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## THE ORIGIN OF LIMESTONE CAVERNS

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### INTRODUCTION

CAVERNS in massive limestones are usually more or less filled with dripstones, and thus exhibit the work of two contrasted processes: excavation and replenishment. The first process, as generally understood in the United States, is taken to be the solutional work of percolating vadose water (water descending from the land surface to the water table) associated with the corrasional work of vadose or water-table streams. No adequate explanation for the change of process from excavation to replenishment is usually given with this explanation.

Another explanation of caverns was proposed by Grund in 1903.<sup>1</sup> He suggested that they are the solutional work of ground water below the water table during a lower stand of the cavern region; and that

<sup>1</sup> Alfred Grund, "Die Karsthydrographie." *Penck's Geogr. Abhandl.*, 7, 103-200, 1903.

when the water filling is withdrawn in consequence of regional elevation, dripstone deposition begins.

I have attempted to work out the consequences of these two rival explanations, with special attention to their application in regions of level-bedded limestones; and then to confront the unlike consequences with facts of observation in the hope of determining which explanation works best. A fuller discussion of the problem is presented in the *Bulletin* of the Geological Society of America for 1930. The statement here given is assertive rather than argumentative.

### CAVERNS EXCAVATED ABOVE THE WATER TABLE

The joints and bedding planes in a mass of recently uplifted, level-bedded limestones are here assumed to be close-fitting. Minute water ways will be opened along them, especially on lines of intersection, and a complex, angular, three-dimensional network of tube-

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