(i) that the theory be invariant with respect to coordinate and λ-transformations, (ii) that it be transposition-invariant (that is, that the equations read from right to left are equivalent to those read from left to right), and (iii) that the equations have the greatest possible "strength." The "strength" of a system of equations is a new concept introduced by Einstein, which measures the extent to which the equations determine the field variables. In contrast to the concept of a Cauchy problem, which requires the singling out of a direction of continuation, the definition of strength treats all four coordinates on the same footing.

We do not yet know whether Einstein's nonsymmetric field theory, or any other "unified field theory" proposed so far, will have a place in the physical theories of the future. Very possibly the time is not ripe for progress in this field. But anyone who sincerely believes in the organic unity of nature will be impressed by the program of unified field theory as an important approach toward the recognition and understanding of that unity. The last book by Albert Einstein represents an extremely significant contribution to this quest.

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L'Evolution de la Lithosphere. I, Pétrogenèse. Henri Termier and Genevieve Termier. Masson, Paris, 1956. 654 pp. Illus. Cloth, F. 8800; paper, F. 8000.

This is the second volume of the *Traité de Géologie* by these authors. The first part was published in 1952, and two more volumes are promised. Petrogenesis is divided into two parts: "Generalities," of 9 chapters (264 pp.), and "Problems of petrogenesis," 13 chapters (335 pp.)

Starting with a brief resumé on the constitution of matter (including a periodic table), the authors consider the gaseous material from which solids are supposed to have condensed. Here the tectites, iron, stone-iron, and lastly the stone meteorites are discussed. The ideas of Urey on the origin of the earth, the build-up of the primitive atmosphere, the birth of water and the accumulation of the oceans, and the beginning of life, are also discussed. These first three chapters are a sort of introductory containing mostly theory. In chapter 4 the lithosphere is introduced, and the authors consider the effect on the crust of cosmic and ultraviolet rays and how photosynthesis and oxygen reduction produce energy. Terrestrial magnetism and gravitation lead naturally to a discussion of isostasity with stable and unstable areas, buckling and orogenies. These, along with thermodynamics, give us regional metamorphism, volcanism, and the formation of granite.

Starting with Laue's work in 1912, the internal structure of crystals has been under investigation, giving us more and more insight into molecules and atoms. The authors state that the "tetra coordinates of silicon is one of the fundamental characteristics of the Lithosphere," and that the silica and aluminum make up the upper part of the lithosphere, the sial of E. Suess. The classification of Green of (i) metals or conductors, (ii) the sulfurs or nonconductors, (iii) the OH groups, (iv) the hydrogene, (v) the silicates, and (vi) natural gases, is given. In chapter 6 the displacement and diffusion of matter in the lithosphere by various means, along with the various imperfections of crystals, are considered.

Chapter 7 deals with minerals from the glasses to the rare earths. Chapter 8 discusses geochemistry and considers the organic as well as the usual inorganic side of earth chemistry. Carbon comes in for careful consideration, especially the isotopes C^{12}, C^{13} and C^{11}, as well as C^{14}. Chapter 9 gives the age of the universe as about 6000 million years and the age of the earth as about 3500 million years, considered from some nine different radioactive approaches.

Under "Problems of petrogenesis," chapter 1 gives us the interinfluence of the terrestrial and meteoritic processes of the geologic evolution of the crust. The zones of weakness, both parallel and at angles to the directions of orogenesis (chapter 2), are followed (in chapter 3) by a synopsis giving succession of the phenomena with the tectonic phases and geosynclinal phases following through stages of deformation, sedimentary deposits, volcanism, metasomatism, petrogenesis, and occurrence. These chapters serve to localize the rocks in time and space.

After reviewing the mode of occurrence (chapter 4), the chemical classification, mineralogical occurrence, chemical-mineralogical classification, the C.I.P.W. classification as modified by Lacroix, Niggle's classification, and statistical methods, the authors give a simplified genetic classification of (i) rocks supersaturated with silica, (ii) rocks saturated with silica, (iii) rocks not saturated with silica, but with feldspathoids, (iv) ultrabasis rocks, and (v) charnockites, anorthosites and lamprophyres. Chapter 5 examines the magmas from various points of view and includes a table showing a series of continuous and a series of discontinuous changes supposed to go on in the liquid material. Next, in chapter 6, volatile, fluid parts, gases, waters, and mineralizing fractions lead naturally to volcanism. In chapter 7 some seven types of volcanic activity are listed. The contribution of geosynclines to the sima occupy chapter 8.

Chapter 9 is a long one and deals with metamorphism, pneumatolytic metasomatism, and hydrothermal metasomatism, running the gauntlet from granite pegmatites to evaporates. Here are introduced the authors' idea of "fronts," sorts of zones of combat between different materials in the crust. The numerous ideas are documented by numerous examples largely from the authors' experiences, but the vast literature is drawn on to bolster their ideas. The problems of granite fill chapters 10 and 11. Finally, chapter 12 discusses convergent rocks (in the biologic sense of convergent), and the last chapter tells of the aberrant rocks.

Throughout the book, the authors consider the importance of the atomic structure of the minerals and the crystal fabric. The influence of gravitation on crustal material is pointed out, and the authors consider metasomatism of the first order in identification and transformation of petrographic types. They favor the progressive differentiation of the sial at the expense of the sima and feel that some petrographic types have a plural or convergent origin.

In all, it is a very detailed study; each chapter, and even some subdivisions, has its own bibliography, sometimes running well over 100 titles. The amount of material covered makes it slow reading, but the book is well worth the effort. The figures and tables are clear and effective. The plates are well chosen and are placed at appropriate places in the text. The style is more literary than that of most geologic textbooks, and it is clear and very much to the point. Certainly all petrographers, mineralogists, and geologists should study it, for there is much to be derived from it, and it is a fitting volume of *Traité de Géologie.*

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Geometrical Optics. L. C. Martin. Philosophical Library, New York, 1956. 215 pp. $7.50.

This is an interesting and well-written treatise covering the elementary problems of geometrical optics, with the addition of some short chapters on diffraction and photometry.

In the first chapter, "The laws of geometrical optics," the author discusses the refraction and reflection laws and basic concepts, such as tangential and sagittal focus, real and virtual images, and the Smith-Helmholtz relation coordinating transverse and angular magnification.

The second chapter covers the first-