Meetings

Strata Control and Rock Mechanics

New techniques for combating the earth forces created by underground mining operations were discussed at the fourth international conference on strata control and rock mechanics, held in New York City, 4–8 May 1964.

Robert Merrill (U.S. Bureau of Mines) reported on an experimental program to determine the changes in the stress field surrounding a mine drift in a block caving operation when the undercut slot is created a fixed distance above the drift. The positioning of the stress meters was based on a two-dimensional photoelastic study of the problem. From the information obtained to date, it may be concluded that the general stress picture predicted by the photoelastic study is present around the mine drift in this block caving operation.

The theory of beams on elastic foundations has been used for a number of years to predict the convergence phenomena surrounding a longwall mining operation. With the rapid development of the mechanization of mining processes, a number of new problems have arisen which cannot be explained by this theory. Polish mining engineers gave the results of an extensive 10-year testing program that was designed to modify this theory. The roof subsidence phenomena in front of an advancing longwall face was found to be best approximated by a functional form $y = ae^{bx}$. For subsidence behind the longwall face the functions $w = w_1(1 - e^{-bd})$ and $w = [(d)/(a + bd)]$ gave the best approximation, where *a*, *b*, and *d* refer to material and geometric parameters.

European developments in underground support were of great interest to the American mining engineers. Probably the most fascinating development is the use of powered longwall supports or self-advancing hydraulic supports. These supports have been developed to cope with the problems generated by rapidly advancing longwall faces. Traditionally a 300- to 400-yard longwall face was advanced at the rate of 27 feet per week. Modern mining equipment has made it feasible to advance faces at three to four times this rate provided proper control of the strata at the face can be obtained.

English experience indicates that an important aspect of self-advancing support design is its ability to resist lateral movement of the strata. This movement results in distortion of the support system and causes less resistance to convergence. A further important conclusion is that an increase in support load density up to ¾ to 1 ton per square foot of exposed roof reduces roof-to-floor convergence. Increase in load density beyond this amount brings about roof and floor fracture and a general deterioration of strata control conditions without materially changing roof-to-floor convergence.

Experiments with self-advancing supports in France and Belgium take account of the more difficult coal mining conditions on the continent. Here the majority of the coal fields have been repeatedly affected by tectonic movements, and consequently have extreme irregularities in the geometry of the deposits and in the physical characteristics of the strata. Support stability in dipping strata, the increment of support advance, the density of support, and the methods of mining appear to have a more pronounced effect on the utility of self-advancing hydraulic support in the continental coal fields.

Jacobi (Steinkohlenbergbauverein) reported the results of testing a large model of a longwall face. The face model was constructed on a scale of 1:10 and was 30 feet long, 6 feet high, and 1½ feet wide. Strengths were reproduced on the same scale and the load pressure was produced by a system of hydraulic jacks and corresponded to a mining depth of 2000 feet. The effect of mining on the model was to produce a shear fracture system which gave rise to wedge-shaped blocks of strata. The fractures extended over the seam in advance of the mining. The coal face moved inwards. On the basis of this model testing, self-advancing supports were designed to meet these anticipated operating conditions. Further testing is in progress.

A general mathematical formulation of the deformation of a macrogranular body under mining processes was presented by Jerzy Litwiniszyn. Litwiniszyn, using a set of heavy spheres in a gravity field as a model, derived a fundamental solution for the probability that a given amount of macrogranular material would move under mining processes from position (x, z) to (x_0, z_0) where $z > z_0$. Under the system of postulates that we have a unique operator F and that F is linear and nonnegative, Litwiniszyn showed that the movement of macrogranular material can be defined by the Chapman-Kolmogorov equation. This is the fundamental equation of the theory of stochastic processes and a media whose displacement is described by this equation is defined as a "stochastic media." Evaluating the parameters of a "stochastic media" requires subtle experimentation and therefore the degree of correspondence between the mathematical formulation of the problem and nature needs further proof and remains questionable at this time.

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Atherosclerosis

Supplying data for an atlas on atherosclerosis in various animal species was the purpose of the conference on comparative atherosclerosis (spontaneous and experimental) which took place in Beverly Hills, California, 30–31 January 1964.

There were discussions of fish and reptiles (Vastesaeger), cetacea (Roberts), wild animals (Fiennes), pigeons (Prichard, Lofland), turkeys (Middleton, Gresham), fowl (Siller, Pick), rats (Wilgram, Thomas, Priest), rabbits (Haust, Constantinides, Pollak), minipigs (Zugibe), swine (Luginbuhl, Getty, Moreland), canines (Luginbuhl, Geer, Straus), and subhuman primates (Clarkson, Taylor). Gonzales reported on the histochemistry of com-