into the yolk without taking in any albumen. If some albumen gets into the pipette it does not do much harm except that it increases the bulk of material which is apparently not eaten and later has to be removed. The pipetteful of yolk is taken and then by a pressure it is placed at the bottom of a dish where the planarians are kept. The yolk usually gets out from a pipette in the form of a ribbon which pressed out sinks down to the bottom or may be attached to the sides of the dish if desired. Planarians if hungry respond to the food at once. They gather from all directions, eagerly eat the yolk, and in fifteen or twenty minutes most of them become yellow on account of the ingested food. If just a sufficient amount of yolk is given, practically all of it is eaten up and there are no remains left after the feeding. If more than necessary has been placed in the dish, the excess should be removed before any putrefaction sets in. It may remain for a day or so without any harm, but this depends upon the sensitivity of the animals toward the decaying food materials. With the Philippine planarians the yolk may be kept for a couple of days without any bad effect.

Using this method of feeding and changing water once a week (or even once in two weeks in more neglected cultures) I kept my stock of planarians for over a year in a very good condition. In these cultures, especially in the ones which had a few stones at the bottom of a dish, the animals not only lived well but some of them became sexually mature and even laid the eggs.

Entomostracans, such as Ostrocoda, Annelids, especially Aeolosoma, and rhabdocoeles also thrive well when fed on egg yolk.

The yolk is not only good as a regular food, but it is also very suitable for feeding these animals for use in the study of problems of digestion. The yolk can be easily beaten with non-irritant coloring matter such as carmine and then fed to the animals. With carmine beaten with the yolk I was able to obtain preparations of planarians showing the digestive system well.

In the sea water the yolk can not be used for this purpose. Here it goes in solution, and it soon makes the water foul without doing any good to the animals.

P. B. SIVICKIS

DEPARTMENT OF ZOOLOGY,
UNIVERSITY OF THE PHILIPPINES

SPECIAL ARTICLES

SERIES RELATIONS IN THE FIRST LONG PERIOD

IN *Nature*, July 24, 1926, I reported the discovery that certain pairs of lines appearing in the high-potential spark spectra of these elements seem to be the first P doublets. These are shown in Table I, which is quoted here for reference.

Further series relations for these elements are now given in Tables II and III. The wavelengths of already known lines are quoted from Fowler's Report, with the exception of the single line of Sc II, Table II, which is taken from Ireton's paper[1] and the Ca sextet, which comes from Russell and Saunders' paper.[2]

TABLE I

FIRST P DOUBLETS

Element	Wave length I. A. vac	I	Wave number	Separation
K I	7664.94	10 R	13042.82	57.71
	7699.01	10 R	12985.11	
Ca II	3933.66	10 R	25414.41	222.85
	3968.47	10 R	25191.56	
Sc III	2699.9	10	37038.4	474
	2734.9	9	36564.4	
Ti IV	2067.6	9	48363	821
	2103.4	8	47542	
V V	1680.4	5	59510	1462
	1722.7	3	58048	
Cr VI	1446.7	4	69123	2367
	1498.0	2	66756	

It will be noted that the intensity of the pairs of doublets decreases continually with increase in atomic number and that the shorter member of each pair has the greater intensity. Of course the intensity given for the first two pairs is quoted from the report and no direct comparison is intended between this and the intensity of the following pairs. It was found, however, that the Ca lines were very much more intense than those of Sc on the same plate.

The existence of these doublets from Sc onward, if this arrangement has a real physical significance, forces us to a conclusion which has already been reached on account of magnetic and chemical behavior, that when the electrons of the N levels are removed one or more of the extra electrons in the M levels moves out to the N levels more or less frequently. As we proceed toward heavier elements the likelihood of this happening seems clearly to decrease, as shown by the failing intensity of the doublets. Catalan[3] also found it necessary to assume some such transition to explain his multiplets.

There is very considerable doubt about the single

[1] Proc. Roy. Soc. of Can., Vol. XVIII, p. 103, 1924.
[2] *Astro. Phy. J.*, Vol. LXI, No. 1, Jan., 1925.
[3] Phil. Trans. A., Vol. 223, p. 166.

TABLE II

FIRST SINGLETS

Element	Wave length I. A. vac	I	Wave number
Ca I	4226.73	10 R	23652.4
Sc II	2273.8	5	43979
Ti III	1581.54	2	63229
V IV	1224.18	1	81687

line assigned to V IV. The accuracy of the irregular doublet law method is not great enough to distinguish among lines when several are present and the intensity is weak, for here the intensity falls regularly with increasing atomic number just as in the doublets.

Here again the intensity falls toward higher atomic numbers, as was clearly found for Sc and Ti, but the Ca group was not photographed in this work. The intensities are quoted from Russell and Saunders' paper.

TABLE III

SEXTETS

Element	Wave length I. A. vac	I	Wave number	Principal separation
	4318.65	45	23155	
	4307.74	45	23214	105
Ca I	4302.53	60	23242	
	4298.99	30	23261	52
	4289.38	40	23314	
	4283.01	30	23348	
	2563.30	2	39001	
	2560.35	3	39048	
Sc II	2555.90	2	39115	230
	2552.46	3	39168	
	2545.24	2	39279	113
	2540.94	1	39345	
	1802.97	1	55494	
	1797.10	0	55645	
Ti III	1792.58	1	55785	470
	1787.35	2	55949	
	1781.98	1	56117	158
	1777.63	1	56255	

It must be remembered that most of the tests for series relation are lacking in the extreme ultra-violet. The Zeeman effect and temperature classification of most of these lines is impossible to apply as yet. Even the outstanding intensity of these principal lines, which has been used as a guide in other elements, fails one. We are, therefore, left with little but the doublet laws, the accuracy in the application of which is not great.

My appreciation of the assistance of Dr. E. P. Clark in the preparation of the Sc is here gratefully acknowledged. These results will be discussed in greater detail eleswhere.

R. J. LANG

UNIVERSITY OF ALBERTA,
CANADA

STUDY ON SUGAR CANE MOSAIC[1]

DURING our investigations on the subject of susceptibility of different cane varieties to mosaic disease, a problem confronted us at the outset requiring immediate solution—that of a reliable method of inoculation. The desideratum was a method that would render the work as simple, rigid and as rapid as the work in animal pathology is rendered by the use of rats or guinea-pigs. A prerequisite of the method was, in addition, that each single individual cane should furnish material for duplicate inoculations and the relative uninoculated control. After trying many other methods with various degrees of satisfaction, some also involving the use of insect vectors, the procedure summarized below, which unites all the above-mentioned points of value, was adopted with satisfactory results.

The procedure adopted consists in obtaining, from the field, mature canes, the leaves and history of which indicate that the plant is free of disease. After having divided each cane into as many pieces as there are internodes with uninjured bud, two of the resulting seed pieces (one from the terminal and another from the basal portion of the cane) are separated and planted immediately to serve as controls. A hole is bored, in the remaining pieces diagonally into the node, immediately above the leaf scar and as close as possible to the bud, without thereby impairing this tissue. For this work a 3 mm sterile cork borer is used, the small core thus resulting being kept to seal the wound at the site of inoculation. In the hole thus prepared a small piece of fresh apical bud tissue, obtained from an infected cane, is introduced and crushed by means of a sterile glass rod. The hole is closed by means of the cork-borer core and the wound, finally, hermetically sealed with a small cotton plug soaked in melted paraffin. Planting is done soon after inoculation.

The infected tissue for inoculation should be removed from a freshly exposed apical bud only a few seconds before use, the cut being renewed for every prelevation of a new inoculum, in order to avoid undue aeration.

The results reported are hereby presented with no other intention than to show that the infective agent of cane mosaic, introduced in the tissue of the node (parenchyma and vascular bundles) is transmitted to the tissue of the apical bud and there maintained

[1] Contribution from the Chaparra Agricultural Experiment Station.