

kind of thing, for data are only conceivable where measurements can be made or where we have, contrary to Bacon's exhortation, accepted a dream of fancy for a model of the world.

In that branch of mathematical physics which is called statistical mechanics and which includes the atomic theory, we speak of the *completion* of a system when we wish to refer to the positions and velocities of all the elements or particles of the system; let us use this word in the statement of the postulate of indetermination. *The completion of the world to-morrow is not determinate, that is to say, it does not grow out of the completion of the world to-day as a single-valued determinate thing.* This is a postulate which, as it seems, must be accepted as a working hypothesis in the "extra-equilibrium" world, the world of actual happenings, where things never do stand still but go forward by fits and starts impetuously and beyond all control.

#### LITTLE PHYSICS AND BIG PHYSICS

The most fertile source of ideas in physics is the atomic theory which now runs through the whole of physics. Indeed we now have our atomic theory of elasticity, our atomic theory of crystal structure, our atomic theory of gases, our atomic theory of heat (including the whole of chemistry), our atomic theories in nearly every branch of electricity and magnetism, and our quasi-atomic theories of radiation; and the atomic theory suggests that erratic action is universally dominant in the physics of the very small. Therefore the term micro-physics, or little physics, is frequently used to designate what we have called statistical physics, and the term macro-physics, or big physics, is frequently used to designate the classical physics where nature is idealized more or less and one-to-one correspondences rule.

W. S. FRANKLIN

#### THE MINING INDUSTRY

THE accomplishment of the mining industry in the six-month period just completed warrants the forecast that 1916 is to be a record-breaking year, according to the director of the United States Geological Survey. Active demands and good prices have furnished the mine operators with full opportunity for success in working developed properties, and this in turn has given added incentive and available funds for exploration, prospecting and experimentation with new processes.

Summarizing the special reports which are now being made public, Director Smith continues his review:

The returns for six months furnish a basis for the belief that 1916 will set up a new record for the soft-coal mines. Every coal-mining state is sharing in this prosperity and of course this demand for coal is to be traced back to the increased business of the railroads and of the steel and other large industries.

Drilling activity throughout the oil-producing states has brought about a gratifying increase in production of crude oil that promises to make 1916 a record year for marketed petroleum. Already production and consumption are reported by the surveys specialist as essentially in balance east of the Rocky Mountains, with a tendency to lower prices.

The Portland cement industry has had a busy six months and the manufacturers are optimistic. It is predicted that in both production and shipments of cement this year will show a gain over last year, if indeed it does not establish a new record for cement.

Among the metals copper is continuing the steady increase in production which began early last year, and the forecast for 1916 indicates not only the largest output ever known but also the largest profits.

Shipments of iron ore from Lake Superior points for five months of 1916 exceeded by more than 80 per cent. those for the same months in 1915, and the indications for the year are favorable for a new high record on iron-ore production, and of pig iron as well. Higher prices with a steady demand are stimulating the mining of manganese, with the result that

this year's output of ore is expected to surpass the large production of last year.

The lead and zinc mines are producing ore at a rate even exceeding that of last year and the prevailing prices have made possible the working of large quantities of low-grade ore.

Most precious-metal mines are operating at full capacity. The gold production will probably fall below the high yield of last year, but silver, the one metal last to benefit by the general domestic prosperity, is expected this year to break all previous records.

In quicksilver the outlook is for a continuance of the output of 1915, which was the largest for several years. Thus far in 1916 the average price has greatly exceeded the 1915 prices; and although the reaction in prices has come, conditions are favorable for steady and profitable operation of the quicksilver mines, some of which are newly opened.

The reports from the survey's western offices are all optimistic. In Arizona mines and smelters are working at high pressure, and the production of metals already shows an increase that promises to make the value of the output nearly double that of last year. Arizona will maintain first place as a copper producer. New Mexico is continuing its rapid progress as a metal-mining state, with increases in its output of lead, copper, zinc, gold and silver. The mines of Colorado in the six months just past have shown some changes in output as compared with last year; an increase of 30 per cent. in copper is indicated, together with small gains in lead and zinc, a 15 per cent. decrease in gold, and little change in silver. This output, however, represents a large gain in value of mine production. Mining has also been stimulated in Montana, and the forecast indicates an increase of 60 per cent. in the value of the mine product over that of last year. Here also record outputs may be expected for 1916. Idaho mines are increasing their shipments in all the metals, with higher wages and larger dividends as the result of better prices.

Utah is experiencing an ore production in excess of smelter capacity. The value of the 1916 output of copper is expected to be double

that of last year. Throughout Nevada the old term "boom" best expresses the present mining revival. Old mines are being reopened and regular producers are working at full capacity. The chief gains in production will be in copper, lead and zinc. The increased activity in the mining industry of California is finding expression largely in the reopening of mines that have been long idle and the opening of new mines for chrome, tungsten, manganese, antimony and magnesite, rail shipments of these ores to the east being made possible by prevailing high prices. Washington is another state which shows increased production, the mining industry there being in better condition than for several years past. Alaska also is benefiting by the increased activity of its mines. Copper mining is showing great advances, and the output of both copper and gold promises to exceed that of last year.

#### THE OPTICAL SOCIETY OF AMERICA

At the recent regular election of the newly organized optical society, the name Optical Society of America was chosen. The officers chosen for the year are: President, P. G. Nutting; Vice-president, G. E. Hale; Treasurer, Adolph Lomb; Secretary, F. E. Ross. The Executive Council consists of the above officers and F. E. Wright, C. E. K. Mées, Norman Macbeth and J. P. C. Southall. The charter members of the society are:

Mr. Adelbert Ames, Jr., research, Clark University; Mr. Edward Bausch, member Bausch & Lomb Optical Co.; Dr. E. J. Bissell, research ophthalmologist; Dr. Wm. Churchill, Corning Glass Co.; Professor Louis Derr, professor of physics, M. I. T.; Dr. Marshall D. Ewell, consulting optical engineer; Professor C. W. Frederick, chief, lens designing and testing, E. K. Co.; Dr. H. P. Gage, optical research and design, Corning Glass Co.; Dr. G. E. Hale, director, Solar Observatory, Mt. Wilson; Dr. E. P. Hyde, director, Nela Research Laboratory; Dr. H. E. Ives, optical research, U. G. I. Co.; Mr. L. A. Jones, optical research, E. K. Co.; Dr. H. Kellner, chief, scientific bureau, B. & L. Co.; Mr. C. H. Kerr, director, research laboratory, P. P. Glass Co.; Dr. Walter B. Lancaster, research ophthalmologist; Mr. Adolph Lomb, member Bausch & Lomb Optical Co.; Mr. Norman Macbeth, editor and