemic concerns, live virtual events and recordings were employed in place of face-to-face courses in 2021. Through online offerings, the CE program was able to provide high-quality, user-friendly instruction to a global audience located in 23 countries.

The following was accomplished in 2021.

- Based on eight course evaluations with four pending, attendees highly rated their CE experience using a scale of one to five.

- Overall course rating: 4.52
- Instructor evaluation: 4.72
- Ease of registration: 4.62
- Would recommend course: 4.62
- A new health, safety, security, and environment field-safety leadership course was approved. It will support SEG field camps, Geoscientists *without* Borders<sup>®</sup>, and members interested in field-safety training.
- The committee expanded machine learning, programming, and deep learning options by adding a course taught by Sid Misra titled "Python programming for subsurface data analysis."
- Three-year course reviews were completed including "Understanding and adapting rock-physics principles for mudrock (shale) reservoirs," "Understanding seismic anisotropy in exploration and exploitation," "Gravity and magnetics for explorationists," "Geopressure and prospect's risk assessment," and "A practical understanding of seismic inversions."
- We successfully scheduled two courses in direct support of IMAGE '21, with 39 registrations.
- In addition, we completed six in-house virtual contract courses for Saudi Aramco and Petronas.

**NEW COURSES IN 2021**

The following courses were added to the course catalog.

- "Passive surface wave methods using ambient noise: From basic 1D

REPORTS OF COMMITTEES

- soundings to high-resolution 3D imaging” by Koichi Hayashi
- “Practical machine learning methods in the geosciences” by Jerry Schuster
- “Practical applications of time-lapse seismic data” by David Johnston
- “The geology of unconventional reservoirs” by Bruce Hart

- “Synthetic seismograms — Construction and use” by Dhananjay Kumar
- “Seismic uncertainty evaluation (SUE)” by Manish Agarwal

**SUPPORT FOR REGIONAL OFFICES**

In concert with the Tulsa business office, SEG regional offices hosted public and contract courses independent of those shown earlier. They included two public courses, with a total of 29 registrations,

and two in-house virtual contract courses previously cited.

**SEG ON DEMAND**

Beginning in June 2020, five virtual course recordings were captured and offered as on-demand resources for SEG members. In 2021, 12 recordings were added, resulting in 21 direct sales.

- “Synthetic seismograms — Construction and use” by Dhananjay Kumar

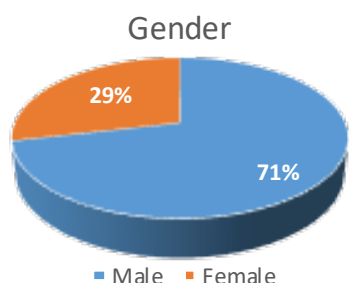


Figure 3. The committee includes 14 members, of which 10 are male and four are female.

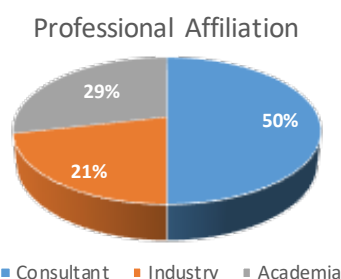


Figure 4. Seven of the committee members are consultants, four are in academia, and three are in the industry.

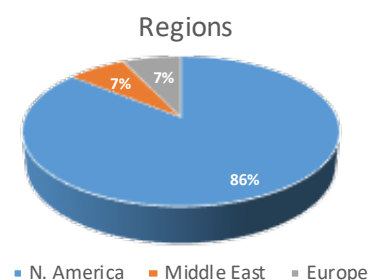


Figure 5. Of the 14 committee members, 10 are located in the United States, two are located in Canada, one is located in Saudi Arabia, and one is located in Austria.

Table 3. CE public courses held in 2021.

Instructor/event	Course	2021 dates	Number of occurrences	Number of attendees
Dhananjay Kumar, live virtual*	Synthetic seismograms – Construction and use	21–23 January	1	5
Michal Ruder, live virtual	Gravity and magnetics for explorationists	21–24 February	1	3
Bruce Hart*	The geology of unconventional reservoirs	1–4 April	1	4
John Bancroft, live virtual*	Practical mathematics and its applications in seismic processing	20–24 April	1	4
Salim Shaker, live virtual*	Geopressure and prospect’s risk assessment	27–29 April	1	6
Manika Prasad, Petrobras*	Understanding and adapting rock-physics principles for mudrock (shale) reservoirs	5–8 July	1	13
Jerry Schuster, IMAGE ’21*	Practical machine learning methods in the geosciences	26–27 September	1	32
Leon Thomsen, IMAGE ’21*	Understanding seismic anisotropy in exploration and exploitation	23–26 September	1	7
David Johnston, live virtual*	Practical applications of time-lapse seismic data	18–22 October	1	5
Jack Dvorkin, live virtual	Rock physics: Seismic reflections of rock properties	30 Nov–2 December	1	18
Koichi Hayoshi, live virtual*	Passive surface-wave methods using ambient noise: From basic 1D soundings to high-resolution 3D imaging	15–17 December	1	38
Mike Graul and Fred Hilterman, live virtual	AVO: Seismic lithology	13–16 December	1	9
Ian Jones, Kuala Lumpur regional office	An introduction to migration and velocity model building	1 March	1	14
Scott MacKay, China regional office	The interpreter’s guide to depth imaging	29 April	1	15
		<b>Totals</b>	<b>14</b>	<b>173</b>

\*New course.

## REPORTS OF COMMITTEES

- “An introduction to migration” by Ian Jones
- “A practical understanding of seismic inversions” by John Bancroft
- “Geopressure and prospect’s risk assessment” by Selim Shaker
- “The geology of unconventional reservoirs” by Bruce Hart
- “The interpreter’s guide to depth imaging” by Scott McKay
- “Understanding and adapting rock-physics principles for mudrock (shale) reservoirs” by Manika Prasad
- “Practical machine learning methods in the geosciences” by Jerry Schuster
- “Gravity and magnetics for explorationists” by Michal Ruder
- “Practical applications of time-lapse seismic data” by David Johnston
- “Passive surface-wave methods using ambient noise: From basic 1D soundings to high-resolution 3D imaging” by Koichi Hayashi
- “Rock physics: Seismic reflections of rock properties” by Jack Dvorkin

**2022 GOALS**

- Expand public course curriculum to include energy-related and near-surface topics.
- Increase engagement between the committee and instructors.
- Recruit committee members from outside North America and have more representation from the industry. ■■■

**DEVELOPMENT AND PRODUCTION**

MARIANA GHERASIM, CHAIR

For the 2020 SEG Annual Meeting, the Development and Production Committee sponsored one postconvention workshop titled “4D under complex overburden: Are we there yet?” The workshop was well attended and generated interesting discussion among the group.

Our members continue to be involved in SEG education and professional-development efforts. Ali Tura served as Distinguished Lecturer for the third and fourth quarter of 2021, teaching “Recent advances in seismic reservoir characterization and monitoring.” Additionally, David Johnston taught the course “Practical applications of time-lapse seismic data” in October 2021.

We have continued our collaboration with the Oil and Gas Reserves Committee, chaired by Richard Xu. A planned merger of the two committees has been postponed.

The committee had its fourth-quarter 2021 meeting immediately after IMAGE ’21, with a focus on sharing feedback about IMAGE and reviewing committee activities and membership.

Looking ahead to 2022, the Development and Production Committee plans to do the following.

- Propose one postconvention workshop titled “Subsurface characterization: How can monitoring help energy transition?” for IMAGE ’22.
- Continue involvement in SEG education and professional-development efforts.

- Discuss new applications for committee membership, with a focus on early-career members.
- Continue engagement with other professional societies.
- Communicate the mission of the committee via articles published in *The Leading Edge* or other avenues.
- Discuss possible development and production forums in 2022 and 2023, with Houston as the preferred location due to travel limitations. Engagement may be explored with the Society of Petroleum Engineers, Geophysical Society of Houston, Houston Geological Society, or the American Association of Petroleum Geologists. ■■■

**DISTINGUISHED INSTRUCTOR SHORT COURSE**

ADEL EL-EMAM, CHAIR

It has been a great honor for me to serve the geoscience community as Distinguished Instructor Short Course (DISC) chair. I want to thank all of the committee members and distinguished instructors for their support in accomplishing the goals set by the committee during this period. It is now time to inject new blood into the committee. I am confident that Adriana Ramirez, the new chair, will bring fresh ideas and ensure continual improvements and success for DISC.

It was a quiet year with lower activity than expected as the pandemic continued to impact businesses and traveling throughout 2021. Therefore, this year’s report will be brief.

## REPORTS OF COMMITTEES

Professor Manika Prasad is still working on completing her book for the 2019 DISC program.

Dave Monk's 2020 planned tour as instructor of "Survey design and seismic acquisition for land, marine, and in-between in light of new technology and techniques" continued through 2021. We managed to organize seven virtual courses, achieving an attendance of more than 200 geoscientists.

Monk's most attended virtual course was at the 2020 SEG Annual Meeting, reaching approximately 60 attendees. During 2021, many countries lifted the lockdown and opened for travelers. This will help the planning of Monk's scheduled visits to Canada, Kuwait, Saudi Arabia, and the United Arab Emirates in March 2022 for in-person stops.

Joe Dellinger started the course "Forensic data processing" in 2021, with a private virtual meeting for PETRONAS. Dellinger will continue in 2022 as DISC instructor, with a full tour schedule featuring virtual and in-person stops.

Mark Willis, the 2022 DISC instructor, with the topic "Distributed acoustic sensing for seismic measurements — What geophysicists and engineers need to know," will start his tour at IMAGE '22 in September and will continue until the next meeting in 2023.

In 2021, the DISC Committee continued its effort to achieve planned programs and ensure success. The following are highlights from the year.

- We welcomed Adriana Ramirez, the new committee chair, for the 2021/2022 year.

- The SEG DISC contract was updated with adjusted deadlines/timelines for instructors to stay on track with book production.

- DISC tours will now start in conjunction with IMAGE. The tours will run from one annual meeting to the next instead of by calendar year.

- The committee is currently working on nominating/voting for the 2023/2024 DISC instructor.

Once again, I would like to thank all of the committee members for their great contribution; SEG staff, particularly Melissa Presson for her endless support; and instructors for their professional work and tireless efforts to ensure the successful continuation of DISC. 🙏

### DISTINGUISHED LECTURE ROCCO DETOMO, CHAIR

The SEG Lecture program, including the Distinguished Lecture (DL), Honorary Lecture (HL), and Virtual Near-Surface Global Lecture, continues to be one of the most effective outreach programs of SEG. Due to pandemic and financial challenges, all lectures in 2021 were delivered twice virtually. The lectures reached 7864 total registrants and had 3291 unique views. Each lecture is targeted to specific time zones, enabling the regional-based lecturers to reach a more global audience. An office-hour option is now offered to each lecturer so they can virtually interact with attendees following their lecture.

### 2021 DISTINGUISHED LECTURERS

#### Lucy MacGregor Q1/Q2 SEG DL, two virtual lectures

**Title:** "Multiphysics analysis: Extracting the most from diverse data sets"

**Attendance:** 745 registrations with 338 unique attendees

**Countries reached:** 60

**Office hours:** two with an attendance of 11 and 22

**Quote:** "Lucy is such a great speaker. She is knowledgeable and skilled at explaining the information."

#### Ali Tura Q3/Q4 SEG DL, two virtual lectures

**Title:** "Recent advances in seismic reservoir characterization and monitoring"

**Attendance:** 922 registrations with 374 unique attendees

**Countries reached:** 45

**Office hours:** two with an attendance of 16 and 20

**Quote:** "Ali's knowledge of the discipline and ability to communicate his learnings are superb. I appreciate the calm way in which he approaches challenges and answers questions. It was time well spent."

### 2021 HONORARY LECTURERS

#### Xiaogui Miao Pacific South, Q1/Q2, two virtual lectures

**Title:** "From multicomponent imaging to ocean-bottom seismic technology — Challenges or opportunities?"

**Attendance:** 553 registrations with 186 unique attendees

**Countries reached:** 31

**Quote:** "This was one of the best SEG presentations I have attended."

REPORTS OF COMMITTEES

**Adriana Citlali Ramirez**  
**Europe, Q1/Q2, two virtual lectures**

**Title:** “Seismic technology in northern European waters and the prevalence of multiples”

**Attendance:** 632 registrations with 237 unique attendees

**Countries reached:** 44

**Office hours:** two with an attendance of five and seven

**Quote:** “The content was very impressive and demonstrated a mastery of the subject while making the explanation for the processing technique simple and easy to understand.”

**Nimisha Vedanti**  
**South and East Asia, Q1/Q2, two virtual lectures**

**Title:** “Understanding seismic wave attenuation mechanisms in porous and nonporous media: Some new insights”

**Attendance:** 816 registrations with 307 unique attendees

**Countries reached:** 37

**Quote:** “Commendable depth of knowledge and clarity of concepts.”

**Miguel Bosch**  
**Latin America, Q3/Q4, two virtual lectures**

**Title:** “The new paradigms in seismic inversion”

**Attendance:** 836 registrations with 337 unique attendees

**Countries reached:** 54

**Office hours:** two with an attendance of 12 and 10

**Quote:** “I am looking forward to applying the concept of seismic rock-physics joint inversion in my next research work. Thank you for sharing your ideas with us.”

Table 4. Statistics for the 2021 virtual lectures.

Lecturer	Region	Virtual registration	Virtual attendance
Lucy MacGregor	Q1/Q2 DL	745	338
Ali Tura	Q3/Q4 DL	922	374
Xiaogui Miao	HL Pacific South	553	186
Adriana Citlali Ramirez	HL Europe	632	237
Nimisha Vedanti	HL South and East Asia	816	307
Miguel Bosch	HL Latin America	836	337
Mark Zoback	HL North America	1734	890
Jack Dvorkin	HL Middle East and Africa	813	313
John Bradford	Near Surface	813	309
		7864	3291

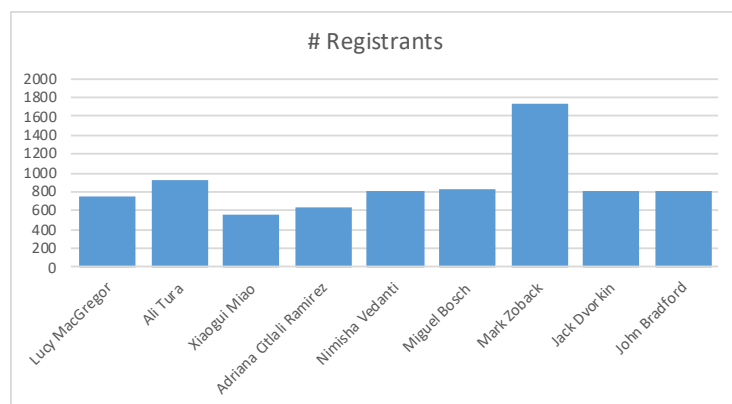


Figure 6. The number of registrations for the 2021 virtual lectures.

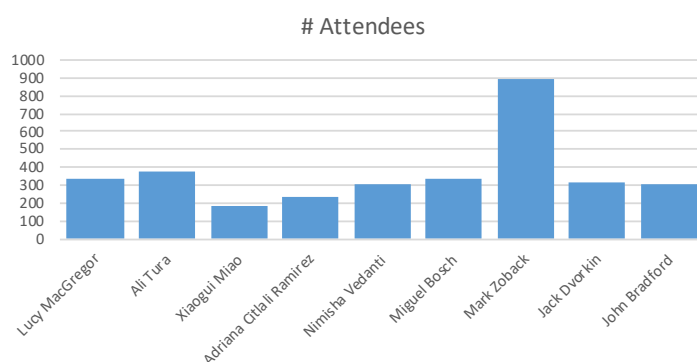


Figure 7. Attendance numbers.

REPORTS OF COMMITTEES

**Mark Zobak**  
**North America, Q3/Q4, two virtual lectures**

**Title:** “Geomechanical issues affecting long-term storage of CO<sub>2</sub>”

**Attendance:** 1734 registrations with 890 unique attendees

**Countries reached:** 60

**Quote:** “Mark is an outstanding speaker and world-class authority on the topic covered.”

**Jack Dvorkin**  
**Middle East and Africa, Q3/Q4, two virtual lectures**

**Title:** “Modern rock physics — Challenges and solutions”

**Attendance:** 813 registrations with 313 attendees

**Countries reached:** 51

**Quote:** “Clear and easy to understand presentation of difficult issues. It was motivating for younger generations of

researchers and provided guidance for future research.”

**2021 VIRTUAL NEAR-SURFACE GLOBAL LECTURER**

**John Bradford**  
**two virtual lectures**

**Title:** “Taking the power of exploration geophysics from the oil patch to help solve the world’s grand challenges”

**Attendance:** 813 registrations with 309 unique attendees

**Countries reached:** 43

**Quote:** “The lecture was excellent. It was not only informative, but inspirational.”

The following is an approved list of 2022 lecturers. The committee’s recommendation is to offer each of the lecturers the option to deliver a few in-person lectures in their local area, in addition to two virtual lectures. Although the virtual

lectures have a broader reach, the in-person lectures would allow for additional in-depth discussions and personal interactions that are often considered beneficial by both lecturers and attendees.

**2022 DISTINGUISHED, NEAR-SURFACE, AND HONORARY LECTURERS**

- Q1/Q2 DL: Laura Bandura
- HL Pacific South: Mojtaba Rajabi
- HL Europe: Klaus Holliger
- HL South and East Asia: Elita Li
- SEG-AAPG DL: Roel Snieder
- HL Latin America: Carlos Calderón-Macías
- HL Middle East and Africa: Ariel Lellouch
- HL North America: Partha Routh
- Near Surface: Susan Hubbard

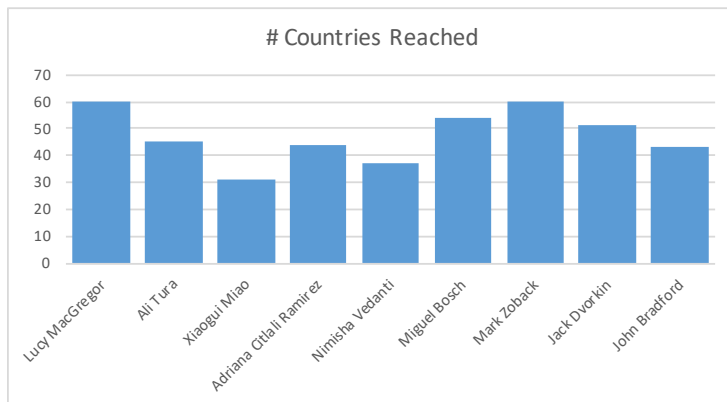
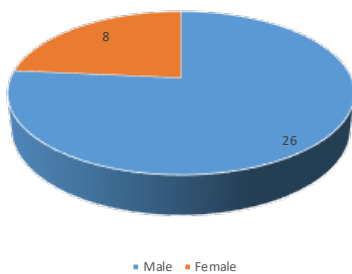
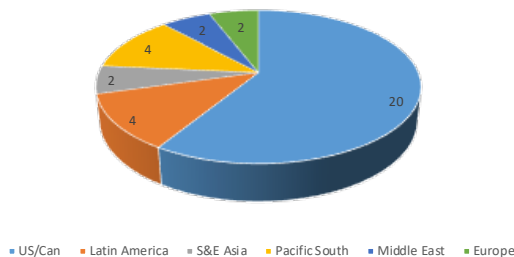


Figure 8. Countries reached for the 2021 virtual lectures.

Gender Representation = 76.5% M, 23.5% F



Geographic Representation = 59% US/Can



Professional Affiliation

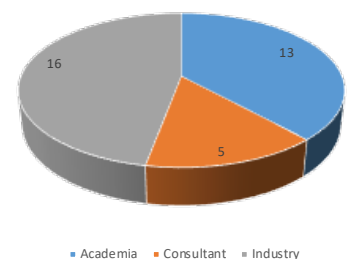


Figure 9. Committee member demographics.

## REPORTS OF COMMITTEES

In 2021, the committee did the following.

- Proposed updated joint procedures for the SEG-AAPG DL.
- Updated the committee nominee online voting procedures and streamlined the SEG staff requirements for vote compilations.
- Offered office-hour options for lecturers, with guidelines and procedures, and structured virtual lectures so a committee host is always available.

In addition, the committee discussed demographics and updated committee membership to better reflect gender balance. Committee membership was updated and is currently approximately 20.5% female, with every region represented. However, better balance is still needed. A nonvoting Student member was added to the committee for a unique point of view. The committee also strived to improve representation for the future New Energies and Non-Oil-and-Gas Geophysics lectures by requesting lecturer nominations in these areas in line with SEG's Strategic Pillars.

The committee requests that the SEG boards, committees, and membership become more active in nominating future lecturers. The committee also recommends that members take the opportunity to view SEG lectures online by visiting <https://seg.org/education/seg-on-demand>. ■■■

## EMERGING PROFESSIONALS INTERNATIONAL

AURELIAN ROESER, CHAIR

The 2020–2021 time period was the seventh year for the SEG Emerging Professionals International Committee (EPIC). EPIC is dedicated to positively increasing SEG's professional, technical, and social impact on the lives of early-career geophysicists around the world. An emerging professional is defined as someone who has worked in the industry for eight years or less and may be gaining seniority and increasing responsibility. The main goal for 2021 was to strengthen the committee's representation of all emerging professionals in the SEG community.

We updated our policies and procedures regarding three main aspects. A stronger focus on EPIC's international character and gender-neutral language facilitates the inclusion of people of all different backgrounds. In addition to being a catalyst for the transition from Associate to Active membership, we emphasized our support in the transition from Student to Associate membership to keep recent graduates and active student volunteers as SEG members and early-career volunteers. In order to provide more continuity for the committee, we changed the leadership structure to a three-year succession plan of vice chair, chair, and past chair, each serving for one year.

In our endeavors to create new networking opportunities for emerging professionals, the committee established an Instagram account (@seg\_epic) and appointed a social media manager. The specific goals of the account are to engage with the SEG community, promote SEG events, and share the activities of early-career volunteers. ■■■

## EVOLVE

JENNY THOMPSON, CHAIR

SEG EVOLVE offers students direct experience in conducting integrated subsurface analyses using real-world seismic, wireline, production, and other data. The teams use a range of software platforms including locally installed Petrel, Kingdom, and DecisionSpace or the open-source OpendTect. They utilize modern technology and gain an understanding of the exploration technical and business workflows used by oil companies, with a goal of recommending the best investment opportunity in their assigned data sets. The teams gain experience in soft skills such as communication, teamwork, and project management.

EVOLVE is a virtual internship, providing students with an opportunity for experiential learning that will help prepare them for jobs in the real world. The students are provided a data set and guided by a team of experienced mentors to utilize academic concepts, technologies, workflows, and critical thinking to find business value. Currently EVOLVE is focused on oil and gas, but we introduced a carbon-mitigation component in 2021 for the students to research, evaluate, and propose for their final investment opportunity.

Each team includes four to six students with backgrounds in geology, geophysics, petrophysics, and reservoir engineering, working together to review a technical data set. We had 42 teams apply for the EVOLVE 2021 program. In November 2020, the technical committee met to review the applications and make selections. After review and discussion with the technical coordinator, Allen Bertagne, 17 teams were selected. In several cases, we joined two teams together from one

## REPORTS OF COMMITTEES

country to include more students and maintain a manageable number of teams. The joined teams are slightly larger and require the students to communicate effectively, similar to two companies in a joint venture. EVOLVE 2021 includes 130 students in 17 teams from 22 universities and 15 countries.

The EVOLVE 2021 program began in January with kick-off meetings for each of the teams. Weekly meetings were held on Fridays, allowing the teams to provide updates on their progress, ask questions, and receive mentoring. These meetings were followed by open office hours where anyone could ask questions. The meetings were conducted by Bertagne, and additional attendees included the support team of Jesus Nevarez, Mario Ballinas, and Johnathan Torres as well as mentors. Mike Forrest has been a huge supporter of the program and attended most of the meetings. Arthur Cheng held regular meetings with the teams in the Southeast Asia region to align with their time zone.

Mid-project presentations were held in March, with final technical presentations in May of each team's best investment opportunity. The teams presented virtually to the executive committee, which is a group consisting of members of the technical committee, mentors, and select leaders from a variety of exploration and production companies. The presentations were allocated two-hour time slots. Students presented for 45 minutes, and their presentations were followed by general comments and specific feedback. The review board consisted of an excellent panel of mentors from a broad range of disciplines and experience. They provided helpful and real-world feedback to all of the teams. For many, it was the first taste they got of delivering presentations in a business setting.

Despite continuing pandemic restrictions, with many universities not allowing students to come together physically, students continued to work virtually as a team on their projects. Many of the teams were challenged by access to software, computers, and the Internet, but they still completed a presentation on their best investment opportunity. The EVOLVE program was already utilizing virtual meeting technology prior to the pandemic. This provided an easy transition into continuing the program during this time.

With the support and guidance of Forrest, Rocco Detomo, and Jenny Thompson, management of the program was transitioned to SEG to execute the summer portion of the program. Ten teams committed to continuing their work through the summer and were assigned individual mentors to guide them through the process of refining the potential exploration targets previously identified. In some cases, they created new targets, validated prospects, and completed mapping and economic analysis. This work was delivered as a 20-minute presentation of the best investment opportunity and approach to carbon-footprint mitigation for the development of the field. The presentations were delivered at IMAGE '21 during a virtual session, and team posters were displayed on the exhibit floor.

**EVOLVE 2022**

Applications for EVOLVE 2022 opened in October 2021 and closed in November 2021. The technical committee is in the process of reviewing the 20 applications, with a plan to select 10 teams for EVOLVE 2022 by early December. Thompson will take over the role of technical coordinator, and Kathryn Elkins will be the SEG program manager for the 2022 EVOLVE program.

Aligning the EVOLVE program with the school year (January to June) was designed so universities/schools could offer the program for credit as a class. In 2020, Heather Bedle of the University of Oklahoma and John Castagna of the University of Houston offered an EVOLVE course. They are both planning to offer EVOLVE courses for credit again in 2022. Students in the class consisted of the EVOLVE team, as well as additional students working on the data sets and providing information to the team. Due to the pandemic and changes at the universities, there were no for-credit EVOLVE courses offered in 2021.

SEG is planning a carbon capture, utilization, and storage (CCUS) initiative within the EVOLVE program. It will bring together multidisciplinary student teams that will use current oil-and-gas transferable skills, incorporate new approaches and technology for carbon capture, and consider sequestration, utilization, and storage. The program intends to incorporate best practices from academia and leading industry standards to encourage geoscientists and engineers to propose solutions to geologic carbon sequestration. The pilot program will focus on the reservoir-characterization aspects of designing, evaluating, and proposing investment in a CCUS project.

The deliverables for the teams will be to prepare and present a proposal for investment in a CCUS project. The technical focus will be geosciences for reservoir characterization, simulation, and monitoring of geologically sequestered carbon. The focus for EVOLVE students will be on the reservoir aspects of the project proposals. Reports and recommendations will include economic, permitting, policy, infrastructure, and economic analysis while focusing on the technical aspects of reservoir

## REPORTS OF COMMITTEES

characterization, simulation, and monitoring of sequestration in geologic formations. An initial investment from ExxonMobil will fund pilot development and implementation for several teams in 2022, though further financial support will be required for future expansion.

It is anticipated that the pilot program will launch in the third quarter of 2022 as a four-month educational/experiential learning opportunity to engage participation from several multidisciplinary teams integrating geoscience, petroleum, chemical, and civil-engineering practices. The program objective will be to propose the best carbon-mitigation and utilization proposal based on the geotechnical aspects of the reservoir and its potential to permanently store CO<sub>2</sub>. Proposal outcomes could include ways to positively impact the volume of CO<sub>2</sub> removed from the atmosphere through geologic sequestration, ways to produce profit through repurposing of the carbon, or other practicable outcomes identified throughout the process. ■■■

## FIELD CAMPS

FRANCESCA FAZZARI, CHAIR

In 1993, the Field Camp Grant program was established by the SEG Foundation to provide seed money for geophysics faculty and SEG student chapters to create and support field courses that provide students with hands-on experience in data collection and analysis using geophysical instruments and software applications. In 2021, the Field Camps Committee provided continued leadership in evaluating applications and awarding grants to eligible applicants, ensuring that geophysics students around the world receive valuable field training in contexts that emphasize safety and high-quality learning. During the second year of the pandemic, all but two awarded field camps took place. All applications addressed COVID-19 in their health, safety, security, and environment (HSSE) plans.

In 2021, SEG received 32 applications for funding (an 11% decrease from 2020). The total funding requested was US\$303,084. From the submitted applications, the committee selected 16 awardees, totaling \$88,165. Individual award values ranged from \$529 to \$10,093. For reference, in 2020, 16 awardees were selected, and available resources were 29% more than the 2021 funds. This year, awards were provided to field camps in Canada, Colombia, India, Italy, Mexico, Nepal, Nigeria, Romania, Russia, and the United States.

In regard to applications, the committee continues to refine the application

questions, as well as provide feedback to the unsuccessful applicants. The goal of the feedback is to improve subsequent applications in the hope that awards can be made. The committee also encourages applicants to take advantage of the volunteer application readers who provide feedback prior to the submission deadline. This is a complimentary service provided by SEG member volunteers.

The Field Camps Committee continues to partner with the HSSE Committee, chaired by Luke Decker, to assess applicant HSSE plans. The HSSE plans in the applications over the past years of this partnership continue to improve. The Field Camps Committee and SEG staff worked with 2021 awardees to strengthen HSSE plans based on feedback from the HSSE Committee.

Members of the Field Camps Committee have contributed to the HSSE Committee's effort to develop and offer a field-safety course to SEG members. Coordination with the HSSE Committee continues to elevate the work of the Field Camps Committee.

In 2021, the Field Camps Committee welcomed two new members. The committee consisted of Francesca Fazzari (chair), Hendratta Ali (Foundation liaison), Alex Fick, Geoffrey Pang, Payson Todd, and Rui Zhang. ■■■

## REPORTS OF COMMITTEES

**GEOPHYSICS**

JEFFREY SHRAGGE, EDITOR-IN-CHIEF

In 2021, *GEOPHYSICS* again proved to be an extremely successful journal, with 819 submissions. Handling this volume of submissions is possible thanks to the commitment of the *GEOPHYSICS* Editorial Board, which includes assistant and associate editors, guest editors associated with special sections, and numerous knowledgeable reviewers. I thank them for their dedication and volunteer time. The whole process from submission to publication would not be possible without the professionalism and commitment of SEG staff.

One major change instituted in 2021 was additional restructuring of the senior editorial team by formalizing the role of the past editor, who joins the editor-in-chief and the senior assistant editor in forming the *GEOPHYSICS* senior editorial positions. A second major change was the shortening of the terms for each position to one year, which will allow for additional and ideally more diverse editorial talent to flow through these three positions. John Etgen formally took over as *GEOPHYSICS* editor on 1 August 2021, with Arthur Cheng being promoted to senior assistant editor, and myself moving into the past editor role.

I invited 24 new associate editors to serve at the start of my term, largely in response to the doubling of *GEOPHYSICS* submissions in the previous five years. The subjects that attract large numbers of manuscripts are seismic inversion, seismic migration, seismic modeling and wave propagation, electric and electromagnetic methods, and signal processing.

In response to research trends and increased applications in exploration geophysics, the journal started a new section on multiphysics and joint inversion. A total of 28 case histories and six papers accompanied by code in the geophysical software and algorithms category were published in 2021.

The average time required for first review is 68 days, an increase of three days from 2020. The average time between acceptance and publication is 82 days, an increase of 13 days from 2020 (although the just-accepted version of papers now appears online within a few days of acceptance). As a signer of the San Francisco Declaration on Research Assessment (DORA), SEG encourages the use of a variety of journal-based metrics that provide a rich view of journal performance. Current metrics are found in Table 7 and in the journal's About page in the SEG Library.

**SPECIAL SECTIONS**

In 2021, *GEOPHYSICS* published three special sections. The first was “Shallow void, tunnel and other anomaly detection,” which contains 13 papers and covers the manifold challenges faced by practitioners when undertaking such tasks. The second special section was “Hydrogeophysics,” published in collaboration with the American Geophysical Union. It contains 12 papers that cover a wide range of aspects in the integration of hydro(geo)logic and geophysical data sets acquired at multiple spatiotemporal scales to improve the understanding of subsurface water resources. The final special section was “Advances in seismic multiple reflection processing,” with 16 papers that cover a wide range of the methodology and applications for processing seismic multiples. Three

Table 5. Submissions by country from 1 January 2021–31 December 2021.

Argentina	1
Australia	20
Austria	1
Brazil	23
Canada	26
China	458
Czech Republic	1
Denmark	6
Egypt	2
France	7
Germany	15
Greece	1
Hungary	1
India	13
Iran (the Islamic Republic of)	10
Israel	1
Italy	7
Japan	7
Jordan	1
Korea (the Republic of)	5
Malaysia	2
Mexico	2
Netherlands	8
New Zealand	1
Norway	19
Oman	1
Pakistan	1
Poland	2
Portugal	4
Russian Federation	6
Saudi Arabia	10
Senegal	1
Serbia	1
Singapore	1
South Africa	1
Spain	2
Sweden	1
Switzerland	4
Taiwan	1
Thailand	2
Turkey	2
United Arab Emirates	4
United Kingdom of Great Britain and Northern Ireland	22
United States	115
<b>Total</b>	<b>819</b>

## REPORTS OF COMMITTEES

special sections currently are planned for 2022. “Applications of humanitarian geoscience” will be published in January–February 2022, “GPR data imaging and interpretation” is expected in July–August 2022, and “Advances in mathematical geophysics” is expected in November–December 2022.

## REVIEWER OF THE YEAR

Clément Kostov has been awarded 2021 Reviewer of the Year. He has been serving as a reviewer for *GEOPHYSICS* for more than two decades. In addition to reviewing nearly two papers per month, Kostov has had both an excellent turnaround time and one of the highest ratings for review quality. The *GEOPHYSICS* Editorial Board also appreciates his efforts as a guest associate editor for the special

Table 6. Origin of papers submitted for publication in *GEOPHYSICS* by employer from 1 January 2021–31 December 2021.

Universities	641
Research institutes	87
Oil companies	37
Governments	18
Service companies and manufacturers	18
Consultants	7
Mining companies	4
Retired	5
Instrument companies	2
<b>Total</b>	<b>819</b>

Table 7. *GEOPHYSICS* metrics.

Indicator (source)	2021 score
h5-index (Google Scholar)	56
h5-median (Google Scholar)	81
CiteScore (Scopus)	6.3
Journal Citation Indicator (Web of Science)	0.91
Journal Impact Factor (Web of Science)	2.928

section devoted to “Advances in seismic multiple reflection processing.” His scientific and technical knowledge has been an important resource for the journal and authors alike. ■■■

Table 8. Manuscript-handling statistics.

Year submitted 1 July–30 June	Average number of days required for first review
1991–92	172
1992–93	157
1993–94	184
1994–95	182
1995–96	211
1996–97	186
1997–98	205
1998–99	214
1999–00	212
2000–01	211
2001–02	178
2002–03	133
2003–04	141
2004–05	105
2005–06	66
2006–07	53
2007–08	57
2008–09	55
2009–10	66
2010–11	61
2011–12	66
2012–13	61
2013–14	72
2014–15	70
2015–16	66
Year submitted 1 January–31 December	Average number of days required for first review
2016	66
2017	71
2018	80
2019	78
2020	68
*2021	65

\*First reviews have not been returned for all papers.

## GEOSCIENTISTS WITHOUT BORDERS®

CENGIZ ESMER SOY, CHAIR

This was a busy year for the Geoscientists *without* Borders® (GWB) Committee,

Table 9. Manuscript-handling statistics.

Year published 1 July–30 June	Average number of days between acceptance and online publication
1991–92	176
1992–93	181
1993–94	178
1994–95	210
1995–96	N/A
1996–97	N/A
1997–98	180
1998–99	177
1999–00	202
2000–01	208
2001–02	213
2002–03	195
2003–04	161
2004–05	158
2005–06	181
2006–07	143
2007–08	82
2008–09	111
2009–10	122
2010–11	135
2011–12	126
2012–13	78
2013–14	72
2014–15	65
2015–16	69
Year published 1 January–31 December	Average number of days between acceptance and online publication
2016	66
2017	53
2018	65
2019	70
2020	69
2021	82

## REPORTS OF COMMITTEES

with a record number of grant applications — indicating the success of our outreach program — and recommendations made for future direction.

Members of the committee in 2021 included Bethany Burton (USGS), Paul Cunningham (Amigos Energy), Cezar Iacob (Dirac), Elaine Mattos (Fairfield), Bonnie Milne (Swift Energy), Adil Mukhitov (Schlumberger), Robert Merrill (Catheart Energy), and Sissy Theisen (Landnoise). The committee was supported by SEG personnel Pallavi Bharadwaj, Annabella Betancourt, and Katie Burk, along with Board Liaisons David Lumley and Maurice Nessim.

**NEW PROJECTS**

The committee reviews grant applications twice a year. Each application period has two phases: (I) initial proposals are submitted for preliminary selection and (II) final proposals are submitted and funding selection is made. This year, 86 grant applications were reviewed for phase I, and 21 were reviewed for phase II. Table 10 shows the project categories of 2021 submitted and accepted projects, together with ongoing projects, some of which were funded in previous years.

Projects are evaluated based on criteria including human/community benefit, technical feasibility, sustainability, and financial transparency. The United Nations Sustainable Development Goals are used as a guide. Significant student involvement is encouraged. In H1 and H2 application cycles, six projects were selected for funding.

- “Testing the feasibility of an earthquake early warning system” (US\$50,000) (Nepal)

- “Geophysical habitat management of fisheries in Lake Nsumbu Tanganyika” (\$73,000) (Zambia)
- “Increasing natural hazard resiliency in Guatemala” (\$79,970)
- “Kujana-multimethod geophysical approach to borehole development in poorly weathered crystalline rock” (\$79,946) (Zambia)
- “Integrated groundwater potentials and aquifer vulnerability study in parts of Anambra State, Nigeria” (\$32,010)
- “Provision of potable water to communities in northeastern Ghana” (\$30,617)

**ADVISORY TASK FORCE**

The Advisory Task Force formed in 2020 to provide input for a three- to five-year business plan and fundraising efforts. It completed its work in May and provided a final report.

The task force was headed by Cengiz Esmersoy and members were Fred Boadu (Duke University), Colin MacBeth (Heriot-Watt University), Robert Merrill (Catheart Energy), Susan Morrice (Belize Natural Energy), Richard Nolen-Hoeksema, Laura Reich, and Rob Stewart (University of Houston).

The team looked at seven different areas, from visibility to fundraising to new activities, and provided more than 20 recommendations. The top three recommendations are as follows.

- Launch a global membership and crowdfunding campaign.

- Continue developing corporate partners and expand it to non-oil-and-gas companies and organizations.
- Reach out to other humanitarian groups and governmental organizations for joint activities and funding.

**FINAL REPORTS**

We received two project completion reports.

The first is “Hydrometeorologic and geologic hazards at Pico de Orizaba Volcano, Mexico.” The main objective of the project was to contribute toward a better understanding of the glacier and high-altitude hydrometeorological phenomena in relation to lahar (mud and debris flows) formation in order to inform and warn local populations and to protect life, property, and infrastructure from related hazards.

The second is “An international partnership to develop volcano monitoring capacities in Guatemala.” The main goal of this project was to assist the Instituto Nacional de Sismología, Vulcanología, Meteorología e Hidrología in improving monitoring at the Santaguito Volcano through the installation of geophysical equipment. It also aimed to provide training in modern volcano monitoring technology to local technical and scientific personnel.

**PROGRESS REPORTS**

Nine progress reports were received. Some that were nearing completion in 2021 have been extended into 2022–2023 due to ongoing pandemic uncertainty and travel restrictions. These project leads requested no-cost extensions, which the GWB Steering Committee approved on a case-by-case basis.

## REPORTS OF COMMITTEES

- “Low-cost geophysical instrumentation for groundwater management in West Africa,” Colorado School of Mines and University of Abomey-Calavi (Benin)
- “Geophysical investigation to improve the landslide susceptibility analysis in Kerala, India,” University of Kerala and the Jamsetji Tata School of Disaster Studies at the Tata Institute of Social Sciences
- “Toward improved earthquake hazard assessment in Myanmar: Tools, knowledge, and infrastructure,” Myanmar Earthquake Committee, University of Yangon, Louisiana State University, and others
- “Understanding high mountain aquifers to source drinking water in the Sagarmatha National Park, Nepal,” University of Kansas, Tribhuvan University, and others
- “Building resilience to seismic hazard in Indonesia: Training in multichannel analysis of surface waves (MASW) and implementing seismic disaster mitigation strategies,” Brigham Young University, Utah Valley University, Universitas Pembangunan Nasional, and others
- “Development of sustainable groundwater resources in Saint Catherine area, Sinai, Egypt,” Texas A&M University, Corpus Christi; Suez Canal University; and the Desert Research Center
- “NepalEEW: Testing the feasibility of an earthquake early warning system in Nepal,” Institute of Geophysics of the Czech Academy of Sciences, Czech Republic, Oregon State University, and the National Disaster Risk Reduction and Management Authority
- “Geophysics applied to geotechnical study in Ouro Preto, MG — Brazil,” Sociedade de Geofísica Aplicada de Ouro Preto, Federal University of Ouro Preto, and others
- “Hydrogeophysics for community monitoring of groundwater in degraded dry forest quebradas of Peru,” EcoSwell; University of Piura, Peru; and University College London

**OTHER**

In one of our ongoing projects, “Geophysical investigation of fault zone aquifers and water quality assessment, Nkoteng, Cameroon,” the project investigator (PI) had difficulties with geologic surprises, equipment availability, and her availability due to a new assignment. We are working with the PI to save the project. If we cannot, we plan to cancel it to save the remaining funds. ■■■

Table 10. GWB project categories of 2021.

Submittal subject	Submittals	Funded	Ongoing
Water, sanitation, and hygiene (WASH)			
Groundwater resource exploration	22	1	3
Water resource management	18	1	2
Water quality	12	1	1
Disaster risk reduction			
Earthquake preparedness	8	1	3
Tsunami preparedness	2		
Terrain stability	9		3
Volcano preparedness	6	1	1
Flood mitigation	0		
Natural hazard education	2		
Food security			
Fisheries conservation	1	1	1
Environmental and cultural conservation			
Habitat conservation	1		
Pollution mitigation	1		
Archaeology			
Other			
Geothermal exploration	1		
Mineral exploration	3		

## REPORTS OF COMMITTEES

**GRAVITY AND MAGNETICS**

IRINA FILINA, CHAIR

In 2021, the Gravity and Magnetism Committee was involved in the organization of technical sessions, the Gravity and Magnetism Keynote Luncheon, and two day-long postconvention workshops at IMAGE '21. In addition, the committee organized the Gravity, Electromagnetic, and Magnetic (GEM) Career Panel, which was focused on students and early-career geoscientists with interests in nonseismic geophysical methods. Other activities throughout 2021 included reviewing technical publications, arranging publications for the committee's Meter Reader column in *The Leading Edge*, establishing collaboration with other SEG communities, and organizing a joint workshop with the American Geophysical Union (AGU).

The chair of the Gravity and Magnetism Committee for 2019–2021 was Irina Filina. Marianne Rauch served as vice chair in 2020 and started her two-year term as chair at the conclusion of IMAGE '21. Sergio Espinosa was elected as the vice chair for 2021–2023.

One of the committee's goals for 2021 was to increase collaboration with other SEG communities as well as with other professional societies. Toward that goal, the committee organized two workshops during IMAGE '21 jointly with the SEG Near-Surface Geophysics Technical Section (NSTS) and the SEG Mining Committee. The committee also organized one special session focused on new instrumentation jointly with NSTS. Collaboration also continued with AGU. In addition, the committee members volunteered as panelists for events organized by NSTS, including two sessions of the Student Applications Workshop run before and during IMAGE '21.

There were three gravity and magnetic-related technical sessions at IMAGE '21: one oral, one poster, and one virtual poster session. Chuck Campbell has been organizing the technical oral and poster sessions for many years, with abstract-reviewing assistance from committee members. Campbell continued this task in 2021 and has once again volunteered to do so for IMAGE '22.

The committee sponsored the Gravity and Magnetism Keynote Luncheon featuring Cynthia Evans, the lead exploration scientist from NASA Johnson Space Center, talking about the Antarctic asteroid program. The luncheon was held in person during IMAGE '21 and was a sold-out event.

The committee organized two successful full-day postconvention workshops in 2021. The following committee members were involved in the organization and chairing of both workshops: Ed Biegert, Ben Drenth, Jiajia Sun, and Rao Yalamanchili. The workshop "Filling in the gaps: The role of multiphysics to understand geologic and mineral systems" was run in collaboration with the Mining Committee. It featured virtual technical presentations in real time from all over the world and attracted approximately 40 participants. The workshop "Magnetic method for near surface and mining applications: In memory of Afif Saad" was organized jointly with NSTS and the Mining Committee and was also run virtually with approximately 40 participants. The downside was that the workshops were scheduled simultaneously and thus competed with one another. This was a subject of discussion during the post IMAGE '21 Gravity and Magnetism Committee meeting. The committee requests that SEG meeting organizers avoid similar scheduling

conflicts for the committee's events in the future.

The committee supports the Meter Reader column in *The Leading Edge*, focusing on different issues related to potential fields. Alan Morgan coordinated the publication of this column in 2021 and will be replaced by Irina Filina in 2022. In 2021, there was one article published in the column focused on drone magnetism, and one more is currently in review for 2022.

Another committee goal for 2021 was to promote nonseismic geophysical methods. Toward this goal, the virtual GEM Career Panel was organized in August 2021. The panel featured Gravity and Magnetism Committee members as panelists and targeted students interested in careers focused on nonseismic geophysics. The event was marketed by SEG and attracted approximately 70 participants. The panel was a successful outreach event that triggered good discussions between the committee panelists and students interested in nonseismic careers.

Dale Bird is the Gravity and Magnetism Committee representative on the AGU-SEG Collaboration Committee. A joint AGU-SEG workshop on distributed arrays was postponed from the summer of 2020 to February 2021 due to the pandemic. Another joint workshop on full-waveform inversion for near-surface applications was held in the summer of 2021. For 2022, a joint workshop focused on the geophysics of convergent margins is planned.

The committee remains active on social media (LinkedIn, Facebook, Twitter, and Instagram). In 2021, the dedicated LinkedIn group <https://www.linkedin.com/groups/150047/> was rejuvenated and rebranded with a new name "Potential

## REPORTS OF COMMITTEES

fields — Magnetic personalities.” In addition, the committee submitted content toward the quarterly newsletters published by NSTS.

The committee will continue to support SEG-related activities that promote knowledge and applications of gravity and magnetic methods at the annual meeting and throughout the year. ■■■

## HEALTH, SAFETY, SECURITY, AND ENVIRONMENT

SHARON TEEBENNY, CHAIR

The mission of the Health, Safety, Security, and Environment (HSSE) Committee is “to help ensure that HSSE is taken into consideration for any activities that the SEG manages or sponsors. The committee will not duplicate the work that the International Association of Geophysical Contractors and International Association of Oil and Gas Producers do with HSSE for geophysical operations, but rather complement it and utilize wherever possible industry guidance already developed.”

### 2020–2021 ACCOMPLISHMENTS

Sharon Teebenny replaced Luke Decker as chair of the committee. The following was accomplished.

- We collaborated with the Field Camps Committee to strengthen and improve HSSE plans. This included the development of a threat-assessment matrix and sample HSSE plan.
- The committee reviewed and evaluated field camp proposal HSSE plans. We provided constructive feedback to the applicants to let them know how to improve their plans. This will enable the

applicants to resubmit their plans and receive travel grant funding.

- The committee drafted guidance documents for international travel by SEG members for both U.S. and non-U.S. citizens.
- We integrated geophysical safety concerns into Kevin Bohacs’ widely recognized field-safety course, gaining provisional acceptance through the Continuing Education Committee. We will scope the possible cost structure for the course and make it available to those who are planning field camps.

- We developed HSSE guidelines for managing pandemic risks for in-person events as they begin to resume.

### 2021–2022 OBJECTIVES

- We will liaise with the Near-Surface Geophysics Technical Section to determine how we can best support the environmental portion of our mandate.
- The committee will complete documents on international travel guidelines for SEG members and staff.
- We will continue to support the Field Camps Committee by providing feedback on HSSE plan components of proposals.
- The committee will facilitate dialogue with the Student Congress and Field Camps Committee on managing student health and safety.
- Additional committee members will be added.
- We will revamp the HSSE information on the SEG website. This will include a major refresh and placing

guidance documents where they are easy to locate.

- The committee will launch a LinkedIn campaign.
- We will define a strategy for global external visibility.
- The committee will plan webinars including external webinars on topics related to HSSE and the committee. ■■■

## HONORS AND AWARDS

JOHN BRADFORD, CHAIR

The Honors and Awards Committee consists of the five most recent past presidents of SEG. The 2021 members were John Bradford (chair), Bill Abriel, Nancy House, Rob Stewart, and Rick Miller.

Nominations were solicited from the membership at large following the 2020 SEG Annual Meeting. Nominations for certain Best Paper or Best Presentation awards were provided by the Technical Program Committee for the 2020 Annual Meeting, the editor of *GEOPHYSICS*, the Editorial Board of *Interpretation*, and the Editorial Board of *The Leading Edge*.

The Honors and Awards Committee — following extensive research by each of the committee members — makes and documents recommendations, which must receive approval from the SEG Board of Directors. In some cases, the recommendations must be unanimously approved by both the committee and the Board.

The following awards were conferred at IMAGE ’21 in Denver. Full citations for these awards were published in *The Leading Edge*.

## REPORTS OF COMMITTEES

**MAURICE EWING MEDAL**

Rosemary Knight

**VIRGIL KAUFFMAN GOLD MEDAL**

Joe Dellinger

**HONORARY MEMBERSHIP**

Arthur C. H. Cheng

**REGINALD FESSENDEN AWARD**

Chengbo Li, Boris Gurevich, and Estella Atekwana

**LIFE MEMBERSHIP**

Reinaldo Michelena

**J. CLARENCE KARCHER AWARD**

Niels Grobde, Xukai Shen, and Jiajia Sun

**SPECIAL COMMENDATION**

Isaac J. Crumbly and Yang Liu

**OUTSTANDING EDUCATOR**

Deyan Draganov and Kelly Hong Liu

**CRAIG J. BEASLEY AWARD FOR SOCIAL CONTRIBUTION**

Tanvi Arora

**BEST PAPER IN GEOPHYSICS**

“Estimation of in situ hydrocarbon saturation of porous rocks from borehole measurements of spontaneous potential” by Joshua Bautista-Anguiano and Carlos Torres-Verdín

**BEST PAPER IN THE LEADING EDGE**

“SaltNet: A production-scale deep learning pipeline for automated salt model building” by Satyakee Sen, Sriharath Kainkaryam, Cen Ong, and Arvind Sharma

**BEST PAPER IN INTERPRETATION**

“Subsurface basement, structure, stratigraphy, and timing of regional tectonic events affecting the Guajira Margin of northern Colombia” by Eleine Vence and Paul Mann

**BEST PAPER PRESENTED AT THE 2020 SEG ANNUAL MEETING**

“A logical error in Gassmann poroelasticity” by Leon Thomsen

**BEST POSTER PAPER PRESENTED AT THE 2020 SEG ANNUAL MEETING**

“A workflow of separating and imaging diffraction wave by using deep learning network: An application of GPR data” by Ming Ma, Rui Zhang, and Jonathan Ajo-Franklin

**BEST PAPER PRESENTED BY A STUDENT AT THE 2020 SEG ANNUAL MEETING**

“Event detection using a fast matched filter algorithm — An efficient way to deal with big microseismic data sets” by Hanh Bui

**BEST POSTER PAPER PRESENTED BY A STUDENT AT THE 2020 SEG ANNUAL MEETING**

“Wasserstein cycle-consistent generative adversarial network for improved seismic impedance inversion: Example on 3D SEAM model” by Ao Cai

**INTERPRETATION EDITORIAL BOARD**

BALAZS NEMETH, EDITOR-IN-CHIEF

This is the ninth *Interpretation* annual report since its launch in October 2012. The Editorial Board members for 2021 included Balazs Nemeth (editor-in-chief [EIC]), Kurt Marfurt (deputy EIC), William L. Abriel, Saleh Ammar Al-Dossary, Sunday Amoyedo, Huyen Thi Thanh Bui, Dallas B. Dunlap, Vsevolod Egorov, Shu Jiang, Robert K. Merrill, Lisa Stright, Oskar Vidal Royo, Bradley Wallet, Chicheng Xu, Hongliu H. Zeng, Bo Zhang, and Hongtao Zhu. In 2021, a new EIC, Vsevolod Egorov, and a new deputy EIC, Bradley Wallet, were appointed by the SEG Board of Directors and the AAPG Executive Committee based on the recommendation of the past EIC and deputy EIC. To help keep track of special-section submissions, a special-section coordinator role was created and trialed. During the annual meeting of *Interpretation* editors, the effectiveness of the role was evaluated and the decision was made to make this role permanent.

Due to the pandemic, all board and other editorial meetings in 2021 were conducted remotely. The recordings and minutes of the meetings are stored and available to board members on the *Interpretation* Basecamp website.

*Interpretation* is built on special sections, with standing sections on “Tools, Techniques, and Tutorials,” “Pitfalls,” and “Funny-Looking Things” added this year, as well as a general technical section. There are three motivations for the special sections. First, the readers of *Interpretation* can find multiple articles addressing a given technical topic or geologic basin, thereby identifying unifying themes and alternative perspectives. Second, the

## REPORTS OF COMMITTEES

special sections are organized by guest editors, thereby broadening not only the intellectual scope but also the geographic and demographic diversity of the journal. Third, in addition to the published call for papers requesting submissions from the geotechnical community at large, the special-section editors directly enlist contributions from potential authors who are either authorities on a specific technical topic or seasoned interpreters in a specific basin. Such invitations from the special-section editors on behalf of AAPG and SEG to publish in *Interpretation* greatly facilitate the release of proprietary data, workflows, and best practices from company management. Indeed, such requests are correctly viewed as outside recognition of company expertise and therefore aligned with business goals of being a preferred partner, operator, or technology provider.

The expectation is that each board member will initiate at least two special sections per year. Not all special sections receive the minimum of three papers; in this case, accepted papers appear in the general technical section. Papers that miss the special section due to delays in data release or additional revisions appear in the next technical section. Papers accepted for publication prior to the target special-section publication date are placed online as accelerated articles immediately after they have gone through the galley proof.

Table 11 summarizes the origin of papers by country for 2021. The origin roughly represents the membership of SEG and AAPG. As in 2020, the focus of the special sections can influence the origin of the papers. In 2021, the main countries of origin were China and the United States. Compared to previous years, significantly more papers were received from the

Russian Federation and Nigeria, due to special sections targeting these regions. There were fewer papers published from geographic areas outside of these four.

Table 12 groups the contributions by type of institution. With the desire of university faculty and students to document their capabilities through peer-reviewed publications, it should be no surprise that universities contribute 60% of the papers, unchanged from previous years. However, note that the simple classification in these tables has a bias — with many of the Chinese university authors working in institutions that are more accurately categorized as university-industry-government technology labs based at university sites.

Table 11. Origin of papers submitted for publication in *Interpretation* by country between 1 January 2021 and 31 December 2021.

China	112
United States	48
Russian Federation	15
Nigeria	12
India	5
Poland	5
Australia	4
Canada	4
Saudi Arabia	3
Tunisia	3
Brazil	2
Egypt	2
Ghana	2
Netherlands	2
Norway	2
United Kingdom of Great Britain and Northern Ireland	2
Benin	1
Denmark	1
Malaysia	1
Senegal	1
Spain	1
<b>Total</b>	<b>228</b>

The success of the journal led to a continued increase in the number of unsolicited papers to the general technical section (Table 13). To aid in this effort, we have enlisted a suite of high-energy deputy associate editors, including Andrea Miceli-Romero, Bruno Honorio, Chaoli Lan, ChingWen Chen, Chris Ogiesoba, Debapriya Paul, Felipe Lozano, Gaurav Dutta, Marcilio Matos, Murari Khatiwada, Poona Srinivasan, Rui Zhang, Shuo Zhang, Shuvajit Bhattacharya, Sumit Verma, Tao Zhao, and Xinming Wu. These deputy associate editors have been proficient in conducting efficient, timely, and objective reviews of papers in a wide range of topics.

The manuscript-handling statistics are listed in Tables 14 and 15. There is no significant change in the number of days required for the first review (Table 14) and in the average number of days spent between acceptance and online publication (Table 15). Out of papers receiving a final decision in 2021, 70% were accepted, this is 7% lower than in 2020.

During its ninth year, in 2021, the metrics of the journal indicate that it became a mature earth-science journal with further potential to grow. The 2021 metrics for the journal are listed in Table 16. The pandemic did not seem to have any detectable impact on the journal submissions based on the 2021 statistics.

Table 12. Origin of papers submitted for publication in *Interpretation* by employer between 1 January 2021 and 31 December 2021.

Universities	135
Oil companies	40
Research institutes	22
Governments	14
Consultants	10
Service companies and manufacturers	6
Retired	1
<b>Total</b>	<b>228</b>

## REPORTS OF COMMITTEES

Table 13. Special section and paper count.

	Planned special sections	Published special sections	Special section papers	General technical section papers	Total papers published
2013					
August	1	1	8	9	21
November	1	1	10	7	19
2014					
February	2	2	23	4	28
May	2	3	21	6	26
August	4	3	19	2	21
November	8	4	26	9	35
2015					
February	8	6	35	4	40
May	8	6	32	7	41
August	6	8	50	4	55
November	7	4	30	6	38
2016					
February	3	3	27	7	35
May	5	5	22	11	34
August	6	6	28	13	42
November	6	6	13	18	33
2017					
February	4	4	19	11	30
May	4	2	23	12	38
August	7	6	39	14	53
November	5	4	20	14	35
2018					
February	4	3	18	16	34
May	3	2	14	19	36
August	4	2	16	20	37
November	4	4	27	21	49
2019					
February	1	1	3	18	23
May	3	2	10	20	30
August	5	3	29	12	42
November	5	4	21	15	36
2020					
February	4	1	7	16	25
May	4	4	17	18	36
August	2	2	26	15	41
November	7	7	54	32	86
2021					
February	1	1	2	19	23
May	6	4	19	23	45
August	1	1	2	27	32
November	2	3	19	12	34

In summary, through the efforts of the SEG editorial staff, the work of the special-section editors, the board of editors, and most importantly, the contribution of the authors and reviewers, *Interpretation* is running smoothly, addressing the needs of our readership, and further building its reputation as a peer-reviewed journal. ■■■

Table 14. Manuscript-handling statistics.

Year submitted 1 July–30 June	Average number of days required for first review
2013–14	64
2014–15	69
2015–16	59
Year submitted 1 January–31 December	Average number of days required for first review
2016	61
2017	66
2018	63
2019	64
2020	61
2021	65

Table 15. Manuscript-handling statistics.

Year published 1 July–30 June	Average number of days between accep- tance and online publication
2013–14	82
2014–15	70
2015–16.	58
Year published 1 January–31 December	Average number of days between accep- tance and online publication
2016	68
2017	56
2018	73
2019	71
2020	73
2021	82

## REPORTS OF COMMITTEES

Table 16. *Interpretation* metrics.

Indicator (source)	2021 score
h5-index (Google Scholar)	27
h5-median (Google Scholar)	34
CiteScore (Scopus)	2.0
Journal Citation Indicator (Web of Science)	0.44
Journal Impact Factor (Web of Science)	1.201

## JUSTICE, EQUITY, DIVERSITY, AND INCLUSION

JOSÉ ARCE, CHAIR

The Justice, Equity, Diversity, and Inclusion (JEDI) Committee was formed midway through 2021 on a foundation of work by two task forces, both chaired by Anna Shaughnessy. The Equity in Process Task Force was formed by Rick Miller in 2020. In January 2021, it submitted three recommendations to the SEG Board of Directors, all of which were approved. The first was to add a preamble to the SEG Policies and Procedures Manual describing SEG's commitment to justice, equity, diversity, and inclusion. The second was that the manual be edited to remove gender-specific language. This was accomplished later in the year. The third was to form a new task force called the JEDI Task Force. The task force was focused on establishing a charter and procedures for the JEDI Committee, which was approved during the April 2021 Board meeting.

Maurice Nessim and Shaughnessy asked José Arce to be the first chair of the committee. An invitation to join the committee was extended to JEDI Task Force members, and Estella Atekwana, Lillian Flakes, Eileen Martin, and Manika Prasad

all agreed to participate. Flakes agreed to be the committee's cochair, and Ted Bakamjian continued as the staff liaison.

The next step was to form a truly diverse group within the committee, representing all regions and groups from the world. An invitation was sent out openly for people interested in participating. The committee received many responses from interested parties. In the end, 13 new members joined.

The committee is formed by the JEDI Task Force members mentioned earlier and incoming members Alan de la Fuente (Mexico), Chi Zhang (Austria), Ellie Ardakani (Canada), Ibrahim Amni (Egypt), Annisa Mutiara Badri (Indonesia), Sean Walker (Scotland), Rick Miller (USA), John Eastwood (USA), Rocco Detomo (USA), and Ramesh Neelamani (USA). Brandy Hawkins accepted an assignment as board liaison, and Alex Biholar took the role of SEG Foundation board liaison.

The committee had meetings discussing ideas on how to foster adoption of JEDI values across SEG, starting with its committees and boards. Consensus is that training in justice, equity, diversity, and inclusion is needed and that further action needs to be informed by better diversity metrics. Late in 2021, the committee sent an introductory message to leaders of most SEG committees and boards and asked them to place a high value on JEDI recruiting and practice and to supply metrics and recruiting practices. This work was just beginning as this report was assembled. The initiatives that grow from it will help SEG make needed significant cultural changes. ■■■

## MACHINE LEARNING

BOB CLAPP, CHAIR

The Machine Learning Committee was established by vote of the SEG Board of Directors in October 2020, on the recommendation of a Machine Learning Task Force that was formed by Rick Miller earlier in the year. Under the committee's charter in the SEG Policies and Procedures Manual, the committee advises the SEG Board on matters involving machine learning applied to geoscience problems and organizes events that advance the application of machine learning to geophysics. Leaders of the group in addition to myself are Cochair Mauricio Araya, Chris Liner (chaired the task force), and Bill Abriel. They have helped engage other SEG members involved in machine learning. ■■■

REPORTS OF COMMITTEES

**MEETINGS REVIEW AND PLANNING**

JOSÉ ARCE, CHAIR

The main goal of the Meetings Review and Planning Committee (MRPC) is to analyze and approve SEG’s involvement in meetings and activities apart from the annual meeting. This was my last year as chair of the committee. The new chair will be Alex Martinez.

The 2021 committee members were Mohammed Badri, Terrel Dhanpaul, Paul

Cunningham, Rocco Detomo, Carmen Dumitrescu, Tim Dean, Cengiz Esmersoy, Jesse Baker, Irina Filina, Feng Zhang, and Alex Martinez. Our staff liaison was Kristi Casey.

The review and approval of events continues to be a streamlined monthly process. When the documentation and support forms are added for the monthly events, each member analyzes them and casts their vote in an online spreadsheet. In 2021, 42 events were reviewed and approved from January to October, with

more than 70% participation. The only exception was the month of March.

The need to have faster approval for online events was brought up in a committee meeting 28 January 2021. This was mainly due to the surge in one- to three-day virtual events, which have brief turnaround times. The committee determined that if the event has a duration of one day or less, requirements will be provided to the interested party. Approval from the committee is not needed. However, the events still need to be submitted to the committee so they can be placed on the calendar of events.

Another item approved during the meeting was that an exception will be made to perform the approval process outside of the normal time period for meetings with six months or less prior to the event.

There was a surge of virtual events in 2021, mostly due to the pandemic. Compared to previous years, there were fewer events in North America. The Middle East and China offices continue to be strong in planning and executing local events. Africa would be better served with a regional office or representative committee. ■■■

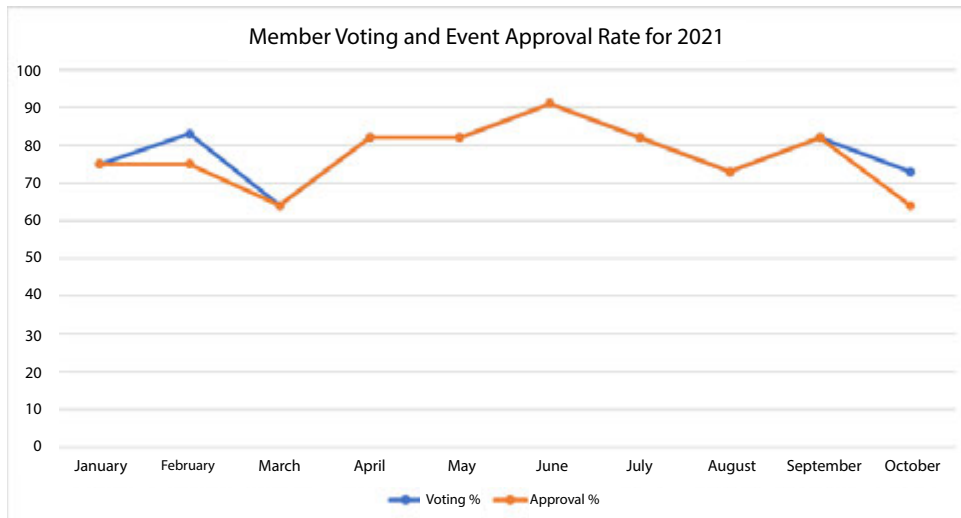


Figure 10. Results of the 2021 voting and approval process.

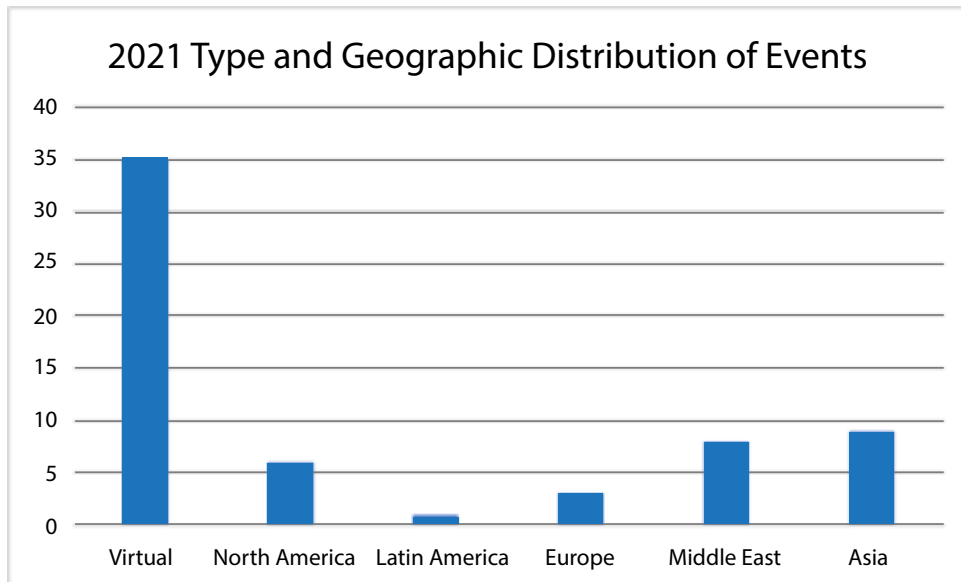


Figure 11. Type and geographic distribution of events in 2021.

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**MEMBERSHIP**

MICHEL VERLIAC, CHAIR

The 2020–2021 time period saw a decrease in membership of approximately 10% (from 15,484 to 13,574 as of 7 September). However, these numbers are better than budgeted (US\$795,000 for the \$677,000 budgeted).

The Membership Committee is comprised of 26 members representing industry, academia, and retired personalities. In late 2020, the committee decided to meet more often. Six meetings took place between October 2020 and September 2021, and several topics were discussed during this difficult time for our industry and communities.

The main objectives of the meetings were to look for solutions to retain members and evaluate how SEG could expand. Similar to the oil-and-gas industry, our gender diversity is poor, with a ratio of one (female) to eight (male). A specific action should be defined in this aspect. Another important topic concerned the emeritus status and how SEG should promote and develop interaction with

this group during our conferences and beyond. They are the memory of our community and among the most motivated and should be a part of our activities. Other topics such as developing our geographical footprint (especially in Asia and China) were discussed, although specific challenges have to be overcome. Attraction of young talent is also crucial for our future. It was discussed that “new” disciplines such as civil engineering and near-surface geophysics have potential for the future.

Another topic of concern in our community is the possible merger of the American Association of Petroleum Geologists and Society of Petroleum Engineers, with potentially the addition of SEG. This should be addressed in the coming months.

The new chair will be Aaron Girard, replacing Michel Verliac. The vice chair will be Anita Thapalia. 🏠

**MINING**

GLENN CHUBAK, CHAIR

During the last two years, I have been supported by Sarah Devriese (vice chair) and Jiajia Sun (key technical contact). The mission of the Mining Committee continues to be organizing technical content at the annual meeting and arranging activities within the mining community. Each year, committee meetings are held at the SEG annual meeting, Association for Mineral Exploration Roundup Conference, and Prospectors and Developers Association of Canada (PDAC) International Convention. In 2021, the Roundup and PDAC meetings were held virtually, while the SEG meeting was in person with a virtual follow-up. In years where the Australian Society of Exploration Geophysicists meets, a committee meeting may be scheduled there.

During IMAGE '21, the committee organized two in-person oral sessions, one virtual oral session, one in-person poster session, and two virtual poster sessions, with a total of 22 presentations. The committee organized a postconference workshop titled “3D computer geologic modeling for geophysicists and how to integrate geologic and geophysical computer earth modeling.” The committee also coorganized workshops with the Gravity and Magnetics Committee and Near-Surface Geophysics Technical Section titled “Filling in the gaps: The role of multiphysics to understand geologic and mineral systems” and “Magnetic method for near-surface and mining applications: In memory of Afif Saad.” All of the workshops were virtual. Attendance at the oral sessions was low, ranging from five to fewer than 20. The memorial workshop was well attended, with 45 people registered. In addition to the technical content, a student night

**PERCENTAGE BREAKDOWN OF MEMBERS BY TYPE PAID & UNPAID**

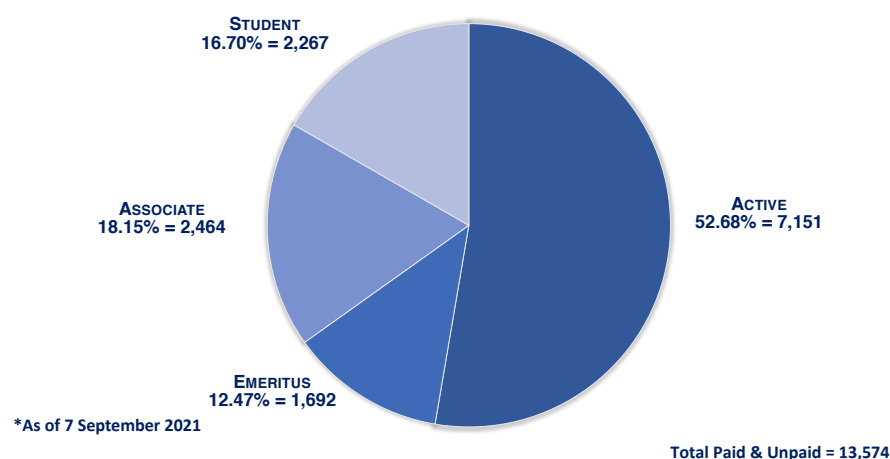


Figure 12. Members by type.

## REPORTS OF COMMITTEES

was held at a local venue. Several industry professionals were in attendance to meet with the students.

In 2021, topics at the committee meetings included planning for the SEG annual meeting, the need for the mining community to better communicate with government and the public, restructuring of SEG, and methods communication within the committee. ■■■

## NEAR-SURFACE GEOPHYSICS TECHNICAL SECTION

CATHERINE TRUFFERT, CHAIR

The 2020–2021 Near-Surface Geophysics Technical Section (NSTS) leadership included Catherine Truffert (chair), Chester Weiss (past chair), Erika Gasperikova (chair-elect), John Goff (vice chair), Christine Downs (secretary), Kennedy Doro (chair of the Global Subcommittee), and Sarah Morton Rupert (vice chair of committees).

The new leadership who were elected on 1 July and will take office after the SEG annual meeting are: Lee Slater (incoming chair-elect), Blair Schneider (incoming vice chair), and Elita Li (incoming chair of the Global Subcommittee). Appointed leadership include Morgan Sander-Olhoeft (student program lead), Niels Grobde (finance and grants lead), Ariel Lellouch (publications lead for GEOPHYSICS), and Steve Sloan (publications lead for *The Leading Edge*).

NSTS has developed two subcommittees including the Student Subcommittee and Global Subcommittee. The Global Subcommittee is comprised of the global chair and vice chair, along with Ahzegbodor Phillips Aizebeokhai, Theophile Ndougsa Mbarga, Elisha

Shemang, and Gilles Grandjean. The Student Subcommittee is comprised of the student program lead and vice chair of committees, along with Kristen Burke, Christopher Terra, Alejandro Garcia, Iga Pawelec, and Noah Dewar. Both subcommittees have been active throughout the year.

NSTS has continued sustained growth. The joint AGU-SEG workshop on distributed acoustic arrays was postponed to February 2021 due to pandemic-related issues. ■■■

## NOMINATIONS

TAD SMITH, CHAIR

The Committee on Nominations is charged with assembling a list of candidates for the Board of Directors and district representatives, as well as overseeing all membership votes. The committee is made up of three immediate prior SEG past presidents; four representatives from sections, associated societies, technical sections, or geographic districts; the chair of the Council; and two SEG directors at large. This year's committee members were Nancy House, Rob Stewart, Rick Miller, David Rampton, Yang Liu, Anton Bogrash, Gustavo Carstens, Sherif Hanafy, and Tad Smith.

Finding candidates can be a challenge because requirements and expectations for each Board position are unique. For example, all president-elect candidates are required to have prior Board service, with a record of affecting change for the betterment of the Society and our profession. For the other executive positions, previous experience on the Board or working directly with the Board and a recognized history of active and meaningful engagement with SEG are key requirements. For vice president,

publications, extensive experience with the SEG Publications Department is a requirement. For the director-at-large positions, an established history of SEG committee work and Society involvement are the two primary considerations. No previous direct engagement with the Board is required for the director-at-large positions, which allows us to identify candidates from a much larger pool of members.

The committee formally submitted its slate of candidates to SEG President Maurice Nessim in February 2021. The candidates are listed below.

## 2021 SEG ELECTION CANDIDATES

President-elect:

- Guillaume Cambois
- Kenneth Tubman

Second vice president:

- Aldo Vesnaver
- Joseph M. Reilly

Vice president, publications:

- Douglas Foster
- Jeffrey Shragge

Director at large:

- José R. Arce
- Sandeep Kumar Chandola
- Ana Curcio
- Leo Eisner
- Olga Nedorub
- Huasheng Zheng

In addition to the Board of Directors election, all districts held elections for one new representative.

District 1:

- Cheryl Mifflin
- Neda Bundalo

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## District 2:

- Kathryn Hardy
- Paul Anderson

## District 3:

- Christopher Ross
- Weldon H. Beauchamp

## District 4:

- Ray Earley
- Subhashis Mallick

## District 5:

- Craig Funk
- Raul Cova

## District 6:

- Marco Ceia
- Luis Donoso

## District 7:

- Laura Bornatici
- Irina Bayuk

## District 8:

- Barbara Ciurlo
- Maria Helena Caeiro

## District 9:

- William Henry McLellan
- Obi Ifeanyichukwu

## District 10:

- Ilya Silvestrov
- Abdulmohsen AlAli

## District 11:

- How-Wei Chen
- Ruijia Wang

## District 12:

- Lisa J. Gavin
- Kim Frankcombe

Survey & Ballot Systems Inc. (SBS) was contracted to conduct the SEG election for the Board of Directors. SBS designed and distributed an electronic ballot and

a paper ballot to each Voting member. SBS received, tabulated, and verified the votes and submitted the results to the SEG business office. The Committee on Nominations verified the count provided by SBS.

Official ballots were sent out 2 June 2021 to 8343 Voting members eligible to vote in this year's election. The annual election had a participation rate of 18.34%.

**ELECTION RESULTS**

President-elect: Kenneth Tubman  
 Second vice president: Joseph M. Reilly  
 Vice president, publications: Jeffrey Shragge  
 Directors at large: Ana Curcio and Olga Nedorub  
 District 1: Neda Bundalo  
 District 2: Kathryn Hardy  
 District 3: Christopher Ross  
 District 4: Ray Earley  
 District 5: Craig Funk  
 District 6: Marco Ceia  
 District 7: Laura Bornatici  
 District 8: Barbara Ciurlo  
 District 9: Obi Ifeanyichukwu  
 District 10: Abdulmohsen AlAli  
 District 11: Ruijia Wang  
 District 12: Lisa J. Gavin

In addition to the Board of Directors and district representatives election, all Voting members were asked to vote on two Bylaws amendments. Both of the amendments were approved.

The first amendment, in the Table of Contents and Article I, established Houston, Texas, USA, as the location of the Society's headquarters by removing language requiring that the Society's principal office be located in Oklahoma. The second amendment, in Article XIV, incorporated gender-neutral language to this section of the Bylaws. ■■■

**OIL AND GAS RESERVES**

RICHARD XU, CHAIR

In 2021, the Oil and Gas Reserves Committee continued promoting SEG and geophysics in petroleum reserves and resources assessment/management through communicating and collaborating with sister societies, writing and updating the Petroleum Resources Management System application guidelines, and raising awareness of reserves/resources evaluation to fellow geophysicists within SEG.

The petroleum industry and industry-related professional societies are in a transition from hydrocarbon exploration and production to a broader low-carbon energy business. The committee should revisit its mission and scope to reflect the expansion from oil-and-gas-centered reserves/resources management to include other natural resources such as geothermal, lithium, helium, etc. and storage resources management such as CO<sub>2</sub> geologic storage, with more collaboration both within and outside of SEG.

**COMMITTEE MEMBERS**

- Chuandong (Richard) Xu, chair
- Dan Maguire, vice chair
- Andrew Royle
- Mohammed Ibrahim
- Enzo Aconcha
- Jean-Pierre (J. P.) Blangy
- Maria Angela Capello (Board liaison)
- Annabella Betancourt (staff liaison)

**PETROLEUM RESOURCES MANAGEMENT SYSTEM**

SEG is one of the sponsoring societies of the Petroleum Resources Management System (PRMS) and its application guidelines (PRMS-AG). The Society of Petroleum Engineers (SPE) is the lead

## REPORTS OF COMMITTEES

organization managing the update process and leading the efforts to finalize the latest version of PRMS-AG.

The committee finished the draft/edit/revise work for chapter 3, “Seismic applications.” We also participated in the review of other chapters for the PRMS-AG at the end of 2021. Final reviews are being performed by the SPE Subcommittee. The PRMS-AG is expected to be formally released by SPE in mid-2022.

### OTHER ACTIVITIES

The committee submitted three papers, of which two were accepted, to IMAGE ’21 about the role of geophysics and this committee in the management of reserves/resources and its relation to sustainability. The papers were presented at the event. In July, we gave a presentation at the SEG Board of Directors’ quarterly meeting to share the status of the committee.

In addition, members of the committee initiated the idea to organize a webinar on petroleum reserves/resources centered on the updated PRMS. We contacted SPE, the American Association of Petroleum Geologists, and the European Association of Geoscientists and Engineers to discuss cohosting the webinar.

### COMMUNICATION AND COLLABORATION WITH PEER SOCIETIES

The observer and chair of the committee attended a semi-annual meeting in May and annual meeting in October with SPE, delivered the committee update, and participated in discussions of SPE reserves/resources activities and initiatives.

### COMMUNICATION AND COLLABORATION WITHIN SEG

In 2021, we held a meeting with the Development and Production Committee chair to discuss cooperation on common topics.

### JOINT COMMITTEE ON RESERVES EVALUATOR TRAINING

The Joint Committee on Reserves Evaluator Training (JCRET) was formed in 2006 by AAPG, SPE, Society of Petroleum Evaluation Engineers, World Petroleum Council, and SEG with the purpose of providing high-quality industry-recognized training for individuals responsible for the evaluation of petroleum reserves and resources. However, SEG was inactive in recent JCRET, and we are reestablishing the connection.

### COMMITTEE MEETINGS AND PLANS FOR IMAGE ’22

Committee meetings were held in March and October 2021. During the meetings, we reviewed our progress and developed plans for the coming year. Topics included current committee structure, possible subcommittees, committee building, involvement with the CO<sub>2</sub> Sequestration Management System, socialization within the SEG community, etc.

The committee recommends organizing both a technical oral session and post-convention workshop on resource evaluation and management toward sustainability for IMAGE ’22. We propose that the oral session be chaired by members of the committee.

### THE ROAD AHEAD

The following are future tasks for the committee.

- Communicate the updates of the PRMS-AG to the SEG community when they are published in mid-2022.
- Further build the network of expert geophysicists/practitioners within SEG on reserves/resources.
- Develop a collection of published cases of geophysical application in reserves assessment.
- Collect effective examples of geophysical applications on shale reserves assessment.
- Initiate discussions with international/regional and United Nations agencies/organizations who are making standards and systems for reserves/resources management. Discuss how SEG should be involved in the development of geophysical applications in the standards, guidelines, and best practices.
- Decide if the committee should extend its context from oil and gas to other natural resources such as geothermal, lithium, helium, etc. and the storage management system such as CO<sub>2</sub> storage, hydrogen, etc. ■■■■

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**PASSIVE SEISMIC**

DAVE DILLER, CHAIR

On 1 December 2020, Ulrich Zimmer contacted Dave Diller regarding the chair position of the Committee for Passive Seismology. Zimmer shared that the committee had been dormant, and the last workshop was undersubscribed and canceled. Zimmer asked Diller if he would be interested in taking over as chair of the committee. Diller accepted the proposal a few weeks later on the condition that the name of the committee be changed in order to broaden its scope. The appointment of Diller as chair was approved in early 2021.

Diller requested that the committee be renamed as the Committee for Passive Seismic. The term “passive seismic” encompasses passive monitoring of seismic waves at any scale and for any use, including traditional applications such as earthquake seismology and microseismic monitoring. It also includes distributed acoustic sensing (DAS) applications such as security, industrial, and infrastructure monitoring.

The committee has been meeting on the first Wednesday of every month. There has been some discussion and healthy disagreement regarding the broadened scope. Members of the committee agreed to explore what industrial DAS applications may be suitable for geophysical methods and related signal processing.

The committee agreed to use some webinars with presentations from experts in DAS applications to explore this further. The webinars presented in 2021 included the following.

- “Distributed fiber-optic sensing development: Urban infrastructure

management applications” by Michael Montgomery of AP Sensing was presented through the Denver Microseismic Study Group on 20 July.

- “Distributed acoustic sensing applications in engineering and geoscience” by Andres Chavarria of OptaSense was presented through the Denver Microseismic Study Group on 17 August.
- “Distributed acoustic sensing with disposable fiber” by Jessica Barhaug of Great Western, Matthew Lawrence of Ziebel, and Richard Gibson of NanoSeis was presented through the Denver Microseismic Study Group on 23 September.
- “Plain trains, and automobiles: Apply geophysics to the monitoring of transport networks using DAS” by Kit Chambers of Motion Signal Technologies was presented through our committee on 19 October.
- “Distributed acoustic sensing applications in engineering and geoscience” by Andres Chavarria of OptaSense was presented through our committee on 2 December.

Also in 2021, Piero Basini was nominated and approved as vice chair of the committee during a meeting on 3 June.

The challenges ahead for the committee are to begin narrowing the scope and planning the agenda for a workshop in 2022. ■■■

**PUBLICATIONS**

SERGEY FOMEL, CHAIR

The SEG Publications Committee is an umbrella committee for handling topics spanning multiple publication venues at SEG, including journals, books, and expanded abstracts. The committee includes leaders of all SEG publications teams. In 2020–2021, they were Jeffrey Shragge (GEOPHYSICS editor-in-chief), Yongyi Li (*The Leading Edge* Editorial Board chair), Balazs Nemeth (*Interpretation* editor-in-chief), Lianjie Huang (Books Editorial Board chair), Bryce Swinford (Technical Program Committee chair), Lucia Torrado (Translations Committee chair), William Green (Reviews Committee chair), and James Rector (member at large). Ted Bakamjian (associate executive director, publications and communities) served as staff liaison, and Jennifer Cobb (director, journals and books) and Jenő Mavzer (publishing platform manager) provided considerable support for all committee activities.

During 2020–2021, the committee had virtual meetings and e-mail discussions, which resulted in submitting two proposals for adjustment of member publication benefits in order to help the Society’s publications program operate in a financially sustainable way. Both proposals were subsequently approved by the SEG Board of Directors.

The first proposal was to limit the benefit of *The Leading Edge* in print to members paying at the World Bank IV group countries (high-income) rate. This was approved at the January 2021 Board meeting and immediately put into effect.

The second proposal was to create a new pricing scheme for member

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subscriptions to publications. Under this proposal, all members are going to receive, as a benefit of membership, online access to the following publications: *The Leading Edge*, all meetings papers in the SEG Library, and all GEOPHYSICS content published from 1936 to 1999. The previous member benefit of online access to either *Interpretation* or current and recent issues of GEOPHYSICS was eliminated and replaced with options to purchase access to any of several bundles of publications, some of which include access to the *Journal of Environmental and Engineering Geophysics*. Prices were set for each bundle, with members from World Bank I and II (low-income countries) and students offered the opportunity to subscribe at approximately half the World Bank III/IV price.

The Board approved the new member-subscriptions plan at its April 2021 meeting. It was expected that the plan would be applied for all new and renewing members starting in June 2021. However, due to a shortage of SEG IT resources to put the plan into place, it wasn't implemented until renewals for members with 1 January anniversary dates were issued in late October.

Aside from these publications-sustainability matters, the committee engaged in strategic discussions on two key topics: (1) whether SEG should consider changing the length and format of expanded abstracts; and (2) whether procedures for selecting best papers for SEG journals require any adjustments to criteria and processes. The discussions were productive but have not resulted in concrete proposals.

After the committee's abstracts discussion, SEG joined the American Association of Petroleum Geologists

(AAPG) in a unified annual meeting — the International Meeting for Applied Geoscience and Energy (IMAGE) — which in 2021 featured a combination of SEG four-page abstracts and AAPG one-paragraph abstracts. For IMAGE '22, meeting organizers decided to offer authors the option of submitting papers of 500–2000 words, not exceeding four pages (including graphics).

The Publications Committee compared the best-paper criteria of SEG's three journals — GEOPHYSICS, *Interpretation*, and *The Leading Edge* — and developed a consensus that it will not be necessary for all of the journals to follow the same criteria but will be helpful to ensure that all editors making selections from among nominated papers are clear on the criteria they should apply and that the criteria are shared with the SEG vice president, publications.

This report brings to conclusion my four-year service, which began with my election to two years of service as vice president, publications on the SEG Board and was followed by two years of service as Publications Committee chair. During my first year as chair (2019–2020), the committee worked closely with the SEG staff to develop or amend several SEG publications policies. In my second year, there were no significant policy changes beyond the member-benefits adjustments. Several important areas of policy may arise during 2021–2022, when Baishali Roy will lead the committee after her two years of service as vice president, publications. These may include a revision to article-sharing permissions, strengthening of data-availability requirements for journal articles, and revising open-access principles for better alignment with other publishers. ■■■

**RESEARCH**

ARIA ABUBAKAR, CHAIR

SERGIO CHÁVEZ-PÉREZ, PAST CHAIR

The Research Committee serves to improve communication among earth scientists interested in applied research, to advise the SEG Board of Directors on research matters, to identify research topics worthy of focused workshops, and to organize those workshops. The committee meets twice a year, with much of the committee's business conducted by e-mail. Membership is open to all researchers. Currently, the committee includes 96 members from a variety of industrial and academic segments, including young professionals and student members.

In our column in *The Leading Edge*, we aim to share news, poll members, and discuss a wide range of topics in exploration geophysics such as carbon capture and storage, fiber-optic sensing, machine learning, sustainability, smart cities, urban environments, near-surface studies, minerals, and environmental, engineering, and humanitarian applications. Currently, business models and climate for future technology generation are also of interest to us. The committee is made up of a variety of members with unique views and interests, so this column is written by a different member each time. Two instances of the column were published in 2021. One was on early-career researchers and the other was on high-tech low tech.

There were three committee meetings in 2021. The first meeting was used to discuss IMAGE '21 postconvention workshop proposals. The second meeting was used to discuss postconvention workshop proposals for IMAGE '22. The final meeting

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focused on reviewing the results of the IMAGE '21 postconvention workshops.

In October 2021, Aria Abubakar became chair of the committee following the service of Sergio Chávez-Pérez. Vice chair selection will take place in early 2022.

The following postconvention workshops were held during IMAGE '21.

- Anisotropy and microseismics — In memory of Vladimir Grechka and his contributions to applied seismology
- Distributed fiber-optic sensing in applied geophysics (two parts)
- Machine learning versus conventional approaches/workflows in applied geophysics — Challenges, values, and where we are heading (two parts)
- The role of geophysics for carbon capture, usage, and storage
- The role of geophysics for carbon capture, usage, and storage, part 2: How to design and implement a “smart” monitoring plan
- Geophysical challenges in presalt carbonates
- Geophysical methods and applications for sustainable cities

In addition, the Research Committee organized a special session during IMAGE '21 titled “Recent advances and the road ahead: Geophysics for new energy applications.” In this special session, five presentations were delivered on geoscience applications for carbon capture and storage and offshore wind farms. ■■■

**REVIEWS**

BILL GREEN, CHAIR

In 2021, there was a decline in the number of reviews appearing in *The Leading Edge* (*TLE*). There were 17 published reviews in 2021, compared to 27 in 2020 and 29 in 2019 and 2018. This is mostly due to ongoing effects of the pandemic, with challenges in getting books from publishers and dramatic changes in work schedules and environments for many committee members, reducing their ability to take on extracurricular activities. For 10 months, we published one review per issue of *TLE*, but have recently increased this to two and expect to return to the typical count of three soon.

The committee roster remains steady at 32 for a third year. The committee members continue to provide innovative insights into the books received for review, which undoubtedly makes the Reviews page of *TLE* an important checkpoint for many readers. Their efforts also make it a great pleasure for me to be involved in the process.

Having completed a year as chair, I am grateful to my predecessor Amit Padhi for the well-organized operation that he passed on and for the in-depth transition meeting via Zoom, which covered every issue that may arise. Perhaps most important to the ongoing success of the group is Kelsy Taylor, who keeps information flowing freely, seamlessly handles the logistical aspects, and has great editorial vision for fixing the grammatical excesses and lapses that occasionally sneak into the reviewers' submissions. ■■■

**SCHOLARSHIPS**

ESTHER BABCOCK, CHAIR

Since its inception in 1956, the SEG Scholarships program has helped advance the field of applied geophysics by encouraging students who excel in geoscience. Gifts from SEG members, their employers, corporate sponsors, SEG Sections and Associated Societies, and memorial funds given in honor of colleagues, friends, and family members provide substantial merit-based financial awards for deserving students. More than US\$11 million in scholarship money has been awarded to date to the top geoscience students in the world. From freshmen just beginning their education to graduate students doing research to advance the field, SEG scholarship awardees are recipients of the most prestigious geoscience scholarships in the world.

During 2021, the Scholarships Committee managed the application process for the 2021–2022 academic year. The committee included Esther Babcock (chair), Lorie Bear, Lorelee Dickson, Yong Ma, Kai Zhang, Adam Mangel, Ahmed Ismail, and Nizar Chemingui. The committee evaluated 330 applications and granted 89 student scholarships, totaling \$386,974.

During the evaluation process, each committee member ranked applicants for merit based on information provided in their applications. Individual rankings were compiled and a composite forced ranking was created to determine the highest qualified applicants in each of six categories (freshman, undergraduate, and graduate, each divided into North American and non-North American).

The committee considered the specific selection criteria for each of the individual scholarships and carefully matched

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qualified applicants, in some cases with the assistance of advisory boards that provided feedback and recommendations on applicants. All scholarships are merit based, ensuring that the top geoscience students in the world are honored and encouraged in their pursuit of this field of study.

Committee members also are serving as advisors to each of the recipients for the 2021–2022 academic year. In the advisor role, committee members answer student questions, offer advice as requested, and encourage student engagement. They also help recipients learn more about career opportunities in geophysics and connect them with valuable resources to enhance their education and prepare for their careers.

For additional information, please visit <https://seg.org/scholarships> and <https://seg.org/education/student/financial-assistance/scholarships/list-of-scholarship-recipients>.

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## SEG–NGWA COLLABORATION

ROB JACOB, COCHAIR

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The SEG–NGWA Collaboration Committee (SNCC) was established as part of the SEG–NGWA affiliation MOU signed 23 May 2016. In the MOU, the National Groundwater Association (NGWA) was “charged with considering and making recommendations to the respective organizations regarding areas of cooperation, such as joint workshops or programs and continuing education courses.”

NGWA and SEG provide complementary support for geophysical sciences, with SEG focusing on methodology development in applied geophysics and NGWA primarily supporting geophysics as applied to hydrologic scientific questions.

SNCC identified the following areas of overlap between the two communities: water resource management, ground and surface water measuring and monitoring, and remediation of water resources.

SNCC meets four times a year, of which two meetings are in person at the major annual meetings of each organization. For 2020 and 2021, there were no in-person meetings due to the pandemic.

### COMMITTEE MEMBERS:

- Rob Jacob, Bucknell University  
SEG cochair
- Bill Ally, NGWA  
NGWA cochair
- John Lane, USGS
- John Jansen, Collier Consulting
- Jonathan Ajo-Franklin, Lawrence Berkeley National Laboratory
- Kristina Keating, Rutgers University
- Gordon Osterman, Aarhus University

- Stephen Moysey, East Carolina University
- Niels Grobbe, University of Hawaii at Manoa
- John Bradford, Colorado School of Mines
- Kathy Butcher, NGWA

There has been agreement in sponsoring joint events at each society’s annual meetings, and the organizations are open to the development of joint meetings. ■■■

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## TECHNICAL STANDARDS

SHAWN NEW, CHAIR

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Shawn New (Katalyst Data Management) served as chair and will continue to serve as chair for the 2021–2022 term. Joel Allard (Kosmos Energy) will serve as vice chair for the 2021–2022 term.

The Technical Standards Committee (TSC) serves as a forum for discussion of geophysical developments for which standards need to be defined. When problems are identified that warrant action by SEG, an appropriate subcommittee is appointed to develop standards and make a recommendation to the Board of Directors concerning their adoption.

## OSDU COLLABORATION

Following discussions and review over several months, SEG and The Open Group finalized an MOU in August 2021, and the Open Subsurface Data Universe (OSDU) consortium nominated a TSC liaison in September (Yoryenys Del Moro, Ikon Science). This enables collaboration between TSC and OSDU, which seeks to develop a new standardized data platform for geoscience.

Participation in an OSDU operator-led work group tasked with publishing

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recommendations for seismic data management on the platform began in October, and in late November New presented TSC recommendations for the poststack data-delivery best-practices document. The work group agreed to publish an update in the second quarter of 2022 requiring the adoption of SEG-Y Revision 2.0 (SEG-Y\_r2.0) by year's end. This is significant because it is the first published requirement committing to SEG-Y\_r2.0 from a group of operators, and it provides a timeline for TSC to share expertise on proper adoption and promote its benefits compared to legacy versions.

**SEG-Y\_r2.0 MAJOR CHANGES**

There was a delay in review, collation, and annotation of major changes proposed at the end of 2020. Since that time, committee members from Troika International have proposed another major change that preserves legacy version SEG-Y textual, binary, and trace-header definitions to enable easier conversion of data to SEG-Y\_r2.0. The committee agreed to the change, and a draft is in progress to submit for Board approval by the end of January 2022 that also includes the 2020 revisions.

**ADDITIONAL ACTIVITIES**

In November 2021, Jill Lewis presented an update on committee activities to the Norwegian Petroleum Directorate (NPD). Several operators and vendors in attendance were eager to see industry adoption of SEG-Y\_r2.0 and were pleased that TSC is participating in OSDU activities. NPD offered to provide data for TSC to publish as Rev0, Rev1, and Rev2 versions, and the committee will work with SEG to make this available online by the end of the first quarter of 2022. ■■■

**THE LEADING EDGE EDITORIAL BOARD**

YONGYI LI, CHAIR

*The Leading Edge (TLE)* Editorial Board members for 2021 were Yongyi Li (chair), Steve Sloan, Ulrich Zimmer, Margarita Corzo, Madhumita Sengupta, Arpita Bathija, Chengbo Li, Chester Weiss, Heather Bedle, and Niels Grobbe. Sloan and Zimmer completed their terms of service on the Editorial Board at the conclusion of IMAGE '21, and Bedle and Grobbe were selected to fill the vacated positions. Also at that time, Li was chosen to serve a fifth year on the *TLE* Editorial Board and to serve a second year as its chair.

*TLE* received 115 submissions in 2021. In all, 82 technical articles were published, with 61 of those being published in special sections and the other 21 appearing as “standalone” technical articles or technical departments such as The Meter Reader, Interpreter's Corner, and Acquisition/Processing. Numerous nontechnical articles including President's Page, workshop reviews, book reviews, and Society news items were also published.

In 2021, the Editorial Board made a concerted effort to stretch the boundaries of *TLE*'s editorial coverage while still maintaining focus on traditional areas of applied geophysics. *TLE* published 12 special sections and many high-quality standalone articles with topics ranging from exploration geophysics to near-surface geophysics to energy sustainability and energy transition. In 2021, *TLE* received a CiteScore of 3.7, which is a 23% increase from the previous year. During the past four years, *TLE*'s CiteScore has almost doubled from 1.9 in 2017, which indicates a significant and continuous increase

of *TLE*'s popularity in the geophysical community.

Special-section topics covered in 2021 included the following.

- January: Remote sensing
- February: Mining geophysics
- March: Basin exploration
- April: Geophysics in a net-zero-carbon world
- May: Seismic imaging below complex overburdens
- June: The role of advanced modeling in enhanced carbon storage
- July: Seismic interpretation
- August: Surface-wave applications
- September: Rock physics
- October: Quantitative interpretation
- November: Geomechanics
- December: Latin America

Notable technical and nontechnical standalone articles published in 2021 included “The Geophysical Sustainability Atlas: Mapping geophysics to the UN Sustainable Development Goals” by Capello et al., “The magneto-seismic method in geoscience” by Li et al., “A three-component optical sensor for borehole seismic applications” by Haldorsen et al., “SEG emphasizes its unique contribution in call for action to address climate change” by SEG staff, and “Monumental geophysics: J. Clarence Karcher and the reflection method” by Frehner, the publication of which coincided with the 100<sup>th</sup> anniversary of field testing of Karcher's seismic reflection technique.

The 2020 *TLE* Best Paper Award was presented to Satyakee Sen, Sribharath Kainkaryam, Cen Ong, and Arvind Sharma for their paper, “SaltNet: A production-scale deep learning pipeline for automated salt model building.” Honorable Mentions were awarded to

## REPORTS OF COMMITTEES

Ran Bachrach and Edan Gofer for their paper, “A nonlinear and anisotropic data-driven litho-petroelastic inversion for single-loop subsurface characterization: Theory, uncertainties, and a case study,” and to Owen Huff, Ariel Lellouch, Bin Luo, Ge Jin, and Biondo Biondi for their paper, “Validating the origin of microseismic events in target reservoir using guided waves recorded by DAS.” 🏢

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**TRANSLATIONS**

LUCIA TORRADO, CHAIR

OLGA NEDORUB, VICE CHAIR

The Translations Committee reviews applied-geophysics books and articles published globally and recommends to the vice president, publications and/or chair of the Books Editorial Board published materials deemed to be of sufficient interest to the general membership to warrant translation and publication either in SEG journals or as an SEG special publication. Historically, the committee focused on translations into English but has expanded its role to consider translations of works into other languages as well.

The Translations Committee also collaborates with the Community Content Committee in the translation of content published through the SEG Wiki. Significant progress has been made on a review of the quality and consistency of the Spanish-translated terms from the *Encyclopedic Dictionary of Applied Geophysics, fourth edition*. This includes a hard-copy review so a printed Spanish version of the book can be produced. A new translation effort of this seminal reference volume into Arabic has begun. The letter A has been translated, and the addition of those terms into the wiki is ongoing.

In addition, *Digital Imaging and Deconvolution: The ABCs of Seismic Exploration and Processing* has been added to the wiki at the request of the Latin America Regional Advisory Committee. They are organizing teams of volunteers to translate the English text and add the Spanish text to the wiki. Following a training session in June, they are continuing their work on this project and making progress with the translations of chapters 1, 2, and 12. 🏢

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**TRAVEL GRANTS**

CHANDRA PRAKASH DUBEY, CHAIR

The primary purpose of the Travel Grants Committee is to evaluate student and recent-graduate applications for grants that offset costs associated with attending the annual meeting. The majority of grants go to attendees of the SEG/Chevron Student Leadership Symposium (SLS). The committee also evaluates applications for the Technical Program Travel Grant (TPTG) for those planning to present their research at the annual meeting. Lastly, the committee evaluates applications for the SEG Near-Surface Research Award, which offsets costs associated with a near-surface geophysics project.

The year 2021 brought many changes to our committee. The most foundational was the ending of the SEG/ExxonMobil Student Education Program. After many years of student and industry participation, members of the committee were sad to see this go. We know that the legacy and opportunity brought to many hundreds of students will ripple well beyond the conclusion of the program.

We saw the continuation of the pandemic in 2021. Although impacts were lessened,

the pandemic still affected the committee’s award process.

- SLS was conducted virtually, with 53 participants awarded out of 60 applicants.
- The TPTG was given to all 31 applicants, after eligibility verification, in the form of registration to IMAGE ’21. This was down from 33 applicants/recipients in 2020.
- The 2021 Near-Surface Research Award was presented to Stephen Slivicki of Boise State University for the project “Seismic response of natural CO<sub>2</sub> gas migration through the Little Grand Wash Fault, Utah.”

**2021 ACTIONS**

- The committee chair interfaced with multiple other student-centric committees to push wider networking efforts, committee integration, collaboration, and process improvements within messaging to students.
- The 2021 Near-Surface Research Award initially had three applicants at the submission deadline. The committee voted to extend the deadline from 31 March to 30 April, and a messaging campaign was leveraged through social media. This extension and networking efforts brought the total number of applicants to 15. The extension may become permanent.

**PLANS FOR 2022**

- We will continue to search for new and diverse membership.
- The committee plans to further develop and suggest improvements to the online descriptions and available information for all grants as seen on the SEG website.

## REPORTS OF COMMITTEES

- The committee also plans to gather and reconnect with all of the former travel grants recipients.

I would like to acknowledge and thank the committee members and in particular the past chair, Tyler Schwenk, for their service to SEG and its members during the 2021 session.

- Paloma Acuña
- Emma Butler
- Seth Haines
- Dalton Hawkins
- Sara Kellal
- Ali Mahdy
- John Onayemi
- Cecilia Ramirez
- Tyler Schwenk (past chair)
- Zhiguo Wang
- Deborah Wehner 

## UNIVERSITY AND STUDENT PROGRAMS

JOAN MARIE BLANCO, CHAIR

In 2020, the Committee on University and Student Programs (CUSP) said goodbye to Aurelian Roeser and Chirag Tyagi, student cochair and industry cochair, respectively, after four years of service. The position of student cochair was filled in early 2021 by Annisa Mutiara.

During 2021, the committee continued to build better connections with student chapters through regular contact from CUSP members. In the first and second quarters, the points of contact from CUSP held one or more virtual meetings with the chapters. During the meetings, they discussed topics of interest and answered questions previously collected through a survey. A student chapter Slack channel for each district was created to expedite communication.

The committee also met with representatives from the Field Camps, Travel Grants, Research, EPIC, and EVOLVE committees to discuss joint activities and ways to promote student engagement.


In the third and fourth quarters, the committee had a work session with the Field Camps and Travel Grants committees. The session focused on brainstorming and planning for increased participation. They discussed guidelines to guarantee good-quality applications and initiated the planning of a student workshop about field camp grants. CUSP also gathered the

opinions of its members to determine the type of content for future student webinars/meetings and confirmed their commitment for 2022.

The Student Chapter Excellence Program Subcommittee of CUSP evaluated applications for 2021 Best Student Chapter. There were approximately 200 active student chapters at the time. Two new chapters were organized and approved by the SEG Board. A total of 65 chapters submitted applications for Best Student Chapter. The evaluators selected the University of Bucharest, Romania, as the Best Student Chapter and Nnamdi Azikiwe University as the Most Improved Student Chapter for 2021.

### 2022 OBJECTIVES

The committee's main objectives for 2022 include the following.

- Continue connecting with student chapters on a regional level with improved and more efficient ways to reach to them.
- Develop and implement the proposal for the Program in Near-Surface Geophysics through new alliances with interested organizations and individuals.
- Become a reference for student chapters in content creation. Resume hosting webinars/in-person events for students, adding technical topics and workshops to the discussion of SEG, student programs, and application procedures. 

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**WOMEN'S NETWORK**

ELLIE ARDAKANI, CHAIR

The SEG Women's Network Committee (WNC) was created in 2011 to promote gender parity, celebrate women achievements, raise awareness, and find solutions for the challenges women encounter in applied geophysics and related fields.

**ACCOMPLISHMENTS**

The committee achieved several accomplishments in 2021.

- WNC continued to shine light on women scientists across the globe by giving them a podium to share their knowledge through free and open public monthly webinars with an average of 300 registrants.
- For the first time, WNC established Student Communities, with more than 50 student leaders from more than 15 countries. Since inception of WNC, this is the largest number of students and emerging professionals actively engaged with us.
- The Student Communities organized monthly "Ask me anything" sessions with leaders in the industry and academia in applied geophysics to provide transparent insight and mentorship to students in the community.
- The committee organized and offered a virtual panel discussion in celebration of International Women's Day on 8 March 2021, with a theme of choosing to challenge the gender parity in professional societies. It included an array of esteemed leaders from SEG, the American Association of Petroleum Geologists (AAPG), and Society of

Petroleum Engineers. The event was attended by 127 individuals.

- The committee, in collaboration with the AAPG Women's Network leadership, organized and offered a hybrid luncheon at IMAGE '21 for a screening of "Picture a Scientist" followed by a panel discussion. The event was sold out.
- In collaboration with ADVANCEGeo, Earth Science Women's Network Inc., Association for Women Geoscientists, and the AAPG Women's Network, WNC presented a free open-to-the-public virtual presentation and question and answer on the first day of IMAGE '21 focused on the empowerment of geoscientists to transform the workplace climate. The event recording has been shared with more than 100 registrants.
- Newsletter subscribers increased by 300% to more than 3000. The quarterly newsletter provides timely information on upcoming activities and updates for SEG members who are subscribers.
- WNC now offers pages on social media platforms including LinkedIn, Twitter, Facebook, YouTube, and Instagram and has exceeded 4500 followers collectively. The engagement rate of LinkedIn posts on average surpasses 4% and 10,000 impressions.
- Social media guidelines were drafted in multiple languages and distributed to key members who are tasked with handling social media channels.
- This year, WNC offered their Resume Review service for the second year in row to students and emerging

professionals. Members of the committee provided feedback on hundreds of resumes.

- The committee has been transparent and organized in our activities since inception, with successful incorporation of digital communication, administration, and management-improvement platforms. These platforms were successfully adopted and are used on a daily basis by committee members.
- WNC executive committee members and the advisory council played a key role in nomination of women SEG awards recipients.

**FUTURE GOALS**

- Increase promotion and representation of women in SEG leadership.
- Boost gender equity for SEG award recipients.
- Further globalization of the WNC members with focus on next-generation professionals.
- Modernize the WNC webpage for better user experience and promotion.

**COMMITTEE LEADERSHIP**

- Ellie Ardakani, chair
- Elaine Mattos, vice chair
- Fernanda Carozzi and Dorothy Kanini, Student Communities cochairs

**EXECUTIVE COMMITTEE MEMBERS**

Members include Elaine Mattos, Cara Hunter, Renee Richards, Roxy Bush, Natt Srisuttiyakorn, Teresa Santana, Blair Schneider, Xiaojun Huang, Sandra

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Arevalo, Ogochukwu Ozotta, Uche Aigbokhai, Ming Wong, Lanlan Yan, and Hamidya Adams.

**ADVISORY COUNCIL**

Council members are Maitri Erwin, Nancy House, Eve Sprunt, Hendratta Ali, Maria Angela Capello, Manika Prasad, Anna Shaughnessy, Estella Atekwana, and Ellie Ardakani.

The Board liaison was Maria Angela Capello, and Shelly Jo Oakley served as the staff liaison. Student chapter leads were Fernanda Carozzi and Dorothy Kanini. 🏛️

# REPORTS OF TASK FORCES



## REPORTS OF TASK FORCES

**ANNUAL MEETING**

WAFIK BEYDOUN, CHAIR

Maurice Nessim reactivated the Annual Meeting Task Force (AMT) in January 2021. It was cochaired by Wafik Beydoun, Anna Shaughnessy, and Jim White. Three tracks were created.

**TRACK 1: PROGRESS REVIEW OF THE 2021 ANNUAL MEETING**

The team included Julie Shemeta, Brandy Hawkins, Jenny Cole, Mai Elfouly, Lee Bell, Laurie Whitesell, Annabella Betancourt, and Stephanie Moore. They provided reporting and reviewed challenges. They also evaluated logistics challenges if the annual meeting was concurrent with another regional meeting outside of the United States. Because this was the first joint meeting with the American Association of Petroleum Geologists (AAPG), they assisted in the integration of the combined venue.

**TRACK 2: STRATEGY FOR REGIONAL MEETINGS**

The team included Baishali Roy, Alfred Liaw, Tom Agnew, Maurice Nessim, Gustavo Carstens, Sharon Teebenny, Laurie Whitesell, and Stephanie Moore. They defined a potential strategy for holding regional events outside of the United States. An initial idea was holding an annual meeting expansion in China. However, timing and commitment from authorities in China prevented an event in 2021. The team discussed possible roadmaps for 2022 and beyond.

**TRACK 3: CONCEPTS OF OUTSOURCING PART OF THE ANNUAL MEETINGS**

The team included Ken Tubman, Scott Singleton, Ted Bakamjian, and Rick Miller. They engaged with DMG Events, had a variety of discussions, and evaluated proposals. The announcement in March 2021 of a five-year agreement between SEG

and AAPG to hold joint annual meetings created a new focus. This focus was to provide the SEG Board of Directors with elements that would enable them to make informed decisions regarding the joint annual meetings. The team engaged with firms for outsourcing but keyed in on DMG to develop a strategy and format. Jim White took the lead in communicating with DMG, and a draft proposal was provided to SEG for the 2022 annual meeting. White also engaged with AAPG to review the proposal. It was determined that timing would prevent any possible engagement for 2022 and we will defer to potential opportunities in 2023. ■■■

**CARBON SOLUTIONS**

SCOTT SINGLETON, CHAIR

Carbon capture and storage (CCS) and carbon capture, utilization, and storage (CCUS) are expanding at lightning speed as the world embraces the need for a carbon-neutral future. According to the U.S. Department of Energy, CCUS is a process that captures CO<sub>2</sub> emissions from sources and reuses or stores it so it will not enter the atmosphere. Storage of CO<sub>2</sub> in geologic formations includes oil-and-gas reservoirs, unmineable coal seams, and deep saline reservoirs. These are structures that have stored crude oil, natural gas, brine, and CO<sub>2</sub> over millions of years. The International Energy Agency describes CCUS as the only group of technologies that helps reduce emissions in key sectors and remove CO<sub>2</sub> to balance emissions that are difficult to avoid. It is a critical part of net-zero goals. New investment incentives and climate goals have built momentum in CCUS.

Because of this, virtually all of the major integrated and independent oil companies have pivoted to a corporate stance that highlights their support for a

net-zero-carbon future. Professional societies are also taking notice. The Society of Petroleum Engineers (SPE) has a CCUS technical section that has hosted workshops, e-sessions, and technical papers since 2014. The American Association of Petroleum Geologists (AAPG) has a CCUS technical interest group and CCUS committee. This year, the CCUS committee hosted their first conference in March and are planning their next one in March 2022. SEG has a CO<sub>2</sub> Subcommittee as part of the Research Committee that hosts workshops and seminars. Recently, they hosted a postconvention workshop at IMAGE '21 and are planning a summer research workshop in June 2022.

At the beginning of this year, Maurice Nessim established the six Strategic Pillars for SEG. The third pillar is “preservation,” and its purpose is to lead the application of geophysics in decarbonization and other environmental sustainability efforts. CCUS is one of the elements in that pillar. Nessim authorized the formation of the Carbon Solutions Task Force. The objective was to form a collaborative association of academics, oil-and-gas operators, service companies, and governmental/regulatory authorities. Additionally, numerous professional societies were engaged, with the intent that their collective expertise would be more effective in a collaborative entity. This entity would act to educate the public about carbon solutions, be an outlet for leading-edge research, and form a community of like-minded professionals. The primary outlet for the task force was envisioned to be an international conference on carbon solutions, the first of which would be held in the first quarter of 2022. The task force would also host workshops and other events as needed throughout the year or advertise the workshops of other entities, such as the Research Committee, the new SEAM CO<sub>2</sub>

## REPORTS OF TASK FORCES

Sequestration project, and the SPE CCUS technical section.

Our task force grew to 25 industry professionals very quickly, in a large part due to the popularity of the topic. Academics from institutions such as Colorado School of Mines, Stanford University, Oklahoma State University, University of Calgary, University of Texas, and University of Wyoming are engaged. Many of these researchers have been in the field for decades and are currently working on large Department of Energy (DOE) CCUS grants. There are representatives of large oil-and-gas operators such as Exxon, BP, Total, Shell, ConocoPhillips, and Oxy, as well as service company representatives. Individuals from the DOE and the National Energy Technology Library are involved as well. Representatives from the SEG Board of Directors include Baishali Roy, Brandy Hawkins, and Scott Singleton. In an effort to be inclusive of other groups in this field, the task force also has as members the chairs of the AAPG CCUS committee (Autumn Haagsma), SPE CCUS technical section (Steve Carpenter), and SEG Research Committee CO<sub>2</sub> Subcommittee (Michel Verliac). Josef Paffenhotz represents SEAM.

From the time we started meeting in March of this year, we sought to achieve our primary objectives of forming a community among like-minded professionals and educating through regular presentations by members on their work in the CCUS field. We also focused on our goal of bringing together the three societies (AAPG, SPE, and SEG) to create a multisociety collaboration for workshops and seminars and to produce a formal conference that would be modeled after the Offshore Technology Conference and Unconventional Resources Technology Conference. To do that, we needed a

contractual agreement between the societies. A motion to begin intersociety discussions was presented to the SEG Board at its July 2021 meeting and was approved. SEG Executive Director Jim White then engaged with his counterparts at AAPG and SPE. All societies expressed a desire to collaborate in these challenging times. Finalization of the agreement has been temporarily delayed.

AAPG has moved ahead with planning for its 2<sup>nd</sup> Annual CCUS Conference in March 2022. It is planned to be an in-person event with a hybrid component. SPE and SEG are sponsors and are contributing observers to the AAPG CCUS planning committee. Several members of the task force have volunteered to be on the AAPG CCUS committee. After an intersociety agreement is signed, the three societies will move forward to create a new CCUS committee that has equal representation between the societies. This will allow the AAPG CCUS committee to continue to work on this conference, the SPE CCUS technical section to have a multisociety outlet for their workshops, and the SEG task force to achieve its goal of a multisociety collaborative event that promotes a net-zero-carbon world, which can only be achieved with the contribution of applied geophysics. ■■■

**DIGITAL TRANSFORMATION**

BILL ABRIEL, CHAIR

The purpose of the Digital Transformation Task Force is to identify business opportunities for SEG to expand in digital and virtual space. A significant digital transformation is impacting all of the industries that employ applied geophysicists. It is impacting what we do, how we do it, with whom we interact, and how businesses operate. SEG can participate in the transition to the benefit of the Society, its members, and the community it serves.

Members of the task force included SEG information technology (Steve Tomlinson), finance (Carlos de la Garza), marketing (Stephanie Moore), publications (Ted Bakamjian and Jenő Mavzer), business development (Myra Gonzales), programs (Annabella Betancourt), SEAM Corporation (Shelly Oakley), Board of Directors (Rick Miller, Ken Tubman, and Scott Singleton), and volunteers (Xiaojun Huang and Bill Abriel).

The task force has identified key elements that SEG needs to consider for growing a digital business, as illustrated by successful companies in other industries. Examples such as Google, LinkedIn, Amazon, Uber, and others provide lessons for building a business model based in digital space, and many of these lessons are relevant to a viable future for SEG.

Fundamental to achieving a business model is the importance of customer discovery. The task force has devoted time to a study of the industries using applied geophysics and the various job types involving geophysics professionals. Following best practices in virtual market analysis, job types help identify the “personas” that comprise the customer base and are described in terms of what customers desire, what SEG can provide, and

## REPORTS OF TASK FORCES

through what channels. Although preliminary, the task force has segmented the customer base into nine separate personas (student, consultant, interpreter, etc.). SEG marketing is currently employing business intelligence software to test and refine personas from our database of customers.

Further analysis of the customer discovery suggests that applied geophysicists of a particular industry tend to operate in four specific and overlapping professional society markets that SEG supports. These markets are knowledge, trade, technology development, and connectivity. An SEG virtual business can provide valuable products, services, and networking in these markets beyond its traditional offerings. The task force has inventoried ongoing SEG digital business line transitions and identified new opportunities not currently employed as part of SEG's traditional business.

The task force is currently framing how a digital and virtual business model could be built along the concepts of supporting a full community with common business interests. Two pilot projects are being outlined. The first is Energy in Data (EiD), a joint society (SEG, American Association of Petroleum Geologists, and Society of Petroleum Engineers) conference supporting digital transition in the energy industry. The new business model for EiD is envisioned to not be a conference but an online community, with conferences as a secondary or possibly unnecessary delivery channel. The second trial is a community-based online business model for content derived from SEAM projects. Both trials are centered on new business lines from which SEG may be able to capitalize by providing a virtual business model. ■■■

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**GEOTHERMAL**

ARTHUR C. H. CHENG, COCHAIR  
MICHAEL FEHLER, COCHAIR

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Geothermal energy is a key component of the energy transition from fossil fuel to renewables. There are many places on earth where one can produce significant amounts of electricity from geothermal reservoirs. In addition to electricity generation, geothermal energy is used extensively for space heating. The identification, construction, and operation of a geothermal energy system requires the expertise of geophysicists. The Geothermal Task Force was established to study the many ways SEG can incorporate geothermal energy research and development into its activities and services. The task force aims to collaborate with sister societies in an effort to lead applied geothermal efforts in the industry. The SEG Strategic Pillars that this relates to are preservation, innovation, and collaboration.

In 2022, the task force will focus on planning a geothermal forum and panel with the world leaders in the topic. We will also look into the possibility of a special section in *GEOPHYSICS*.

The task force is led by Mike Fehler of the Massachusetts Institute of Technology and Arthur Cheng of the Chinese University of Hong Kong. Other members include Erika Gasperikova (Lawrence Berkeley National Laboratory), Andy Jupe (Altcom), Hiroshi Asanuma (National Institute of Advanced Industrial Science and Technology), Patricia de Luga (Strataimage), and Kukunda Blessing (Makerere University). The members are located on all continents except Australia.

Because of the wide distribution of the task force members over many time

zones, we did not meet face to face. Instead, each member contributed observations and descriptions of geothermal energy within their regions. These were collected and an interim progress report was presented to the SEG Board in July by Fehler. The main findings are as follows.

Geothermal systems are widespread in both the developed and developing world, usually close to the Ring of Fire, where active volcanism is present. Some of these areas are Iceland, Japan, Philippines, and the west coast of the United States. There are also enhanced geothermal systems that can be applied in places with high temperature at depth by creating fracture systems through fluid injections. There is increased direct use for heating and cooling with both hot water produced from wells and geothermal heat pumps that can be widely deployed. Currently, geothermal is only contributing a very small percentage of renewable energy in the world but this is slowly increasing. It is also sometimes available in places where hydroelectric, wind, or solar energy are less available.

There are currently four major organizations focusing on geothermal energy including Geothermal Rising, International Geothermal Association, European Geothermal Energy Council, and International Energy Agency (IEA) Geothermal Technical Collaboration Program. In addition, the U.S. Department of Energy maintains a geothermal energies office.

Geothermal Rising formed in 1972 to serve as the main professional and educational association for the geothermal community and public. It operates an annual meeting, unfortunately often in conflict with SEG's annual meeting date.

The International Geothermal Association is a global platform for geothermal

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energy. It is committed to pushing geothermal as a game changer for achieving U.N. Sustainable Development Goal #7 by providing affordable, clean, baseload energy for all. The association connects the global geothermal community, serving as a hub for networking opportunities aimed at promoting and supporting global geothermal development. With industry partners, the association sets standards, matures the technology agenda, and nurtures entrepreneurs engaged in clean technology. It holds the World Geothermal Conference.

The European Geothermal Energy Council is an international organization founded in 1998 to promote the European geothermal industry and to enable its development both in Europe and worldwide by shaping policy, improving business conditions, and driving more research and development. It is the organizer of the largest European geothermal conference, the European Geothermal Congress. It is held every three years, with the next instance set to occur in Berlin in 2022.

The IEA Geothermal Technical Collaboration Program is a framework for international collaboration and networking among nations, industries, and industry organizations on geothermal energy and resources.

The task force proposes that SEG considers working with all four organizations in different capacities. We are constantly evaluating opportunities of conducting workshops and cosponsoring conferences with other societies. The task force also proposes to organize a geothermal special section in GEOPHYSICS. Gasperikova and de Lugão are taking the lead in this effort. We feel that there is currently no journal focused on geophysics related to geothermal research. We

hope that the proposed special section will lead to more geothermal papers being submitted to GEOPHYSICS. ■■■

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## PLANETARY EXPLORATION TASK FORCE

ROB STEWART, CHAIR  
MATTHEW BRZOSTOWSKI, COCHAIR

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SEG has been a worldwide leader in advancing the people, science, and application of geophysics. Much of this effort has been dedicated to high-resolution probing of the earth's subsurface in the quest for resources, especially hydrocarbons. Considerable prosperity has followed. However, the energy and environmental worlds are in transition, including applied geophysics. New understandings and constraints along with increasing needs have created exigent demands and consequently abundant opportunities for our contributions. Thus, SEG is looking ahead to where our geophysical expertise can be usefully applied. One such area, the space and planetary sector, is currently experiencing considerable growth and excitement. Space-based communication and observation along with contact exploration of asteroids, moons, and planets are burgeoning. Much of this work has geoscientific goals and ultimately economic objectives. Geophysical techniques are a key part of many space missions. Private and public space companies are also increasing in numbers, funding, and activity.

The period around 1500 was a remarkable age of global exploration, discovery, and mapping. The early 2000s bear many similarities to that expansive time, but now on the scale of the solar system. We anticipate human habitation on other planetary bodies in the near future. Thus, as a society of explorers, there is a compelling

opportunity for SEG to expand its scope as well as innovate and collaborate in planetary science.

## MANDATE

In May 2021, the Planetary Exploration Task Force was convened by Maurice Nessim, with an overall mandate to “summarize the state of planetary exploration and envision SEG involvement and potential contributions.” In further detail, the task force was formed to survey and summarize “what is out there” in planetary exploration, especially as relevant to applied geophysics. This includes the lay of the land/space; current happenings; sector dollar size; and relevant associations, equipment manufacturers, space companies, and agencies. In addition, considerations were to be undertaken concerning where space efforts are going and the planetary community's needs.

With this information and knowledge, we were to imagine where geophysics could contribute. How could geophysics grow in planetary exploration and become more relevant and valuable? In particular, how could we organize SEG's interest, especially as relevant to the SEG Pillars innovation, digitization, and collaboration? And finally, what could be SEG activities?

## TASK FORCE COMPOSITION AND TIMELINE

The task force was originally comprised of a varied group of members including the Chair Rob Stewart (SEG past president, University of Houston), Cochair Matthew Brzostowski (retired from Schlumberger), Andrew Feustel (NASA Astronaut Office), Nicholas Schmerr (University of Maryland), Johan Robertsson (ETH-Zurich), Dave Watts (Schlumberger), and Pascal Lee (Mars Institute, NASA). Over the next few months, two members were added: Peter

## REPORTS OF TASK FORCES

James (Baylor University) and Deborah Domingue (Planetary Science Institute).

The original group first met on 11 June 2021 and started submitting information to the SEG Basecamp site. Several further meetings and discussions were convened before presenting preliminary findings at the SEG Board of Directors meeting on 29 July 2021.

### FINDINGS

The task force summarized a long history of geologically oriented space (approximately the region above 100 km altitude from sea level) activities, from lunar soil sampling to earth observation. There are many companies involved in the space sector, along with a host of national space agencies. The global space market may be about 1/7 the size of the oil-and-gas sector, but earth observation data sales and analysis alone may be about 1/3 the size of oil-and-gas geophysics. A satellite launch is about the price of an oil well. Both countries and companies are endeavoring to access space in less expensive and more comprehensive ways. Resource discovery and use in manufacturing and settlement on other planetary bodies is becoming much closer to reality. A burgeoning satellite, space station, and planetary exploration set of activities is fueling substantial engineering and scientific advancement, along with considerable further understanding of our world and its neighborhood. A vibrant space economy is continuing to develop. These preliminary findings and the space-sector summary were received positively by the Board, with general support for the task force to continue its work.

### POTENTIAL SEG PLANETARY ACTIVITIES

There were a number of ideas proposed as potential activities that SEG could develop. They included: journal/magazine articles and special volumes, workshops, visits/field trips, conference sessions and exhibits, courses, special and distinguished lectures, student chapter involvement and competition, NASA/ESA days, analogue field expeditions (wide variety of current programs), partnerships for development, and provision or arrangements for funding.

### GROUPS AND ACTIVITIES

Task force members have participated in the American Association of Petroleum Geologists' astrogeology committee (recently at IMAGE '21) and are exploring collaborations. There are a number of space-oriented conferences where SEG and its members could participate. These include the American Geophysical Union's meetings, SpaceCom, and the Lunar and Planetary Science Conference. Particularly interesting would be the development of specific webinars such as "Using Mars and lunar seismic data for planetary exploration," which has been proposed to the SEG Continuing Education Committee. The task force will reconvene in January 2022 to continue its work by assembling a report, publication, and recommendation for the development of specific future activities. We foresee a bright future for applied geophysics in planetary exploration. ■■■

# REPORTS OF REPRESENTATIVES



## REPORTS OF REPRESENTATIVES

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**GEOSCIENCEWORLD  
ADVISORY COUNCIL**


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 TED BAKAMJIAN, REPRESENTATIVE
 

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GeoScienceWorld (GSW) is a nonprofit collaborative and comprehensive online resource for research and communications in the earth sciences that is built on a core database of peer-reviewed journals and is integrated with the GeoRef index. SEG is one of GSW's seven founding organizations, along with the American Association of Petroleum Geologists (AAPG), the Geological Society of America (GSA), the Geological Society of London (GSL), the American Geosciences Institute, the Mineralogical Society of America (MSA), and the Society for Sedimentary Geology (SEPM). The journals aggregation launched in February 2005 and today includes 51 journals from 31 publishers. SEG has three journals available through GSW: *GEOPHYSICS*, *The Leading Edge (TLE)*, and *Interpretation* (copublished with AAPG). SEG also is one of 11 publishers participating in GSW eBooks, which launched in 2014 and includes more than 2200 titles, including more than 145 from SEG.

GSW is supported by institutional journal and book subscriptions and perpetual-access sales of books to institutions. Institutions subscribing to the journals are required to purchase access to the entire journals aggregation. Compensation to participating publishers is based on a combination of the amount of content the publisher contributes and how much it is used. By participating in GSW, SEG extends the usage of its publications beyond the SEG Library while also earning royalties. GSW also serves as a collective, giving strength to SEG and other independent geoscience publishers in an

increasingly challenging scholarly publishing economic climate.

Approximately 20% of usage of *GEOPHYSICS*, *TLE*, and *Interpretation* occurs through GSW, with nearly all of the rest enabled by the SEG Library. Royalties SEG earns from its participation in the GSW journals program remain a significant portion of SEG's total subscription revenue. SEG also participates in GSW's open-access journal *Lithosphere*, along with AAPG, GSA, GSL, MSA, SEPM, and the Society of Economic Geologists. The journal is compliant with research-funder mandates that are requiring authors to publish in fully open-access journals. SEG's journals are hybrid open-access journals, meaning that authors can pay a fee to make their articles free under an open license.

By participating in *Lithosphere*, which GSW acquired from GSA and launched as its own journal in January 2020, SEG gives authors who must or want to publish in a fully open-access journal the option of gaining one round of peer review through *GEOPHYSICS* or *Interpretation* prior to manuscript transfer. Also, with author approval, SEG editors can transfer manuscripts that they decline to accept for their own journals yet deem sound scientifically despite perhaps being lean on novelty or out of the SEG journal's scope. Through 2021, though, few papers had been transferred by SEG to *Lithosphere*, which is getting the majority of its articles via direct submission despite anticipation that most would come from publisher transfers. In late 2021, however, SEG journals were considering a collaboration with *Lithosphere* on a multijournal, multipublisher special section on the energy transition. Having been nominated by SEG, Shuo Guo of Tsinghua University in

China serves as an associate editor on the editorial board of *Lithosphere*.

Phoebe McMellon completed her first full year as GSW CEO in 2021, having been hired in November 2020 following 12 years as an executive with Elsevier. McMellon has prior connection to SEG not only through Geofacets in which our Society participates but also as a former member of the Geoscientists *without Borders*® Committee.

I served as chair of the GSW Nominating Committee in 2021. Maggie Simmons of GSL and Kevin Murphy of the Mineralogical Society of Great Britain and Northern Ireland were the other members. Our task was relatively easy, as two of the founding societies — GSA and AGI — nominated veteran publishers to serve on the GSW Board of Directors. Our committee approved the nominations of Beverly Moore of GSA and Sharon Tahirkheli of AGI, and they subsequently were voted onto the GSW Board by the GSW Advisory Council, of which I have been a member since GSW's 2005 launch. ■■■

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**INTERNATIONAL ASSOCIATION  
OF OIL AND GAS PRODUCERS**


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 SHAWN NEW, SEG REPRESENTATIVE
 

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There was no engagement with the International Association of Oil and Gas Producers (IOGP) Geomatics Committee (previously the Surveying and Positioning Committee) in 2021. SEG Technical Standards Committee (TSC) evaluation of P1/11 as a replacement for the Shell Processing Support (SPS) format was put on hold to focus on engagement with The Open Group's Open Subsurface Data Universe (OSDU) on SEG-Y Revision

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2 (SEG-Y\_r2.0) updates and adoptions. In 2022, TSC will work with publications, leverage committee-member networks, and ask for operator volunteers to confirm that P1/11 can replace SPS as written or provide IOGP with additional format requirements before SPS is retired. ■■■

## IPTC MANAGEMENT

MOHAMMED BADRI, BOARD MEMBER  
SANDEEP KUMAR CHANDOLA, BOARD MEMBER

The International Petroleum Technology Conference (IPTC) has been recognized globally as the preferred event that brings together the technologies and knowledge sharing of all four partner societies. IPTC rotates between Asia Pacific and Middle East locations. It is organized to advance technology related to exploration, drilling, and production as well as transportation and processing covering upstream and midstream technologies. IPTC partners are the American Association of Petroleum Geologists (AAPG), European Association of Geoscientists and Engineers (EAGE), Society of Petroleum Engineers (SPE), and SEG. SPE operates IPTC on behalf of the partnership.

Key factors responsible for IPTC's success are the host national oil company, an international oil company cohost, and service-sector support. Structurally, IPTC is incorporated with the four societies as owners (20% interest to SEG). The board of directors consists of eight members, two appointed from each society. Mohammed Badri, vice president technology and strategic partnership for John Crane Company, and Sandeep Kumar Chandola, head of geophysics solutions for PETRONAS, are SEG's IPTC board of directors representatives.

## IPTC 2021 IN KUALA LUMPUR (23 MARCH to 1 April 2021)

The 13<sup>th</sup> edition of IPTC was held virtually as the pandemic continued to pose a risk globally. The theme of the conference was "Progressive collaboration and innovative solutions: Shaping the future of energy." The announcement of the 13<sup>th</sup> IPTC Excellence in Project Integration Award recipient was also highlighted at the conference. The conference attracted 4266 attendees from 1233 organizations and 79 countries. Attendance from the Asia region was 77% of the total and 13% from the Middle East region. The event was hosted by PETRONAS. Mubadala Petroleum and Schlumberger were the cohost organizations.

Founded in 2005, IPTC has established itself as the flagship multidisciplinary oil-and-gas technical event in the eastern hemisphere. IPTC is focused on the dissemination of new and current technology, best practices, and multidisciplinary activities designed to emphasize the importance of the value chain and maximizing asset value. Attended by industry leaders and sponsored by four premier oil-and-gas organizations and societies, IPTC 2021 brought together global experts to share their knowledge, innovation, and latest technologies.

IPTC 2021 was opened by the Honorable Dato' Sri Mustapa bin Mohamed, minister in the Prime Minister's Department (Economy). In attendance were Tengku Muhammad Taufik, president and group CEO of PETRONAS; Mansoor Mohamed Al Hamed, CEO of Mubadala; Olivier Le Peuch, CEO of Schlumberger; and Mahmoud Abdelbaqi, IPTC and ARGAS chair. The opening ceremony also featured global thought leaders, CEOs, and executives from leading national oil companies and international oil companies;

government officials; and heads and leaders of the energy industry from various countries around the world. It marked the beginning of one week that catered to the dynamic interests of global oil-and-gas professionals and sparked discussions about key solutions and technologies that will take the industry on a path of further development and innovation.

The distinguished Leaders' Dialogue covered a wide range of issues in the industry such as sustainability, oil price volatility, and the future of the industry. Speakers who shared their views in the dialogue included Nasir Al Naimi, business line head of Upstream Saudi Aramco; Julie Sweet, CEO of Accenture; Kerry Moreland, vice president of Sub-Saharan Africa and Asia Pacific exploration and new ventures of ExxonMobil Upstream; and Arnaud Breuillac, president of exploration and production of TOTAL.

The CEO Plenary Session focused on the theme of the conference. It addressed how the energy sector has to satisfy growing demand for environmental protection and climate change, how it is being transformed, and the vision to prosperity. Global warming as a result of methane and CO<sub>2</sub> emission was highlighted. The session included a panel of global industry experts including the CEOs of PETRONAS, Mubadala Petroleum, and Schlumberger.

The Executive Plenary Session was titled "Managing transformation to shape the future of energy" and featured industry speakers from Baker Hughes, Masdar, PETRONAS, Saudi Aramco, and PTTEP.

Five panel sessions highlighted a wide range of noteworthy topics to help attendees deepen their knowledge and understanding of emerging technologies,

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best practices, and trends in the industry. Topics included the energy transition; balancing accessibility, sustainability, and affordability; human capital dynamics for the future; navigating the future of gas; digital transformation; powering the energy industry through necessary disruption; and Asia Pacific exploration opportunities. The sessions featured distinguished industry leaders and experts from the Ministry of Economy, Trade, and Industry Japan; Mubadala; PETRONAS; World Energy Council; Bain and Company; Colorado School of Mines; Halliburton; PT Pertamina Hulu Energi; PTTEP; Shell; Boston Consulting Group; Accenture; Schlumberger; TOTAL; Baker Hughes; CGG; SKK Migas; and more.

A total of 68 technical sessions with 337 technical presentations took place across the five days, covering a range of disciplines including geosciences, reservoir engineering, drilling and completions, facilities, development and production, the unconventional business, and improved and enhanced recovery. This included 21 geoscience and seven integrated reservoir engineering and geoscience sessions. In total, the 2021 IPTC Program Committee reviewed more than 2218 paper submissions. A total of 337 submissions were selected to form the event's comprehensive agenda.

The IPTC Society Presidents Panel Session featured the presidents of IPTC's four sponsoring societies. They shared their visions and how the latest technological advances are shaping the future of the industry. The panel was moderated by IPTC Board Member Mike Gunningham.

Three Ask-the-Expert Sessions were held before the event as virtual webinars. They featured leading academics and industry

professionals followed by interactive question-and-answer sessions.

In addition, 307 e-poster sessions took place at IPTC, where authors presented their technical papers, and attendees had the opportunity for further knowledge sharing and networking opportunities.

#### PROJECT CASE STUDY SESSIONS

The IPTC Education Week program aims to give students from around the world a clear insight into the industry they are about to join and provide them with the opportunity to interact with a number of major industry employers who are looking to recruit the best talent from institutions around the world. Education Week was organized for up to 100 of the best third- and fourth-year undergraduate university students who major in science, geoscience, and engineering from international institutions. Selected students will have their travel and accommodations funded by IPTC in order to attend this week-long program held concurrently to IPTC. However, this year due to the pandemic, student travel was not possible because the conference was held virtually.

The IPTC 2021 Integrated Project Award went to INPEX for the Ichthys LNG project. The project was ranked among the most significant oil-and-gas projects in the world.

Finally, the exhibition was held virtually and featured more than 19 exhibitors who exhibited their products and services, showcasing the latest solutions and technologies and enabling delegates and visitors to discuss potential partnerships and projects.

#### IPTC 2022 IN RIYADH (21–23 February 2022)

Considering the improving control on the pandemic and high percentage of vaccines administered to the public, the 14<sup>th</sup> IPTC 2022 and exhibition will be held in person in Riyadh, Saudi Arabia, 21–23 February under the patronage of His Royal Highness Prince Mohammed Bin Salman, the Crown Prince of Saudi Arabia.

By returning to an in-person format, IPTC is committed to providing the industry with a platform for continued multidisciplinary knowledge sharing and professional development and to hearing from thought leaders on the challenges facing our industry. In addition, an in-person event will provide opportunities for sponsoring and exhibiting companies to showcase solutions, network, and connect with long-standing and potential clients during this challenging time. The event has received 4233 abstracts, of which 832 have been accepted for presentation at the event. A total of 107 technical sessions are planned. IPTC will attract global industry leaders at the ministerial level and executives of oil companies, service companies, and government organizations.

The in-person event will be held over three days at the Riyadh International Conference and Convention Centre and will include a Ministerial Panel on 20 February. New sessions such as an IPTC Insights series will provide a unique opportunity to hear from industry leaders engaging in in-depth discussions on key topics related to business, technology, industry trends, and environment. Saudi Aramco will serve as the host organization. At the time of writing this report, the program included five panel sessions, 10 Insights sessions, 44 technical sessions

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presenting 443 papers, and three Ask-the-Expert sessions.

The event is being planned to have optimum financial return on IPTC due to the commitment from Saudi Aramco to support and secure large attendance.

### FINANCIALS

The audited financial results reported a negative outcome from IPTC 2021 of US\$38,532. SEG will bear a 20% share (\$7706). This result is attributed to travel bans and the pandemic affecting most regions of the world. It is expected that IPTC 2022 will bring a surplus in financial results. ■■■

### NAPE ADVISORY

PATRICK RUTTY, REPRESENTATIVE

The North American Prospect Expo (NAPE) is an environment designed for prospect developers to interact with potential buyers. This environment naturally draws engineers, geoscientists, landmen, and capital providers and other financial participants. Because there is the expectation of making deals, many attendees are decision makers.

Partners in NAPE are the American Association of Petroleum Landmen (AAPL), Independent Petroleum Association of America (IPAA), American Association of Petroleum Geologists (AAPG), and SEG. NAPE was founded by AAPL in 1993, with IPAA joining as a partner in 1995. In 2004, AAPG and SEG came aboard, each taking a 10% interest, leaving IPAA with 29% and AAPL with a majority-ownership 50.5% position. NAPE Management LLC retains 0.5% and serves as NAPE's general partner. Partners participate through the NAPE

Advisory Board, on which SEG has one representative.

### NAPE SUMMIT (10–12 FEBRUARY 2021, HOUSTON, TEXAS)

In mid-November 2020, the NAPE Operating Committee made the difficult decision to move NAPE Summit to 16–20 August, in consideration of the health and safety of attendees, exhibitors, sponsors, partners, staff, and community in light of a surge in the pandemic. The NAPE Advisory Board unanimously supported the decision.

### NAPE SUMMIT (16–20 AUGUST 2021, HOUSTON, TEXAS)

After 18 long months, NAPE Summit returned in person to the George R. Brown Convention Center in Houston and online via the NAPE Network. Houston Mayor Sylvester Turner welcomed attendees, noting, “Now more than ever we need to bring energy professionals together.” Roomier than in years past — but by design — the expo was purposefully stretched across a larger footprint that would easily allow for social distancing. NAPE-goers were excited to see the return of crowd favorites such as the Global Business Conference, Icebreaker Reception, and Prospect Previews, as well as this year's Connections and Conversations Panel on Women in Energy, which tackled a broad range of pressing issues including environmental, social, and governance;

talent retention; big data; and innovation. They also enjoyed the debut of two new NAPE innovations including the Renewable Energy Pavilion and a NAPE and Offshore Technology Conference (OTC) fireside chat. OTC was held the same week in Houston, and the two events collaborated in several ways.

Keeping the connecting, learning, and dealmaking going for an extended run, the NAPE Network was live 9 August through 3 September, giving in-person and virtual NAPE attendees access to prospects, exhibitors, networking, speaker biographies, livestreaming, on-demand viewing of NAPE sessions, and bonus virtual presentations. For a detailed review of NAPE Summit 2021, please see the article in the October issue of *NAPE — The Magazine for Dealmakers*.

With 4054 attendees (3% registered virtual only), NAPE Summit exceeded a typical summer NAPE (2500–3000) but fell far short of a typical February NAPE Summit.

### NAPE SUMMIT 2022 (9–11 FEBRUARY 2022, HOUSTON, TEXAS)

As of August 2021, plans for the return of NAPE Summit to its February slot were well under way, with almost US\$250,000 of exhibitor/sponsor bookings. The Global Business Conference, which has over the last several years experienced consistent

Table 17. Attendance information from recent NAPE events.

	Attendance			Exhibitors	Net surplus (8/8 <sup>ths</sup> )
	Expo	Business Conference	Charities Luncheon		
Summit 2018	12,298	914	1083	720	\$4,610,140
Summit 2019	12,368	963	1600 (sold out)	704	\$5,000,933
Summit 2020	11,004	1064	1300 (sold out)	671	\$3,930,679
Summit 2021 (summer)	4054	296	none	340	0

## REPORTS OF REPRESENTATIVES

growth in attendance, was slated to feature issues of infrastructure, ESG, and carbon capture, utilization, and storage. Former Director of the CIA and Secretary of State Mike Pompeo was scheduled to headline the Charities Luncheon.

### OTHER BUSINESS

Barely two years old, *NAPE — The Magazine for Dealmakers* continued its remarkably successful run, with advertising doubling in the first half of the year and a strong lineup of articles and profiles for October 2021 and beyond.

### SUMMARY

NAPE's decision to hold back surplus from NAPE Summit 2020 has, in hindsight, proven extremely wise, allowing the organization to financially weather the storm caused by the pandemic. Given the world's steady (albeit sometimes halting) progression back to in-person events and the appetite among attendees for their return, the future for NAPE looks bright. Strong oil prices, especially through the second half of 2021, will also help spur a return to business as usual.

Current NAPE staff and board members excel at delivering high-quality media and web platforms, industry relationships, sales and marketing, and events. In such a high-functioning organization, it may seem counterintuitive to suggest changes. However, it is this representative's opinion that continuing to adapt to the virtual needs of attendees and to the expansion of the energy remit beyond oil and gas will require more diversity in NAPE leadership (Operating Committee and Advisory Board). Such diversity — geographic, ethnic, gender, age, and profession — should be actively pursued over the coming years in order to maintain NAPE's position as the ultimate venue for energy deals. ■■■

## OFFSHORE TECHNOLOGY CONFERENCE

ALEX MARTINEZ, SEG  
BOARD REPRESENTATIVE

The Offshore Technology Conference (OTC) is an excellent collaboration between multiple professional societies including SEG. The conferences that OTC sponsors bring people together to discuss and learn about the latest advances in offshore technology and new business opportunities. OTC has continued successfully for more than 50 years, adapting and evolving over that time to meet the needs of attendees and exhibitors. In addition, it brings needed revenue to the organizing societies.

OTC returned to Houston in a hybrid format in August 2021, after being canceled in 2020 and deferred from its usual time in May 2021. The conference staff adhered to strict COVID-19 protocols (e.g., masking, encouraging vaccinations, etc.), and the event was held in a safe manner. After careful consideration and accounting for international travel restrictions, the exhibit floor of the conference was condensed to 2.5 halls (150,000 ft<sup>2</sup>). Overall attendance was within the expected range of the OTC staff estimates. The event was financially successful and offset the losses that were incurred in 2020. SEG received a distribution of approximately US\$86,000 for the 2021 fiscal year.

In early 2021, Alex Martinez was voted in by the OTC Board to serve as the vice chair. This is a two-year term (2022–2023), after which he is expected to serve as the chair (2024–2025).

A brief summary of each OTC event is below.

### OTC HOUSTON

After the 2020 OTC cancellation, the 2021 conference was held successfully this year in August as a hybrid event with both online and in-person attendance. SEG organized a well-attended invited technical session on ExxonMobil's Guyana Liza development. The session catered well to the OTC core audience interested in technology application in support of offshore developments. As in past years, sessions based on niche geophysical technologies that were assembled from submitted abstracts received less attendee attention. This is in comparison to those in which the role of geophysics underpinning exploration, appraisal, and field development success was naturally highlighted as part of an interdisciplinary session.

Going forward, OTC is further increasing a multiyear effort to position itself as the leading forum for offshore technology, complementing but not replacing its classic oil-and-gas focus. This coincides with an increasing number of technical abstract submissions on energy-transition themes, especially offshore wind and CO<sub>2</sub> sequestration. In support of this effort, during the 2022 OTC conference, SEG will host a high-profile panel on the role of geosciences in the energy transition, bringing together the vantage points of operators, service providers, regulators, and academia. This panel will be cochaired by the former SEG President Fred Aminzadeh and the current International Association of Geophysical Contractors President Nicky Martin.

The OTC Technical Program Subcommittee has used the inclusion of two new members to maintain its agility while increasing its membership diversity. Marty Terrell will take on the role

## REPORTS OF REPRESENTATIVES

of chair in May 2022, succeeding Stephan Gelinsky. Elive Menyoli will become the new vice chair.

**OTC BRASIL**

Due to ongoing challenges in South America and restrictions presented by the pandemic, OTC Brasil has been deferred to 24–26 October 2023. Advisory and program committee activities will start in May 2022.

**OTC ASIA**

OTC Asia was last held as a virtual event in 2020. OTC Asia 2022 is currently planned to be a hybrid event held in March 2022 in Kuala Lumpur. The program theme is “Excellence in Asia: Setting the pace for future energy.”

**ARCTIC TECHNOLOGY CONFERENCE**

The OTC Board is currently evaluating the future of the Arctic Technology Conference. ■■■

**UNCONVENTIONAL RESOURCES TECHNOLOGY MANAGEMENT**

FRANK BROWN, REPRESENTATIVE

The Unconventional Resources Technology Conference (URTeC) is a science-based annual conference developed as a collaboration of the American Association of Petroleum Geologists, Society of Petroleum Engineers, and SEG. URTeC focuses on unconventional reservoir development, with a specific emphasis on integrated workflows. URTeC operates through the Management Committee outlined in a Sponsoring Organizations Agreement. Leadership of the committee rotates among societies. The Technical Program Committee operates with cochair from the three societies. SEG’s cochair for 2021 was Scott Singleton.

URTeC 2021 was held 26–28 July in Houston, Texas. Due to continued pandemic concerns, the meeting was a hybrid event. The combined in-person/virtual format was by all accounts a success. To avoid conflicting with IMAGE ‘22, URTeC 2022 will be held 20–22 June in Houston. It will most likely be a hybrid event.

**URTEC 2021 HIGHLIGHTS**

The return to an in-person component was certainly welcome. The lessons learned in conducting the 2020 virtual

meeting contributed to a successful conference. Some highlights include the following.

- The opening plenary session, “Unconventionals in transition,” featured Vickie Hollub.
- Conference registration was 4805, of which 70% was in-person attendees.
- There were 135 conference exhibitors.
- An audit is under way for the financial results; however, a surplus is anticipated.

**URTEC ONE-DAY WORKSHOPS**

Unfortunately, one-day workshops scheduled for Midland, Texas; Denver, Colorado; and Oklahoma City, Oklahoma were postponed again due to the pandemic. We are hopeful of conducting these workshops in 2022.

**GLOBAL URTEC CONFERENCES**

We will continue to plan and conduct URTeC conferences in Asia and South America. ■■■

# FOUNDATION REPORT



## FOUNDATION REPORT

## FOUNDATION BOARD OF DIRECTORS

MICHAEL G. LOUDIN, CHAIR

The SEG Foundation spent much of the last year building a strong framework for success in partnership with SEG leadership. The Development Committee was reorganized into six focused subcommittees, with every director playing a vital role. Along with the continued Geoscientists *without* Borders® (GWB)-focused partnership with the American Geosciences Institute, the SEG Foundation's Executive Committee hired new and dynamic fundraising consultants and selected Mark Leonard as our new major gifts officer. Additionally, six new directors were appointed to the SEG Foundation Board in 2021, bringing an exciting diversity of background and talent to the team.

The SEG Foundation, a wholly owned subsidiary of SEG, is the fundraising arm of the parent organization. The Foundation is an IRS 501(c)(3) charitable organization, which means donations to the Foundation are tax deductible in the United States. The Foundation financially supported 16 programs that benefited thousands of SEG members in 2021 by contributing more than US\$1.1 million to SEG from the combination of endowment spending and numerous pass-through donations from corporations and individuals. At the end of 2021, the Foundation's endowment was approximately \$16.1 million, of which about half supports scholarships, and the annual spending rate for endowed programs was 4%.

Thank you to the hundreds of individuals who contribute their time, talent, and treasure to the SEG Foundation each year. You enable the education and continued

development of thousands of members globally, as well as the application of geophysics in the service of humanity.

### 2021 FUNDRAISING RESULTS

- \$586,327 (unaudited numbers)

### CORPORATE GIVING: \$29,081

- SEG Summit on Drone Geophysics — Near Surface Geophysical Research Award: \$20,000
- SEG Soil Investigations Symposium — Near Surface Geophysical Research Award: \$4931
- SEG Net-Zero Workshop — Student membership dues: \$4000

### SOCIETY/SECTION GIVING: \$63,000

- AAPG Foundation — GWB: \$60,000
- AIPG Foundation — GWB: \$3000

### INDIVIDUAL GIVING: \$494,246

- 12 Major Gift Donors — Cumulative total: \$304,468
- 31 Sustaining Trustee Associates (\$2000/year)
- Donations with SEG membership dues: \$24,330
- Employer matching gifts: \$15,103

### 2021 FOUNDATION BOARD OF DIRECTORS

The Foundation Board included Michael G. Loudin (chair), Arthur Cheng (vice chair), Tony P. Lupo (treasurer), Allyson Anderson Book, David C. Bartel, Craig J. Beasley, Alex Biholar, John H. Bradford, Raymond C. Farrell, Morgan Gilmore, Xiaojun Huang, John A. Lambuth, and Zhaobo (Joe) Meng. A mid-term resignation was accepted for Hendratta N. Ali

(appointed as a program director at the National Science Foundation).

### FUNDRAISING IN 2022 AND BEYOND

The SEG Foundation is eager to stand alongside SEG leadership as the Society advances a strong case for new innovative programs and builds partnerships for responsible sustainability. With the global energy transition and new technologies being introduced every day, the next chapter for geophysics is here. The Society, now more than ever, must provide our new professionals with the practical learning experiences and resources that will speed their contributions to the science.

The SEG Foundation aspires to help geophysicists adapt and respond to humanity's increasingly diverse and urgent needs. Carefully stewarded and strategically applied by the Foundation, philanthropic investment will be vital to our profession's dynamic future, yielding exceptional educational, scientific, economic, and humanitarian benefits as applied geophysics continues to evolve. 🏛️

# SUBSIDIARIES REPORTS



## SUBSIDIARIES REPORTS

**SEAM BOARD OF DIRECTORS**

ADRIANA CITLALI RAMÍREZ, CHAIR  
SHELLY JO OAKLEY, DIRECTOR OF  
OPERATIONS

SEAM was created by SEG as its research arm in 2004 and incorporated as an independent nonprofit corporation in 2007. Our mission statement asserts: “SEG Advanced Modeling Corporation (SEAM) is a not-for-profit research entity that hosts collaborative projects between sponsoring stakeholders to further geophysical research by industry and academia.”

To this end, we organize collaborations between industry, government, and academia. The majority of SEAM’s projects have focused on building realistic subsurface models and simulating corresponding numerical benchmark data sets for long-term utilization. In doing so, we stimulate research and development, help democratize data, and provide a basis for industry leaders to discuss and learn about specific geophysical problems of common interest. In addition, motivated by the digital transformation, we have initiated new projects that focus on industry challenges (technology generation), further democratization of data and industry benchmarks, digital twins, and industry standards.

The 2021 SEAM Board of Directors included Adriana Citlali Ramírez (chair), Peter Haffinger (vice chair), Edith Miller (treasurer), Eric Verschuur, Aria Abubakar, Tanya Herwanger, Kris Innanen, Gary Murphy, and Nancy House. Tad Smith served as the SEG Board liaison. The Executive Committee, consisting of the officers of the board, meets every two weeks to discuss current issues or concerns. Working committees are

utilized on an as-needed basis. The Board continues to ensure that the operations of SEAM are conducted in a fiscally and legally responsible manner.

**ARTIFICIAL INTELLIGENCE PROJECT**

The Artificial Intelligence project was launched in September 2019 with six industry participants. Since the launch, an additional participant has joined. The Management Committee includes Konstantin Osypov (Aramco), Adam Halpert, (chair, Chevron), Jicai Ding (CNOOC), Aria Abubakar (Schlumberger), Pandu Devarakota (Shell), Rami Nammour (Total), and Meng Xiangbin (Sinopec).

The first round of a data challenge hosted by AICrowd titled “Parihaka geology and seismic facies classification” was successfully completed in October 2020. A town hall, hosted by AICrowd, was held in November 2020 to announce and award prizes. The second round of the data challenge launched 10 November and ran through 8 December 2020. Cash prizes were awarded to the top three leaders.

Information and knowledge gathered from the competitions will serve as a valuable resource in hosting other data challenges and developing parameters and metrics for constructing a cloud collaboration platform. Plans for early 2021 include a multiday workshop/hack-a-thon on machine learning in geophysics.

**CURRENT PROJECT ACTIVITIES**

The AI Management Committee approved issuing two requests for bids (RFBs) to prepare benchmark data sets for artificial intelligence and machine learning. One RFB was for field data sets, and the other was for SEAM synthetic data sets.

The field data set tasks were defined as: identification, packaging, and provision of benchmark field data sets; interpretation and labeling of benchmark field data sets; and quantitative inversion of benchmark field data sets.

The SEAM synthetic data set tasks were defined as: event identification and traveltimes picking by ray-trace modeling; preparation of SEAM data sets for noise and interpolation studies; and preparation of SEAM data sets for quantitative multiphysics inversion.

As such, two RFBs were issued on 3 August 2021 and advertised on SEG/SEAM social/professional media channels. The main goal of the bids is to prepare multiple field data sets for challenges and prepare multiple SEAM data sets for data processing/imaging challenges.

Six bids were received by the 30 September deadline. Four bids were for field data benchmarks, and two bids were for synthetic data benchmarks. After the bids are evaluated, awards will be announced and contracts will be executed before work begins.

The current schedule is:

- 31 July — RFPs published
- 30 September — Due date for proposal submission
- 31 October — Winning vendors announced and contracts executed
- 30 April — First deliverables due

**PROJECT DEVELOPMENT****• CO<sub>2</sub> Sequestration Project**

The purpose of the project is to improve fracture detection during CO<sub>2</sub>

## SUBSIDIARIES REPORTS

sequestration in a subsurface reservoir, monitor the CO<sub>2</sub> plume, and demonstrate CO<sub>2</sub> containment. The project proposes to use geologic models to simulate CO<sub>2</sub> injection in the subsurface, its effect in the overburden of the reservoir, and test the capabilities of methods to map the CO<sub>2</sub> plume and its changes during and after injection. Letters of intent have been received, and contract negotiations are under way. The launch of the project is tentatively scheduled for January 2022. Discussions are in progress with the Department of Energy for additional funding.

#### • SEAM Data Platform

The vision for this project is to establish a SEAM Data Platform as the number one global platform for geophysical synthetic data sets and models for industry, university, and individual users in geophysics and associated fields. The goal is to collect and host on this platform open-source data sets/models from industry and academia, along with the best-in-class data sets/models produced by 17 years of SEAM projects. The open-source component aims to help democratize research data by further establishing our data as global benchmarks, reaching a much larger audience. This audience includes startups, research labs, and academics who do not always have the economy to license other products in our database. In addition, this democratization will provide further promotion of our corporation through publications and word of mouth, which will be translated in better sales of our data portfolio and attract new members to our future projects.

#### • Near Surface/Civil Engineering

SEAM is scoping options for a near-surface geophysical project focused on either groundwater or civil engineering. The Life of Field project executed over the past few years and completed in December 2020 has advanced the art and science of coordinated numerical modeling for geology, engineering, geomechanics, and geophysics. The opportunity now exists to focus this capability on other geophysical applications in non-oil-and-gas industries. Business development for SEAM in groundwater and civil engineering will proceed with two important processes. The first is defining the value proposition of cooperative numerical modeling in near-surface geophysical communities. The second is the formation of workshops with potential participants to detail the deliverables of the project. Over the months to come, SEAM will be reaching out to industry and academia for advice on designing one or more projects to advance modeling in near-surface geophysics. ■■■

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#### SEG GLOBAL INC.

HUASHENG ZHENG, CHAIR

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SEG Global Inc. (SGI) is the SEG subsidiary established to promote and expand the global impact of applied geophysics around the world. It was originally tasked with operating all of SEG's regional offices. The scope of SGI's business interest has been concentrated in China, with oversight of the China office. The operating model has been evolving and maturing thanks to the great effort of SEG staff to optimize the impact and efficiency of SGI. The SGI Board of Directors is comprised of leaders in the global community and serves to complement the SEG China Advisory Committee.

#### SGI BOARD OF DIRECTORS

- Huasheng Zheng (chair)
- Tien-wen Lo (vice chair)
- Abdulaziz M. Al Muhaidib (treasurer)
- Alfred Liaw
- Jianwei Ma
- Jie Zhang
- Joe Changxi Zhou
- Richard Xu
- Said Sadykhov
- Xuri Huang

## SUBSIDIARIES REPORTS

With the pandemic continuing, 2021 has been a challenging year for our industry, profession, and Society. The SGI board conducted quarterly reviews and provided guidance on the SEG China office technical programs and financial activities. The SEG China office combines the Chinese market to build and expand a new development pattern in four major directions.

- Collaborated with other societies to explore more cooperation with mining, engineering, etc. to expand the ecosphere and branding
- Created diversified media positions to reach more audiences, especially young generations, and more people know about geophysics through these media platforms
- Strengthened connections with student chapters, encouraging and supporting them to host a geophysics student workshop or to participate in competitions, which aim to cultivate student leadership and develop academic research capabilities
- Deeply explored the needs of key corporate customers in China, offering customized services and in-house training to help solve practical technical problems
- SUT/SEG Marine Resources Exploration and Development Technology Symposium, 6–8 January, SEG/SUT Corporation, Changsha, China (hybrid)
- The Interpreter’s Guide to Depth Imaging, 20 March, SEG China, 16-hour course by Scott Mackay (live stream)
- Southwest Petroleum University Geophysics Student Workshop, 30 May, SEG/student chapters, Chengdu, China (in person)
- SEG China BAGS, 28 September, panel discussion at IMAGE ’21, Chengdu, China (hybrid)
- 9<sup>th</sup> BGP Cup National Geophysical Students Competition, 3 December, Student Competition, BGP/China University of Petroleum-Beijing, student chapters/SEG/SPG, Beijing, China (hybrid)
- Central South University Graduate Students Workshop, 17 December, SEG/student chapters, Changsha, China (hybrid)
- 4<sup>th</sup> Mathematical Geophysics Workshop, 17–19 December, SEG, Beijing, China (live stream)

**ORGANIZATION OF SEG EVENTS**

In 2021, the pandemic made some traditional physical events impossible in China. The SEG China office moved quickly to broaden its thinking, learn from new successful cases, develop a transformation program, implement a series of events to build in-depth connectivity, expand influence, cultivate young professionals, and cooperate with key customers. Seven events were held.

The events attracted 1288 participants from 20 countries.

**INITIATIVES TO INCREASE MEMBERSHIP AND OUTREACH**

The SGI strategic initiatives approved by the SEG Board of Directors in 2019 include acceptance of membership dues in local currency and establishment of an SEG website in Chinese. Both have been fully implemented and achieved good initial results toward intended objectives.

Until the end of August 2021, there were 543 new SEG professional members, 45 of which are from China (ranking second). There were 617 new Student members, 33 of which are from China (ranking fourth). A total of 687 members are registered in China. This is a decline compared to the same period last year. In the future, we will provide more benefits to SEG individual and corporate members.

Building on the initial success of these new initiatives, the SEG China office will continue to maintain market sensitivity to explore in-depth, multifield, diversified, and multidimensional innovative development and cooperation. The SEG China office will be able to collaborate with the SEG headquarters and other SEG offices more broadly in the future. ■■■

# FINANCIAL REPORTS





**SOCIETY OF EXPLORATION  
— G E O P H Y S I C I S T S —**

**CONSOLIDATED FINANCIAL STATEMENTS**

**DECEMBER 31, 2021 and 2020**

**WITH**

**INDEPENDENT AUDITOR'S REPORT**

FINANCIAL REPORTS

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## INDEPENDENT AUDITOR'S REPORT

To the Board of Directors  
Society of Exploration Geophysicists

### Qualified Opinion

We have audited the consolidated financial statements of Society of Exploration Geophysicists and its affiliates (the Society), which comprise the consolidated statements of financial position as of December 31, 2021 and 2020, the related consolidated statements of activities, functional expenses and cash flows for the years then ended, and the related notes to the consolidated financial statements (collectively, the financial statements).

In our opinion, except for the omission of the information described in the Basis for Qualified Opinion section of our report, the accompanying financial statements present fairly, in all material respects, the financial position of the Society as of December 31, 2021 and 2020, and the changes in their net assets and their cash flows for the years then ended in accordance with accounting principles generally accepted in the United States of America.

### Basis for Qualified Opinion

The Society is the sole corporate member of SEG Foundation (the Foundation) and as a result has a controlling financial interest in the Foundation. The Society does not include the accounts of the Foundation in these financial statements. Accounting principles generally accepted in the United States of America requires consolidation of an entity when the reporting entity has a controlling financial interest in that entity. If SEG Foundation were consolidated in these financial statements and intercompany accounts and transactions had been eliminated, assets, liabilities and net assets would increase by \$26,753,845, \$0 and \$26,753,845, respectively as of December 31, 2021, and \$25,693,565, \$1,210 and \$25,692,355, respectively, as of December 31, 2020. Also, revenues, expenses and change in net assets would increase by \$1,368,119, \$306,629 and \$1,061,490, respectively, for the year ended December 31, 2021. Revenues, expenses and change in net assets would increase by \$3,616,939, \$121,453 and \$3,495,486, respectively, for the year ended December 31, 2020.

We conducted our audits in accordance with auditing standards generally accepted in the United States of America (GAAS). Our responsibilities under those standards are further described in the Auditor's Responsibilities for the Audit of the Financial Statements section of our report. We are required to be independent of the Society and to meet our other ethical responsibilities, in accordance with the relevant ethical requirements relating to our audits. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our qualified audit opinion.

### Responsibilities of Management for the Financial Statements

Management is responsible for the preparation and fair presentation of the financial statements in accordance with accounting principles generally accepted in the United States of America, and for the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is required to evaluate whether there are conditions or events, considered in the aggregate, that raise substantial doubt about the Society's ability to continue as a going concern within one year after the date that the financial statements are issued or available to be issued.

### **Auditor's Responsibilities for the Audit of the Financial Statements**

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance but is not absolute assurance and therefore is not a guarantee that an audit conducted in accordance with GAAS will always detect a material misstatement when it exists. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control. Misstatements are considered material if there is a substantial likelihood that, individually or in the aggregate, they would influence the judgment made by a reasonable user based on the financial statements.

In performing an audit in accordance with GAAS, we:

- Exercise professional judgment and maintain professional skepticism throughout the audit.
- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, and design and perform audit procedures responsive to those risks. Such procedures include examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Society's internal control. Accordingly, no such opinion is expressed.
- Evaluate the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluate the overall presentation of the financial statements.
- Conclude whether, in our judgment, there are conditions or events, considered in the aggregate, that raise substantial doubt about the Society's ability to continue as a going concern for a reasonable period of time.

We are required to communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit, significant audit findings, and certain internal control-related matters that we identified during the audit.



Tulsa, Oklahoma  
July 15, 2022

**SOCIETY OF EXPLORATION GEOPHYSICISTS**  
**CONSOLIDATED STATEMENTS OF FINANCIAL POSITION**  
**December 31, 2021 and 2020**

	2021	2020
<b>Assets</b>		
Current assets:		
Cash and cash equivalents	\$ 1,283,627	\$ 1,625,312
Accounts receivable, net	1,843,878	805,282
Accounts receivable, SEG Foundation	468,581	729,773
Inventories	236,461	260,325
Prepaid expenses	626,567	2,240,323
	4,459,114	5,661,015
Total current assets		
Investments	20,278,154	19,683,135
Property and equipment, net	243,239	476,297
Other long-term assets	250,000	250,000
	25,230,507	26,070,447
Total assets	\$ 25,230,507	\$ 26,070,447
<b>Liabilities and Net Assets</b>		
Current liabilities:		
Accounts payable and accrued liabilities	\$ 1,010,779	\$ 952,122
Current portion of capital lease obligation	121,853	172,967
Current portion of deferred revenue	2,264,919	1,620,461
	3,397,551	2,745,550
Total current liabilities		
Capital lease obligation, less current portion	60,527	174,639
Deferred revenue, less current portion	1,206,823	2,839,192
	4,664,901	5,759,381
Total liabilities		
Net assets without donor restrictions	20,565,606	20,311,066
	20,565,606	20,311,066
Total liabilities and net assets	\$ 25,230,507	\$ 26,070,447

See notes to consolidated financial statements beginning on page 99.

## FINANCIAL REPORTS

**SOCIETY OF EXPLORATION GEOPHYSICISTS**  
**CONSOLIDATED STATEMENTS OF ACTIVITIES**

**Years ended December 31, 2021 and 2020**

	2021	2020
Revenues:		
Membership dues	\$ 812,662	\$ 947,154
Conferences and meetings	2,150,049	2,113,389
Publication sales and advertising	2,576,229	2,517,235
Professional development	130,679	203,849
Research and data	1,137,865	32,449
Foundation support for programs	1,200,235	1,072,668
PPP loan forgiveness	1,067,737	-
Investment income	1,573,963	4,095,151
Total revenues	10,649,419	10,981,895
Expenses:		
Program expenses:		
Community engagement	259,812	372,060
Meetings	1,122,899	1,525,060
Publications	2,294,816	2,341,703
Professional development	1,017,785	843,659
Students	634,111	610,749
Regional offices	935,587	964,458
Business development	721,122	1,232,812
Research and data	832,436	41,343
Total program expenses	7,818,568	7,931,844
Supporting services	2,576,311	2,577,549
Total expenses	10,394,879	10,509,393
Change in net assets	254,540	472,502
Net assets, beginning of period	20,311,066	19,838,564
Net assets, end of period	\$ 20,565,606	\$ 20,311,066

See notes to consolidated financial statements beginning on page 99.

## FINANCIAL REPORTS

**SOCIETY OF EXPLORATION GEOPHYSICISTS**  
**CONSOLIDATED STATEMENT OF FUNCTIONAL EXPENSES**  
**Year ended December 31, 2021**

	Community Engagement	Program Expenses								Supporting Services	Total
		Meetings	Publications	Professional Development	Students	Regional Offices	Business Development	Research and Data			
Staffing	\$ 168,971	\$ 559,779	\$ 1,200,930	\$ 369,210	\$ 158,310	\$ 675,327	\$ 642,270	\$ -	\$ 1,674,058	\$ 5,448,855	
Travel	2,278	10,879	3,406	-	2,410	12,747	1,985	-	59,780	93,485	
Office	27,686	146,490	245,900	109,251	23,351	103,773	54,425	-	224,636	935,512	
Program awards	-	-	-	322,795	438,595	-	1,977	-	10,000	773,367	
Production	-	-	539,262	-	-	770	-	-	-	540,032	
Postage	709	985	121,362	3,816	331	800	1,108	401	5,659	135,171	
Commissions, honorariums and royalties	-	-	31,969	55,953	-	24,500	-	-	-	112,422	
Cost of sales	-	-	37,011	-	-	-	-	-	-	37,011	
Events	1,670	254,174	2,413	2,526	2,732	46,168	1,585	-	35,713	346,981	
Promotion costs and other committee expenses	3,766	36,961	6,506	1,845	300	4,301	120	-	62,783	116,582	
Outside services	45,804	81,198	63,947	133,413	1,066	63,501	2,984	831,038	344,159	1,567,110	
Other	-	3,578	(7,611)	(984)	-	(5,884)	-	997	78,628	68,724	
Taxes	234	889	1,674	761	208	7,784	509	-	18,077	30,136	
Depreciation and amortization	8,694	27,966	48,047	19,199	6,808	1,800	14,159	-	62,818	189,491	
<b>Total</b>	<b>\$ 259,812</b>	<b>\$ 1,122,899</b>	<b>\$ 2,294,816</b>	<b>\$ 1,017,785</b>	<b>\$ 634,111</b>	<b>\$ 935,587</b>	<b>\$ 721,122</b>	<b>\$ 832,436</b>	<b>\$ 2,576,311</b>	<b>\$ 10,394,879</b>	

See notes to consolidated financial statements beginning on page 99.

## FINANCIAL REPORTS

## CONSOLIDATED STATEMENT OF FUNCTIONAL EXPENSES

Year ended December 31, 2020

	Program Expenses								Supporting Services	Total
	Community Engagement	Meetings	Publications	Professional Development	Students	Regional Offices	Business Development	Research and Data		
Staffing	\$ 269,558	\$ 880,943	\$ 1,168,031	\$ 385,871	\$ 153,916	\$ 672,602	\$ 802,753	\$ -	\$ 2,273,847	\$ 6,607,521
Travel	1,677	28,104	1,971	32,636	893	29,772	6,156	877	27,396	129,482
Office	45,866	206,781	283,056	111,509	37,222	95,392	75,366	-	96,157	951,349
Program awards	-	-	-	5,760	407,275	-	180,758	-	6,705	600,498
Production	1,191	-	572,160	-	-	2,929	-	-	-	576,280
Postage	12,060	4,419	122,658	3,662	1,104	1,299	1,067	-	5,401	151,670
Commissions, honorariums and royalties	-	-	44,621	69,569	-	3,000	-	-	-	117,190
Cost of sales	-	-	38,108	1,577	-	-	4	-	-	39,689
Events	-	288,171	8,511	360	3,256	22,760	3,947	-	7,981	334,986
Promotion costs and other	1,998	26,320	10,658	2,749	-	9,926	843	-	12,309	64,803
Outside services	29,891	49,600	48,022	211,011	681	99,146	482	25,248	51,125	515,206
Other	13	226	(673)	1,288	-	15,041	143,341	15,218	19,871	194,325
Taxes	295	577	1,580	1,670	205	11,621	642	-	18,053	34,643
Depreciation and amortization	9,511	39,919	43,000	15,997	6,197	970	17,453	-	58,704	191,751
Total	\$ 372,060	\$ 1,525,060	\$ 2,341,703	\$ 843,659	\$ 610,749	\$ 964,458	\$ 1,232,812	\$ 41,343	\$ 2,577,549	\$ 10,509,393

See notes to consolidated financial statements beginning on page 99.

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**SOCIETY OF EXPLORATION GEOPHYSICISTS**  
**CONSOLIDATED STATEMENTS OF CASH FLOWS**

**Years ended December 31, 2021 and 2020**

	2021	2020
<b>Cash Flows from Operating Activities</b>		
Change in net assets	\$ 254,540	\$ 472,502
Adjustments to reconcile change in net assets to net cash used in operating activities:		
Depreciation and amortization	189,491	191,751
Net realized/unrealized gain on investments	(1,328,148)	(3,858,615)
Loss of disposition of property and equipment	47,345	-
Change in operating assets and liabilities:		
Accounts receivable, net	(1,038,596)	1,495,011
Accounts receivable, SEG Foundation	261,192	275,324
Inventories	23,864	19,719
Prepaid expenses	1,613,756	(772,695)
Accounts payable and accrued liabilities	58,657	(17,158)
Deferred revenue	(987,911)	(769,704)
	(905,810)	(2,963,865)
<b>Cash Flows from Investing Activities</b>		
Purchases of property and equipment	(3,778)	(24,006)
Purchases of investments	(9,885,308)	(14,912,182)
Proceeds from sale of investments	10,618,437	10,389,807
	729,351	(4,546,381)
<b>Cash Flow from Financing Activities</b>		
Payments on capital lease obligations	(165,226)	(165,050)
	(341,685)	(7,675,296)
Net change in cash	(341,685)	(7,675,296)
Cash, beginning of period	1,625,312	9,300,608
Cash, end of period	\$ 1,283,627	\$ 1,625,312
<b>Supplemental Cash Flow Disclosures</b>		
Interest paid	\$ 12,450	\$ 19,202
<b>Noncash Investing and Financing Activities</b>		
Termination of capital lease	\$ -	\$ 38,027

See notes to consolidated financial statements beginning on page 99.

**SOCIETY OF EXPLORATION GEOPHYSICISTS**  
**NOTES TO CONSOLIDATED FINANCIAL STATEMENTS**

**December 31, 2021 and 2020**

**Note 1 – Summary of Significant Accounting Policies**

Nature of organization

The Society of Exploration Geophysicists (the Society or SEG), was organized in 1930 as a not-for-profit organization. The objectives of the Society are to promote the science and common scientific interests of geophysicists, and to maintain a high professional standing among its members. The Society accomplishes these objectives by publishing scientific literature, conducting professional development and student programs, hosting technical meeting and conferences, and providing other informational services.

The Society maintains offices in the United States, United Arab Emirates, and China. The corporate headquarters are in Houston, Texas.

Basis of presentation

The consolidated financial statements include the accounts of the Society and its subsidiaries, SEG Advanced Modeling Corporation (SEAM), SEG Real Estate Corp (REC), and SEG Global, Inc. All material intercompany balances and transactions have been eliminated in consolidation. The land and buildings held within REC were sold in 2019 and there are no longer operations within this entity.

These consolidated financial statements do not include the SEG Foundation (the Foundation), an affiliated not-for-profit organization governed by a separate board of directors. The Foundation receives contributions to support scientific, educational, and charitable activities to benefit geophysicists and their professional community. The Society is the sole corporate member of the Foundation.

Cash and cash equivalents

Cash and cash equivalents include cash in banks and all highly liquid investments with an original maturity of three months or less. Accounts at each institution are insured by the Federal Deposit Insurance Corporation up to \$250,000. Typically, cash exceeds federally insured limits, but management believes any possible risk of loss is minimal.

Accounts receivable

Accounts receivable largely consists of uncollateralized billings for exhibit space, research completed and in progress, the Society's share of revenues related to collaborative conferences, advertising and page charges. Accounts receivable are stated at the amount billed, less an allowance for uncollectible accounts.

The Society provides for losses on receivables using the allowance method. The allowance is based on experience, terms of agreements, and other circumstances affecting the ability of customers to meet their obligations. Outstanding balances are written off when management determines that the receivables will not be collected. The Society provides for probable uncollectible amounts through a provision to bad debts expense and a corresponding amount to the allowance based on management's assessment of the current

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status of individual accounts. Unpaid amounts that remain after management has pursued reasonable collection efforts are written off through a charge to the allowance for uncollectible accounts and a credit

to accounts receivable. Interest is not charged on outstanding balances. At December 31, 2021 and 2020, management estimates that the allowance for uncollectible accounts of \$72,352 and \$11,163, respectively, is adequate to absorb losses arising from nonpayment.

### Inventories

Inventories of publications for resale are valued at the lower of cost, determined by the average method, or net realizable value.

### Investments

Investments in marketable securities are carried at estimated fair value as reported by the asset custodians. See Note 3 for description of the fair value inputs and methodologies utilized. Unrealized gains and losses are included in the statement of activities.

### Property and equipment

The Society capitalizes all expenditures for property and equipment in excess of \$1,000. Property and equipment are carried at cost. Depreciation is computed using the straight-line method based on the estimated useful lives of the assets. When assets are retired or otherwise disposed of, the cost and related accumulated depreciation are removed from the accounts, and any resulting gain or loss is included in the statement of activities. Expenditure for maintenance and repairs are charged to expense as incurred. Major improvements are capitalized. The lives used in computing depreciation for software, tenant improvements, furniture and equipment range from three to five years.

The Society reviews the carrying value of property and equipment for impairment whenever events and circumstances indicate that the carrying values of long-lived assets may not be recoverable from the future cash flows expected to result from their use and ultimate disposition. In cases where the undiscounted expected future cash flows are less than the carrying values, an impairment loss is recognized equal to the amount by which the carrying value exceeds the fair value of each asset. The factors considered by the Society in performing an impairment assessment include current operating results, trends, and prospects, and the effects of obsolescence, demand, competition, and other economic factors. Based on these criteria, there was no impairment for the years ended December 31, 2021 and 2020.

### Net assets

Net assets are classified based on the existence or absence of donor-imposed restrictions. Accordingly, the Society's net assets and changes therein are classified and reported as follows:

*Without donor restrictions* – Net assets without donor restrictions represent those resources that are not restricted by donors.

*With donor restrictions* – Net assets with donor restrictions reflect donor-imposed restrictions that require the Society to utilize or expend the related assets as specified. The Society does not have any net assets with donor restrictions at December 31, 2021 or 2020.

### Contracts with customers

The Society follows Accounting Standards Codification (ASC), *Revenue from Contracts with Customers* (ASC 606) for all revenue forms other than contributions or investment income. In determining the appropriate amount of revenue to recognize, the Society applies the following five-step model: (1) identify contracts with customers, (2) identify the performance obligations in the contract, (3) determine the transaction price, (4) allocate the transaction price to the performance obligations, and (5) recognize revenue as each performance obligation is completed. The Society accounts for a contract with a customer when it has approval, the contract is committed, the rights of the parties, including payment terms, are identified, the contract has commercial substance and consideration is probable of collection.

*Contracts with customers* – A contract exists when services to be performed and products ordered are specified in a submitted and accepted membership application, written contract, purchase order or similar instrument.

*Performance obligations* – The Society's contracts may have a single or multiple performance obligations. For contracts with multiple performance obligations, the Society allocates the contract transaction price to each performance obligation using the estimated standalone selling price of each distinct good or service in the contract, generally equal to the prices specified in the contract. Membership terms include many benefits and discounts available to the member. The Society treats these as a single performance obligation, the availability of the benefits, resources and discounts, as the customer may not utilize all benefits and value is created to the member for the integration of these benefits. There is not a contribution component of the membership dues.

For membership dues and online publications, revenue is recognized ratably over the membership or subscription term as the customer receives and consumes the benefits. Revenue from each print publication is recognized in the month they are mailed to subscribers. Revenue from conferences, meetings and other events is recognized when the event is held, and services are rendered. Generally, advertising revenue is recognized when the advertisement is delivered, either in publication or its display at an event. Research and data revenue is recognized upon completion of the project and the beginning of the customer's exclusivity period.

Payment terms for memberships and subscriptions are due when the contract is initiated. Payment terms for conferences, meetings and other events vary based on stated contract terms, but typically require an upfront deposit upon registration for the event and the remainder due shortly before the event occurs. Payment terms for research and data projects require payments according to contract milestones. These payment terms do not approximate timing of revenue recognition. Contracts typically do not contain variable-consideration, any consideration payable to the customer or any significant financing components.

*Contract modifications* – The Society considers contract modifications to exist when the modifications either create new or changes the existing enforceable rights and obligations. Most contract modifications are for goods or services that are not distinct from the existing performance obligation(s). The effect of a contract modification on the transaction price is recognized as an adjustment to revenue on a cumulative catch-up basis.

The Society has adopted the following practical expedients and accounting policy elections:

*Incremental costs of obtaining a contract* – These costs are included in supporting services expense as incurred when the amortization period is generally one year or less.

*Shipping activities* – The Society has elected to treat shipping and fulfillment activities as fulfillment costs rather than a separate performance obligation. As a result, any consideration received related to

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these activities will be included as a component of the overall transaction consideration and allocated to the performance obligations of the contract.

*Sales tax and other related taxes* – Sales and other tax amounts collected from customers for remittance to governmental authorities are excluded from revenue.

#### Foundation support for programs

The Society recognizes foundation support revenue from the Foundation as it incurs expenses that the Foundation has agreed to reimburse.

#### Functional expenses

The costs of providing various programs and supporting activities have been summarized on a functional basis in the consolidated statement of activities. The consolidated statement of functional expenses present expenses by function and natural classification. Expenses directly attributable to a specific functional area of the Society are reported as expenses of those functional areas while indirect costs, include salaries and benefits, that benefit multiple functional areas have been allocated among the various functions based on estimated cost attributable to each function.

#### Income taxes

The Society is exempt from federal income taxes under Section 501(c)(6) of the Internal Revenue Code. Income from its consolidated for-profit subsidiary is subject to income tax. Advertising income not directly related to the Society's tax-exempt purpose is subject to taxation as unrelated business income. The Society did not incur any tax expenses associated with unrelated business income for the years ended December 31, 2021 or 2020.

#### Use of estimates

The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities, disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenue and expenses during the reporting period. Actual results could differ from those estimates.

#### Subsequent events

Management has evaluated subsequent events through July 15, 2022, the date the financial statements were available to be issued.

#### Accounting pronouncements not yet adopted

In February 2016, the Financial Accounting Standards Board (FASB) issued Accounting Standards Update (ASU) No. 2016-02, *Leases (Topic 842)*, which amends the existing accounting standards for lease accounting, including requiring lessees to recognize most leases on their statement of financial position. The standard requires a modified retrospective transition approach for all leases existing at, or entered into after, the date of initial application, with an option to use certain transition relief. The primary impact of the adoption is that the Society will recognize right-of-use assets and offsetting lease liabilities for the present value of the future operating lease payments. In June 2020, the FASB issued ASU 2020-05 which defers the effective date of ASU 2016-02 one year, making it effective January 1, 2022. The Society will

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record a lease asset and liability equal to the present value of its future minimum lease payments on the statement of financial position and include additional disclosures on its leases in the footnotes to the financial statements.

## Note 2 – Financial Assets and Liquidity Resources

The Society's financial assets available for general expenditures within one year of the December 31, consolidated statement of financial position are as follows:

	2021	2020
Assets:		
Cash and cash equivalents	\$ 1,283,627	\$ 1,625,312
Accounts receivable, net	1,843,878	805,282
Accounts receivable, SEG Foundation	468,581	729,773
Investments	20,278,154	19,683,135
Total financial assets available to management for general expenditures within one year	<u>\$ 23,874,240</u>	<u>\$ 22,843,502</u>

The Society maintains a policy of structuring its financial assets to be available as its general expenditures, liabilities and other obligations come due. The intent is for investments to not fall below 50% of budgeted operating expenses in any year.

## Note 3 – Investments

### Fair value measurements

Fair value is defined as the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. Accounting Standards provide a consistent framework for measuring fair value and a fair value hierarchy that prioritizes the inputs to valuation techniques used to measure fair value. The hierarchy gives the highest priority to unadjusted quoted prices in active markets for identical assets or liabilities (Level 1 measurements) and the lowest priority to measurements involving significant unobservable inputs (Level 3 measurements). The three levels of the fair value hierarchy are as follows:

- Level 1 – Quoted prices in active markets for identical securities
- Level 2 – Other significant observable inputs (including quoted prices for similar securities)
- Level 3 – Significant unobservable inputs

The level in the fair value hierarchy within which a fair measurement in its entirety is based on the lowest level input that is significant to the fair value measurement in its entirety. There were no investment transfers due to changes in the observability of significant inputs between Level 1, Level 2 and Level 3 assets during the years ended December 31, 2021 or 2020.

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Investments measured at fair value on a recurring basis consisted of the following:

	Fair Value of Measurements as of December 31, 2021			
	Level 1	Level 2	Level 3	Total
Mutual funds	\$ 4,073,315	\$ -	\$ -	\$ 4,073,315
Equity securities	14,214,398	-	-	14,214,398
Fixed income	-	607,157	-	607,157
Government and agency securities	1,126,247	257,037	-	1,383,284
<b>Total investments at fair value</b>	<b>\$ 19,413,960</b>	<b>\$ 864,194</b>	<b>\$ -</b>	<b>\$ 20,278,154</b>
	Fair Value of Measurements as of December 31, 2020			
	Level 1	Level 2	Level 3	Total
Mutual funds	\$ 4,692,166	\$ -	\$ -	\$ 4,692,166
Equity securities	12,521,716	-	-	12,521,716
Fixed income	-	903,984	-	903,984
Government and agency securities	946,198	619,071	-	1,565,269
<b>Total investments at fair value</b>	<b>\$ 18,160,080</b>	<b>\$ 1,523,055</b>	<b>\$ -</b>	<b>\$ 19,683,135</b>

Investment income consists of the following for the years ended December 31:

	2021	2020
Interest and dividend income	\$ 391,083	\$ 355,407
Realized/unrealized gain on investments	1,328,148	3,858,615
Investment fees	(145,268)	(118,871)
	<b>\$ 1,573,963</b>	<b>\$ 4,095,151</b>

#### Note 4 – Property and Equipment

Property and equipment consist of the following at December 31:

	2021	2020
Building and leasehold improvements	\$ 21,772	\$ 104,065
Application development	594,362	594,362
Furniture, fixtures, and equipment	371,350	597,286
Capital lease equipment	680,036	680,036
	1,667,520	1,975,749
Less accumulated depreciation and amortization	(1,424,281)	(1,499,452)

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**Note 5 – Related Party Transactions**

The Society and Foundation support each other with contributions, and the Society provides services to the Foundation, some of which are reimbursed by the Foundation. Those transactions for the years ended December 31, are as follows:

	2021	2020
Foundation support for the program activities	\$ 1,200,235	\$ 1,072,668
Reimbursement from the Foundation for direct fundraising and administrative services	139,891	200,193
Reimbursement from the Foundation for indirect administrative services	106,185	143,341
	<u>\$ 1,446,311</u>	<u>\$ 1,416,202</u>

**Note 6 – Retirement Plan**

The Society sponsors a defined contribution plan. The plan is nondiscriminatory and covers all SEG employees who are foreign nationals or legal residents of the United States and have attained the age of 21. The Society's contributions to this plan are computed based on a safe-harbor nonelective 3% of salaries and a one-for-one safe-harbor matching contribution of employees' contributions, up to a maximum of 3% of salaries. In addition, a discretionary profit-sharing contribution can be made after reaching the end of the plan year. The discretionary contribution, if any, will be determined from year-to-year.

For the years ended December 31, 2021 and 2020, the Society's expense for the safe-harbor match and safe-harbor nonelective contributions was \$215,066 and \$161,860, respectively. The Society did not make discretionary contributions to the plan in 2021 or 2020.

**Note 7 – Deferred Revenue**

Deferred revenue consists of the following at December 31:

	2021	2020
Dues	\$ 395,539	\$ 520,019
Subscriptions	407,564	359,305
Meetings	1,493,706	773,075
Research and data projects	1,174,933	2,807,254
	<u>\$ 3,471,742</u>	<u>\$ 4,459,653</u>

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**Note 8 – Capital Leases**

The Society leases certain equipment under a capital lease and has recorded an outstanding obligation and related lease assets. Capital lease assets of \$176,453 and \$346,462 (amount net accumulated amortization of \$503,584 and \$333,575) as of December 31, 2021 and 2020, respectively, is included in property and equipment. Amortization of the leased property is included in depreciation and amortization expense.

The following is a schedule of future minimum lease payments under capital leases as of December 31, 2021:

2022	\$ 127,711
2023	50,128
2024	<u>11,624</u>
Total minimum lease payment	189,463
Less interest	<u>(7,083)</u>
Total present value	182,380
Less current portion	<u>(121,853)</u>
Capital lease, net of current portion	<u><u>\$ 60,527</u></u>

Interest expense on the capital lease obligation was \$12,450 and \$19,202 for the years ended December 31, 2021 and 2020, respectively.

**Note 9 – Operating Leases**

The Society leases certain offices and equipment under noncancelable operating leases. Rental expense for the years ended December 31, 2021 and 2020, totaled \$335,371 and \$456,171, respectively. Future minimum rental payments are as follows at December 31, 2021:

2022	\$ 269,260
2023	261,109
2024	239,685
2025	178,573
2026	<u>48,702</u>
Total	<u><u>\$ 997,329</u></u>

**Note 10 – Concentrations**

All of the Society's customers are companies and professionals in the oil and gas industry both within the United States and internationally.

The Society has significant investments in equity and debt securities and is therefore subject to concentrations of credit risk. Investment advisors who are supervised by the Finance Committee manage investments. Market value of investments is subject to fluctuations on a year-to-year basis; however, the Finance Committee believes the investment policy is prudent for the long-term welfare of the Society.

**Note 11 – Paycheck Protection Program Loan**

On March 27, 2020, the Coronavirus Aid, Relief, and Economic Security Act (CARES Act) was enacted in response to the COVID-19 pandemic. On February 3, 2021, the Society received loan proceeds of \$1,067,737 from a bank under the Paycheck Protection Program (PPP), which was established as part of the CARES Act. Under the PPP, the Small Business Administration (SBA) will forgive the proceeds received and accrued interest if eligibility and certain other criteria are met related to use of the funds. The portion of the proceeds received that is not forgiven, if any, is converted to an unsecured term note payable in monthly principal and interest (at 1%) payments for five years. The Society is not obligated to make any payments of principal or interest before the date the SBA notifies the Society that no forgiveness is allowed.

The proceeds were expended in 2021 for qualifying purposes and the Society submitted a request for loan forgiveness. The Society has elected to account for the PPP loans as conditional contributions and has determined that SBA forgiveness was a barrier that must be overcome before it was entitled to the loan proceeds. In August 2021, the SBA notified the Society that the PPP loan had been forgiven and no repayment is due. Accordingly, the Society recognized \$1,067,737 as revenue in the accompanying 2021 statement of activities.