THE finer portion of the soil and especially the colloidal fraction tends to become dispersed, to take up much more water, and to swell under one set of conditions in nature. In this physical condition the soil is regarded to be structurally unstable. Under another set of conditions the soil tends to be flocculated, coagulated, cemented, contracted, and to absorb less water. In this physical condition the soil is considered as being structurally stable. The factors that tend to produce these unstable and stable structural conditions are many, but chief among them are chemical composition of the soil colloids, application of certain fertilizers, the presence of certain native salts, and leaching.

The problem now is to devise methods which are capable of ascertaining which soils have a stable and which an unstable aggregate structure, and to measure, on a comparative basis, the degree of instability. At present, there seem to be no methods for making such determination.

In measuring the ultimate structure of soils (1), the effect of various chemical agents on the rate of slaking of soils (2), and the effect of salts on the moisture equivalent and on the concentration of the soil solution (3), it was strikingly evident that of all the chemical agents employed potassium chloride and sodium hydroxide or sodium silicate had the most outstanding influence on the structure of soils. The potassium chloride tended to cause the greatest volume contraction and the greatest decrease in moisture content, while the sodium hydroxide or sodium silicate tended to produce the greatest dispersion, swelling, and increase in water content. Somewhat similar observations have been made by other investigators who have studied the effects of salts or exchangeable cations on soils or soil colloids (5, 6, 7, 8, 9).

It was at once suggested that advantage might be taken of the striking effect that KCl has upon soils in causing them to contract and in decreasing their water-holding power, to ascertain which soils possess a stable and which an unstable aggregate structure, and to measure the range of instability. It was reasoned that soils that were dispersed either as a result of leaching, or as a result of the presence of some chemical agent, and therefore possessing an unstable aggregate structure, would coagulate, flocculate, contract, and their water-holding power decrease when treated with KCl solution. Contrariwise, soils that were already flocculated, contracted and consequently in a stable structural condition, either as a result of chemi-