Comment from Ken Mahrer:

This is GEOPHYSICS' 75th year. In celebration, Vladimir Grechka, Tamas Nemeth, Enders Robinson, Sven Treitel, and Kees Wapenaar coordinated and compiled a commemorative special section in GEOPHYSICS. They asked each associate editor to write an overview, or suggest an expert or experts to write the overview, covering the associate editor's discipline within GEOPHYSICS. The response was wonderful. Seventeen papers were accepted; some are historical and others are tutorial. Since Kees worked so hard he deserves the credit: he wrote this month's *Bright Spots* column. In his words, "What follows is a discussion of … some bright spots between the bright spots."

Professor Klaus Helbig ("From reflection elements to structure") gives a historical account of seismic interpretation in the predigital era. He discusses "ruler-and-compass constructions" of seismic rays in various configurations. Figure 1, from Theodore Krey's doctoral thesis (1965), shows a simple construction of a common midpoint ray via a dipping reflector and the associated reflection point shift. It shows how close Krey came to predicting DMO. Helbig's message: techniques evolve, foundation principles stay the same.

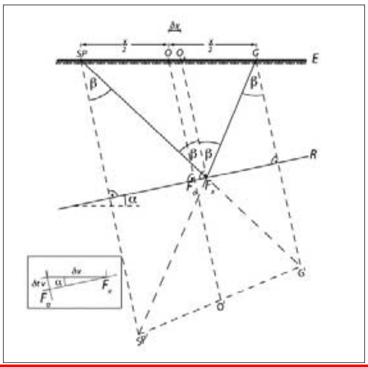

Figure 1. A common-midpoint ray. (Figure 13 from "From reflection elements to structure" by Helbig).

Dragoset et al. ("A perspective on 3D surface-related multiple elimination") review the history of multiple elimination, explain the theory and mechanism of surface-related multiple elimination (SRME), and discuss approaches to 3D SRME and possible future developments. Using a number of impressive examples, the authors show 3D SRME potential. Figure 2 confirms Helbig's message.

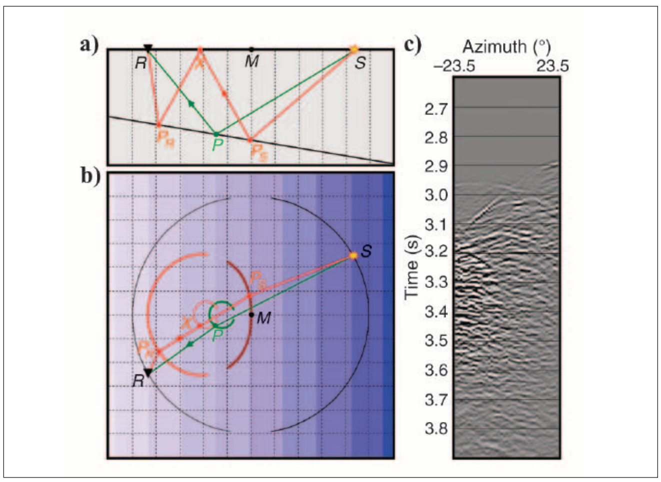

Figure 2. *(a) Common-midpoint rays for a primary and a multiple reflection. (b) Plan view of primary (small arcs) and multiple reflection points (large arcs), for varying azimuth angle. (c) Predicted multiples as a function of azimuth. The strong azimuthal variation explains why a proper application of SRME must be 3D. (Figure 11 from "3D surface-related multiple elimination: A perspective" by Dragoset et al.)*

Since the 1950s, geophysicists have investigated the link between seismic velocity and porosity. GEOPHYSICS' 25th anniversary special section contains a paper by Pickett (1960), comparing laboratory measurements and empirical models (Figure 3). Avseth et al. ("Rock physics diagnostics of depositional texture, diagenetic alterations and reservoir heterogeneity in high porosity siliciclastic sediments and rocks—A review of selected models and suggested workflows") show that over the intervening years the sophistication of rock physics models has increased tremendously. They review some existing rock physics models and the link between rock physics and geologic processes. For example, with good local validation of the models, one can quantify the degree of sorting and cement volume from diagnostic crossplots (Figure 4). In conjunction with Avseth et al., Bosch et al. ("Seismic inver-

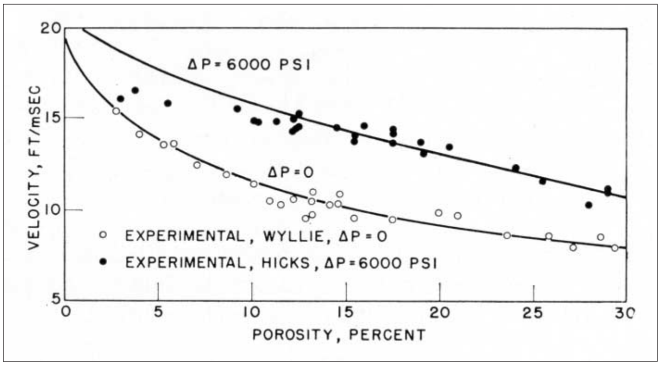

Figure 3. *Compressional-wave velocity data versus porosity and superimposed empirical model. (Figure 5 from "The use of acoustic logs in the evaluation of sandstone reservoirs" by Pickett, 25th anniversary special section.)*

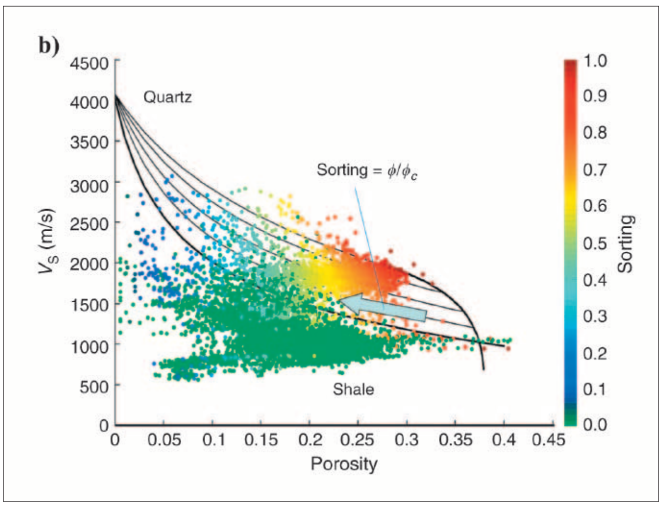

Figure 4. *Shear-wave velocity data versus porosity and superimposed diagnostic rock physics models. Using the models, one can quantify the degree of sorting. (Figure 10b from "Rock physics diagnostics of depositional texture, diagenetic alterations and reservoir heterogeneity in high porosity siliciclastic sediments and rocks—A review of selected models and suggested workflows" by Avseth et al.)*

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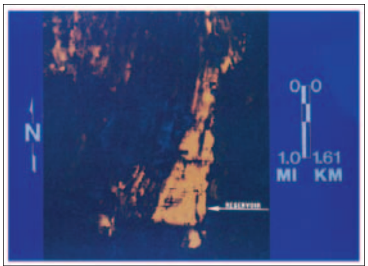

Figure 5. *A flattened horizontal slice that shows the areal extent of a producing reservoir (Figure 6 from "The effectiveness of offshore three-dimensional seismic surveys – Case histories" by Horvath, 50th anniversary special section.)*

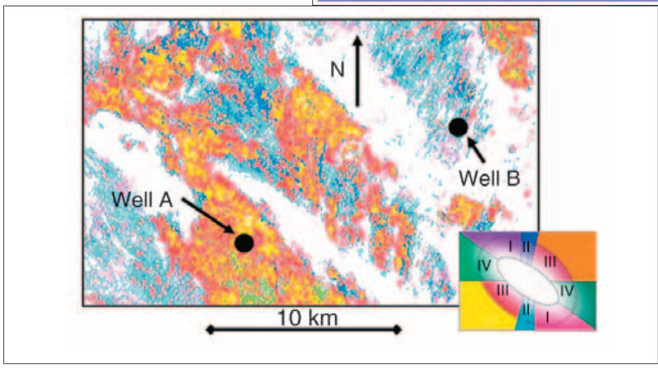

Figure 6. *Amplitude extraction from an AVO classification volume. This extraction is from the reflection from the top of the reservoir. Well A shows a relatively strong class III anomaly and Well B shows a class II anomaly. The porosity in Well A is higher than the porosity in Well B. (Figure 19 from "Interpretation of AVO anomalies" by Foster et al.)*

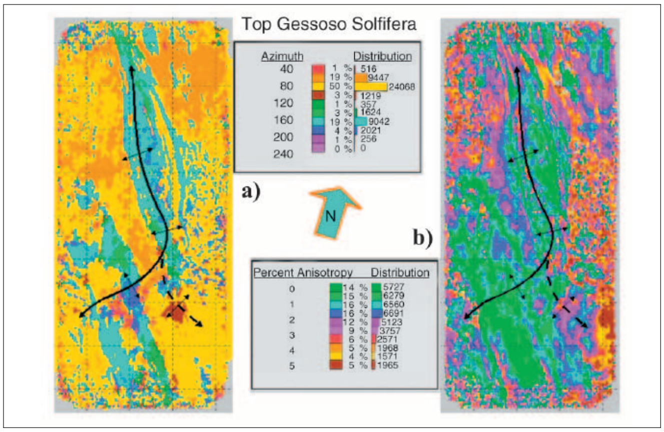

Figure 7. *(a) Polarization azimuth of the PS_1-wave and (b) the shear-wave splitting coefficient (in percent) above the Gessoso Solfifera Formation at Emilio Field. (Figure 8 from "Seismic anisotropy in exploration and reservoir characterization: An overview" by Tsvankin et al.)*

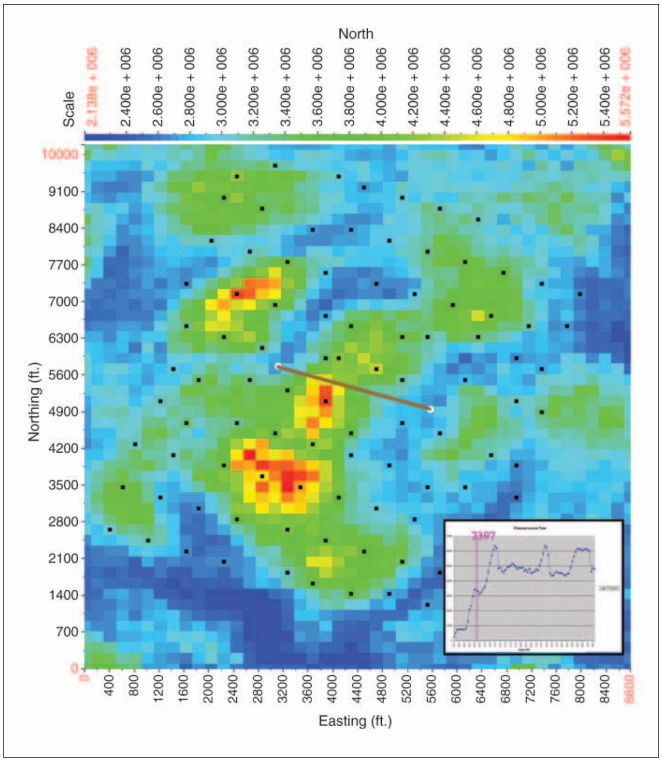

Figure 8. *Depth slice at the reservoir level through an emission energy cube derived from one minute of observation time during a hydraulic fracture stimulation of a horizontal well. The hotter colors represent areas of higher energy acoustic emission. The energy distribution is consistent with fractures being set up in two directions (Figure 1 from "Reservoir characterization using surface microseismic monitoring" by Duncan and Eisner.)*

sion for reservoir properties combining statistical rock physics and geostatistics: A review") discuss how rock physics models, combined with geostatistics and seismic inversion, can be used for quantitative reservoir characterization.

Three-dimensional seismic data acquisition, imaging, and characterization are approximately 35 years old. Geophysics' 50th anniversary special section contains an interesting collection of 3D case histories by Horvath (1985). Figure 5 shows a 3D seismic horizon with a "bright spot" indicating a producing reservoir. Many 3D methods have emerged since 1985, enabling the industry to better understand and exploit reservoirs. For example, Foster et al. ("Interpretation of AVO anomalies") review the development of AVO technology and provide guidelines for using AVO to extract reservoir properties. Figure 6 shows that AVO attributes enable the distinction between high- and low-porosity zones.

Using multicomponent data, Tsvankin et al. ("Seismic anisotropy in exploration and reservoir characterization: An overview") determine the polarization azimuth of the PS_1-wave and use this for fracture and stress characterization of a reservoir (Figure 7).

Maxwell et al. ("Petroleum reservoir characterization using downhole microseismic monitoring") and Duncan and Eisner ("Reservoir characterization using surface microseismic monitoring") monitor hydraulic fracturing of a reservoir. The latter authors relate the energy distribution of the fracturing noise at reservoir level to the direction of maximum principal stress (Figure 8).

Finally, other tutorial and overview papers in the 75th anniversary special section deal with electrical and electromagnetic methods, engineering and environmental geophysics, ground-penetrating radar, poroelasticity, seismic data acquisition, seismic interferometry, and seismic modeling and wave propagation. Furthermore, this special section contains recollections of past editors, an article on most-cited papers, an article on impact factor, best papers, and classic papers published in previous anniversary issues. TLE

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