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Every rock tells a story

Chromastratigraphy: Colors Are the Clues

By LOUISE S. DURHAM, EXPLORER Correspondent

Back in the day, geologist and petroleum engineer William "Bill" Ellington Jr. was gainfully employed as a reservoir engineer who spent his days looking at well logs.

Problem was, he wanted to look at rocks.

The opportunity came in 1989, when he joined the company formed by his retired geochemist dad. Today, he is an AAPG member and president of a family-owned geologic services company, Ellington & Associates.



Geologists using a new stratigraphic analysis tool dubbed ChromaStratigraphy® have discovered a "colorful" approach for correlation of chromatic data in well log format. *Graphics courtesy of Ellington & Associates*

"One thing I noticed was the subtle changes in colors."

"When I went in, I was surrounded by lots of rocks and cuttings, but the only way to make sense of this was to turn them into well log format," Ellington said. "My goal was to turn cuttings into well logs.

"One thing I noticed when all these cuttings were lined up for processing analysis was the subtle changes in colors," he said. "We were trying to create logs for all sorts of properties but not creating logs for color changes, so that was the quest."

The "quest" turned out to be a 10-year journey for Ellington and his colleagues, as they continued to use a variety of techniques to try to capture the colors of the rocks – but never were they quite happy with the product.

And then, ironically, an industry disaster triggered an all-out effort that led them to success.

When the infamous Macondo blowout occurred it shut down about half of the company's business because so much of their work was in the Gulf of Mexico.

"We then spent considerable time doing self-funded research, and that's when we perfected the techniques to get the product out," Ellington said.

"The changes in color in the rock have a story, yet no product was recording those colors; they are easily recordable so you're able to log those changes."

A Colorful Creation

The resulting new stratigraphic analysis tool, dubbed ChromaStratigraphy®, can be defined as a quantitative technique for the rapid, reproducible characterization and correlation of chromatic data in well log format.

Quantitative chromatic data can be reproducibly acquired from ditch cuttings, core or outcrop samples on rocks from any region or age, according to AAPG member Doug Kneis, senior sales adviser at Ellington & Associates.

Here's how it works: Raw color data are extracted from saturated slurries of pulverized sample and distilled water "using an imaging device and proprietary software to calculate an average color for that depth or interval," Kneis said.

This process, he added, can be implemented in a lab setting or at the rig site for near real-time results.

"A key element of ChromaStratigraphy is the graphic display of the reconstructed color from the measured samples, which produces a virtual core much like viewing a real core or outcrop," he noted. "This enables immediate recognition of facies and formation changes, particularly in well documented settings."

For an example, Ellington mentioned that his company is working with an operator who is moving to a new location in its general operations area and wants to map out a new color chart, basically on the two pilot holes they will be drilling.

"When they go horizontal, their colors will be locked in for the organic event where they like to go horizontal in the Eagle Ford," he said. "When you're in a new area you have to create a type well log, just as with an exploration well when you run suites of well logs and create a type well log where you make zonations based on changes, events your well logs will see.

"We're adding additional data tracks, creating a type well log for the section by running a Chromalog," Kneis added. "When you start drilling offset wells, you'll be able to correlate them to the type log."

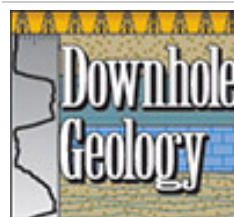
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Steering Toward Success

Geosteering would seem to be a tool that can benefit significantly from ChromaStratigraphy technology.

"In 90 percent of the wells being drilled now in unconventional resources, people are steering with one data point, and that's the gamma ray off their pilot or offset wells," Kneis said. "Where you're trying to stay in zone on an important well, the Chromalog gives them a second data point that is inflexible.

"We have the color chart already established in the trend, and the color is what it is," he noted. "The computer sees it and locks the color in and can tell you exactly when you get out of section, whether you've faulted up or down."

Geosteering application is possible because the data analysis can be done close to real time either at the well site or in the lab.

Ellington noted that their chromatic analysis technique also can function as a quickly-available proxy for total organic carbon in addition to its value for stratigraphic identification and correlation.

Besides numerous domestic shale plays and other plays, including overseas, the company is using its technology in legacy wells in the eastern Gulf of Mexico to assist with correlations in conventional reservoirs.

"We can go back and pull samples out of storage that were drilled 20 years ago or whenever," Kneis said. "Using ChromaStratigraphy, we can create well logs from cuttings on older wells to correlate with new things people are wanting to do.

"We have also taken outcrops like the Eagle Ford and related those back to the subsurface." 