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.