perature of about 87° F.[2] and the uniformity of flow regardless of seasonal variations in precipitation indicate that the water rises from considerable depth.

The spring waters contain large amounts of calcium bicarbonate and salt (sodium chloride) and considerable quantities of other constitutents. The figures in Table 1 are an average of two very similar analyses of waters from two of the springs.

TABLE 1

COMPOSITION OF WATER FROM PINKERTON HOT SPRINGS*

Constituent	Milligrams per liter (Approximately parts per million)
Silica (SiO_2)	37
Ferric oxide + alumina ($Fe_2O_3 + Al_2O_3$)	Tr. – 14.1
Calcium (Ca)	513
Magnesium (Mg)	37
Sodium (Na)	665
Potassium (K)	100
Bicarbonate radicle (HCO_3)	1,255
Sulphate radicle (SO_4)	636
Chloride radicle (Cl)	945
Total dissolved solids	3,805
Excess carbon dioxide (CO_2)	453

* H. A. Curtis, in R. D. George, *op. cit.*, pp. 291–292.

The water from one of the springs is led through an iron pipe into a large concrete-lined swimming pool. Calcareous tufa, stained yellowish brown with iron oxide, is deposited rapidly and by the end of the summer tourist season, which lasts from June through September, the walls and floor of the pool are coated with 6 inches or more of the material. The pool is scraped clean once a year.

"Oolites" were found forming along the sloping floor of the pool in the early summer of 1935. They were most abundant where the water was less than 6 inches deep. They ranged from a fraction of a millimeter to about 2 millimeters in diameter and consists of film or skins of calcium carbonate that enclosed bubbles of gas, almost certainly carbon dioxide. The precipitate was very thin or absent on the tops of the mineral "balloons," but thick below. Many of the growths assumed the shape of tiny wine glasses, with slender stems 2 to 3 millimeters in height supporting the gas bubbles which were wholly or partly enclosed by calcareous material. The balloon-like bodies that were not attached to stems were easily detached from the floor of the pool, when they rose to the surface and almost invariably burst. The slight but almost constant agitation of the shallow water thus tended to prevent the formation of thick-walled or solid oolites.

Late in the summer, after the pool was drained, it was found that the "oolites" also formed in running water. At that time the spring water was allowed to run across the floor of the pool to a lower outlet. "Oolites" formed about gas bubbles in shallow pools and eddies along the sides of the stream, where agitation was at a minimum. The constant movement caused most of the structures to break soon after formation, however.

The gas bubbles were undoubtedly formed because of cooling and slight evaporation of the water which reduced the solubility of the carbon dioxide gas in the water. The bursting of the shells when they reached the surface may have been due to the sudden agitation, to the slight change in pressure, or to rapid partial drying on exposure to the air. No explanation is offered as to the mechanism that caused the formation of pedestals or the fact that most of the shells were thinner on top than on the bottom.

The occurrence has some bearing on the origin of oolites. Calcareous oolites are reported to form about gas bubble nuclei off the Florida coast.[3] The thin spherical coatings of calcium carbonate at Pinkerton also form about gas bubbles. It seems possible that under certain conditions these coatings could persist long enough to develop thick walls and thus become true oolites. The occurrence shows conclusively that some spherical bodies form without mechanical agitation, a conclusion at variance with that reached by some of the geologists who have studied oolites. At Pinkerton the "oolites" form both in quiet and in slowly moving water.

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U. S. GEOLOGICAL SURVEY

[2] R. D. George, *Colo. Geol. Survey Bull.*, 11: 291–292, 1920.

[3] T. W. Vaughan. Florida studies, Carnegie Inst. of Wash., Year Book 11, 157–158, 1913.

THE RELATION OF MAXIMUM CRUSHING STRENGTH OF WOOD TO THE DEGREE OF SWELLING INDUCED BY VARIOUS CHEMICALS[1]

THE object of these experiments was to determine the effect of a number of chemicals upon the strength of wood and the relationship of the latter with the swelling caused by the chemicals. Sets of small blocks of Norway pine sapwood (*Pinus resinosa*) were oven dried, measured and placed in various organic liquids, mostly alcohols. Other sets of blocks were not oven dried, but the moisture content was raised above the fiber saturation point; the blocks were measured and then injected with various aqueous solutions. After the proper time the following results were obtained:

An inverse correlation of crushing strength with swelling was found for wood which was saturated by various organic liquids. The organic liquids did not weaken the wood to the same extent that water did for any given amount of swelling from the oven-dry condition. The intensity of swelling declined as the alcohol molecules became more nearly hydrocarbon in

[1] The experimental work was done at the Division of Forestry, University of Minnesota. The project was completed at the Division of Forestry, West Virginia University.

constitution. More than 120 days were required for the swelling of wood to reach equilibrium in n-butyl alcohol.

Increased swelling beyond water-swollen dimensions by concentrated aqueous solutions did not necessarily cause decreased crushing strength. The chloride salts increased strength and swelling, although not in proportion to concentration or swelling. Thiocyanate and iodide salts, on the other hand, caused decided swelling but decreased strength, as did also resorcinol, pyrogallol and urea solutions. Chloral hydrate increased the crushing strength by about 40 per cent., yet caused the greatest swelling. Some radial contraction occurred in several aqueous solutions.

The experiments indicated that decreasing crushing strength of wood by organic liquids was associated with increased swelling. The strength of wood in concentrated aqueous solutions apparently was not governed by this standard. In both cases, specific effects of the chemicals on the wood were important. A detailed report will appear in another journal.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A SIMPLE METHOD FOR FILING MINIATURE NEGATIVES AND MICROFILM RECORDS IN STRIPS

THE increasing use in scientific work of miniature cameras and of microfilm records makes the problem of film storage of considerable importance. I venture, therefore, to describe a simple and inexpensive method for filing films of the smaller sizes.

Film negatives of 35-millimeter size are in my experience more easily handled in the enlarger if they are cut into strips than if they are kept in the long rolls. In particular there is less likelihood of the negatives in the strips acquiring finger marks and scratches.

Records copied on microfilm may also be kept conveniently in strips. It is much simpler to remove the desired strip from its storage pocket than it is to unwind a long roll of film and then to find on it the particular frame needed for consultation. On microfilm copies of scientific papers or books kept in strips any particular page is easily found. Some types of readers for microfilm handle the strips equally as well as the rolls, but it is possible that not all types of readers will handle the strips.

For filing strips of miniature film, stationers' envelopes, size No. 10, are very satisfactory. These envelopes measure $4\frac{1}{8}$ by $9\frac{1}{2}$ in size and are therefore long enough to take film strips made up of 6 double-frame negatives of 35-millimeter size. Each envelope is divided inside into a number of compartments by paper partitions. A sheet of paper $3\frac{7}{8}$ by $9\frac{3}{8}$ inches is just right to make a single partition. By the use of these dividing sheets all the film strips cut from one roll of 35-millimeter film may be stored in a single envelope. The usual roll of 36 exposures will require 5 partitions.

Papers or books copied on microfilm are usually arranged so that 2 pages go on a double-frame negative. A film strip of 6 double frames will therefore contain 12 printed pages. A book of 96 printed pages will, accordingly, go on 8 of these strips, which will not unduly crowd a single envelope. Most scientific articles are much shorter than this. Microfilm copies of books over 100 pages long will require 2 or more envelopes.

In the envelopes provided with paper partitions each film strip is kept in a separate paper compartment with no danger of rubbing against any other strip. When a film strip is to be removed from the envelope it is picked up by its uppermost edge. The unused margin of the film is of course wide, for it contains the perforations. If the strip is handled carefully no finger prints need ever be made on a negative.

The envelopes described can be obtained at a small cost from any stationer. If a standard size of envelope and standard grade of paper are chosen there should be no difficulty in future purchases in duplicating either the size of the envelope or the quality of paper. The paper for the envelopes and for the inside partitions should be of good quality linen. A poor quality of paper is likely to deteriorate rapidly and it may contain injurious chemicals. In damp climates the gum on the flap may inadvertently seal the envelope. To avoid this the gum can if desired be removed with a damp cloth.

The best time to cut the film into strips is as soon after development as it is dry. If the film has been kept rolled for some time it will have strong tendency to curl. However, if the film strips are placed in an envelope and then the envelope placed under a book or other weight for a few days the tendency of the film to curl will gradually be lost.

In cutting the roll of film into strips one should if possible divide it into lengths of 5 or 6 exposures each. Strips containing 4 exposures are also satisfactory, but I find that strips containing only 3 exposures are less easily handled in the enlarger or microfilm reader than are the longer strips. The inclusive frame numbers or page numbers for each strip should be marked in pencil on the upper edge of the paper partition behind the strip.

On the front of each envelope may be written data