liquids. The method is intended for the determination of the pressure and density in the gradual "double" compression behind the fronts of the reflected shock waves. The objects of the experiment were light metals—aluminum and compounds with light atoms transparent to x rays such as water, paraffin, and plexiglas. For all the materials investigated, high pressures and densities of from 600,000 to 900,000 atm were maintained in the reflection region, and these were several times as great as the pressure due to the shock wave before the impact.

Nonequilibrium Dissociation of a Mixture of Gases behind a Shock Wave, Yu. P. Lun'kin and F. D. Popov, pp. 523–526.

The nonequilibrium dissociation of a two-component mixture of gases behind a direct shock wave is investigated.

The passage of a gas through a shock wave is accompanied by a disturbance in its internal degrees of freedom. The different times of relaxation of rotations, oscillations, and dissociation of the molecules significantly facilitate the study of the nonequilibrium processes in a real gas.

Elsewhere an approximate method was proposed for the solution of the system of equations that describes the nonequilibrium dissociation of a pure, diatomic gas behind a shock wave. In the present work, this method is made more precise and is generalized to the case of a two-component mixture consisting of diatomic or of monatomic and diatomic gases. If both components are diatomic, we restrict ourselves to the case where there dissociation energies differ considerably and we can consider the dissociation of each component separately.

Refraction of Detonation Waves Incident on the Boundary between Two Gas Mixtures, L. G. Gvozdeva, pp. 527–533.

We discuss one of the phenomena characteristic of detonation waves—the refraction of such a wave when it passes from one explosive mixture to another.

By using a high speed movie camera, photographs have been obtained of the phenomenon that occurs when a detonation wave moving through a medium capable of reaction passes through a boundary dividing this medium from an explosive or inert medium.

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Present State of the Theory of Liquids, I. Z. Fisher, pp. 239–250.

The present stage in the development of the theory of the liquid state originated for the most part in the numerous researches of Jacob Il'ich Frenkel, which he summarized in his classical book *Kinetic Theory of Liquids.* He was one of the first to point out that the approximately equal particle density in solid and fused crystals, and the consequent approximate equality of their intermolecular interaction intensity, is bound to make the structure and the character of thermal motion of the atoms and molecules nearly the same in both phases. This gives rise to the known parallelism between the physical properties of solids and liquids, and creates a real basis for the theory of the processes that relate both phases. The views developed by Frenkel proved equally fruitful for both the theory of crystals and the theory of liquids. These views presupposed the increasing *disorder* in real crystals with rising temperature, and the presence of elements of *order* in liquids. The notion of defects (in the broad sense) in crystals and of their role in thermodynamic, electric, kinetic, and optical properties of real solids was a most important step in the development of solid state theory. On the other hand, the ideas of short-range order and strong interaction between the particles of a liquid, and their specific influence on its physical properties, has given rise to a new branch of physics—the statistical theory of liquids.

We shall attempt to review briefly the present status of statistical theory of simple liquids, confining ourselves to nonquantum theory. Except for liquid helium and to some extent liquid neon, all monatomic liquids can be described satisfactorily by classical methods.

The lack of a simple and readily visualized model for liquids, one capable of serving as the "zeroth approximation" in the building of a theory of liquids (in contrast with the perfect-gas and ideal-crystal models in the theory of gases and solids) makes the development of the theory extremely difficult. The mathematical difficulties encountered on the path toward the development of the theory of the liquid state of matter are so great that only a statistical theory of simple monatomic liquids is feasible at present. Liquefied inert gases and fused metals are real examples of simple liquids. We can also include, with some degree of approximation, certain monatomic liquids with molecules and force fields that have some measure of specific symmetry.

Many problems in the statistical theory of liquids recently have been discussed in detail in reviews and books. Therefore we have attempted to pay more attention here to questions that are relatively new or insufficiently explained in the review literature. Many problems in the theory of liquids have not been touched upon at all.

Physical Theory of Plasticity and Strength, V. L. Indenbom and A. N. Orlov, pp. 272–291.

During the 50 years that have elapsed since the discovery (in 1912) of diffraction of x rays by crystals and the development of the dynamic theory of the crystal lattice (1915), the physics of plasticity and strength has turned from a descriptive science with only formal premises into a major division of solid state physics, based on reliable experimental researches and on fully developed theoretical notions. The development of the physical theory of plastic deformation and failure is closely connected with the work of J. I. Frenkel, whose varied interests included basic problems in the theory of mechanical properties of both crystalline and noncrystalline solids. The present development of theoretical ideas and experimental methods of research on the real structure of solids has prepared the ground for the decisive stage in the development of the physics of plasticity and strength, namely, the direct investigation of the atomic mechanism of plastic deformation and failure. This is most clearly pronounced in the case of crystalline bodies.

Present State of Research on Atmospheric Electricity, I. M. Imyanitov and K. S. Shifrin, pp. 292–322.

Introduction
1. Basic information
2. Two theories
3. Vertical structure of field, conductivity, and current in "good weather"
4. Distribution of space charge in the atmosphere
5. Time variation of field and potential at high altitudes
6. Description of electric processes in regions of good weather
7. Electricity of stratified clouds
8. Electricity of cumulus and cumulus congestus clouds
9. Structure of shower and thunderstorm clouds
10. Accumulation of charges in thunderstorm clouds

References

Present State and Lines of Development of Optical Flame Pyrometry, A. E. Kadyshevich, pp. 347–363.

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Frequency Modulation of a Crystal Oscillator by Means of a Controlled Capacitance of a *p-n* Junction, Ye. G. Servinsky, pp. 25–35.

In this article the possibility of applying a controlled capacitance of a *p-n* junction to frequency modulation of a crysta oscillator by means of a series control circuit is discussed. Analytical expressions are developed from which it is possible to determine the limits of frequency deviation, the coefficients of nonlinear distortion, and frequency stability. The characteristic of several types of *p-n* junctions are also included.

The application of a controlled capacitance of a *p-n* junction t frequency modulation (FM) of oscillators has already found wid use. We shall discuss certain problems associated with the application of a *p-n* junction capacitance to FM modulation of