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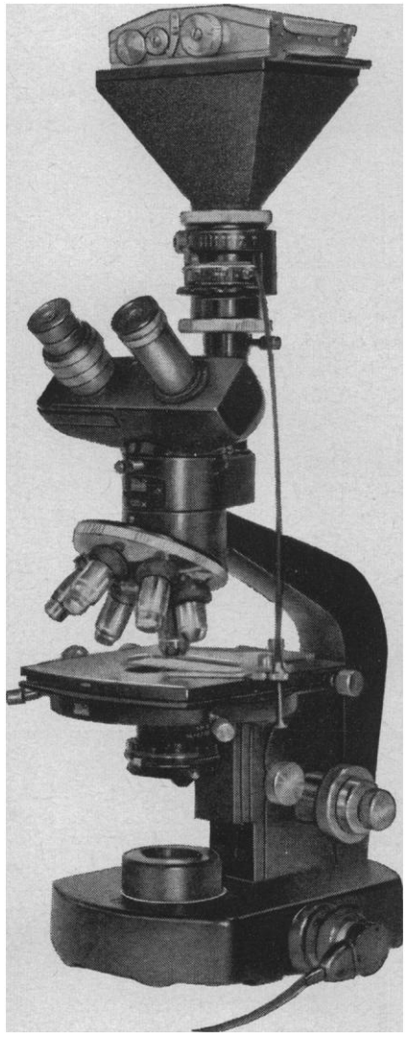

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Letters

Color Phenomena

Recently I reported [*Sci. American* **202**, 168 (1960)] that many of the colors described by Land could be obtained binocularly in a procedure that was essentially the same as that of N. Geschwind and J. R. Segal [*Science* **131**, 608 (1960)]. Additional unreported results indicate that a "natural image situation" is not necessary for the appearance of colors in a binocular setup. In the attempt to isolate a critical variable and, moreover, to obviate the need for transparencies, I drew two circles in India ink on a white card. The centers were so spaced that when stereoscopic fusion occurred the subject saw two concentric circles. When a red filter (Wratten 25 A) is placed before one eye, the circle stimulating the other eye (no filter) is dark red, and the other circle is green. Changes in the intensity of light can change the green to blue. This result appears to be a case of simultaneous contrast and, of course, is related to colored shadows. The fact that G. L. Walls [*Psychol. Bull.* **57**, 29 (1960)] has reinterpreted Land's major results in terms of simultaneous contrast suggests a principle for explaining the colors obtained by me and by Geschwind and Segal.

For an additional point of possible interest I repeated J. L. Brown's procedure [*Science* **131**, 155 (1960)] stereoscopically. Brown used a mechanical chopping device for alternately interrupting the two light beams projecting registered images on a screen. Without any filters, Brown reported the usual variety of colors and hues. When I tried this procedure I did not obtain any colors at all.

NICHOLAS PASTORE
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The Term "Cosmoparticle"

A meteorite has been defined as "a solid body of subplanetary mass that either is in space or has come therefrom, is falling or has fallen as a discrete unit onto the Earth or onto some other astronomical body, and still retains its essential cosmic character." Since there seems to be some need now for a term to include all particles of *submeteoritic* mass, it is proposed that the word *cosmoparticle* be used for this purpose. A cosmoparticle may be defined as "a discrete material entity of submeteoritic mass, either in space or having come therefrom."

Cosmoparticles may be "free" or individual molecules or atoms or molecular or atomic constituents of any kind—ions, atomic nuclei, protons, neutrons, electrons, positrons, and so on. Cosmoparticles and meteorites, as here defined, evidently together comprise all material entities below the category of planet.

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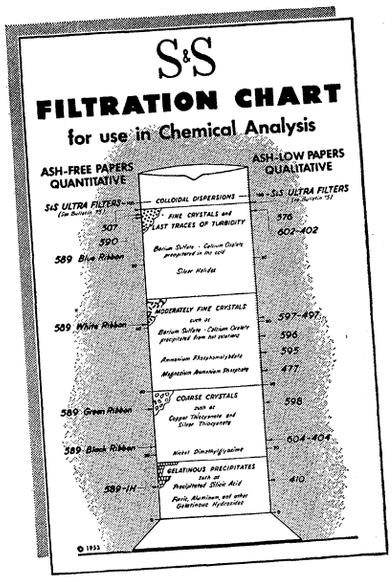
Stochastic Models

The article on stochastic models of population dynamics by Jerzy Neyman and Elizabeth L. Scott [*Science* **130**, 303 (1959)] contains the statement, "with a little luck in attracting the attention of more workers in the field, the process of clustering, with its further theoretical developments, may easily become the basis of a new theory which we like to call indeterministic cosmology." An offer from these particular statisticians to devote their energies to cosmology should not go without comment at a time when more and more observational data will be coming out of this nation's space science program for use in analysis and testing of various models.

The claim by Neyman and Scott that an indeterministic model will solve some problems in cosmology that the deterministic model is incapable of solving goes counter to the feeling of many in the physical sciences who reject any research not aimed at complete understanding, which, to them, means a deterministic model. Any model that is not deterministic is not considered realistic. An explanation in stochastic terms is no explanation at all. Knowledge must be gained with a deterministic model at every step of the way. An unfortunate result of this attitude is that difficulties in a limited area of a given field of research can slow down progress in the entire field until the difficulties are completely resolved in a deterministic manner. This is like not allowing the use of x to represent an unknown quantity, denying the use of algebra, and insisting that all problems must be solved through the more realistic arithmetic methods. Also unfortunate is the fact that frequently there is no meeting of minds in arguments on this point because these implicit assumptions or subconscious convictions do not come to the surface and the controversy centers around secondary concepts that follow from them.

Now let us look at the other side of the problem. Does a stochastic model



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really solve some problems or is it merely a utilitarian way around them? Neyman and Scott seem to take either view at various times. In some of their writings they admit that their stochastic approach may be at least partly utilitarian. In other places they state that the people who espouse determinism are trying to explain an indeterministic world with a deterministic model and so are doomed to failure. This can alienate some potential friends from the physical sciences. In yet another place Neyman calls such speculation idle. It may be idle technically but it can affect cooperation among scientists from different disciplines. A more accurate way of saying the same thing might be that the utilitarian aspects in the work of Neyman and Scott stand up no matter how we view the basic nature of the universe. The random portion of a stochastic model can be used to describe: (i) a truly random process; (ii) a process that appears random to us; (iii) a process that is too complex to be described completely.

If the world is basically indeterministic, the stochastic model can, of course, be realistic. If the world is basically deterministic, the stochastic model can still be thought of as a utilitarian generalization of a deterministic model. For example, when research reaches an impasse such as the contradiction between the cosmological principle and local irregularities, one can bypass it by the use of a stochastic model. The former impasse becomes an "island of indeterminism" within an otherwise deterministic model. Such a model can never explain in deterministic terms that part of the mechanism which has been assumed to be random. This statement is trivial but it does point up an important divergence in "parlance" between some theoretical statisticians and some physical scientists. To a statistician, any reduction of unexplained variation can be called an explanation. He can happily refer to an explanation of the behavior of aggregates in an "island of indeterminism" while the physical scientist bemoans the fact that the behavior of individuals is unexplainable with such a model.

Perhaps such divergence in views can be reconciled. To a statistician, any particular model is highly expendable. As knowledge increases, one can construct newer models with a decreasing area of indeterminism so that one approaches a deterministic model. The ultimate degree of approach will depend upon the nature of ultimate reality. A scientist can believe whatever he wishes about the ultimate state of affairs and still accept the stochastic model for its utilitarian aspects. This should be comforting to those in the physical sciences who like to feel that they are now working with reality even though the model they are using has replaced many former models and will itself inevitably be replaced some day.

NICHOLAS E. MANOS
National Aeronautics and Space Administration, Washington, D.C.

Detecting Antibodies to Penicillin

The report by Marguerite Epp [*Science* **130**, 1472 (1959)] that sera from penicillin-allergic subjects agglutinate erythrocytes coupled to penicillin by means of a bis-diazotized-benzidine linkage confirms results of my co-workers and me with the same method plus the use of human antiglobulin (Coomb's) reagent as a final step to "develop" the reaction. As a matter of fact we believe that our procedure, as reported to the first Latin American Congress of Microbiology (Mexico, 12–19 October 1958) and to the National Congress of Allergists (Toluca City, Mexico, May 1958), avoids the necessity of making the "checkerboard" titration that Epp uses.

References to our work appear only in Spanish [reports and abstracts of works presented to the first Latin American Congress of Microbiology (1958); F. Martínez and L. Martín *Prensa méd. Mex.* **24**, 245 (1959); M. Salazar Mallén and L. Ortiz, *Alergia Rev. iberoam. alergol.* **7**, 348 (1959); and the thesis of L. Ortiz, University of Mexico (1959)].

We believe that the description that Epp gives of the method she uses and the information given here will encourage other investigators to take advantage of this first specific in vitro procedure, so useful in our hands, for diagnosing or confirming diagnoses of penicillin allergy.

M. SALAZAR MALLÉN
Medellín 94, Mexico City, Mexico

There are several points of importance in M. Salazar Mallen's letter which, I think, should be made clear. I rather question his statement that the "checkerboard" titration to establish the optimal ratio of penicillin to bis-diazotized-benzidine is unnecessary. In practice, there are variations in biological and chemical products. For example, the optimal ratio may vary as follows: from 2.5 to 4.5 mgm of penicillin to from 0.25 to 0.5 ml of the diluted chemical compound. Moreover, the method of Salazar Mallen and his collaborators and that described by me differ in principle. The former detects incomplete antibodies, whereas the procedure described in my report measures complete antibodies.

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