whose record has been given, where, for the five days beginning with April 3 and ending with April 7, eight eggs were laid.

There are two other instances where an average of more than one egg in a day for a limited period was made. In both of these cases the possible mistake in the reading of the numbers on the bands is to be considered, as the hens had no other distinguishing mark. The records for the particular period for each of these hens follow.

HEN NO. 27. JUNE, 1906

Date	5	6	7	8	9	10
Eggs.....	0	1	1	2	1	0

HEN NO. 203. MAY, 1907

Date	1	2	3	4	5	6	7	8	9	10	11	12
Eggs..	0	1	1	1	1	1	1	2	1	1	1	Set

There are eight other instances recorded where hens laid two eggs in a day but in all of these cases on either the day previous or succeeding the day on which two eggs were laid, no egg was laid.

It should be distinctly understood that these were not double yolked eggs, which are not uncommon. Usually one egg was delivered in the morning and the other in the afternoon. In all of the recorded cases, the eggs were of normal size and shape and in most cases they were tested and found fertile.

It is worthy of notice, but not necessarily significant, that the single pullet hatched last year from an egg laid by the hen whose record is first given, did not make an ordinarily good record this year.

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On the Origin of Limestone Sink-Holes

The following are some of the statements found in texts and other books relating to sink-holes and their origin:

1. It is for this reason [solution] too that Limestone districts abound with funnel-shaped cavities, descending from the surface vertically into the rock, into which water sinks and disappears. They are often called swallow-holes or swallows. Wherever there was any little despression in which water could lodge, the bottom was eaten away lower and lower, and a pipe formed at last leading from the surface into the undeground channel. ("Physical Geology," Part I., by A. H. Green, p. 191.)

2. In regions of soluble rocks, as we have seen, many inequalities of the surface are brought about by the chemical and mechanical action of underground water. Most frequently the depressions caused by the collapse of subterranean galleries and caves contain no water. ("Earth Sculpture," by James Geikie, p. 282.)

3. In limestone regions the solvent action of water has frequently gone on so extensively as to leave its imprint upon the topographic features of the landscape. . . . Entire landscapes are undulating through the abundance of sink-holes — shallow depressions down through which water has percolated and escaped into the underground passages. ("Rocks, Rock-Weathering and Soils," by Geo. P. Merrill, p. 259.)

4. From the surface sink-holes and pipes are dissolved downward, while in the mass of rock caverns are dissolved out, often, as in the Mammoth Cave of Kentucky, many miles in extent and with rivers of considerable size flowing in them. ("An Introduction to Geology," by William B. Scott, p. 89.)

5. It has been estimated that there are in Kentucky 100,000 miles of subterranean channels sufficiently large to permit the passage of a man. Many "sinks" are found on the surface, due to subsidence. ("A Text-Book of Geology," by Albert Perry Brigham, p. 87.)

6. When a considerable area has thus been undermined, the upper rocks may cave in, thus letting down the surface of the land above. Many small lakes in Kentucky occupy such sink holes. ("An Introduction to Physical Geography," by Gilbert and Brigham, p. 99.)

7. Thus across the limestone upland of central Kentucky one meets but three surface streams in a hundred miles. Between their valleys surface water finds its way under-

ground by means of sink-holes. These are pits, commonly funnel-shaped, formed by the enlargement of crevice or joint by percolating water, or by the breakdown of some portion of the roof of a cave. ("Elements of Geology," by William Harmon Norton, p. 46.)

8. Underground caves sometimes give rise to topographic features which are of local importance. When the solution of the material in a cavern has gone so far that its roof becomes thin and weak, it may collapse, giving rise to a sink or depression of the surface over the site of the original cave. This is so common that regions of limestone caves are often affected by frequent sinks formed in this way. They are a conspicuous feature of the landscape in the cave region of Kentucky, and are well known in many other limestone districts. They are known as *limestone sinks.* ("Geology," Chamberlain and Salisbury, Vol. I., first ed., p. 216.)

9. Sometimes the ceiling [of caves] gives way, forming the funnel-shaped "sink-holes" or "lime-sinks" so familiar in some of the Mississippi valley states. ("Soils," E. W. Hilgard, p. 41.)

Statements 1, 3 and 4 account for sink-holes entirely by solution. Statements 2 and 5 imply that they are due to the collapse of the roofs of caverns. Statements 6, 8 and 9 plainly say that they are due to the collapse of cavern roofs. Statement 7 teaches that some sink-holes are formed wholly by solution, while others are formed by the collapse of cavern roofs.

The writer thinks that he is not mistaken in stating that the common idea of sink-holes is that they are due to the falling in of the roofs of caverns. That sink-holes are sometimes so formed is certain, but that this method of formation is the rare exception and not the rule becomes evident from the following common features of such depressions:

1. Their almost universal funnel shape.

2. The absence in them of coarse débris such as would be derived from the collapsed roof.

Caverns are irregular in shape. The subsidence of the roof, therefore, would produce in nearly all cases a depression of irregular outline. Of many sink-holes the writer has seen, but one is recalled that was irregular in outline instead of being circular or of a form closely approaching a circle. In this single exception, the roof of the cavern had been of sandstone, and the outline of the "sink" was very irregular. In the bottom were large amounts of débris from the former roof. The limestone had been dissolved out beneath the sandstone roof until the latter could no longer support itself, when the collapse took place. Sink-holes of this character would be expected in regions containing limestone caverns if the surface rock above the limestone were thin and consisted of sandstone, or some other insoluble material. But regions where sink-holes are common are those in which limestone is the surface rock.

In no case except the one mentioned has the writer observed coarse débris, such as would be derived from the roof of the cavern, in sink-holes. In course of time such débris would wholly disappear by weathering, but if it had ever existed a portion of it would be expected to remain, in many, if not in the majority of cases.

The claim is not made that limestone roofs of caverns never collapse, for it is reasonable to suppose that they sometimes do. But certainly such collapses are rare. The rule in the formation of sink-holes is that they are the result of solution *at the surface.* Their locations are determined by crevices in the limestone, that permit the localization of the downward-moving water along tube-like passages that are more or less vertical. The water near the surface, in moving toward this tube, enlarges the upper end by solution, forming a small, funnel-like depression. This depression invites more drainage, resulting in a greater amount of solution and the enlargement of the funnel.

Sink-holes sometimes open into caverns below. The entrances to caves are sometimes at the bottom of these depressions. But probably in the majority of cases there are no caverns of considerable size immediately connected with the sink-hole. The tubular drainage course may pass into a cavern some distance away, or issue at the surface as a spring.

Where the latter condition exists, the surface above the subterranean passage may subside by solution, producing a ravine of solution. Thousands of such exist over the limestone region of northern Arkansas and southern Missouri, known in geological literature as the Boone chert area.

These ravines have been discussed by the writer under "Valleys of Solution in Northern Arkansas."[1] Wide observation since the time of writing the above article has confirmed the belief that the ravines have their origin from solution, but has modified the opinion therein expressed as to their method of development. Instead of beginning at the mouth and developing backward, the usual method was that of starting with sink-holes, well up on the hillside. The drainage from these sink-holes was along subterranean, tubular passages, to the bases of the hills. The gradual subsidence from solution, of the rocks above the subterranean drainage lines, resulted in the numerous striking ravines that form such a conspicuous topographic feature of the region mentioned.

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[1] *Journal of Geology*, Vol. IX., No. 1, January–February, 1901, pp. 47–50.

QUOTATIONS

THE FUTURE OF THE TROPICS

What the comparatively new science of bacteriology has accomplished for mankind could never have been foreseen a few years back, and even now we probably have a very inadequate idea of its possibilities. The recently expressed opinion of Colonel W. T. Gorgas, that within the next two or three centuries the tropical countries, which offer a much greater return for man's labor than do the temperate zones, will be settled by the white races, and that the centers of population and civilization be transferred to the equatorial regions, may not prove a strictly correct prophecy, but its possibility can not be denied, *a priori*, as once it would have been. The discovery of the malaria germ and of the transmission of it and of that of yellow fever by mosquitoes has abolished the principal drawbacks to the habitability of these regions by the white races to a very great extent, and opened for the use of civilized man large portions of the earth's surface that were formerly practically forbidden to him. The question, of course, still remains to be settled whether the white man can retain his physical stamina and energy through residence in the tropics for many generations, and whether the mere conquest of pathologic germs is all that is required. The productiveness of tropical regions is of itself a drawback. The average man works only from necessity, and what renders mere existence the easier does not necessarily tend to the higher development of the race. It was Sir Charles Dilke, we believe, who once called the banana the curse of the tropics, and held that where it abounded human progress and ambition disappeared. There is some truth in this, but it may not be an absolute truth. It is not likely, however, that the tropics will be the leading centers of civilization in the future. The temperate zones, where the struggle for existence brings out the higher abilities of man, will always dominate, and it is not improbable that the tropics will be the recourse of the pervasive yellow races rather than of the white. There is every prospect that with our almost certain conquest of the pathologic conditions that exist in those regions their utility to mankind will be vastly increased and that higher civilizations than now occupy those lands will be developed. We may not be able to look on the tropics as a permanent home for the best of the ruling white races, even two or three centuries hence, but there is hardly any question but that they will be much more habitable and useful than they have been in the past.—*Journal of the American Medical Association.*

CURRENT NOTES ON METEOROLOGY AND CLIMATOLOGY

ROYAL METEOROLOGICAL SOCIETY'S LECTURES

The Council of the Royal Meteorological Society in 1905 appointed a lecturer "to give information on meteorological subjects to