NEW VALUE IN OLD GEOSCIENCE DATA. D.T. Butler, III[1] SLB, 10001 Richmond Ave, Houston, TX 77042 (dbutler4@slb.com)

Introduction: The oil, gas, and mining industries along with governments have a long history of not only acquiring new geoscience data but also enhancing existing data for prospecting purposes. These publicly and privately available data can include well logs, well cores, active seismic, and even synthetic aperture radar. There are both public and private use cases for data acquisition, reprocessing, and dissemination. In the examples described, a recurring theme is the advent of innovative uses for old geoscience data to find new value not foreseen during original data acquisition. As the space resources industry sets its sights on lunar south pole, the lack of detailed, sub-surface data is apparent. We need more acquisition and new techniques applied to legacy data. This reuse and reacquire is analogous to the cases presented. Lunar geophysical surveying has the potential to not only deliver value to humanity's present needs but future needs as well in ways yet to be determined.

Terrestrial Public Data Use Case: The Kentucky Geologic Survey (KGS) ran a surficial mapping campaign from 1961 to 1978 working to geologically map each of 707 7.5-minute quadrangles that cover the state. At which point, Kentucky became the first state to produce a statewide geologic map at 1:24,000 resolution. Two decades later, in 1999, Kentucky commissioned an economic study to assess the economic value in statewide geologic mapping. They found that the $90 million invested in geologic mapping had yielded economic benefits between $2.25 to $3.42 billion [1]. This impressive return on investment is not the only public benefit found in geologic mapping.

Although not part of the initial or primary objective, these geologic maps have since been incorporated into many other studies including radon potential maps. Radon is cancer causing byproduct created through the natural decomposition of uranium found in Kentucky's soil and rocks. Radon potential maps derived from KGS's geologic map have been shown to lower cancer risk and reduce healthcare costs of the public sector between $2.9 and $7.7 million a year [2]. These radon potential maps are another example of the unforeseen public benefits of geologic surveying and deriving new value from old data.

Terrestrial Private Data Use Case: Private enterprises regularly acquire, modify, and sell both publicly and privately available geoscience data. The oil and gas sector actively generates large amounts of geoscience data which is used for the prospecting of natural resources. These data can include seismic and well data. Such data vary in both geometry and vintage. These data vary from 2D data acquired in the 1950s to 3D and 4D datasets presently being acquired. The resource exploration industry is regularly finding new ways of incorporating older datasets into new geologic modelling techniques, getting new value from old data.

In the 2000s, newer, wide-azimuth (WAZ) and multi-azimuth (MAZ) acquisition began to be favored over conventional narrow-azimuth (NAZ) acquisition, because it was realized that greater illumination created a step-change in imaging, particularly in areas of complex geology, such as areas dominated by salt. However, in the 2010s it was found that that older data, whether NAZ or WAZ, could be incorporated with recently acquired data to create volumes of sub-surface data that benefited from significantly increased illumination achieved through processing old and new vintages together to enhance geologically complex areas. Using older data in conjunction with newer data brought new value and understanding of the subsurface.

Similarly, in areas such as the norther equatorial margin of Brazil, which still constitutes a frontier exploration area, there is limited 3D data coverage. Reprocessing and reimaging of 20-year-old 2D data acquisitions with new science and modern computers have made a resurgence in popularity in the basin and brought new hydrocarbon targets. These datasets are being reprocessed to glean new information on potential prospects as well as plan new data acquisitions. The rapid pace of technology in the oil and gas industry is such that these data can typically be reprocessed every 4 to 6 years to attain new value.

Extraterrestrial Use Case: Apollo 17 active seismic data were acquired in 1972 but wasn't converted to the industry standard SEGY until 2009[3]. In 2015, gradiometric techniques were applied to uncover S-wave energy previously undetected [4]. Deriving s-wave data from an original p-wave acquisition almost 50 years later helps reveal additional engineering properties regarding the lunar regolith previously unknown. Over 50 years later the legacy data from the moon is giving the science community new insight on the moons structure.

Conclusion: In each of these examples, previously collected data continued to offer new life to the public and geoscience communities. Whether it is 5, 20, or even 50 years after their original acquisitions, new,

modern techniques along with the incorporation of new data can give insight that was not previously available. With humanity's long-term vision for the lunar south pole in mind, the sooner it begins acquisition of additional geophysical data, the sooner it can begin to reap rewards in ways unforeseen.

References: [1] Bhagwat, S.B. and Ipe, V.C. (1999) Illinois State Geological Survey: *Economic benefits of detailed geologic mapping to Kentucky*. [2] Haneberg, W.C (2023) KGS Factsheet. [3] Brzostowski, M and Brzostowksi, A. (2009) *TLE* 28, 385-496. [4] Sollberger et al. (2016) *GRL*, 43, 10078-10087.