About fifteen miles below the Little Colorado the first bad rapid occurs in what I wanted to name Coronado Canyon. Major Powell told me it should bear my name if he got through and ever had the opportunity to place it on the Government map. Well, he got through all right, but forgot his vows and named it Grand Canyon.

There is no doubt whatever that the Grand Canyon was named by Major Powell not long after he came out of it on his 1869 trip.

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THE REACTION OF INDIVIDUAL BACTERIA TO IRRADIATION WITH ULTRA-VIOLET LIGHT

STUDENTS of the effect of ultra-violet light on bacteria have commonly accepted absence of multiplication, tested by clouding of broth or by colony formation, as the criterion of bactericidal action. This is a convenient but arbitrary endpoint, for "death" is not necessarily coincident with failure to multiply.

Observations on single organisms (*B. coli communis*) in the first hours after irradiation with measured monochromatic light, λ 2377 to 3022, show that there is a wide reaction zone between the behavior of cells which are not visibly affected and those which seem to be killed outright by the exposure. Single organisms which apparently have been unaffected grow and divide regularly on the surface of nutrient agar, producing typical colonies of normal-looking bacteria that ultimately coalesce into a confluent growth. Organisms which are exposed to quickly lethal doses show no increase in size and no cell division, but soon lose their high refractility, become beaded or irregularly refractile and degenerate into ghosts or shadows which are undoubtedly dead. In the intermediate zone between these two extremes the irradiated organisms present a remarkable picture. They increase in size, especially in length, without apparent inhibition, but do not divide when the normal adult stage is reached; so that long filaments of clear, highly refractile protoplasm are formed that look like spaghetti and may attain measured lengths of 50 to 150 microns. The transverse diameter is 1 to 3 times that of normal bacteria. These long forms are actively motile in a fluid medium, progressing with a sinuous motion, or drilling back and forth like spirochaetes. In 2 to 4 hours at 37.5° C the cells reach a limit of individual growth, forming long rafts of parallel filaments on an agar surface. Then cell division or degenerative changes begin. (1) The long cells may undergo a gradual degeneration, with loss of hyaline refractility, beading and ghost formation. (2) They may divide by cross fission into a number of large or small units, which then degenerate without further growth. (3) One or more normal-looking daughter cells may pinch off at one end and multiply rapidly to colony formation. The rest of the filament follows courses 1 or 2 above. Daughter cells have not been observed to form filaments; the reaction is limited to cells directly exposed to ultra-violet light.

Here is an apparent separation of two coordinate functions commonly essential to life. Cell division is regulated by a mechanism which is much more sensitive to wave-lengths below 3,000 than is the concomitant function of growth. By appropriate exposures the one can be temporarily or permanently suppressed, while the other proceeds for hours without hindrance. Ultimately, however, a limit is reached, and unless the division mechanism is restored the cell degenerates. A further study of this cell reaction is in progress.

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LACTOBACILLI IN FROZEN PACK PEAS

MICROBIOLOGICAL analyses of frozen pack peas held in storage from 1 to 26 months show that lactic acid bacteria tolerate well cold storage temperatures. The peas under consideration, representing several batches, were packed in a variety of ways—blanched and unblanched, dry and in brine, in 1 pound paper containers, and in No. 2 tin cans both vacuumized and unvacuumized. The storage temperature in most cases was 15° F., though some containers of the current year's pack were held at minus 5° F.

Some 40 samples from the different packs have been studied from the spoilage view-point alone, the containers being held at ordinary room temperature for 2 to 7 days, at the end of which time the contents were analyzed bacteriologically. Without exception the peas presented a bleached appearance and had a sour odor. Those in tin had developed more or less pressure in the container. The clouded liquors gave positive ferric chloride tests for lactic acid. Acidities of 1.0 to 1.3 per cent., calculated as lactic acid, were found, and the pH values ranged between 4.2 and 4.6. Direct microscopic examination invariably showed gram-positive rods, and medium-sized gram-negative rods were often present, but in smaller numbers. Appropriate cultural technique yielded the *Aerobacter aerogenes* ("colon") type and lactobacilli.

Study of 15 cultures of the lactobacilli isolated places the majority with the *Lactobacillus cucumeris* type, since they ferment arabinose and trehalose in addition to sucrose, dextrose and maltose. Inoculation of pure cultures of these into sterile peas yielded products entirely similar to the fermented frozen pack peas as regarded appearance, sauerkraut-like odor and acidity.

Organisms of this type are widely distributed and occur commonly on vegetables, and their presence on shelled peas is to be expected. Since they are not spore formers, it is noteworthy that they withstand a temperature of 15° F. for over 2 years. While no peas stored at minus 5° F. for more than a month have to date been analyzed, the lactobacilli in all probability would persist at this temperature, for experience has shown that micro-organisms generally tolerate zero Fahrenheit as well as or better than higher freezing temperatures.

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VITAMIN A IN THE PIMIENTO PEPPER

THE pimiento pepper is utilized in the culinary art chiefly as a condiment. This rather limited use in the diet may perhaps be an explanation for the relative paucity of research concerning its food value.

MacLeod and Booher[1] report that the vitamin C content of the canned product is equivalent to that of fresh grapefruit, and analyses have determined its chemical composition.[2] Capsanthin, or an allied pigment so masks any other color present in the pepper that it seems expedient at this time to call attention to its high carotene content.

In the biological study the Sherman technique was followed. Rats varying from 40 to 50 grams at weaning were put upon his vitamin A-free diet until symptoms of depletion were manifest, *i.e.*, signs of ophthalmia and stationary or slightly declining weight. Fresh, commercially canned and dried pepper were each then fed upon three different levels with an average of eighteen animals in the several groups.

This preliminary investigation has shown that, computed upon the dry basis, four milligrams of pepper induced a growth response above that of the Sherman unit. Further, a chemical assay has indicated from 200 to 300 mg of carotene per kilogram of the dried material. Work is in progress to establish the unit level for the pimiento pepper and to ascertain its carotene value.

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EARTHQUAKES IN THE HOLY LAND: A CORRECTION

IN an article on earthquakes in the Holy Land[1] there is given a list of 207 shocks, of which there is record, between the years 1606 B. C. and 1927 A. D. Among these are 27 dates from an Arabian authority, As-Soyuti, whose work appears in translation in the *Journal of the Asiatic Society of Bengal.* In transcribing these dates I failed to observe that they were stated as A. H., *i.e., Anno Hejira,* instead of *Anno Domini.* They are, therefore, as quoted in my list something over six centuries too early. The corrected dates are as follows:

A.H.	A.D.	A.H.	A.D.	A.H.	A.D.
94	712	434	1042	552	1157
98	716	455	1063	565	1169
130	747	460	1067	575	1179
220	835	462	1069	578	1182
233	847	479	1086	597	1200
242	856	484	1091	600	1203
245	859	532	1137	702	1302
393	1002	538	1143	791	1388
425	1033	551	1156	889	1484

Inasmuch as the Hejira dates from July, 622 A. D., and there are adjustments of the calendar dates for fractions, these figures may be off one year. It is also probable that the original dates are approximate. Hence where As-Soyuti differs by a year from others given in the list as published, one shock only is presumably meant.

In this connection I would call attention to a very ancient, yet definite observation regarding the now well-known earthquake fault that traverses the eastern slope of the Mount of Olives:

> And His feet shall stand upon the Mount of Olives which in that day is before Jerusalem on the east; and the Mount of Olives shall be cleft in the midst thereof toward the east and toward the west, and there shall be a very great valley; and half of the mountain shall remove toward the north and half of it toward the south.[2]

Activity on this fault was the occasion of destructive tremors in 1927. That it was the scene of more obvious displacement some 2,500 years earlier we can not doubt in view of the graphic description of the Old Testament writer, although his identity and the exact date of his prophecy are matters of uncertainty, especially with reference to this particular passage.

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A RARE PUBLICATION

THE library of the Academy of Natural Sciences of Philadelphia recently acquired from a dealer in second-hand books a copy of Volume 1, 1892–94 (1895) of the Transactions of the Natural History Society of Queensland. The fact that this is not listed in the Union List of Serials and that the natural

[1] Grace MacLeod and Lela Booher, "The Antiscorbutic Vitamin Content of Some Preserved Foods," *Jour. Home Econ.*, 22: 588. 1930.

[2] J. G. Woodroof and J. E. Bailey, "Pimiento Peppers," *Ga. Exp. Sta. Bull.*, 150. 1929.

[1] *Bull. Seismol. Soc. Amer.*, Vol 18, 1928.

[2] The Old Testament, Zechariah, 14, 4–6, 520 B. C.