is observed. An extremely small quantity of sulphuric acid is able to convert 50, nay, 100 times its own weight of starch, and after having performed this task, we find it uncombined in the liquid, ready to do the same work over and over again. Chemists have as yet vainly endeavored to explain these changes in a satisfactory manner. The sulphuric acid in this case appears to act by its presence only—by its contact with the substances under decomposition, and hence the terms, "*contact-actions, contact-effects, catalytic processes,*" which you frequently meet with in chemical writings; words, of course, which are intended only to convey the meaning, that in the present state of our knowledge these actions cannot be explained. The progress of science has, however, thrown much light even on these recondite processes; and I may have to return to this subject in one of the following lectures, in order to show you that several successful attempts have been made.

The action of acid is not the only mode in which starch may be converted into sugar. There is another process, which appears even more enigmatical. The germination of seeds gives rise to the formation of a peculiar substance, which is capable of changing starch in exactly the same manner as dilute acids do; producing in the first place, dextrin, and ultimately glucose. The chemical composition of this substance, which is generally called "diastase," is unknown, because all attempts to prepare it in a state of purity have hitherto failed. If germinated barley be rubbed to a powder, and exhausted with water of about 30° C., (86° F.,) and the filtered liquid be mixed with absolute alcohol, a yellowish-brown flaky precipitate takes place, which contains the active principle—but the analysis of which has not led to concordant results; in fact, all that is known about it at present is, that it is very rich in nitrogen. You are all aware that the germination of barley is carried out on a large scale, for the purposes of the brewer. He thus obtains what is generally called "malt." For this purpose, the barley is left for some time in contact with water, whereby the grains swell up considerably. In this state it is left exposed to the atmosphere in localities the temperature of which should be under the command of the operator, much heat being evolved during germination. An air-temperature of 7° C. (45° F.) is found most convenient, but the temperature of the germinating mass is scarcely less than 15.5° C. (60° F.) The air is frequently renewed, and the thickness of the layers in which the barley is heaped up diminished in the same measure as the germination advances. As soon as the length of the germ nearly equals the size of the grain itself, it is known from experience that the largest amount of diastase has been produced. The farther progress of the germination is then interrupted by drying the seeds at a high temperature in a kiln, whereby the vitality of the grain becomes destroyed. The malt produced in this manner contains now, in addition to the diastase, a certain quantity of dextrin and sugar, produced by the action of the newly formed diastase upon the starchy matter of the seed. The remainder of the starch is readily converted into glucose by digesting the malt with water, at a temperature of 71° to 76° C. (160° to 170° F.), an operation which is called *mashing* by the brewer, and which furnishes a clear solution of dextrin and glucose, called *sweet wort,* and ready to be submitted to a farther transformation, which I shall mention by and by.

The mode in which diastase exerts its action upon the starch is not better understood than that of the acids. We are at present only in possession of the fact; but this fact is of so much importance, both in a practical and theoretical point of view, that I must not omit to exhibit it to you experimentally as far as possible. The conversion of starch into glucose is too slow to admit of its performance in a lecture-experiment; but its transformation into dextrin takes place with great rapidity, and becomes at once perceptible. For this purpose, I will introduce an infusion of malt (*i. e.* diastase) in lukewarm water into a vessel filled with starch-paste, the temperature of which is kept as near as possible at 71° C. (160° F.) After the lapse of a few minutes, the change becomes manifest by the liquefaction of the mass. Now, if you have time and leisure to follow the reaction by testing from time to time portions of the solution with iodine-solution, which as you