

Exploration of the Deep Continental Crust: The Superdeep Well of the Kola Peninsula; edited by YE.A. KOZLOVSKY. P. 558. New York, 1987 (Springer-Verlag, \$118.00).—In May 1970, the Soviet Union began drilling a deep hole in the Precambrian crystalline shield of the Arctic, Kola Peninsula, with the stated purpose to: (1) obtain direct information regarding the chemical composition and material properties of the upper and middle continental crust, and (2) modernize existing equipment and technology for ultradeep scientific drilling. Seventeen years later and at an approximate cost of 75 million rubles, they reached a depth of nearly 12 km, far exceeding the deepest hole ever drilled into the Earth. The scientific data from this amazing project, including geological, geophysical, and technical drilling information, were published in a monograph entitled *Kol'skaja sverchglubokaja*, first released by Nedra Publishers (Moscow) on the occasion of the 27th International Geological Congress held in Moscow in August 1984. This book is the English translation of that monograph, the second volume in the new series entitled *Exploration of the Deep Continental Crust*, published by Springer-Verlag. In it, Ye.A. Kozlovsky of the Ministry of Geology, USSR, has assembled a richly detailed and amply illustrated account of the world's first super-deep continental drilling project. It is a much welcomed and valuable addition to Springer-Verlag's timely series on the subject.

The book covers a broad range of topics of certain interest to both academic and industry geologists. It opens with a brief but interesting historical account of the Soviet's drilling program, highlighting in chronological order the major achievements and surprises of the program. This is followed, in the first section entitled Geology, by a summary of the regional geology of the well-site, as well as a descriptive analysis of the recovered core. The latter portion presents new data relating to the petrography, geochemistry, and age of the deepest Archean gneisses as well as the overlying Proterozoic mafic volcanic sequence (Pechenga Complex), the host to a major synvolcanic Cu-Ni ore deposit. In addition, there are chapters on topics as diverse as: the distribution and composition of gases, subsurface water, and organic matter within the deep crust, the vertical variation of metamorphic grade, and a concluding chapter on the Precambrian geological evolution of the area. The Geology section is the single-most comprehensive geological summary of the northeastern Kola Peninsula ever produced in English, and it should be a major source of information to a wide range of geologists.

The second section includes topics related to the geophysical investigation of the well and of the core recovered from it. This section includes a chapter on the design and testing of specially designed equipment used to log the well, a chapter summarizing each of the geophysical logging experiments, and a discussion of the physical state of the crust as determined from these experiments. As a nonspecialist in these fields, I found this section particularly interesting and not too detailed to follow. Among the observations surprising to me was the discovery in the profile of highly permeable and water-bearing horizons (or "hollows") existing

at depths greater than 10 km, and the varied but generally low geothermal gradient (11°C/km-23°C/km) encountered in the well.

The third and final section deals specifically with the design and construction of the superdeep well. It presents the methodological and scientific principles used in designing and testing the drilling equipment and includes a description of the on-site facilities and drilling equipment. This section may appeal most to engineering geologists and drilling specialists, as parts of this section are rather technical and concerned with the fundamental problems of drilling in crystalline rocks with continuous core recovery.

Readers may be disappointed, however, with the methods of data presentation and analysis in certain sections. The Geology section, for example, includes a number of "lithopetrochemical" diagrams (simple X-Y plots of element concentrations or elemental ratios) that indicate "sedimentary differentiation" or "terrigenous-chemogenic differentiation" trends without any reasoned explanation as to what these trends mean. Likewise, we are presented with nearly a hundred K-Ar ages of a range of minerals and whole-rocks from which "statistically meaningful" ages are cited; this despite the fact that not all ages for a given mineral are in agreement at the 95 percent confidence level. Unfortunately, this kind of indiscriminate and uncritical analysis occurs much too frequently in the book, and, indeed, this reviewer was left with the impression that some of the analytical work was done with a minimum regard to the problem being addressed. Many of these problems could possibly have been avoided with tighter editing and more critical peer review.

The book itself is beautifully typeset and illustrated, with clear line drawings and high quality black-and-white photographs. In general, the translation to English is good, although the text abounds with complicated phrasing, uncommon terminology, and inconsistent word usage. Despite these shortcomings, this book will likely serve as a source of information of the Kola superdeep well for years to come, especially because the vast majority of the cited references have not been translated to English. For these reasons, I expect that the book will serve as *the* principal reference to this unique scientific experiment and contribute much to our understanding of the constitution and composition of the upper and middle continental crust.

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