paratively easy; and it is found that a good deal of the work can be utilised afterwards in the transition to the three-dimensional cases. Again, the investigation of a simple-harmonic source of disturbance is a natural preliminary to that of a source varying according to an arbitrary law.

Incidentally, new solutions are given of the well-known problems where a periodic force acts transversally to a line, or at a point, in an unlimited solid. These serve, to some extent, as tests of the analytical method, which presents some features of intricacy.

"Some Preliminary Observations on the Assimilation of Carbon Monoxide by Green Plants." By W. B. Bottomley, Professor of Botany, King's College, London, and Herbert Jackson, Assistant Professor of Chemistry, King's College, London. Communicated by Professor J. Reynolds Green, Sc.D., F.R.S. Received June 11,—Read June 18, 1903.

During an investigation by one of us some years ago on "Carbon Monoxide in some of its Physiological Effects," a few experiments were made on plants, and it was noticed that a hyacinth, which had commenced growth and was showing a few small leaves, continued to grow for some weeks when placed in a bell jar in which the air had been replaced by a mixture of 80 per cent. of carbon monoxide and 20 per cent. of oxygen. As this was contrary to the usually accepted ideas as to growth of green plants in carbon monoxide, a number of experiments were recently commenced with a view to determining how far carbon monoxide could replace carbon dioxide as a source of carbon supply for green plants. Although the hyacinth grew in carbon monoxide the experiment was not considered conclusive, because of the large stores of carbohydrates in the bulb. Young plants of *Tropæolum majus*, grown in sterilised sand and supplied with a nutritive solution free from all traces of carbonates, were therefore used. It was found that *Tropæolum* plants would not grow in air in which the carbon dioxide had been replaced by an equal quantity of carbon monoxide. When, however, the relative solubilities of the two oxides of carbon in water were taken into account, and the amount of carbon monoxide was increased proportionately—about twenty times as much carbon monoxide as carbon dioxide—the plants grew well, being healthy and normal. Experiments were also made with varying proportions of carbon monoxide in air free from all traces of carbon dioxide. The plants grew freely and well in proportions varying from 1 to 70 per cent. of carbon monoxide, when care was taken that as the higher percentages of carbon monoxide

were reached, oxygen was added so as to keep the amount of this gas approximately equal to that in normal air.

One very significant fact was noticed during the experiments. When in bright sunshine a negative pressure was always observed in the bell jars containing plants growing in carbon monoxide. This result tends to confirm Baeyer's theory of photosynthesis. In normal photosynthesis the volume of oxygen given off is equal to the volume of carbon dioxide undergoing decomposition. If, however, carbon monoxide be used directly by the plant, only half the amount of oxygen would be given off, hence the negative pressure.

Experiments were also made to find if starch was formed in plants growing in carbon monoxide. *Tropæolum* plants growing in water culture solution were placed in the dark for 48 hours, when the leaves were shown by the iodine test to be free from starch. Some of the plants were then placed in air free from carbon dioxide; others in carbon dioxide free air, but containing 10 per cent. of carbon monoxide. All were then exposed to sunlight for three days, and again examined for starch. The plants grown in carbon dioxide free air had formed no starch, whilst those grown in carbon monoxide gave the iodine test most markedly. Sections of the green stems showed quantities of starch grains in the ground tissue, especially crowded around the vascular bundles, in the plants grown in carbon monoxide, but none in those grown in carbon free air.

Experiments on the germination and growth of seeds in carbon monoxide also gave satisfactory results. Seeds of *Lepidium sativum* were planted in sterilised sand and placed in a mixture of 65 per cent. carbon monoxide and 35 per cent. oxygen. The seeds germinated and formed healthy plants, growing quite normally for three weeks. Certain preliminary determinations of the amount of carbon in the seeds and in the plants point to the accumulation of organic carbon, and as the only possible source for this increase of carbon is the carbon monoxide, some of it must have been assimilated. These results are so important and the results so striking that it has been thought advisable to repeat the determinations with new and specially devised apparatus before quoting figures. Also it is intended to carry out further experiments with carbon monoxide, and with compounds in which the CO-group exists in combination.

In all these experiments with carbon monoxide, great care was taken that efficient absorbers of carbon dioxide were used, and the pressure in the bell jars was regulated by potash-sealed valves.

The present communication is only a note to indicate the general bearings of the research, and does not give any account of many experiments and observations of interest which the authors hope to give later in a detailed paper.