no cryptogamic flora in culture. The above results show that when green, hard figs are entered by thrips they become inoculated with organisms capable of producing various decays and fermentations in the ripening fruit. Though the 1928 season was especially favorable for thrips the comparatively high percentage of green, hard figs found infested would indicate that infection from this source alone is sufficiently great to cause the growers considerable loss. It is also possible that the early start of decay and fermentation in thrips-infested figs, giving rise to odors very attractive to *C. hemipterus* and *D. ampelophila,* is partly responsible for the appearance of these insects in the orchards at the time when figs begin to mature. This and other phases of fig diseases are being further studied by the author.

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GALBA BULIMOIDES LEA AN INTERMEDIATE HOST OF FASCIOLA HEPATICA IN OREGON

IN studies of the liver-fluke problem in Oregon a survey of the *Lymnaeidae* of the state was made. Of the five species[1] collected *Galba bulimoides* Lea was the only one which was found in every fluke-infested pasture which was examined.

Five different cercariae were observed in this species. One of these, an unarmed type, was obtained repeatedly from specimens of *G. bulimoides* collected in a fluke-infested pasture. Studies of this cercaria revealed that it agreed both morphologically and physiologically with the descriptions and photographs of the cercaria of *Fasciola hepatica.* Daughter rediae were not found. Mother rediae, obtained by crushing snails, agreed with the descriptions of redia of liver flukes. Furthermore, these rediae and cercariae were apparently identical with rediae and cercariae obtained from live specimens of *Fasciola hepatica* infested *Lymnea truncatula* Müller received from Dr. R. F. Montgomerie, of University College of North Wales, Bangor, Wales.

It was proved that these were forms of *Fasciola hepatica* by feeding encysted cercariae to guinea pigs and recovering typical liver flukes from their livers upon autopsy.

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[1] Identifications of mollusks were by Drs. H. A. Pilsbry, Paul Bartsch, W. B. Marshall, G. Dallas Hanna, A. W. Hanham and J. R. C. B. Tomlin.

THE RADIOACTIVITY OF LIGHT ELEMENTS

THE statements made in the past and repeated recently (*Lind-Chemical Reviews,* 5 (1928): 366) that no element of atomic weight less than 210 has been found to exhibit radioactivity except potassium and rubidium suggest that these exceptions may eventually be ruled out. The unknown element number 87 coming just before radium in the periodic system would probably be radioactive. This element being a member of the alkali metal family should occur with rubidium or potassium. The suggestion then may perhaps be made that whatever radioactivity is shown by specimens of potassium or rubidium is due to the presence of traces of the heavy element number 87, and that the discovery of this element should come about through the examination of radioactive rubidium or potassium.

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RAMAN SCATTERING FROM HCl LIQUID

WE have observed the Raman effect with pure hydrogen chloride liquid, at $-100°$ C., using a mercury arc and Hilger E62 spectrograph. A scattered line whose center is at 4560 A. U. persists with the incident light filtered so as to give only the 4047 line strongly, indicating an absorption band at 3.60 μ for HCl liquid. The modified line is several times broader than the unmodified line, and is more diffuse at its long than at its short-wave edge. Modified scattering of the 3.6 μ band of HCl gas was reported recently by R. W. Wood (*Nature,* February 2, 1929).

Our resolving power was insufficient for the separation of lines as close together as the rotational lines of HCl gas, but the work is being continued with better resolution. The infra-red spectrum of HCl liquid is also being measured.

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MARCH 22, 1929

PROFESSOR HUNTINGTON'S METHOD IN CONTROVERSY

IN his latest contribution to the discussion on apportionment (SCIENCE, March 8, page 272), Professor Huntington brands as false my statement "that a certain series quotients 'would sum up to 435.'"

I wrote "the whole series would sum to 435," which is true but possibly ambiguous. By inserting the

words "of quotients" Professor Huntington has given my meaning a twist which I never intended. The whole series "of representatives" would sum to 435.

To test how much ground there is in the passage for the misinterpretation I handed copies of my letter to a class of 30 undergraduates, said that there was an ambiguity in one sentence which I identified, and left them to decide what it was, and how they would interpret it. Three fourths of the class thought the meaning was "series of representatives," one fourth thought it was "series of quotients." None of them knew about the interpretation Professor Huntington had put on my words, or why I had asked them the question.

It is hard to understand how a scholar of the position of Professor Huntington could have given my words the meaning he did, and have failed to see that they would bear another meaning which would make them true. It is the harder because after his study of apportionment he must know that in the tables submitted to Congress it has been the practice to print the two series in adjoining columns and to give the sum of the representatives but not of the quotients.

Hitherto I have not answered Professor Huntington's personal attacks but this case is so clear and typical that I have made an exception. *Ab uno disce omnes.*

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QUOTATIONS

INDUSTRIES AND RESEARCH

THERE is one striking and rather disturbing feature of the position in this country with regard to cooperative industrial research. It is specially mentioned in the recently issued report of the Department of Scientific and Industrial Research, and it has been painfully obvious ever since the government scheme for assisting cooperative industrial research came into existence nearly ten years ago. This is the great difficulty of obtaining from the various industries which have set up industrial research associations, with the aid of the government grant, sufficient funds in some cases to earn the government grant and in others even to keep the research association going at all.

The department has hitherto taken a very lenient view of this reluctance on the part of industries to provide funds, but with the approaching completion of ten years of government assistance it is felt that research associations should be self-supporting. Some outspoken comments are made on this matter in the report.

When the scheme was first started cooperative industrial research was an experiment in this country, the result of which no one could accurately foresee, and in the circumstances it was felt that it was justifiable for the state to bear half the cost for a period of five years. When that period came to an end it was agreed that a continuance of state aid was desirable for a further period of five years in view of the special difficulties of British industry. This second period having almost expired, the request has been made to the Department of Scientific and Industrial Research that the state should continue to bear half the cost where industrial research associations have been formed. That proposal has been rejected definitely by the department on the ground that the value of cooperative industrial research has been established, and therefore the industrial research associations, having had ten years' state assistance, should be self-supporting. It is proposed that when the existing contracts come to an end each association shall be considered on its merits and a subscription income fixed which it will be necessary for the association to obtain from other sources before it is eligible for any grant from the department. Only as regards funds obtained in excess of this fixed amount will the department be prepared to make a grant. In other words, this is a clear hint to the industries of the country that they must adequately finance their own research associations, and on general principles it is a sound policy at the present stage of development.

Those who have come in close contact with this work can not but feel sympathy for the manner in which the councils and technical directors of the industrial research associations are always begging the members of their respective industries for additional financial support. At least one such association has gone out of existence because the industry has been unable to raise the necessary funds to earn even the generous grant from the state under the original scheme. The plight of some of the others is such as to cause astonishment. There are at present nineteen such industrial research associations, and it is hard to find a cause why sufficient financial support to enable them to be self-supporting after having had a run of nearly ten years is not forthcoming. Investigation work is having to be curtailed or carried out on a much smaller scale than is desirable for the obtaining of the best results. These associations carry out work of a fundamental character which is inevitably of outstanding financial value to the industries, and in seeking to ascertain the reason for the comparative poverty of our industrial research associations, the reflection is inevitable that all our leading industrial organizations have their own research departments in which a good deal of fundamental, as well as immediately practically valuable, research is being carried out. Whether that is the cause can not be stated definitely; indeed,