

APPENDIX VII

IMPORTANT AREAS OF MINERALS RESEARCH COMPILED BY THE NATIONAL SCIENCE FOUNDATION ADVISORY COMMITTEE ON MINERALS RESEARCH

This outline has been prepared by the Advisory Committee on Minerals Research both as a guide to division of effort among its subcommittees and as a sample catalogue of the kinds of important problems facing the Nation in the minerals research field. It is recognized that items D, E, and F are not basic research areas for which direct financial support by the Foundation is appropriate. They are included, however, since they are of great importance to its evaluation and policy-making functions. They are also likely areas for activity to be financed from resources of other Federal agencies and industry.

A. *Fundamental Geologic Research:*

1. Background and fundamental research into the environments of ore deposition.
 - a. Age relationships.
 - b. Structural features.
 - c. Quantitative mineralogic studies—(Composition of different deposits; total amount of material emplaced and inference as to size of igneous source, if any; zoning within ore bodies and districts, etc.).
 - d. Halos around ore districts—trace elements.
 - e. Geologic thermometry of ore.
2. Reassessment of geologic theories relating to ore deposition and on which theories of ore deposition are based.
 - a. Why are some igneous areas productive of ore deposits, others not?
 - b. Reexamination of theories of evolution of the earth's crust having a bearing on ore depositions.

- c. Relationship of major geologic structures to ore deposits.
 - d. Migration and concentration of elements in geologic time.
3. Study of why some metallogenetic provinces are dominantly copper, others silver-lead, etc.
 4. Restudy of some principal ore districts (combined geological-geophysical-geochemical-geobotanical approach).
 5. Favorability of one rock type for ore deposition over another—library research, statistical study, etc.

B. *Fundamental Geochemical Research:*

1. Physical-chemical relationships in evolution of the earth's crust in relation to ore deposition.
2. Physical-chemistry of ore deposition.
3. Trace elements in sedimentary, igneous, and metamorphic rocks.
4. Study of pressures and temperatures of ore deposition.
5. Chemistry of wall-rock alteration—dolomitization, sericitekaolin alteration, etc.
6. Compilation of a new and up-to-date *Data of Geochemistry*.
7. Mass spectrograph determinations of isotopes of elements in ore deposit.

C. *Fundamental Geophysical Research:*

1. Behavior and movement of fluids under high temperatures and pressures and their movement in different kinds of rocks and openings.
2. Physical characteristics of the earth's crust and substrata.
3. Measurement of electrical, magnetic, seismic, and other phenomena in structures of ore deposits.
4. Interpretation of geophysical data in ore districts where geology is known.

C. *Fundamental Geophysical Research—Con.*

5. Global physical characteristics of the earth's crust and substructure, e. g.:
 - a. Comprehensive investigation and study of electrical ground currents (both telluric and those from spontaneous polarization) should be made in order to increase our knowledge of their relationship to regional and local geology and geologic conditions.
 - b. Comprehensive geothermal studies as in (a).
 - c. Comprehensive geomagnetic studies as in (a), etc.
6. Further research of the transmission of seismic energy in nonhomogeneous media is needed, as mining geology does not deal with homogeneous media as in oil.
7. Instrumentation [see also D (2)].
 - a. Background noise.
 - b. New types of instruments.
 - c. Applications of high-speed computers.
8. Physical properties of rocks and minerals.

D. *Applied Research on Methods of Exploration:*

1. Better drilling methods—correlation with American Petroleum Institute.

2. Improvement of geophysical instruments and techniques.
 - a. What else can be put in automobiles or airplanes?
 - b. Drill hole instruments and techniques.
 - c. Method for detecting disseminated sulphide deposits.
 - d. Quick, cheap, reliable method for determining depth of overburden.
3. Improvement of quick, accurate field methods of chemical analysis—mass spectrometry.

E. *Other Applied Research Applicable to Conserving Raw Material:*

1. Ground water studies in ore districts.
2. Deep mining problems.
 - a. Rock bursts.
 - b. Supports.
 - c. Refrigeration—ventilation.

F. *Appraising Ore Yet to Be Found, cf., Wallace Pratt Survey for Oil:*

1. Below present mining depth.
2. Under gravel covered in grabens of basin-range province.
3. Etc.

G. *Supply, Demand for and Training of Scientific and Technical Manpower.*

