adduced in support of the hypothesis. It is possible to calculate the intervals between the lines which would be produced by the vibrations of such a nucleus. Knowing the masses of the main core and the proton, and taking these from the observed values of Aston for the isotopes of mercury, the calculated intervals are shown to be in good agreement with the intervals between the satellites of mercury lines. The latter were carefully measured by the use of crossed Lummer-Gehrcke plates, and a discussion is introduced on the forms of the interference points so produced. It is concluded that the fine structure of mercury lines is due to the existence of several isotopes.

In the second paper the more general hypothesis is advanced that non-series lines in spectra are produced in an essentially different manner from the series lines. The latter are adequately accounted for by the movements of satellite electrons, according to Bohr's model, but the non-series lines are assumed to arise from the vibrations of pairs of atoms coupled in the manner described above for the mercury nucleus and its associated proton. When an element has two or more isotopes, two kinds of coupling are possible— symmetric and asymmetric—corresponding to pairs of atoms having the same and different masses respectively. A formula is given for calculating the wave-length intervals between lines arising from the coupled atoms, and these are shown to be in good agreement with intervals found in the spectra of elements the isotopes of which are known.

The lines having these intervals are accordingly looked upon as products of atomic vibrations and not of passages of an electron from orbit to orbit. Most of the lines so explained are spark lines. They are remarkably numerous in the spectra of the monatomic gases ; thus, more than 90 per cent. of the 856 neon lines given by Paschen are assigned to atomic vibrations, and in argon a still greater proportion. An explanation of this is given. It is concluded that atomic vibrations give rise to spectra having constant frequency differences, and the suggestion is made that unknown isotopes may be detected from spectroscopic data.

Problems of Unemployment Insurance.

AT the recent Toronto meeting of the British Association, a paper by Prof. John R. Commons, of the University of Wisconsin, on " The Limits of Unemployment Insurance," was read to the Section of Economic Science and Statistics. In view of recent discussion in Great Britain of the relative merits and demerits of insurance by industry, insurance by firms, and the present State system, a short account of this paper may be of interest.

Prof. Commons is a well-known advocate of unemployment insurance in the United States. Conditions in the States are, of course, very different from those prevailing in Britain, and in particular there is a strong prejudice against a State insurance scheme. Prof. Commons in his paper emphasised the point that the principle of overhead charges (*i.e.* those manufacturing costs that go on whatever the number of units produced) applies to labour just as much as to capital, though this fact is not generally realised by industrial firms.

The modern manufacturer is faced with problems of business cycles, overhead costs, and organised labour that were unknown to his predecessors of the time when Adam Smith wrote, or perhaps more correctly it would be truer to say that nowadays these problems are greatly intensified. Business cycles are " a normal abnormality of the nineteenth and twentieth centuries."

The business cycle results in a lag both in time and amplitude in the daily wages received by labour, compared with the prices obtained for the product by the employers. Organised labour, however, tends to reduce this lag by boosting wages during the rise and holding them up during the slump. Consequently, such labour obtains a higher *daily* wage, while employed, on account of the business cycle than would otherwise be the case.

Two solutions of the problem are apparent, either (1) the curve of employment or (2) that of daily wages must be smoothed out. If attention be concentrated on the first solution rather than on the second, the community of interest rather than the antagonism of interest between capital and labour becomes clearer.

Statistics, however, point to a curious paradox, for large firms show greater fluctuations in their labour demands than the smaller. This is not what might have been expected, since the large firm has presumably a much larger item of overhead relative to the number of employees, which would at first sight seem to intensify the inducement to make greater efforts to stabilise production, thus reducing the overhead costs per unit of product. Apparently in practice the large firms take care of their capital overhead by means of high profits at the peak and large reserves for the trough of the business cycle, compelling their employees to take care of the labour overhead on a slumping market. If the employment cycle is to be smoothed out, the principle indicated from this analysis is that industry should take care of both kinds of overhead. The only way, however, to induce industry to take care of this labour overhead charge is " through the pocket book." ·

Prof. Commons arrives ultimately at three propositions :

(1) The larger establishments should each carry, so far as possible, its own risk by way of setting aside its own reserve, not merged with the reserves of other establishments in a common fund.

(2) Establishments having a small number of employees should be treated differently from those with a larger number. They might, for example, be organised in the form of a mutual insurance scheme.

(3) Employees should not ordinarily be required to contribute to the fund out of their wages.

" It will be seen," concludes Prof. Commons, " that only from the largest establishments and not from the smaller establishments, nor from the employees nor from the State, can any material progress be made towards prevention of unemployment."

University and Educational Intelligence.

BELFAST.—Applications are invited for two posts in the Queen's University, namely, the professorship in bio-chemistry and the lectureship in bacteriology. Terms of the appointments are obtainable from the secretary of the college.

BRISTOL.—Prof. Andrew Robertson, professor of mining and mechanical engineering in the Merchant Venturers Technical College, has been appointed principal of the College in succession to the late Dr. Wertheimer.

CAMBRIDGE.—T. R. B. Sanders, Trinity College, has been elected to a fellowship at Corpus Christi College. A. M. Binnie, Queens' College, has been awarded the John Winbolt Prize in engineering. The number of freshmen who have matriculated this term is 1498. The corresponding figure in 1913 was 1110.