Dec 2021

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GSH Journal

GEOPHYSICAL SOCIETY OF HOUSTON
Volume 12 • Number 4

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On The Cover...

A technician checks a line on Alaska's North Slope.

Photo courtesy of WesternGeco.

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Feb 2022 ..... **Dec 16, 2021**
Mar 2022 ..... **Jan 15, 2022**
Apr 2022 ..... **Feb 16, 2022**

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A Word from the Board

SEG Section Representatives Input to the "Word from the Board" GSH Journal

By Lillian Jones, Peter Eick, Klaas Koster, Peter Duncan and Marianne Rauch

The SEG is partly governed by their Council, each member of this Council represents either a particular geographical subset of the SEG membership or an associated society. For example, SEG members in the Houston area are represented by the District 1 representatives, currently Patrice Mahob and Neda Bundalo. In addition to this geographic representation, SEG members may also choose to be represented by one section, associated society, or technical section. Once an associated society like GSH has at least 20 SEG members, they get one representative on the SEG Council. They get one more representative for roughly every additional 250 members. The SEG sometimes adjusts the numbers to keep the total number of Council representatives below 100.

In the current system, GSH provides SEG with a count of the joint membership. Clearly, this is hardly a watertight system and it assumes that all GSH members opt to be represented by GSH on the Council and not by any other section or society. In the future, SEG will instead ask their members on their renewal form if they want to be represented by a section and pick one. That will avoid double counting and representation where none was desired but does not ensure actual paid up GSH membership. Generously, GSH has four representatives for 2021/2022: Lillian Jones, Peter Duncan, Peter Eick, and Klaas Koster. Marianne Rauch is the designated alternate in case someone cannot make the Council meeting. Each representative has a three year term and by tradition the president elect is given one position to maintain continuity. The other positions are appointed by the Executive Committee of the GSH. This team of four representatives is your contact to bring things up to the society, the SEG Council and ultimately the SEG Board of Directors. The representatives are basically there to present your views to the society as a whole and relay the actions of the SEG back to you, the GSH members.

The purpose of the SEG Council is to approve the annual report, approve changes to the dues or dues structure, recommend to the proposed amendments to the SEG Bylaws, topics of interest of the members of the society and to be an advisory group to the SEG board of directors. Specifically, with respect to the GSH, the stated purpose of the SEG Council is to serve the needs of the Sections, Associated Societies, Technical Sections, and Districts; channel information between the Society and the Sections, Associated Societies, Technical Sections, and Districts; and promote cooperation

What specific things can we as representatives bring to the Council? We can submit questions, comments, or recommendations on the procedures and policies for the SEG. We are given a clean copy of the Policies and Procedures manual and any changes must be referenced to the existing manual. You may have seen notices in the Leading Edge or Geophysics where they discuss the changes to the Bylaws and documentation. You may have scanned through these proposed changes and had some opinion about them. Well now you know who you should talk to about your opinions on these changes. We as your representatives can take your ideas and suggestions and move them forward.

The new Council Chair, Allen Bertagne has asked that unlike prior Councils, he was going to have monthly work sessions where ideas and concepts could be brought up in less formal settings. Thus, the opportunity to get a discussion going on your ideas out in front of the Council is quite easy. The next meeting is only a few weeks away, and if you have an idea that you like to move forward, reach out to any of your representatives.

As a representative, it would be easy to assume that our personal "take" on a particular topic is the same as the society membership as a whole, the key though is that title word. We are "representatives" of your ideas, our task is to bring forward your ideas and not turn the Council into a private club. To do this, we need to hear from you, our GSH members.

As best we can tell, the GSH has not had a specific agenda or strategy for Council meetings, and maybe that needs to change. As our society shrinks due to changes in the perception of Oil and Gas and refocuses its direction, we see changes like active discussion of merging the AAPG, SEG and SPE. The next few yearly conferences will be in Houston and will be in the consolidated style of the "Image Conference" recently held in Denver.

What are your thoughts about the "Image Conference" and having it replace the "SEG Annual Meeting"? Traditionally, the SEG Annual Meeting is hosted in a different city each year. What is your opinion on the Image Conference being solely in Houston for the next few years? What are your thoughts about how we can stem the tide of declining enrollment in the society? Finally, there is discussion underway to determine the future of the GSH and possibly affiliating it more strongly with the SEG society. What are your thoughts?

In summary, we are your representatives for the SEG Council and we are looking to you to suggest ideas or items that should be brought forth to the SEG. Look us up, drop us an email, pick up the phone and let's talk. Being a representative means engaging the society and carrying their ideas and thoughts forward to the SEG Council.

Take care and thank you for letting us represent you. □

GSH Technical Events

Rock Physics SIG

Variation of Elastic Wave Velocities with Porosity and Pore Shape in Sandstones with Low Clay Content

Colin Sayers, Dept of Earth & Atmospheric Sciences, University of Houston

Abstract and Bio

Online Event - Dec. 1, 2021 - 12:00pm-1:00pm CST

Register

Unconventional SIG

A New Methodology to Determine Well Spacing in Unconventional Reservoirs - Delaware Basin Study

Dicman Alfred, Scala Energy LLC

Abstract and Bio

Dec. 2, 2021 - 12:00pm - 1:00pm CST

Register

Tech Breakfast

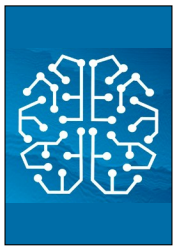
Laboratory Evidence of Transient Pressure Surge in a Fluid-Filled Fractures as a Potential Mechanism for Remotely Induced Seismicity

Yuesu Jin, PhD Student, University of Houstont

Abstract and Bio

Online Event - Dec. 8, 2021 - 7:00am-8:00am CST

Register



Data Science and Machine Learning SIG

End of Year Social - Dec 10th

St Arnold's Brewery

In person event - pre-registration through the GSH,
Walk-ups not permitted - Dec. 10, 2021 - 6:00pm - 9:00pm CST

Register

Tech Lunch

A 108 km2 Compressive Sensing Processing Trial

Dustin Blymyer, Oxy

Abstract and Bio

In person event - Dec. 15, 2021 - 11:00am-1:00pm CST

Register

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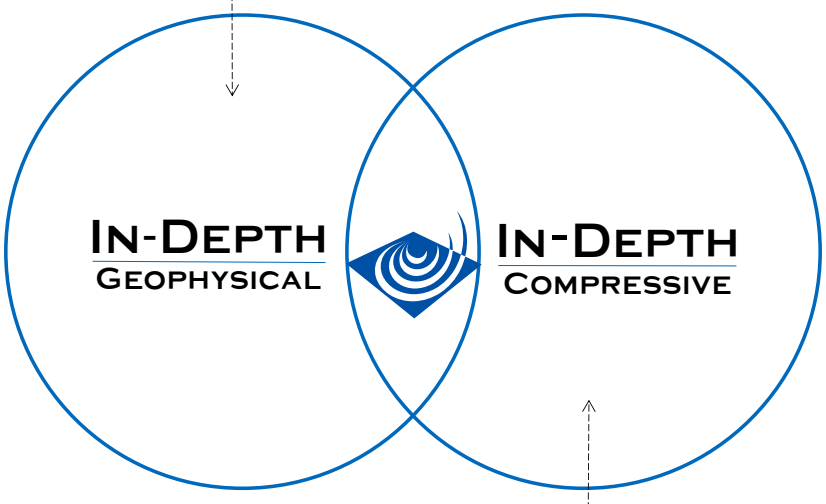

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GSH MEDIA KITS

Soul-searching

By Tony Moraes, Geoscientist, ExxonMobil

I attended my first Society of Exploration Geophysicists (SEG) conference in 2017. That year, the conference was held in the energy capital of the world, Houston, TX. There were over 7,000 attendees, but given the location it felt like more. As a student, I was captivated by rapid uptake of new technology, the challenging projects, and world-class people. That conference solidified my passion to work in the energy industry.

This year, the IMAGE conference was hosted in Denver, CO. The conference was an amalgamation of the SEG, AAPG, and SEPM annual event. This was the first attempt at a hybrid conference, meaning there were both virtual and in-person participants. As for the virtual portion, Daniel Yergin kicked off the conference over Zoom, and it went over without a hitch. However, the technical talks were hit or miss. Many of the talks were recorded, so there were no Q&A's. Hopefully, we can ameliorate this with the integration of Zoom or other video conference tools.

For those who attended in-person, the networking, the exhibit hall, and post-conference socialization were still there. This is the value proposition of large annual conferences: in-person networking. Although a virtual portion allows a broader reach and greater participation, it is impossible to replace the ideas shared over coffee and personal connections achieved in a physical setting. Looking forward, I can see large annual conferences mostly in person with a virtual option.

The technology will continue to advance, the projects will change, and the world-class people will have to adapt.

Reflecting on previous years, IMAGE 2021 felt like an outlier. It wasn't just the hybrid environment or combination of multiple professional societies. It was the entire sentiment. One of our senior leaders best described it as "soul searching." Our industry was hit the second hardest when compared to other sectors (13.1% unemployment rate in December 2020). Many have doubts about our role in the energy transition.

I started my career in March of 2020 as the pandemic first hit and a month before the historic negative oil prices. I thought back to my first SEG conference and I remembered the reasons why I chose the energy industry. While no one can predict the future, the energy industry will still be there. The technology will continue to advance, the projects will change, and the world-class people will have to adapt.

-Tony

Digital Holographic Seismic Imaging – Why it is Different and What it can do with Seismic Data for Oil and Gas Exploration and Production

By Norman Neidell, EurAm Geo-Focus Technologies, Inc.

Introduction

Current seismic imaging does not image the subsurface. It images only reflections from the subsurface. Holography forms images of the subsurface itself and directly. These images are scaled in velocities which approximate the actual earth material values and look much like the subsurface geology. Hence, such images by having greater resolution and visibility may be directly interpreted in great detail. This technology differs from standard seismic data treatments in several aspects:

- Spatial and time resolution depend also on survey data redundancy and not only on survey acquisition field parameters.
- Time resolution is increased by about a factor of 5 and interpretive observations increase significantly.
- The character of the source is incidental.
- There is no common propagating waveform.
- The image space and time sampling are user determined, and typically can be 16 or more times denser taken together, than standard seismic image sampling. Applicable Nyquist limits depend on the user selected image sampling and not only field parameters.

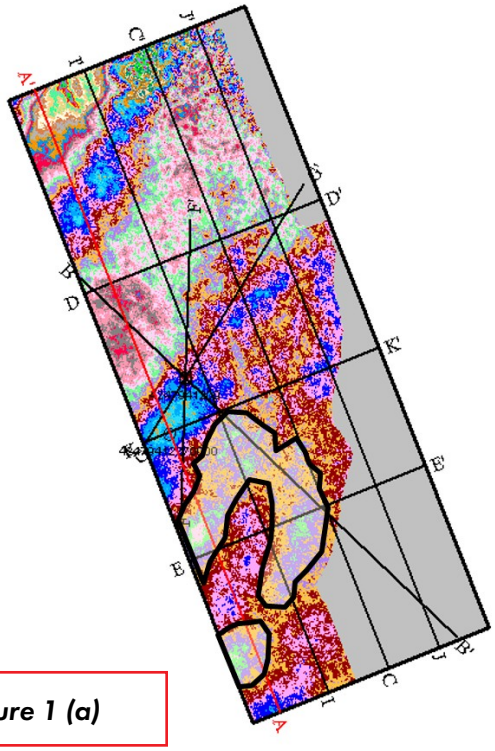
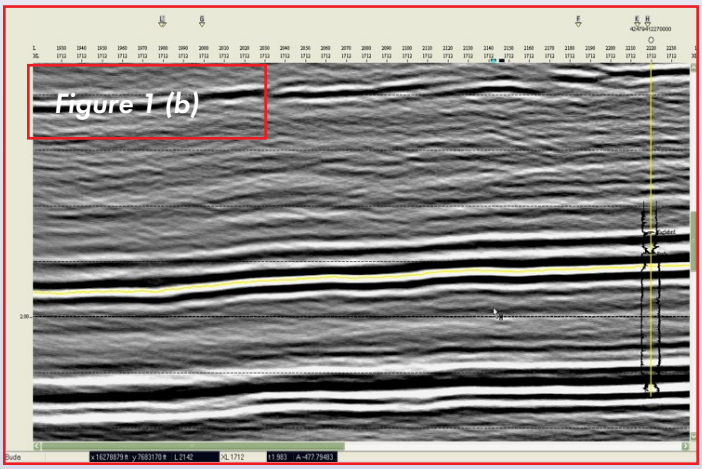


Figure 1 (a)



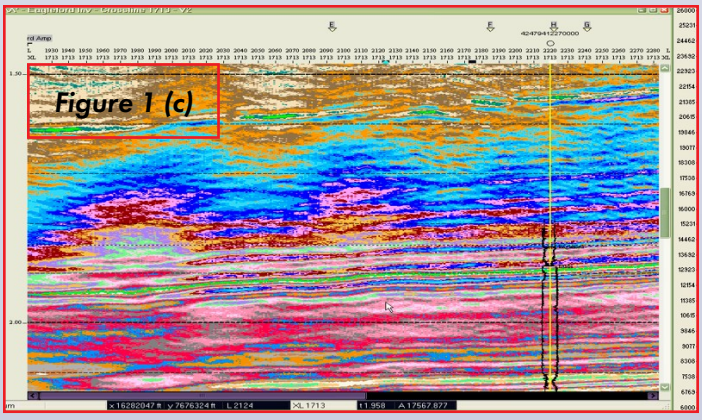


Figure 1: Austin Chalk reef in Webb County, Texas. (a) Location of transect on a time slice through the zone of interest. (b) Seismic line along transect A-A'. (c) EVDR image along same transect.

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For Information Regarding Technical Article Submissions, Contact GSHJ Coordinator Scott Singleton (Scott.Singleton@comcast.net)

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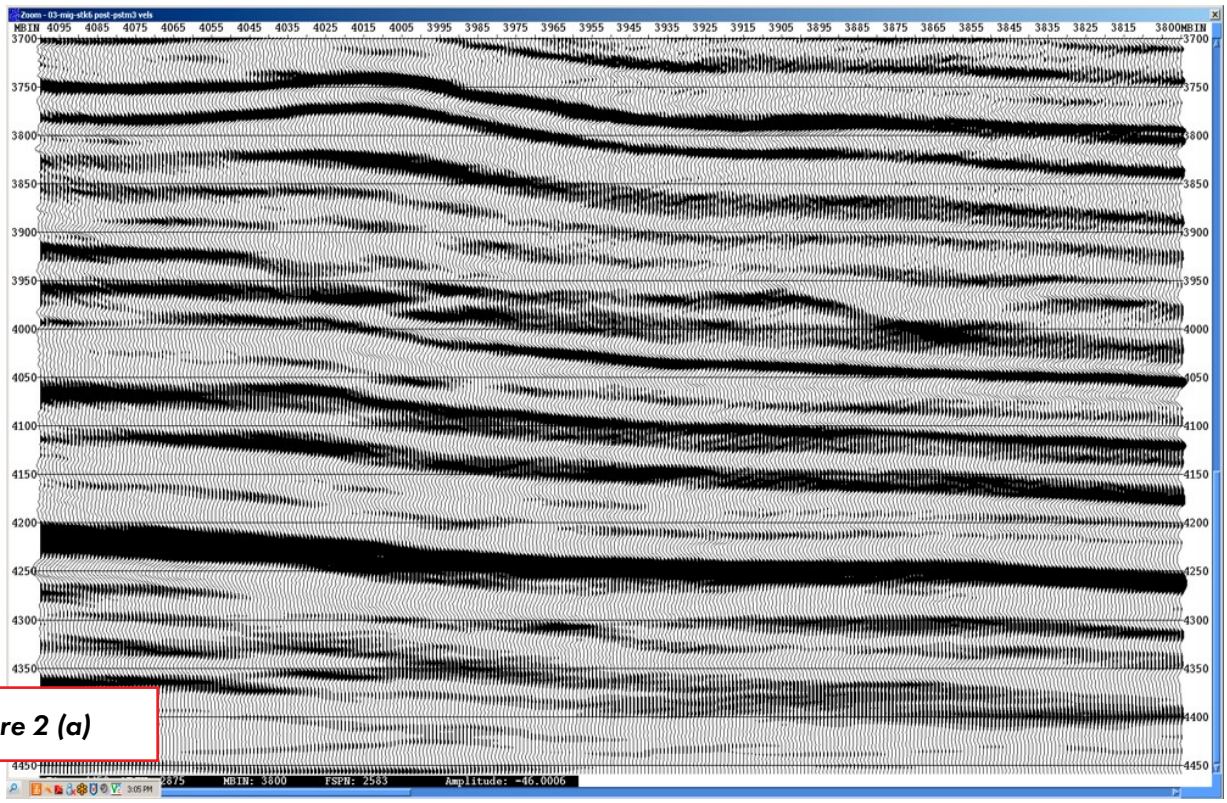

Figure 2 (a)

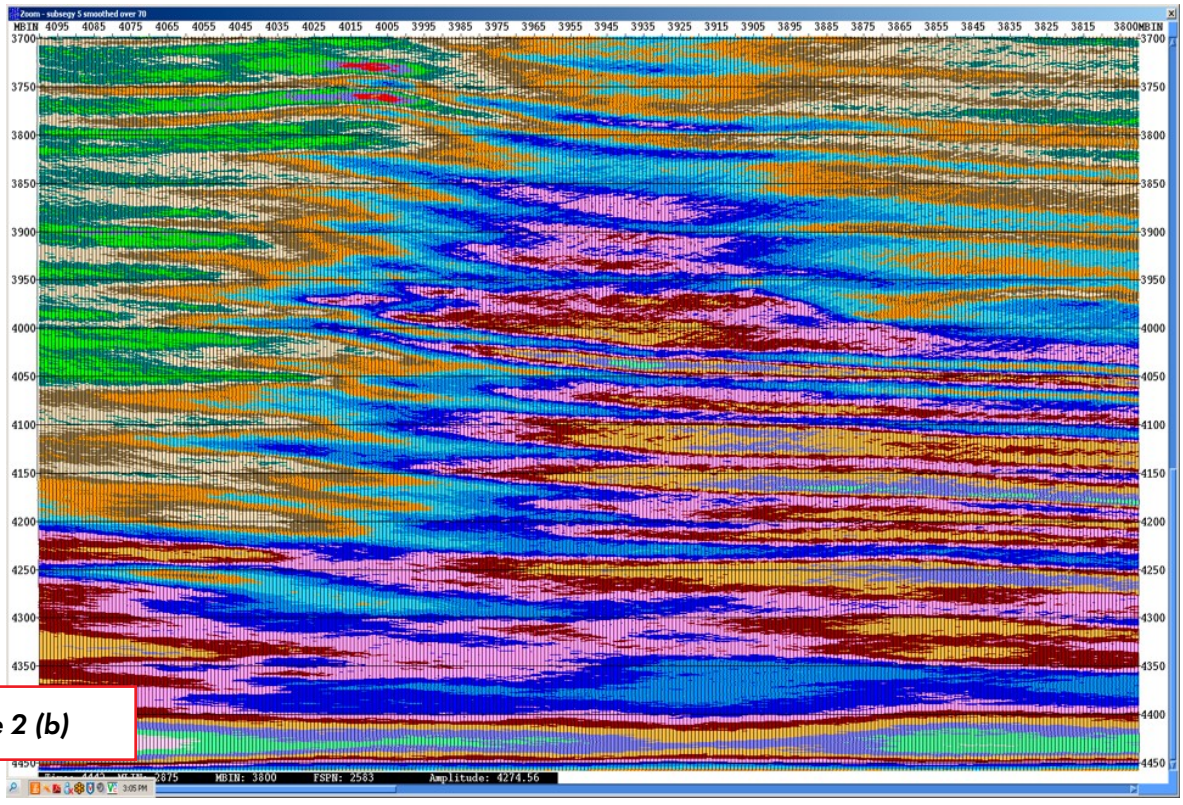

Figure 2 (b)

Figure 2: Atlantic Margin offshore Africa. This is a carbonate section below a clastic section. (a) Seismic section; (b) EVDR color display of same seismic section.

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Technical Article continued from page 9.

- All imaged earth features are seen with frequencies as are necessary to describe their character within the user specified sampling bounds, irrespective of the source character and frequency content.

- The data can be managed and interpreted using standard interpretive systems and is amenable to advanced calculations including attributes.

- With this seismic technology one can usually estimate reservoir volumetrics ahead of the drill-bit in most cases.

Theory

Holographic seismic imaging uses a subsurface model based on voxels, each of which is treated as a point diffractor. Voxel size in space and time is decided by the user but of course must be consistent and compatible with the data information content of the survey. There is no assumption made regarding a layered earth nor containing a common propagating wavelet. Each source illuminates every voxel and information recorded by the many receivers must be restored in best approximation to the appropriate voxel. We seek a relative reflectivity value for each voxel. Please note that this point of view gives great weight also to the data redundancy which seismic field practices routinely include.

The rationale, theory, and mechanics of digital seismic holographic imaging have previously been well documented. Four papers by Neidell in 1997 (Parts 1 -4) explain the underlying concepts, while a fifth publication authored with Mr. James Charuk presents more general considerations and shows many case studies. The four-part series goes from explaining the space-time linkage of variables inherent in operations such as proposed by Kirchhoff to understanding the distinctions between reflective and diffractive contributions. Part 3 views operations like Kirchhoff methods as transformations while Part 4 looks both at the matter of resolution and understanding how imaging the propagation medium differs from capturing images of wavefields.

Method

Seismic holographic data is "rich" in information so that new displays are beneficial to fully present this content. Here we introduce and use extended visual dynamic range (EVDR) color displays scaled as estimated surface velocities in equal increments – usually 200 ft/s or 400 ft/s. A color bar as used should preferably be "universal" so that with minimum experience both lithology and geometry can be understood by knowledgeable inspection. This alone is a great advantage for initial interpretive insights.

These data presentations represent approximations to full wavefield inversions. These differ greatly from full waveform inversions (FWI) which embody all limitations inherent in an assumed propagating waveform. Full wavefield inversion displays closely resemble the underlying geology and provide as noted with increased interpretive visibility. Carbonate features are identified with great detail, and resolution becomes more than adequate for reservoir studies and meaningful 4d work. Interpretive advantages are usually realized for both clastic and carbonate formations, as well as conventional and unconventional reservoirs.

Detailed recognition of structure and velocity changes within formations especially using also corresponding well log measurements and production information, via correlative and AI studies allow reasonable estimates concerning hydrocarbon presence, porosity, and various rock properties to be better determined. This method has been applied virtually all over the globe and has been responsible for a number of significant discoveries. Skeptics to claims and statements made here should read the independent writings of Professor Enders Robinson – the "father" of digital seismic technology, and Professor Elmer Eisner, formerly chief scientist of Texaco, Inc who licensed the technology. Eisner (1998) describes the holographic or holistic method and how it substitutes other criteria as data limits in place of the usually understood Nyquist limits. Also, the work of Robinson in both 1998 and 2018 show a deep understanding and appreciation of the seismic holographic imaging process and strongly advocate its use. The real-world successes and the obvious advantage indicate that digital holographic seismic imaging should offer reduced risks, lower costs, and enhanced profits.

Case studies

As a first case we note the geological equivalent of a unicorn – an image of an Austin Chalk reef in Webb County, Texas in *Figure 1*. Such developments are not likely recognized at all using standard seismic data treatments. This case is a well-developed ancient atoll. It would be interesting to determine how many Austin Chalk reefs have been previously imaged.

The second case study shows a known and thick carbonate section below a highly productive sand section *(Figure 2)*. This example presents a significant interpretive challenge.

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However, the zone of interest clearly stands out in the EVDR color display. In both cases a color bar using 400 ft/s increments is shown on the displays and with colors changes representing quantitative values.

It would be of great value now to note that the existing and readily available systems for managing and interpreting seismic data provide excellent vehicles for presenting and studying results of holographic seismic imaging as presented here. Hence, *Figure 3* displays a holographic seismic imaging result which demonstrates both the capability and flexibility when using readily-available seismic workstation and software. We see that we can show time slices, sections, chair diagrams, etc., and readily perform operations such as flattening on particular horizons as well as other most frequently applied procedures and views. We may also overlay well logs and wiggle trace information to facilitate correlations and combine different kinds of data for correlative purposes.

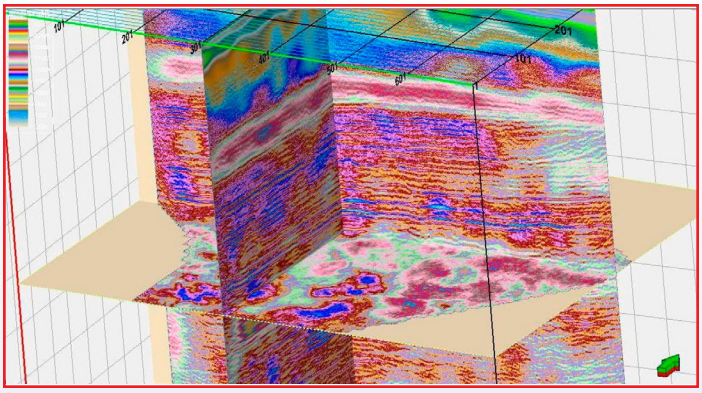

Figure 3: Representative workstation 3D visualization image showing inline, crossline and time slice of EVDR volume.

Conclusions

Holographic seismic imaging with complementary displays uses both existing and new seismic survey data more effectively by increasing resolution at least 5-fold and providing far greater interpretive information via EVDR color displays. Precisely measured velocity changes in the context of the geology and correlative studies with existing well and production information further extend the value of such a holistic approach. The consequence of such studies on operations should be fewer but better wells and these also guided more accurately within individual formations. Even before drilling, estimated reservoir volumetrics from the seismic data may give more reliable economic projections which allow business decisions to be based on better information. From a cost perspective the advantages cited for providing 8-16 times more data of higher resolution with greater information content and at only a modest increase in outlay provides a most compelling alternative to standard practices. □

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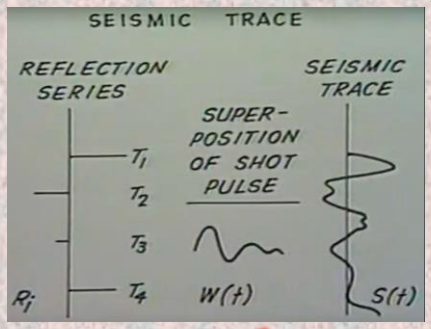
Permalink: Please contact Scott Singleton (Scott.Singleton@comcast.net)

GSH Movie Time

Now Showing

A Convolutional Model of the Seismic Trace*

By David B. Hays – August 1973



Click on red ticket to view movie

This lecture is the first in a series on the topic of **Wavelet Processing**.

Wavelet Processing is a general term for the techniques that attempt to remove the distortions in a seismic trace that mask or alter the wiggles associated to seismic reflections in the earth's subsurface.

The techniques attempt to solve the seismic inverse problem, and most are based on the Convolutional Model of the seismic trace, which is the subject of this first lecture.

*** GSI vintage videos courtesy of Schlumberger – WesternGeco**

GSH Scholarship Recipient for 2021-2022

The Geophysical Society of Houston offers two scholarships through the SEG to outstanding students in the study of Geophysics. The scholarships are named after long-time supporters of the GSH: the Carlton-Farren scholarship and the Hugh Hardy scholarship.

This year the SEG has announced that they are awarding both scholarships to one outstanding scholar,

Kevin Bain, University of Houston

Kevin studied Physics at The University of Texas. He then pursued a Master's at the University of Texas, with his thesis being an examination of the dynamic effects of variations in hydrocarbon fluid properties within a porous sandstone reservoir on the AVA Biot P-P and P-Sv wave reflectivity. His doctoral dissertation at the University of Houston involves a quantitative interpretation of the Vermilion Area (GOM) utilizing time-frequency analysis. Upon completion of the Ph.D., Kevin is interested in working as an exploration geophysicist or within a technology team supporting exploration and production.

For more information about our GSH Scholarship Program, CLICK HERE.

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This month's answer on page 16.

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Item Of Interest

In 1919 an application for a patent in seismic exploration began with the following: "Be it known that we, Burton McCollum and J.C. Karcher, citizens of the United States and residing at Washington, D.C. have invented a new and useful method for determining the contour of subsurface strata, of with the following is a specification." John Karcher spent the summer of that year assembling experimental seismograph apparatus.

The Geological Engineering Company was formed in 1921 with a total budget of $28,000. On June 4, experimental tests were conducted just north of Oklahoma City. In mid-July the seismic crew took its equipment to southern Oklahoma. The crew was John Karcher, William Haseman, Irving Perrine and D. W. Ohern. A profile was shot near a limestone quarry. The experiment was a total success. Further contract work was conducted in northern Oklahoma for Marlin Oil Company until funds ran out. The company was liquidated in mid 1922 with patents and assets going to Burton McCollum. □

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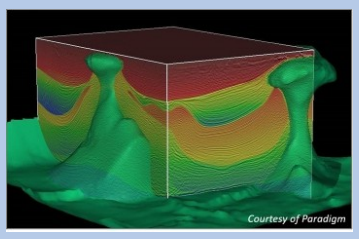

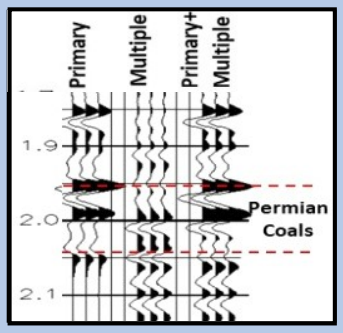

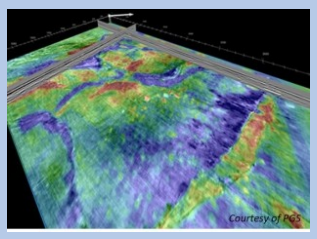

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The Mystery Item
on page 13
is a
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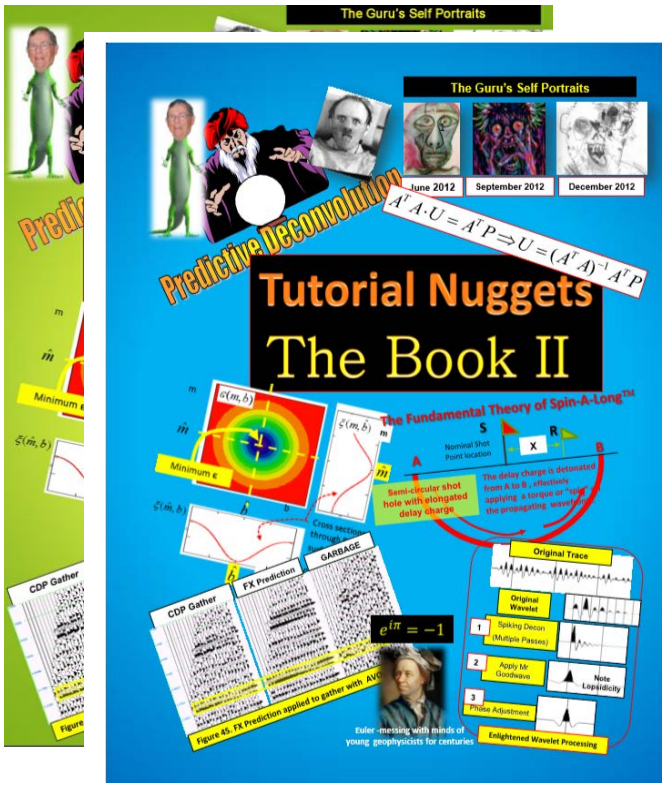

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20th Annual GSH Saltwater Fishing Tournament

Friday, 8 October 2021

Hitchcock, Texas

It was a beautiful fall day to fish the Bay. All of the Teams had full stringers and a great time. It was wonderful to see everyone after missing the 2020 season.

Thank you to Katalyst and TGS for sponsoring this event. Thanks to Archive Data Solutions for providing the pulled pork martinis that everyone enjoyed.

I'm looking forward to seeing everyone in 2022!

- Nathan Lenz

Tournament Team Winners

HEAVIEST TROUT

1st Place	Saltwater Ninja Team
2nd Place	Bad Apples Team
3rd Place	Bad Apples Team

HEAVIEST REDFISH

1st Place	TGS Team Verver
2nd Place	TGS Team Whisonant
3rd Place	TGS Team Whisonant

HEAVIEST FLOUNDER

1st Place	Drift Kings Team

HEAVIEST STRINGER

1st Place	Bad Apples Team
2nd Place	Saltwater Ninja Team
3rd Place	Nauti Boys Team

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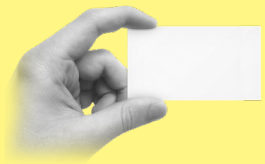

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Summary of the 2nd Annual GSH Fall Forum By Scott Singleton

Carbon Capture, Utilization & Storage (CCUS) – The Path to a Zero Carbon Future

Thanks to our sponsor SensorEra

After a delay of a year due to the pandemic, I can say with a healthy dose of relief that the second Fall Forum was successfully conducted in a virtual environment on November 18. This full-day event attracted 60 registrants who wanted to find out more about what CCUS is and how geoscientists can play a significant role. Judging from the number of questions each of our nine speakers answered, I would say our audience was engaged and came away with a greater understanding of this technology and how it is already being applied in Texas and across the US. We split the talks into three logical groups.

Fundamentals

We started off with a session on Fundamentals where Susan Hovorka of the BEG Gulf Coast Carbon Center, Dr. Steve Carpenter of the U Wy Enhanced Oil Recovery Institute, Quincy Zhang of TGS, and Ali Tura and Daisy Ning of the Colorado School of Mines explained the groundwork of current CCUS usage.

Susan Hovorka
BEG Gulf Coast Carbon Center

Dr. Steve Carpenter
U Wy Enhanced Oil Recovery Institute

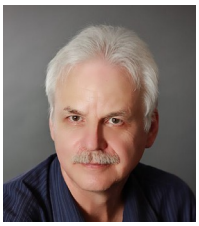
Quincy Zhang
TGS

Ali Tura
Colorado School of Mines

Daisy Ning
Colorado School of Mines

Reservoir Modeling

We next had a Reservoir Modeling session where Josef Paffenholz of the SEG SEAM Corp. and Dr. Hamdi Tchelepi of the Stanford Energy Resources Engineering Dept. explained how CCUS is modeled in the subsurface.



Josef Paffenholz
SEG SEAM Corp.

Dr. Hamdi Tchelepi
Stanford Energy Resources Engineering Dept.

Case Studies

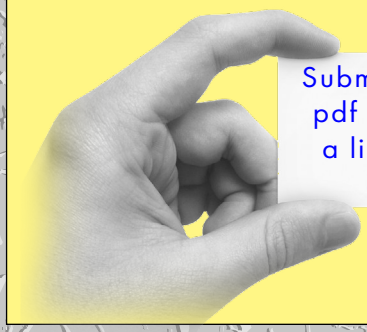
The last session was on Case Studies where Deniz Dindoruk of Shell, Autumn Haagsma of Battelle, Camelia Knapp, chair of the OSU Boone Pickens School of Geology, and Kurt Strack, president of KMS Technologies gave us detailed accounts of projects that are currently sequestering carbon underground.

Deniz Dindoruk
Shell

Autumn Haagsma
Battelle

Camelia Knapp,
Chair of the OSU Boone Pickens School of Geology

Kurt Strack
President of KMS Technologies



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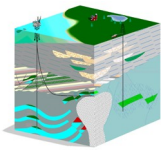

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Doodlebugger Diary

Western Crews Explore In Mysterious Algeria

By The Western Geophysical North Africa Operations Team; originally published in the 1972 Spring-Summer Western Profile

Recounted by Scott Singleton

The Doodlebugger Diary recounts the experiences of geophysicists during their working lives. I've published extensively on my own experiences and encourage those of you with experiences of your own to also contribute. Your fellow industry professionals would love to hear your stories.

I've been occasionally reprinting a series of early 1980's articles from the GSI Shotpoints and GSI Grapevine that can be found at http://gsinet.us/. I also have reprinted various Western Geophysical Profile articles. These can be found at https://seg.org/Publications/Journals/Western-Profile. This month I'm peeling back the years to an even earlier time with another blissful-sounding article from the Western Profile. Enjoy!

Prolog by Scott Singleton

After the end of the Algerian War of Independence (1954-1962) the National Liberation Front (or Front de Liberation Nationale, FLN) became the sole legal and ruling party of the government, an arrangement that lasted until other parties were legalized in 1989 (which, by the way, led to the formation of the Islamic Salvation Front and their second civil war in the early 1990's). Successive governments of the 1960's and 1970's resulted in dramatic increases in authoritarianism and socialism, which in turn led to collectivization of agriculture and nationalization of oil production.

It is in this environment that our intrepid doodlebuggers ventured into Algeria in 1970. It is not too hard to imagine that they were welcomed with open arms; the society was at least at peace after decades of wars, killing and destruction following WWII, and were trying to make it as an independent country. I have written about the same kind of experience in Eretria after their independence from Ethiopia in the early 1990's. It is in this context that our story begins with Western Geophysical ramping up full-scale exploration efforts with the establishment of a central base of operations run by a fairly good sized group of expats in Oran, Algeria, a city on the coast to the west of Algiers near the border with Morocco *(Figure 1)*.

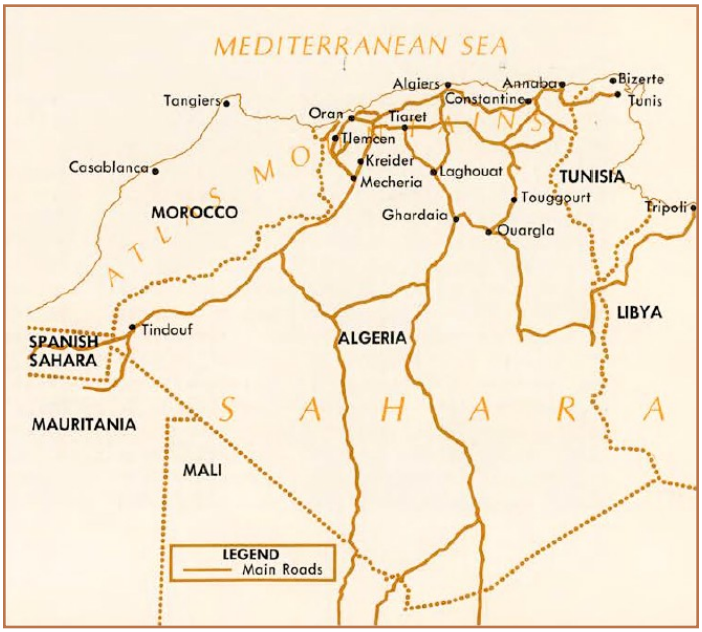

Figure 1: Map of Algeria in 1972 accompanying the Western Profile article. Each of the towns mentioned in the article is on this map so you can follow along with the crew's travels.

Oran, Algeria, 1970

AFRICA -How full of mystery this name seems! For some persons it is synonymous with an immeasurable desert full of masked camel riders, for others it brings to mind veiled women and oriental perfumes, and for some men it means the Arabic belly dancers. For those families living in the "Enchanting City" of Oran, Algeria, however, these descriptions are not altogether as they see them, however much they may match those of tourist pamphlets. No matter, because the object of the PROFILE is to move the

Doodlebugger continued on page 22.

If you would like to add stories to the Doodlebugger Diary, send them to: Scott Singleton at scott.singleton@comcast.net or mail them to Box 441449, Houston, TX 77244-1449

Doodlebugger continued from page 21.

Figure 2: Westerners in Oran, Algeria, can see this view from the base of the mountain located directly across the harbor from the Western building. The structure on the left is the Santa Cruz Fort, and in the background at the right is the top of Santa Cruz Cathedral.

Figure 3: This view of Oran can be seen by Westerners standing across the harbor in the Santa Cruz Fort. Western's building is in top-left background.

Figure 4: A group of Western expats (left foreground) at one of Oran's outdoor cafes.

imagination and increase the knowledge of all Westerners all over the world - in this case, regarding our Company in Algeria.

This Western multi-party operation began in the early fall of 1970. Among the early arrivals in Oran from the States were Supervisor C. Q. (Quin) Williams and wife Billie. Because of their friendly concern for others, they were of great assistance to those crew members in getting established and settled. By October 31 the town-based personnel and many crew families had flown in to begin a "new life" *(Figures 2, 3, and 4)*. Also, the equipment was arriving and awaiting clearance through customs.

Actual Western operations in Algeria began in February 1971 when Party 53 fired its first shot in the Sahara Desert. This was near Ouargla, which was used by this crew as a supply base for food and water and where Fred Cooper then lived and was in charge of our warehouse there.

Party V-54 soon followed and set up camp farther west, near the oasis of Ghardaia. In the cooler mountainous regions northwest of Ghardaia Parties 55 and V-56 used the small livestock community of Mecheria as a supply base. The surrounding land looks like the King Ranch, with no fences, skinny cattle, and an occasional mountain jutting out of the otherwise flat terrain. Meanwhile, the Westerners back in Oran were becoming acquainted with their new "post."

Oran, an important prehistoric town originally called "d'Ilfri' (the Caves) and in Arabic 'Wahran," was founded by the Andalousian Arabs in the 8th century. Prospering under the Almohades and Ziyanides from Tlemcen, the port shared its trade with Rachgoun and Honaine. Following an expedition by Pedro Navarro, Oran was occupied in 1509 by the Spanish, to whom many monuments today bear witness. In 1791, however, as a result of attacks by the Bey of Mascara and an earthquake claiming 2,000 lives, a treaty was negotiated between King Charles IV of Spain and the Bey of Algiers. The city then reverted to Islam and became the home of the Bey for Western Algeria. Built at the foot of a mountain, Oran was surrounded by a wall through which a few doors were built and was bordered by flour mills on the Ah-Rhi River. Today the town has expanded way beyond its wall and, with its numerous high-rise buildings, has become one of the busiest North African towns.

To house its offices and personnel and families, our Company took an entire building, the Immeuble Charles

Doodlebugger continued on page 23.

Doodlebugger continued from page 22.

de Foucauldt. Dubbed "Chez Western," it is majestically situated in the center of an immense naked field (handy for the assembling of vehicle caravans) just on the outskirts of the city. Our office-apartment building has offices on the ground floor and, directly above six floor apartments for the men and those families who accompanied them. With everyone in the same building there are no excuses of taxi or bus strikes or sudden "illnesses" that creep up on a person on cold winter mornings! Whether we like it or not, every morning at 8 o'clock all expatriated office personnel rush downstairs to earn their day.

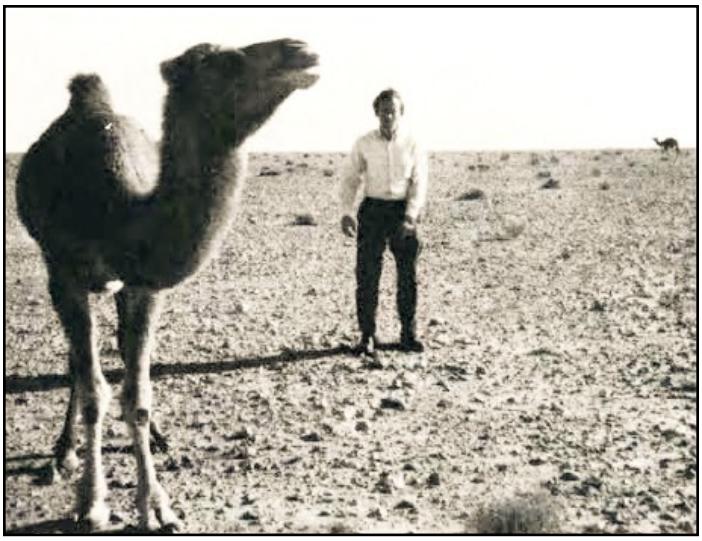

Figure 5: "Sorry but I was here first" this arrogant dromedary seems to be saying to doodlebugger Tom Pack. Field crews in Algeria meet up with many of these humped beasts during their desert wanderings.

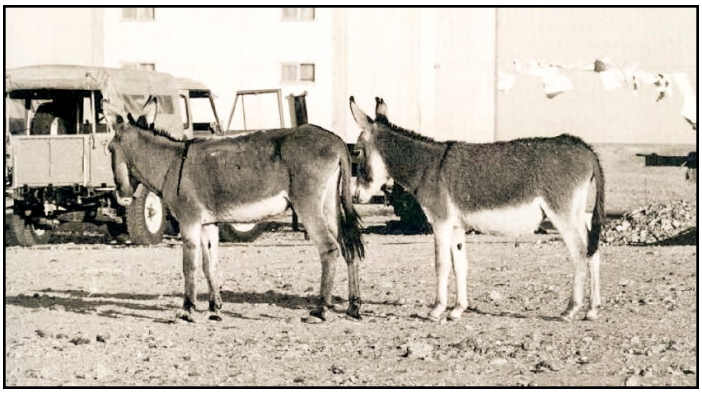

Figure 6: Algeria's deserts do have some luxuries. Where else would you find floppy-eared portable garbage cans such as these?

Now to the field, with Party 53 leading off. To reach this crew we travel through the orange-growing areas and the Atlas Mountains. Just over the mountain is the resort town of Tiaret, surrounded by fir trees. It is a center for schools, in which many expatriates serve as teachers. Leaving Tiaret and the high mountains, we drive through the plain and hills to Laghouat, where petrol and tires must be checked for just outside of this picturesque village is the beginning of the Sahara Desert.

The nearest city is many miles away an oasis called Ghardaia. While wending our way through the hills and down into this tight little valley we are almost certain of viewing a mirage as glimpses of nothing but Mediterranean blue meet the eye, and as we round the final curve there it is, the town of Ghardaia - completely to the last building, dressed in blue. A long-to-be-remembered sight.

Ghardaia actually consists of five walled-in cities connected somewhat loosely by open market places. Persons not from one of these cities are not permitted inside the walls unless accompanied by a guide or resident. Ghardaia is considered to be a holy city and its inhabitants are the Mozabs. They are a religious sect who settled here in the 8th century, much as the Pilgrim Fathers, to be free to pursue their faith and to start business. Both pursuits have proved very successful. Business is thriving. Because of their location, the Mozabs form a trading link between nomads and people from the coast area.

Departing Ghardaia and its abundant date palms, we are again surrounded by the desert, and we begin to see the Bedouin with their camel trains traveling south. Just before reaching the city of Ouargla, we see the first and dunes - Party 53 is surrounded by these. A small green patch in a barren desert, Ouargla itself is a nice city where that all-important item, food, is bought for the party. Located

Figure 7: A distant view of Party V-53's 'home sweet home' emphasizes the desert's barren, arid emptiness.

Doodlebugger continued on page 24.

Doodlebugger continued from page 23.

Figure 8: Looking for a 'bar' in the Algerian desert are Party 53 Surveyor Roger Henry (left) and Digital Technician Daniel Bondoz.

northeast of Ouargla is the beautiful oasis town of Touggourt with lovely palm and white mosques.

While working in the desert, the crews are often visited by camels and donkeys *(Figures 5 and 6)* and less often by gazelles and an occasional hyena or two. The weather is as you would expect, cold in the winters with a few short showers, hot and dry in the summers, and the wind is almost constant *(Figures 7, 8, and 9)*.

Party 53 itself consists of about a dozen expatriates *(Figure 10)*. They are assisted in all phases of the work by approximately 44 local men. Since it is necessary to move camp fairly frequently, there is a tremendous turnover in local labor. This puts a handicap on all of the expatriates. The party manager, Harvey Hearn, and his assistant, Carlos Reijenstein, are constantly involved with labor boards in the various towns.

Snow-covered hills are not exactly the scene one would expect in the desert, but this is the case with Party V-56. At the time of writing, the crew is positioned about 250 kilometers (155.2 5 miles) due south of Oran, near the small town of Kreida and, being so close to the coast, receives its fair share of winter weather. Even the routine task for Party Manager Bob Castille of telephoning the production figures to Oran can prove difficult - and sometimes impossible as that little stream has a remarkable tendency to become a raging torrent when it rains.

Before we Westerners in North Africa say au revoir to our colleagues, we wish to add a few words about our crew that migrated, Party 55. On November 25 there formed outside

Figure 9: Party 53's cable trucks and juggies add life and the third dimension to an arid desert's seemingly infinite plain.

"Chez Western" a "wagon train" as it was known in the days of the pioneers or a caravan as it is known in our desert. In the dim light of early morning the men and equipment of Party 55 departed for Mauritania. They passed through little Algerian towns as they wended their way southwest, waving goodbye to Algeria at the near border town of Tindouf before heading into Mauritania.

This, then is Oran and Algeria as we saw it in 1970. We hope that we have moved your imagination and increased your knowledge of this humble, peaceful, and ancient place. We had a great experience in our Western sojourn in Algeria and will take away some great memories and friendships. We hope that with our work we have in some small way helped these people by exploring for natural resources beneath their lands. And we hope that one day we will be able to return to see some of the fruits of our labor. □

Figure 10: Party 53's dauntless cable crew.