the determinant of the coefficients. It is a sum of six products, each of three of the coefficients, of which $a_1b_2c_3$ is one. Since by hypothesis each of the coefficients is given to six significant figures, the product is determined to six significant figures (and possibly one or two more when the product of the leftmost digits of a_1, b_2 and c_3 exceeds 9 or 99). Although each of the six products is determined to six significant figures, their sum may be determined only to a smaller number of significant figures. For example, suppose the six products are .346215, −.178243, −824171, .129572, .238847, .287416. The sum of these six numbers is −.000364, which is the value of the determinant so far as it can be determined. In this case, x, y and z are not determined by the equations beyond three significant figures.

Professor Berkson states that in certain cases he has found it necessary to retain many places in his calculations in order that his solution, as found, may have as many significant figures as his original equations. By whatever steps he may have carried out his calculations, in all such cases the determinant of his equations contained fewer significant figures than the given constants of his original equations. His results beyond the number of significant figures in the determinant of his original equations were wholly illusory, and much of his laborious calculation, which might easily have been ten times as costly as they would have been under an adequate theory, was wasted.

As has been stated, the solution of the foregoing equations, under the conditions assumed, is determinate only to three significant figures. But by such calculations as Professor Berkson has used, values of x, y and z to six places can be obtained. The extra three figures, however, have no real significance, for other solutions differing in the last three places and exactly satisfying the equations to six figures can also be obtained. All this was illustrated by numerical examples in the paper to which reference has been made.

For the sake of completeness it should be stated that the conditions which are being discussed in the case of simple linear equations occur also in the case of simultaneous equations of any degree or character. This more general problem was encountered, discussed and illustrated in a paper on the theory of the determination of orbits which I published in the *Astronomical Journal* in 1914. In that paper it was shown by numerical illustrations that the elements of the orbits of comets are sometimes given to hundreds of seconds of arc, when other values of the elements differing from them by minutes of arc also satisfy the observations exactly.

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HYDROGEN AND CARBON DIOXIDE PHOTO-ASSIMILATION IN PURPLE BACTERIA

THE uptake of hydrogen together with carbon dioxide under the influence of light by suspensions of purple bacteria (van Niel)[1] was discovered by Roelofsen[2] and further investigated by Gaffron.[3] In spite of the fact that the over-all reaction is slightly exothermic we find that the process is similar to green plant photosynthesis, the quantum yield of which was measured by Warburg and Negelein,[4] in that both processes take about four quanta of light for the reduction of one carbon dioxide molecule.

Measurements of gas pressure changes were made in a mixture of 5 per cent. CO_2 in H_2 over thin suspensions of *Streptococcus varians* in 0.05 M $KHCO_3$ in tap water, irradiated with known intensities of near infra-red light of wave-length 852 with 894 mu from an Osram caesium tube. Separate measurements with the same suspensions gave the fraction of the incident light absorbed by the active photosensitizing pigment, thus allowing the calculation of quantum yields from the measured intensities and pressure changes.

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LENGTH OF LIFE OF A RABBIT

ASSUMING that the length of life of a domestic rabbit might be of interest to biologists, I submit the following case, which I think might establish a record.

The first week in December, 1926, I took a month-old brown and white female rabbit from the Biology Building, University of Wisconsin, to my home. I put the rabbit in a room in the cellar which was dimly lighted by a small window. The rabbit's activity was limited to a floor space ten by twelve feet. The rabbit ate fresh vegetables of all kinds, toast, a handful of shelled peanuts each day and drank water freely. A bale of alfalfa, which was kept in the room to supplement the above feedings, was consumed each year.

Under these conditions the rabbit lived an active life until she died in February, 1936. Death was preceded by a two weeks period of inactivity due to a stiffening of the hind legs. The span of life was ten years and three months.

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[1] C. B. van Niel, *Cold Spring Harbor Symp.*, 3: 138, 1935.

[2] P. A. Roelofsen, Thesis, Utrecht. "On Photosynthesis of the Athiorhodaceae," 1935.

[3] Hans Gaffron, *Biochem. Z.*, 275: 301, 1935.

[4] Otto Warburg and Erwin Negelein, *Z. f. Phys. Chem.*, 106: 191, 1923.