IN THE LABORATORY

Three-dimensional Modeling of Cyclones in Elementary Meteorology

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Students in elementary meteorology have more or less trouble in visualizing wave cyclones in three dimensions. For the past 6 years the writer has found helpful a laboratory exercise based on the use of a sheet of plasticine as the boundary surface between the air masses involved. In addition to the plasticine sheet ($\frac{1}{4}'' \times 10'' \times 16''$ is a convenient size), each student needs some small blocks of plasticine to prop up the main sheet, a knife, a few ticket pins with paper arrows colored to represent the cold and warm winds, a sheet of corrugated cardboard for the ground surface, and chalk to draw successive positions of the fronts on the "ground."

Given this material, the student proceeds to develop the successive stages in the standard Bjerknes wave cyclone "model." After the plasticine has been blocked up at a reasonable angle for a straight stationary front, the wave can be initiated and excess plasticine trimmed out so that the boundary sheet is in continuous contact with the ground. As the warm sector enlarges, additional trimming is done. When the occlusion stage is reached, the plasticine is split a sufficient distance up from the ground junction of the warm and cold fronts and one side tucked under. Thus, from the same cut the plasticine can be shaped to show either a warm or cold front type occlusion. Experience has shown that, once a student has gone through this entire sequence himself, he understands the structure of wave cyclones far better than if he were to rely on the standard cross sections alone.

Isolation of Crystalline Desoxyribonuclease From Beef Pancreas[1]

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A crystalline protein having a powerful desoxyribonuclease activity has been isolated from fresh beef pancreas by the method outlined below. Specific enzymatic activity of the protein is not diminished on recrystallization.

(1) *Preliminary purification by a modified McCarty's procedure* (*2*). An acid extract of ground beef pancreas, prepared according to the method of Kunitz and Northrop (*1*), is brought to 0.2 saturation of ammonium sulfate (114 gm of the salt/liter of extract). The solution is filtered with suction on Eaton and Dikeman No. 642 paper with the aid of 10 gm of Celite 503 (Johns-Manville Corporation) and 10 gm of standard supercel/liter of solution. The clear filtrate is then brought to 0.4 saturation of ammonium sulfate (121 gm/liter) and refiltered with suction, with the aid of 3 gm of Celite 503/liter, on Eaton and Dikeman No. 612 paper. The filtrate can be utilized for the preparation of chymotrypsinogen, trypsin, and ribonuclease. The residue, including the Celite, is suspended in 5 times its weight of water. The suspension is brought to 0.3 saturation of ammonium sulfate (176 gm/liter of water) and refiltered with suction, the filtrate then being discarded.

(2) *Incubation at 37° C followed by fractionation with ammonium sulfate.* The residue is suspended in 10 times its weight of water, and the suspension is brought to 0.15 saturation of ammonium sulfate (83.7 gm of salt/liter of water). The solution is titrated with about 2 ml of 5 N H_2SO_4/liter to pH 3.2 (glass electrode), heated to 37° C, and incubated for 1 hr at that temperature, after which it is cooled to about 20° C and filtered with suction with the aid of an additional 5 gm of Celite/liter of suspension. The residue is discarded.

The filtrate is titrated to pH 5.3 with 5 N NaOH (about 2 ml/liter) and brought to 0.5 saturation of ammonium sulfate (220 gm/liter). The precipitate formed, designated as "0.5 s.a.s. precipitate," is filtered with suction with the aid of 5 gm of Celite/liter of solution.

The clear filtrate is titrated with a few drops of 5 N H_2SO_4 to pH 4.0 (green to bromcresol green on test plate) and brought to 0.7 saturation of ammonium sulfate (135 gm/liter). The light precipitate formed, designated as "0.7 s.a.s. precipitate," is filtered with the aid of 2 gm of standard supercel/liter. The filtrate is discarded.

The "0.5 s.a.s. precipitate" (including the Celite) is then resuspended in 10 times its weight of water and operation 2, including the incubation at 37° C, is repeated several times until no appreciable "0.7 s.a.s. precipitate" is formed. The combined "0.7 s.a.s. precipitate" is suspended in about 10 times its weight of water and filtered with suction. The supercel residue is washed several times with water until the washing is water clear.

(3) *Fractionation with ethyl alcohol.* The combined filtrate and washings are diluted with water to a concentration of about 10 mg of protein/ml.[2] The pH of the solution is adjusted with 5 N H_2SO_4 to about 3.8, and 2 ml of saturated ammonium sulfate is added/100 ml of solution, which is cooled in an ice-salt bath to about 2° C. One-quarter of its volume of cold 95% alcohol is added

[1] The writer appreciates greatly the very helpful cooperation of Maclyn McCarty, at whose suggestion this work was initiated.

[2] The approximate concentration of protein can be determined spectrophotometrically at 280 mμ, the optical density being about 1.2/mg of protein/ml.