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The following abstract is for an article that appeared in issue 176 (September 2017) of the *Explore* newsletter.

"Finally, A Correlation Coefficient That Tells the Geochemical Truth"

Robert G. Garrett[1], Clemens Reimann[2], Karel Hron[3], Petra Kynčlová[4], Peter Filzmoser[4]

Recent advances in compositional data analysis have provided a solution to the Harker diagram problem in which the selected chemical data sum to a constant (e.g., 100%) and the graphical displays make no sense in terms of petrological and mineral stoichiometry. The article employs the Nockolds data set for major element average compositions of igneous plutonic rocks as the basis for a brief tutorial focusing on the Si–Al, Ca–Na and K–Ti relationships in the data. Data pairs are transformed into symmetric coordinates which permit the display of element relationships that are free of the constraints of closure. As a result, Si and Al increase sympathetically from femic to felsic rocks; Na decreases with increasing Ca from felsic to femic rocks and in the albite–oligoclase solid solution; and the inverse relationship between K and Ti becomes much clearer due to the reduction of the impact of the remaining parts of the composition. The procedure also permits correlation coefficients to be estimated and that are free from the effects of closure. Computer programming R scripts are provided for the necessary computations and displays, together with the Nockolds data and examples of the use of R functions.

The following abstract is for an article that appeared in issue 182 (March 2019) of the *Explore* newsletter.

"Application of Fourier Transform Infra-Red Spectroscopy (FTIR) for Mineral Quantification"

John Woods[5]

Fourier transform infra-red spectroscopy is a technique that is used to obtain an infra-red spectrum of absorption or emission for solids, liquids or gases. The absorption excites molecular vibrations and rotations, which have frequencies that are the same as those within the infra-red part of the spectrum. The frequency of the response relates to specific bonds: the greater the response, the higher the concentration. In a manner similar to how X-ray diffraction (XRD) works, it is, possible to both identify and quantify a wide range of compounds. Minerals contain a wide variety of bonds, so the more open their structure, the better the infra-red response. This means that minerals which contain covalent bonds, such as clay minerals, can be both identified and quantified with considerable accuracy. Further to this, the development of new detectors and sampling plates based on attenuated total reflection (ATR) technology means that samples can be presented to the instrument without the need for complex preparation: they simply need to be dry and ground to less than 75 µm. Instrument run time is typically two minutes, and SGS has set up fully quantified methods for the analysis of clay minerals (e.g., illite, chlorite, kaolin, smectite), micas, carbonates (e.g., calcite, dolomite and siderite), feldspars (e.g., plagioclase and K-feldspar), quartz, spodumene, and apatite. The quantification ranges vary between minerals but is usually between 5%–100% with error generally less than 15% ($R2 > 90\%$) even for clay minerals. Although the base methodologies are tolerant of a wide range in matrices, for optimal results it is always preferable to set up matrix matched methods.

The following abstract is for an article that appeared in issue 182 (March 2019) of the *Explore* newsletter.

"Geochemistry at Exploration '17"

Hugh de Souza[6]

Exploration '17 is the most recent in a series of conferences held once every 10 years in Toronto (Canada) that surveys successes in mineral exploration and highlights promising new methods and technologies. Plummeting discovery rates over the last decade have thrown into question the use of conventional exploration techniques, particularly for the discovery of deposits under cover. Paul Agnew, in his geochemistry plenary talk, proposed a detailed geostatistical evaluation of existing data sets augmented by new data from low-detection-limit geochemistry, the use of portable real-time technologies, spectral techniques and an expanded use of mineral chemistry as a fertility and vectoring tool. These approaches were discussed in more detail by specialists in the geochemistry and analytical methods sessions and elsewhere. In the former session, the advantages of molar element ratio lithogeochemical analyses were reviewed, and there was a look forward to where geochemistry needs to advance over the next decade. The methods session highlighted developments in inductively coupled plasma mass spectrometry technology and their role in gold discoveries in the Yukon (Canada). Low level parts-per-trillion detection of gold in groundwater for the exploration of deeply buried ore bodies and the application of isotopes in mineral exploration to delineate processes may be less used, but technical developments are making their applications easier. Portable analytical technology is developing fast and portable X-ray fluorescence has emerged as a key analytical technology of the last decade. With an aging cohort of geochemists still dominating the profession, new blood is desperately needed to ensure continued progress in exploration geochemistry. For more on the 2017 conference (and previous 1967 to 2007 conferences), visit www.DMEC.ca.

The full articles can be viewed at https://www.appliedgeochemists.org/index.php/publications/explore-newsletter.

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