centration camps. Recently a number of Warsaw professors perished as victims of undeserved persecution. "To this black record of German persecutions a new page has been added—the persecutions of Lwow. Executions and concentration camps for Polish men of science—that is what the German 'crusade in the defence of civilization' has brought with it." In view of these new German crimes which bear full witness to a total degeneration of Hitlerite Germany, we feel sure that men of science in all free countries will wish to join in this solemn protest by Polish savants in Great Britain.—*Nature.*

SCIENTIFIC BOOKS

THE ELECTRIC SPARK

The Mechanism of the Electric Spark. By LEONARD B. LOEB and JOHN M. MEEK. xiii + 188 pp. 43 figures. Stanford University Press. $3.50.

THE book is divided into three chapters, dealing respectively with the Townsend theory of the spark discharge, the streamer theory and the calculation of breakdowns in air. The first chapter develops the background necessary to a complete understanding of the problem, the second describes the point of view which the authors have been especially instrumental in developing, and the final section may be regarded as a discussion of certain practical applications.

The authors begin with a critique of the Townsend theory of the progress of an electrical discharge between two surfaces, and examine the regions of validity of this theory. They review the pertinent considerations and show at what points the observed facts depart from simple theory. They conclude that the mechanism envisioned by Townsend, which is known to be quite successful in explaining phenomena at low pressures and small distances, as for example in certain particular cases in Geiger counter action, do not apply in air at high pressures and big gap-lengths. Time-lags are discussed. The amount and nature of the departures of observation from theory suggests criteria to which a more comprehensive picture of the mechanism must conform.

In the next section, the authors develop the picture of the formation of streamers in a discharge. They point out the sources of error in past experiments, such as lack of stability control of potential sources, inaccuracies in voltage-measurement and of gas-purities. The properties of streamers are explored, as are the corollary effects due to overvoltage, branching and time-lags. The ion densities necessary for streamer propagation are computed and photo-effects are discussed. Finally the full development of a lightning stroke is described, and it is shown how the various considerations developed will explain the observed phenomena.

The final chapter deals with the applications of the theory to the actual calculation of breakdowns in gaps. Many examples are given, and the comparison of theory and observation is presented. The effect of pertinent factors such as air-density is discussed. The case of the breakdown in coaxial cylinders is considered at some length, this case being of practical importance in electrical power transmission problems; and finally, corona discharge is briefly considered.

On the whole the book contains a useful summary and digest of discharge theory, and should be of especial value to those working with the various aspects of spark discharges. Possibly owing to the incidence of the present emergency on all scientific work, the book shows some signs of haste in preparation, as a number of amusing statements have appeared which the authors would undoubtedly have altered had time been available. For example, the high speed ions are cited on page 39 as traveling at the incredible speed of 1.3×10^{-8} cms/sec; a sentence on page 56 ends with a reference to ". . . positive ions of a questionable sort," and the name of the firm by which the junior author was employed was spelled in the title page as the "Metropolitan Vicars Company." On the other hand, there is no doubt that the authors have done a good piece of work, and give a useful presentation of a subject on which they may be considered authorities.

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METEOROLOGY

Dynamic Meteorology. By BERNHARD HAURWITZ. 365 pp. New York: McGraw-Hill. 1941. $4.00.

THIS book appears at an opportune moment. In recent years the science of meteorology has suddenly moved into the limelight from a state of comparative obscurity. The demands of civilian and military aviation and of a vastly expanded maritime activity have led ever increasing public circles to a realization of the significance of accurate weather forecasts and of the influence of the atmosphere upon innumerable activities of man.

The book gives an account of the analytical tools used by the meteorologist. Apart from offering to the professional a number of methods and formulae presented for the first time in a text-book, it should be of value to anybody who in the course of his work comes in contact with phenomena in the atmosphere. Although the presentation is essentially mathematical,

the formulae are always reduced to their simplest form and are derived in the clearest, most direct and easily understandable manner. Cross-references and similar complexities that mar most scientific text-books are here reduced to an absolute minimum. The book does not presuppose any particular knowledge of meteorology, but the non-meteorological reader will do well to use the book parallel with one of the numerous non-mathematical accounts of meteorology in order to keep in sight the practical significance of the methods discussed. Otherwise the student will not need more than a general knowledge of college physics and of calculus. Numerous footnotes throughout the book contain carefully selected references to original papers in dynamic meteorology and offer a valuable guide to the reader interested in ampler study in this field.

The first four chapters deal with the application of thermodynamics to the atmosphere, the second law of thermodynamics as far as needed being derived in the book itself. The fifth chapter treats briefly of the effects of solar and terrestrial radiation upon the air. The sixth to ninth chapters deal with the application of the hydrodynamic equations to the simplest cases of atmospheric motions, especially stationary flow. The fundamental equations are again derived in the book itself in a simple manner. The tenth and eleventh chapters contain an account of the theory of turbulence as applied to meteorology; here the simplicity of presentation without loss of comprehensiveness is particularly gratifying. The twelfth to fifteenth chapters deal with a variety of topics, such as the energy of atmospheric motions, the general circulation of the atmosphere, the perturbation theory of atmospheric motions and finally we get a glimpse of the ideas underlying the dynamical theory of fronts and cyclones where there is still much room for controversy and further research. The book brings the student to the threshold of all the important current problems in modern meteorology.

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SPECIAL ARTICLES

THE EFFECT OF INCREASED PANTOTHENIC ACID IN THE EGG ON THE DEVELOPMENT OF THE CHICK EMBRYO[1]

MODERATE variations in the intake of the "B vitamins" appear to be without effect on free-living animals. The ingestion of two or more times the daily requirement by an animal not suffering from a deficiency has not been observed to be associated with any special changes of a physiological nature.

Few if any attempts have been made to investigate the effects of a varied level of these vitamins during embryological development, even though the embryo with its special type of metabolism might be expected to respond in a different manner than has been the experience with post-embryological animals.

In the present investigation the pantothenic acid available to the chick embryo was increased in two ways, by direct injection into the egg before incubation and by supplementing the diet of a flock of hens with three times the daily requirement of this vitamin. For injection 100–150 micrograms or about 10 to 15 per cent. of the total pantothenic acid normally present in the egg was dissolved in sterile egg white and injected in this form into the experimental eggs. The control eggs received the same quantity of pure egg white.

The eggs from the hens on the supplemented diet were incubated at different periods after the special diet had been initiated. In this manner eggs can be obtained with varying levels of pantothenic acid up to more than twice the normal concentration.[2] The hens from which the eggs were taken consisted of pure-blooded white Leghorns whose regular diet was well balanced and apparently adequate in all respects.

After 12 days' incubation the control and experi-

TABLE 1

THE EFFECT OF RAISING THE LEVEL OF PANTOTHENIC ACID IN THE EGG 10 TO 20 PER CENT. BY INJECTION

Experiment	Number of embryos	Viability control = 100	Hemoglobin control = 100	Relative brain weight control = 100	Relative heart weight control = 100
Control	42				
Pantothenic acid	42		108	107	93
THE EFFECT OF RAISING THE PANTOTHENIC ACID LEVEL OF EGGS BY PLACING HENS ON SUPPLEMENTED DIET					
Group 1—Control	13				
Group 1—Pantothenic acid*	30	115	116	106	100
Group 2—Control	13				
Group 2—Pantothenic acid	31	123	113	103	82
Group 3—Control	8				
Group 3—Pantothenic acid	24	130	108	96	83
1 to 3 days after discontinuing supplementary diet					
Group 4—Control	13				
Group 4—Pantothenic acid	27	109	119	90	85

* Group 1, eggs collected 4–6 days after initiating supplemented diet; group 2, 7–9 days; group 3, 11–14 days; group 4, 1–3 days after discontinuing supplemented diet.

[1] This investigation was supported by a grant from the Clayton Foundation.

[2] Snell, Aline, Couch and Pearson, *Jour. Nutrition*, 21: 201, 1941.