

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.

LEEDS.—The council of the University has appointed Dr. F. S. Fowweather to the lectureship in chemical pathology recently instituted. Dr. Fowweather graduated with First-Class Honours in Chemistry (1st Division) at the University of Liverpool in 1914. Later he took up the study of medicine and graduated M.B., Ch.B., at Liverpool in 1922, afterwards obtaining the Diploma in Public Health (D.P.H.).

OXFORD.—Applications are invited by the Imperial Forestry Institute for a lectureship in tropical forest botany. Candidates must possess a thorough knowledge of tropical systematic and economic botany and ecology with special reference to forest vegetation. The latest date for the receipt of applications, which should be sent to the secretary of the institute, is February 15.

THE University of Manitoba is requiring a lecturer in zoology, to enter upon his duties at the beginning of next year. Applications for the post, together with particulars of candidates' published work, should be received not later than December 6 by the Secretary to the Board of Governors, University of Manitoba, Winnipeg, Canada.

APPLICATIONS are invited by the Denbighshire Education Authority for the principalship of the Acton Hall Technical Institute. Applicants must hold an honours degree in science, and a knowledge of mining is desirable. Applications, ten in number from each candidate, must be received by November 24 at the latest by the Secretary and Director of Education, Education Offices, Ruthin.

At the annual convocation of the University of Bombay on August 19 the Chancellor, Sir Leslie Wilson, Governor of Bombay, delivered an address on "Democracy," in the course of which, enlarging on the dignity of labour, he observed that there is no reason why a graduate should not drive a plough or a motor-car. India's crying need to-day, he said, is not for Colleges of Arts but for scientific work and vocational training.

At the time of writing, the following have been elected Parliamentary representatives of the universities of Great Britain and Northern Ireland:—CAMBRIDGE—Mr. J. F. P. Rawlinson (U.), Sir Geoffrey Butler (U.). COMBINED ENGLISH (Birmingham, Bristol, Durham, Leeds, Liverpool, Manchester, and Sheffield)—Sir Martin Conway (U.), Mr. H. A. L. Fisher (L.). LONDON—Dr. E. G. G. Little (Ind.). WALES—Mr. E. Evans (L.). QUEEN'S, BELFAST—Col. T. Sinclair (U.).

WE have mentioned in these columns the guide books and other pamphlets issued this year by the London County Council's Education Committee with the object of popularising the evening classes and other provision for adult education for Londoners. In this connexion it is interesting to note the causes to which the Buffalo Department of Education attributes the popularity of its adult education classes, which were in 1923 attended by one out of every fifteen persons in Buffalo over 16 years of age. These are as follows: Advertisement in newspapers, coloured posters, leaflets taken home by school-children, announcements in motion picture theatres; personal invitations addressed to previous year's students; advisory committees elected by students to keep in constant touch with teachers in regard to subject-matter of courses, units of study and location and hour of classes; and special training for this work of teachers selected on account of their person-

ality and their close acquaintance with the practical side of their subjects.

THE twenty-fifth annual general meeting of the Science Masters' Association is to be held under the presidency of Sir Berkeley Moynihan at the University of Leeds on January 5-7 and will consist largely of lectures and demonstrations by members of the University staff. According to the provisional programme which has been issued, there will be a reception by the Pro- and Vice-Chancellors of the University and Sir Berkeley Moynihan on the evening of January 5, after which the latter will deliver his presidential address. The second day of the meeting will be devoted to lectures and demonstrations, while on the last day there will be a joint discussion with the representatives of the University on the connexion between science teaching in schools and universities, followed by visits to works in the neighbourhood. An exhibition of books and apparatus will be open throughout the meeting. The railway companies are issuing return tickets for the meeting at the rate of a single fare and a third. The honorary secretaries of the Association are Mr. C. E. Sladden, Eton College, and Mr. W. J. Gale, Sloane School, Chelsea.

THE Universities Bureau of the British Empire, which among its many activities has already placed all interested in university education deeply in its debt by the annual production of the Yearbook of the Universities of the Empire, has increased the debt by a pamphlet giving the professional schools and post-graduation courses available in the universities and university colleges of Great Britain and Ireland. The universities are taken in order and under each are given particulars of correlated courses of study such as are generally referred to as "schools" and of specialist studies available at that institution. This is followed by a list of the various "schools"; under each entry is given the centres at which that particular subject can be studied. Finally, there is a list of subjects with the names of centres with which each is particularly associated, so that it is possible from the list to see at a glance where a subject receives special attention. The pamphlet is valuable for reference purposes and should also be extremely useful to colonial and foreign students desirous of pursuing their studies in Great Britain or Ireland. It can be obtained from the Bureau at 50 Russell Square, London, W.C.1.

FROM the Hokkaido Imperial University we have received a pamphlet consisting of replies to a *questionnaire* distributed last year by the League of Nations Committee on Intellectual Co-operation. It covers almost every phase of the university's history, its present condition and plans for the future. The schools of agriculture, forestry, fishery, and civil engineering have since 1918 been frequented increasingly by Chinese students, and some Americans have been attracted by the Fishery School and the entomological collections. In all these schools English has a conspicuous place in the curricula, but all lectures excepting those delivered by foreign teachers of foreign languages (English and German) are now delivered in Japanese. The university farms cover 1500 acres and the university forests more than 300,000. A considerable amount of university extension work is carried on in the form of lectures in scientific subjects for teachers and popular science lectures. The chief publication of the university is the *Journal of the College of Agriculture*, of which 160 exchange copies are distributed to universities and other institutions in foreign countries, including 65 in the United States, 14 in Great Britain and Ireland, 11 in Germany, and 10 in Australia.