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On the Ultra-Violet Spark-Spectra of Some of the Elements

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IX. *On the Ultra-Violet Spark-Spectra of some of the Elements.*

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(*Communicated by Prof.* J. C. McLennan, *F.R.S.*)

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[Plates 25 and 26.]

Contents.

In the following paper an account is given of an investigation on the extreme ultra-violet spectra of a number of the elements. In the preliminary part of the work the spectrograph described by Prof. McLennan* was employed, together with a Rowland grating of 100 cm. focal length, having 6273 lines per cm. and an area 5·4 cm. wide and 7·8 cm. high. The source employed was a water-cooled arc chamber in which the electrodes were tipped with the metals whose spectra were required. This apparatus proved to be unsuitable, for the reason that the spectrograph, as constituted, did not allow the source to be brought nearer the slit than about 1 foot. This resulted in very feeble illumination and consequently long exposures were required, which lasted in some cases for 10 hours. Such exposures were found to be necessary, not only because the source was too far removed, but also because the angular aperture through the slit included only a band across the centre of the grating about 2·5 cm. wide. Some of the modifications which were made in the spectrograph greatly improved its efficiency. A short description of these follows.

Fig. 1 shows a horizontal plan and fig. 2 a vertical elevation of the spectrograph and spark chamber, as at present constituted. The body of the spectrograph A, B, was

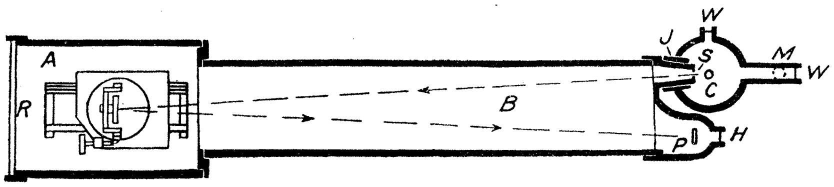

Fig. 1.

* McLennan, 'Roy. Soc. Proc.,' A, vol. 98, 1920.

 [Published December 12, 1924.

designed for a grating of 1-metre focal length and is about 130 cm. long over all. The enlarged portion A, which encloses the grating G and its mounting, is 22 cm. in diameter and 30 cm. long. The smaller portion B has a diameter of 15 cm. As shown in fig. 2

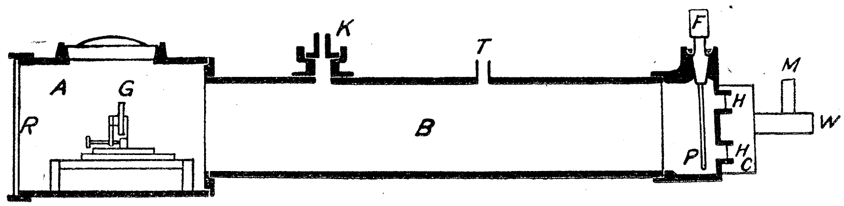

Fig. 2.

the opening above the grating is closed by a brass cap which fits into a tapered ground joint. The opening gives ready access to the grating for adjustment, and when the cap is placed in position, with the bearing surface slightly smeared with "Airtite" and the groove shown in the figure filled with the same, a perfect seal is obtained. The end of the spectrograph nearest the grating is closed by a plate-glass window R, 2 cm. in thickness, set into a cast brass ring, the joint being made air-tight by a hard wax. This window enables one to see that the source, slit and grating are properly aligned.

In the experiments the grating G, described above, was set with its rulings horizontal. The end of the spectrograph remote from the grating was also considerably altered, with the object of bringing the source close to the slit. The spark chamber C was made of a cylindrical brass tube, 12·5 cm. in diameter and 20 cm. high. Its ends were closed by two circular pieces of "bakelite," 2·5 cm. in thickness, set in below the edge and fixed with hard wax. Through the bakelite centre of each of the ends a tapered hole was bored, and tapered ground-brass plugs were made to fit these holes accurately. These plugs carried on their ends the electrodes, arranged in such a way that the width of spark gap could be adjusted by rotating them. These electrodes were tipped with the substance whose spectrum was required. Two windows, W, in the spark chamber allowed the spark gap to be seen from without and facilitated adjustment.

The spark chamber was attached to the spectrograph by a ground-metal joint J, which projected into the spark chamber to within 1·25 cm. from the spark gap and carried on its end the slit S. This made a special plate-holder necessary, which would allow the plate P to be carried forward to the same distance from the centre of the grating as the slit. This was accomplished by making a casting of a special form, shown clearly in the diagram. The plate-holder hung vertically from a ground-steel plug F, which closed the opening after the plate entered the spectrograph. The plug was smeared with "Airtite" and a groove was filled with the same, producing a perfectly satisfactory seal. As the plate-holder was a flat plate of brass it was possible to use each side of it to accommodate one plate, so that two exposures could be made without losing the vacuum. The plates were changed simply by rotating the steel plug through 180°. Two windows, H, in the wall just opposite each end of the plate-holder coincided with two holes through the plate-holder itself. These enabled the operator to see the central image of the grating at one end, and by the use of a fluorescent screen the standard lines 1854·7 A.U. and 1862·7 A.U., used for calibration, at the other. Adjustments were made so that these lines and the central image were sharply focussed.

The spectrograph was exhausted by means of two openings, one in the spark chamber at M and the other in the spectrograph proper at K. A by-pass was arranged at one side of the slit to allow gases to flow freely from the spark chamber to the spectrograph or *vice versa*. The vacuum was produced by two entirely separate sets of pumps. One set, used to exhaust the apparatus of the bulk of the air through the opening K, consisted of two oil-sealed Trimount pumps connected in series. A valve in the pipe connection close to the spectrograph served to close the opening at K when required. The second set of pumps was joined to the spark chamber at M, and consisted of a Kurth diffusion pump backed by a Cenco-Hyvac rotary oil pump. These latter pumps were only operated after the Trimount pumps, which were of large capacity, had exhausted the bulk of the air. When used in this way they quickly reduced the pressure to the point where no visible discharge could be obtained in a Geissler tube attached at T, with an induction coil run under 10 volts.

After these changes had been made it was found that the time of exposure necessary to produce a clearly defined spectrum of the carbon arc was about 15 minutes. To obtain the spectra of the different elements a large X-ray coil, capable of producing a 20-inch spark in air and employing a mercury interrupter, was connected on its primary side to the 110-volt direct-current mains, with a suitable resistance in series. The secondary circuit contained seven large Leyden jars in parallel with the spark gap *in vacuo*. A spark gap in air was placed in series with the one *in vacuo*.

In order that the gases evolved by the electrodes might be removed, the Kurth pump was kept in continual operation during an exposure, and the sparks were made to pass intermittently by means of a make-and-break device operated by a motor in the primary circuit. The frequency and duration of the spark was regulated by the degree of vacuum which the pumps could maintain, and worked out to be about one-tenth of the total time. The length of exposure required was found to be equivalent to about 35 minutes of continuous sparking, or on the average from 4 to 5 hours, intermittent exposure.

In these initial experiments the results obtained were far from satisfactory. This was due to the fact that the grating employed was an old one and badly tarnished, and also to the fact that it was not ruled according to the special method required for very short wave-lengths. The shortest wave-length recorded was about 900 A.U.

Due to the kindness of Prof. McLennan, however, a new grating and new Schumann plates were obtained from the Adam Hilger Co., and with these rapid progress was made. This grating was much smaller in area than the old one, being only 3·5 cm. wide and 5 cm. high, had a focal length of 100 cm. and was ruled with about 14,000 lines per inch.

The time of exposure needed turned out to be about half-an-hour intermittent sparking, which was equivalent to about 3 minutes' continuous sparking. Further exposure was found to decrease rather than increase the intensity of the spectra recorded on the photographic plates. It was easily possible to expose so long that only the trace of one or two prominent lines appeared. With these short exposures the spectra came out quite clearly, as a glance at the Plates will show, and good definition was obtained in most cases. It is worthy of note that the central images were perfectly distinct and clear cut, thus enabling an accurate measurement of the wave-lengths to be made.

Method of Determining Wave-lengths.

The method employed in adjusting the spectrograph was to have the central image fall near the lower end of the plate and the two well-known aluminium lines 1854·7 A.U. and 1862·7 A.U. towards the upper end. The grating was then focussed until sharp images were obtained for these lines and for the central image. Under these conditions the plate lay upon a chord of the circle of normal dispersion, and a slight correction, as worked out by MILLIKAN,* sufficed to give the true wave-length for any part of the plate. However, as we now have so many well-known lines in the Schumann region, it was decided to employ as standards the carbon lines as measured by MILLIKAN† for the high-potential spark, and more recently by SIMEON‡ for the carbon arc, and to plot a calibration curve for the instrument. These wave-lengths when plotted against the distances from the central image on these plates gave a very smooth curve having a very slight curvature. This curve was plotted in six sections and covered the field from 2000 A.U. to 200 A.U. It enabled one to read 0·1 A.U. The distance of successive lines on the plate from the central image was measured by a comparator, reading to 0·005 mm. The choice of the carbon lines as standards has the one great advantage that many of the most prominent of these lines appeared on all photographs taken. This can be seen from the Plates. These served as useful checks on the wave-lengths obtained from time to time. Thus the wave-lengths obtained for a prominent carbon line, chosen at random from plates of different elements, are as follows :—

1335·4 A.U. 1335·5 A.U. 1335·8 A.U. 1335·2 A.U. 1335·6 A.U. 1335·3 A.U.

A further estimate of the accuracy of these measurements may be made from a comparison of the wave-lengths with those recorded by other observers. With the exception of a few cases noted below, it will be seen that the agreement is very good.

A word should be said regarding the purity of the elements used in this investigation. These were supplied to the laboratory as "chemically pure" by Messrs. Eimer and Amend, for the most part, several years ago, and kept in sealed glass containers until

* MILLIKAN, BOWEN and SAWYER, 'Ast. Phys. Jl.,' vol. 53, No. 2, March, 1921.

† MILLIKAN, 'Ast. Phys. Jl.,' vol. 52, No. 1, July, 1920, p. 47.

‡ SIMEON, 'Roy. Soc. Proc.,' Series A, vol. 102, No. A 717, January, 1923.

used. An exception to this was made in the case of carbon, which was cut from an ordinary solid carbon rod, such as is used in the carbon arc; and also in the case of gold, in which ordinary jeweller's material was used, undoubtedly containing some copper. The prominent copper lines have been noted in the table.

Results Obtained.

The spectrum from 2000 A.U. to about 200 A.U. has been photographed by the method already described for the following 20 elements: Carbon, calcium, titanium, vanadium, chromium, manganese, cobalt, arsenic, molybdenum, cadmium, tin, antimony, tellurium, cerium, platinum, gold, thallium, lead, bismuth and uranium. The wave-lengths measured and given in the following Tables are reduced to *vacuo*, and the spectra are shown in Plates 25 and 26 in the order above given.

In all cases where the results of other investigators were available these have been placed in parallel columns for easy comparison. An exception to this should be mentioned. In the case of chromium the recently published values by MILLIKAN and BOWEN* appear to have no correspondence whatever to the values recorded here, in spite of the fact that the wave-lengths of known lines, such as carbon, were determined as accurately on our chromium plates as on almost any others.

Second-order lines have been eliminated from these tables, except in the case of carbon, in which case all lines which appeared on the carbon plates have been retained, second-order lines being indicated by the symbols S.O. In cases where some doubt exists the same symbols are used, but followed by an interrogation mark. The wave numbers of second-order lines have been omitted. It will be noticed that in a few cases certain lines appear, from this work, to be second-order lines which have been recorded as first-order by others. The grating used in this work appears to give about equal intensity in the first- and second-order, and this has rendered the identification of faint second-order lines somewhat uncertain.

The question of the origin of many of these spectral lines has received a good deal of attention, and an effort has been made to eliminate those which are obviously due to common impurities and to indicate by symbols the probable origin of others which are more uncertain. In cases where there is only a small probability that the line is due to a certain impurity the symbol is followed by an interrogation mark. The records of FOWLER, SIMEON, LYMAN, MILLIKAN, HOPFIELD and others, have been freely used, but in such a great number of lines we do not profess to hope that the origin of them all has been discovered. Due to the more recent concentration of effort upon the element, we think that in the case of carbon the spectrum is fairly completely known, and that probably the twenty or so extra lines here assigned to this element may in future be shown to arise from the atoms of other elements.

The investigation of hydrogen as an impurity is a rather baffling one. So many lines

* 'Physical Review,' January, 1924.

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have now been found and recorded by various observers as belonging to this element, that all wave-lengths in certain parts of the spectral range here covered may be pre-empted by this element, within the range of experimental error so far attainable. During these investigations the spectrograph chamber was kept filled with hydrogen when not in use or when plates were being changed. We do not think, however, that this is the cause of the presence of so many presumably hydrogen lines in these spectra. Their origin more likely lies in the hydrogen occluded in the metal electrodes.

We have adopted the general method of listing all lines which appeared in the spectrum of several elements. The list thus formed contained upward of 150 values, of which many appeared in the spectrum of at least eight different elements. These have been omitted from our tables except, as mentioned above, in the carbon table, where all lines appearing on the carbon plates are recorded. There are several cases such as the following which are not easy to explain. LYMAN* records three wave-lengths in hydrogen having intensities as shown herein: 1495·5 (10), 1499·8 (8), 1502·2 (2). The first and most intense of these does not appear in any of these spectra, with the possible exception of Pt and Sn, in which faint lines appear near this value. The second of these lines, which has less intensity than the first, according to LYMAN, appears in the spectrum of at least seven of the elements with strong intensity, and the last of the three appears with five elements. These lines have of course been omitted from our table.

The statement made by MILLIKAN† that the lines of the LYMAN series of hydrogen do not appear strongly in these high-potential spark-spectra is borne out by this work, for while the first line of the series (1215·7) appears on almost every plate taken, the second line (1025·6) was less frequently met with and its intensity was much reduced. The third line (972·5) was seldom if ever seen.

The two lines which appear as 1402·7 and 1393·6 in the carbon table are very interesting. These were at first thought to be faint carbon lines, but it was noticed that in certain spectra, especially of titanium, these lines came out with strong intensity. It was then noticed that another pair of lines, namely 818·2 and 814·7, also appeared with considerable intensity on the same plate in which the first pair were strongly represented. It was therefore concluded that these lines very likely belong to the sharp series of trebly-ionised silicon, as given by FOWLER.‡ These lines are omitted from most of our tables in which they appeared, except Ti, in which they appeared with maximum intensity. The wave-lengths recorded for them in this table are average values obtained from a considerable number of plates.

In the spectrum of calcium there is only a fair correspondence in the lines assigned to this element by various observers. The spectrum of ionised calcium seems to be entirely missing from our plates, with the sole exception of 1555·7, in spite of the fact that the Fundamental Series of doublets is clearly present in the results of all other observers,

* 'Spectroscopy of the Ultra-violet.'

† 'Physical Review,' January, 1924.

‡ 'Roy. Soc. Proc.,' Series A, vol. 103, June, 1923.

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including MILLIKAN's recently published results referred to above. The method of excitation there more nearly approaches that used in this work than the methods employed by any other, and the results should be more nearly comparable. It is probable that the potentials used in this work were higher than those employed by MILLIKAN.

On the other hand the Principal Series of single lines from the normal atom of cadmium, as measured by WOLFF in the vacuum arc, is entirely absent from these results, as it is also from those of all the other observers whose results are shown herein. In the singly-ionised cadmium spectrum, however, there appears a pair of lines which have the doublet separation of the Principal Series, namely: 2033·4 and 1935·7. It would appear, also, that further members not previously recorded of the Sharp Series of singly-ionised cadmium occur on these plates, namely: 1593·3 (5), 1345·9 (2), 1242·3 (1). The corresponding members of these doublets do not appear.

Certain preliminary series relations have been worked out, but it has been decided to withhold these until further investigation has been made before publication.

In conclusion I wish to thank Prof. McLENNAN for suggesting this problem and for his kindness and assistance throughout this research.

TABLE I.—Carbon.

AUTHOR.			MILLIKAN.		SIMEON.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Arc A.U.	I.
	1955·0 S.O.	50				
51789	1930·9	3	1931·1	7	1930·66	5
51921	1926·0 H	1				
	1923·0 S.O.	1				
52471	1905·8 H	1				
	1891·6 S.O.	1				
	1875·2 S.O.	1				
	1866·6 S.O.	1				
53792	1859·0	1				
53940	1853·9 Al	1				
54109	1848·1 H	1				
	1837·8 S.O.	3				
	1831·9 S.O.	2	1832·8	0		
54722	1827·4 Hg	1	1827·3	1		
54905	1821·3 Hg	1				
55132	1813·8	1				
	1807·4 S.O.	50			1807·7	1
56022	1785·0 H	3				
	1769·7 S.O.	3				
56808	1760·3	2	1760·7	4	1760·6	2
56928	1756·6 Hg	2				

TABLE I (continued).

Author.			Millikan.		Simeon.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Arc A.U.	I.
57074	1752·1	1	1752·3	2	1751·8	2
	1722·5 S.O.	10				
	1717·1 S.O.	30				
58462	1710·5 H	1				
58644	1705·2 H	1				
58903	1697·7 H	1				
59017	1694·4	1				
	1687·9 S.O.	1				
59460	1681·8 H	1				
59573	1678·6 N	1				
	1669·8 H	1				
59887	1666·8 S.O.	1				
60335	1657·4	3	1657·6	5	1657·86	8
					1657·20	8
					1656·81	8
					1656·12	8
60657	1648·6 H	1				
61255	1632·5 H	1				
	1619·9 S.O.	8				
	1614·1 S.O.	20				
62165	1608·6 H	1				
62254	1606·3 Al	1				
	1600·0 S.O.	3				
	1593·8 S.O.	1	1592·6	0		
62857	1590·9	2				
			1577·6	1		
	1569·1 S.O.	1				
64049	1561·3	30	1561·3	5	1561·32	9
					1560·67	9
					1560·16	9
64478	1550·9		1550·8	3	1550·8	2
64603	1547·9	30	1548·3	4	1548·3	3
	1545·0 S.O.	1				
65265	1532·2	1	1533·1	0		
	1529·5 S.O.	1	1527·9	0		
	1508·1 S.O.	1				
	1502·2 S.O.	1				
66693	1499·4 H	1				
	1495·2 S.O.? H ?	1				
67046	1491·5 Tl ?	1				
	1490·2 S.O.	1				
67499	1481·5	1	1482·1	1	1481·7	3
67622	1478·8 H	1				
68143	1467·5 H	1			1467·4	2
68334	1463·4 S.O.?	1	1463·7	2	1463·3	4
68540	1459·0	1			1459·1	2
	1457·1 S.O.	1				
	1452·1 S.O.	1				
	1448·7 S.O.	1				
	1443·8 S.O.	1				
69468	1439·5 Sb	1				
	1431·8 S.O.?	1	1432·2	1	1431·6	2

TABLE I (continued).

Author.			Millikan.		Simeon.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Arc A.U.	I.
69993	1428·7 H	1				
70101	1426·5	1	1426·9	1		
	1422·5 S.O.	1				
70646	1415·5	1				
	1406·2 S.O.	1				
71291	1402·7 SiIV ?	1				
	1400·8 S.O.	1				
71571	1397·2 H	1				
71756	1393·6 SiIV ?	1				
	1382·0 S.O.	2				
72516	1379·0 N ? Al ?	3				
	1374·6 S.O.	30				
73040	1369·1 Si IV ?	1				
	1365·2 S.O.	1				
	1361·9 S.O.	1	1362·6	5		
	1356·1 S.O.?	1	1356·2	1	1355·7	1
73931	1352·6 H	1				
74889	1335·3	60	1335·0	15	1335·66	10
					1334·44	10
75233	1329·2	10	1329·4	4	1329·60	8
75580	1323·1	30	1323·7	7	1323·79	7
			1322·3	2		
76045	1315·0 S.O.	1				
76277	1311·0	1	1310·5	1		
76423	1308·5	1			1309·1	2
76781	1302·4	1				
77125	1296·6	1	1296·8	2	1298·8	1
	1289·7 S.O.	1				
	1283·8 S.O.	2				
78100	1280·4 N ?	1			1280·3	2
78277	1277·5 S.O.?	2	1278·7	5	1277·32	4
78492	1274·0	1			1274·3	2
78808	1268·9	1				
79101	1264·2 Al ?	1			1264·6	1
			1262·4	5		
79295	1261·1				1261·21	3
					1260·48	3
79776	1253·5 H	1				
80166	1247·4	30	1247·5	7	1247·2	3
81287	1230·2 O ?	1	1230·2	2		
81893	1221·1	1				
82248	1215·8 H	40			1215·53	3
82658	1209·8 Sn ?	1			1209·94	2
82884	1206·5	1			1206·4	1
	1200·5 S.O.	1				
					1197·2	1
83724	1194·4	1	1194·1	3	1194·4	1
					1193·2	1
	1190·0 S.O.	1			1190·3	1
					1176·08	7
85055	1175·7	50	1175·6	15	1175·56	7
					1174·74	7

TABLE I (continued).

Author.			Millikan.		Simeon.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Arc A.U.	I.
86355	1158·0 H	1				
	1148·7	1				
87588	1141·7	1	1141·5	4		
87811	1138·8 O ?	1	1137·4	3		
	1131·5 S.O.	1				
88573	1129·0 O	1				
	1124·7 S.O.	1				
	1120·8 S.O.	1				
89686	1115·0 O	1				
90187	1108·8	1				
	1098·6 S.O.	1				
91591	1091·8	1	1092·6	3		
92148	1085·2 N ?	6				
	1076·3 S.O.	10				
93231	1072·6 H	1				
93457	1070·0	1				
93791	1066·2	10	1066·0	8	1066·3	1
94099	1062·7 H	1				
96450	1036·8	5	1036·7	11	1036·84	5
					1036·22	5
97513	1025·5 H ? Mg ?	1				
			1022·8	1		
97933	1021·1 H	1				
98599	1014·2 H ?	2				
98980	1010·3	50	1010·2	10	1010·09	4
	998·6 S.O.	1				
100482	995·2 H	1				
100847	991·6 N ?	1				
102354	977·0	50	977·1	12	976·7	5
			966·6	0		
104058	961·0	1	960·6	0		
			954·4	0		
105752	945·6	1	945·6	4	945·0	1
106689	937·3	1	936·4	1	937·3	1
	933·0 H S.O.	1				
	919·3	1				
					917·3	2
109194	915·8 N ?	1				
110619	904·0	50	904·1	10	903·7	8
113032	884·7	1	884·8	1	884·2	1
115021	869·4	1				
	867·5 O.S.O. ?	1			866·4	1
					864·5	1
116495	858·4	40	858·5	5	858·2	7
117813	848·4	1	848·4	0	848·5	2
118497	843·9	1				
	840·3 S.O.	1			840·6	1
119976	833·5 O ?	1			834·0	1
					832·8	1
					825·0	1
121462	823·3	1				
122579	815·8	1				

TABLE I (continued).

Author.			Millikan.		Simeon.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Arc A.U.	I.
123472	809·9	3	810·0	5	809·6	3
123992	806·5	30	806·7	6	806·2	4
124440	803·6 H	1				
125031	779·8 S.O.?	2	799·9	5	799·6	2
125549	796·5 O	1				
125897	794·3	1				
127129	786·6	1	786·5	1		
127518	784·2 Sn ?	1				
128865	776·0 N	1				
	772·7 S.O.	1				
	769·0 S.O.	1				
130838	764·3 O ? N ?	1			765·4	1
					764·1	1
132696	753·6 H	1				
133244	750·5 Si IV ?	1	749·6	0		
133743	747·7 N ?	1				
134318	744·5 S.O.?		743·6	0	742·7	1
135446	738·3 H	1				
136054	735·0 H	1				
136649	731·8 H	1				
137230	728·7 H	1				
137646	726·5	1				
137816	725·6 H	1				
138064	724·3 H	1				
	721·7 S.O.?	1				
139199	718·4 O	1				
140646	711·0	1	711·0	0	710·7	1
141402	707·2 H	1				
142267	702·9	1			702·6	1
142857	700·0	1			700·6	1
144822	690·5	1			690·3	1
145518	687·2	30	687·3	8	687·1	7
146412	683·0	1			683·5	1
146886	680·8	1			680·6	1
147427	678·3	1				
148148	675·0	1				
148964	671·3 N ?	1				
151171	661·5	1	661·5	0		
152160	657·2 O	1				
153421	651·8	10	651·5	6	651·3	5
155062	644·9 O ?	1				
155860	641·6	3	641·8	5	641·8	3
156494	639·0	1				
157183	636·2	1	636·3	3	636·2	2
					633·7	1
158856	629·5 O	1				
	626·0 S.O.?	1				
161812	618·0	1	617·7	1	617·0	1
164122	609·3 O ?	1	609·5	1	609·1	1
166583	600·3 O ?	1	600·2	1	600·3	1
168038	595·1	8	595·1	5	594·9	4
170735	585·7	5	585·7	3	585·5	1

TABLE I (continued).

Author.			Millikan.		Simeon.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Arc A.U.	I.
173190	577·4	1				
174094	574·4	20	574·5	6	574·3	2
176897	565·3	2	564·7	3	564·8	2
177682	562·8 O ?	1			562·4	1
178412	560·5	2	560·5	3	560·5	5
					558·0	1
181950	549·6	2	549·6	2	549·6	2
184026	543·4	2	543·5	2	543·4	1
185597	538·8	30	538·4	7	538·3	3
185977	537·7	1				
187546	533·2	1	533·3	2	533·9	1
188536	530·4	1	530·3	2		
193348	517·2 O ?	1	517·6	1		
195312	512·0	1	511·7	1		
196734	508·3 O	1				
200040	499·9	2	499·7	4	499·7	1
202511	493·8	1	493·7	1		
214362	466·5 H	1				
217344	460·1	20	459·7	6	459·5	3
221680	451·1	1	450·9	1	450·9	1
230520	433·8 O ?	1				
238038	420·1	1	419·8	1	420·3	1
					417·0	1
					416·2	1
247341	404·3	3				
250000	400·0	3				
256739	389·5	1				
259134	385·9	1	386·4	4	386·1	2
260416	384·0	1	384·4	4		
					382·7	1
					382·1	1
268744	372·1	2	372·5	2	371·5	1
276931	361·1	1	360·5	0		
319795	312·7	1				

Table II.—Calcium.

Author.			Millikan and Bowen.		McLennan, Young and Ireton.		Lyman.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Spark A.U.	I.	Spark A.U.	I.
48463	2063·4	1						
48713	2052·8	1						
48835	2047·7	1						
49222	2031·6	3						
49522	2019·3	1						
49593	2016·4	1						
50779	1969·3	5						
50945	1962·9	1						
51334	1948·0	1						
51411	1945·1	1						
52219	1915·0	1						
52609	1900·8	1						
52935	1889·1	1						
53251	1877·9	1						
53427	1871·7	1					1872·5	3
53482	1869·8	1					1870·4	3
							1851·3	7
							1843·8	6
					1840·4	10	1840·2	10
			1838·9	10D	1838·2	10	1838·0	9
54463	1836·1	1						
54630	1830·5	1						
54720	1827·5 Hg.?	1						
54885	1822·0	1						
54954	1819·7	1						
			1814·8	0	1815·0	4	1815·0	8
			1807·8	0	1807·5	4	1807·8	7
55380	1805·7	1						
56004	1785·6 H	1						
56306	1776·0	2						
57094	1751·5	1						
57372	1743·0	1			1742·8	4		
57521	1738·5	1						
57816	1729·6	2						
68357	1713·6	2						
58545	1708·1	1						
58685	1704·0	1						
58910	1697·5	1					1698·9	2
59039	1693·8	1					1692·4	1
59329	1685·5	2						
59439	1682·4	3						
							1680·5	2
59652	1676·4	1					1674·1	1
59963	1667·7	30						
60680	1648·0	1	1647·5	0				
60440	1646·5	1						
60361	1640·4	1						
61463	1627·0	1						
62325	1604·5	1						
62751	1593·6 N ?	1						
63091	1585·0	1	1586·1	0				

TABLE II (continued).

Author.			Millikan and Bowen.		McLennan, Young and Ireton.		Lyman.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Spark A.U.	I.	Spark A.U.	I.
63291	1580·0	1						
			1571·5	0				
63972	1562·4	10	1562·4	4			1561·2	2
64133	1555·7	2	1555·0	5	1555·1	3	1555·1	8
64695	1545·7 N ?	3	1545·6	5	1553·5	3	1553·5	7
65184	1534·1 Si IV.?	1					1533·4	2
							1526·7	2
65591	1524·6	1						
65655	1523·1	1						
66792	1497·2	1	1500·0	0D				
67344	1484·9	1	1485·9	0				
67504	1481·4 C ?	1						
68306	1464·0	1	1464·1	0				
			1454·3	0				
			1434·2	0			1434·3	6
							1433·1	5
70681	1414·8	1						
71281	1402·9 Si IV.?	10					1402·7	4
71768	1393·4 Si IV.?	8					1393·6	5
72764	1374·3	1						
							1370·6	3
							1369·1	3
74425	1346·9	1						
76243	1311·6	10						
77041	1298·0	2						
77423	1291·6	2						
77718	1286·7	1	1286·7	0				
77821	1285·0	1						
78278	1277·5 C ?	1					1276·4	3
78468	1274·4	1						
							1268·2	2
79076	1264·6 S.O.?	2					1264·5	2
							1260·2	1
							1254·3	2
80192	1247·0 C	2					1246·2	1

Author.			Millikan and Bowen.		Author.			Millikan and Bowen.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Spark A.U.	I.
80541	1241·6 H	1						1084·6 N	0
81334	1229·5	1			99621	1003·8	1		
84431	1184·4	1			100680	993·2	1		
86964	1149·9	1			101678	983·5	2		
87146	1147·5	1			104210	959·6	5		
88535	1129·5	1			105553	947·3	1		

TABLE II (continued).

Author.			Millikan and Bowen.		Author.			Millikan and Bowen.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Spark A.U.	I.
106689	937·3	1			174825	572·0	3	572·0	0
107123	933·5	1	934·6	0	175747	569·0	3		
108981	917·5	1			177242	564·2	5		
110096	908·3	1			178285	560·9	8		
110828	902·3	20			179276	557·8	5	558·1	1
112108	892·0	4			180018	555·5	5		
			883·0	0	180636	553·6	3		
113443	881·5	2			181455	551·1	3		
114416	874·0	1	875·3	0	182282	548·6	3		
116932	855·2	2	856·5	1	184672	541·5	5	542·2	1
117647	850·0	1			186116	537·3	8	537·8 C_2	3
118287	845·4	1	846·5	0	187091	534·5	5	535·1	0
119062	839·9	10			189538	527·6	3		
120250	831·6	20			190476	525·0	2		
			821·2	0	191755	521·5	1		
122190	818·4 Si IV.?	1			193050	518·0 O	1		
			810·1 C	0	195848	510·6	1		
			800·1 C	0	187122	507·3 O	3		
126759	788·9	2			198334	504·2	1		
127016	787·3	2			201654	495·9	1		
128452	778·5	1			203874	490·5	1		
129433	772·6 N	1	773·7	1	205973	485·5	1		
129735	770·8	1			206954	483·2	1		
133797	747·4 S.O.?	1	748·2	0	209644	477·0	1	477·5	0
134228	745·0	1	745·9	0	215424	464·2	1		
135281	739·2	1	740·2	1	217722	459·3	1		
135953	735·4 H ?	1	736·3	0	219154	456·4	1		
136612	732·0 H ?	1	732·9	0	222222	450·0	1	450·5	0
137193	728·9 H ?	1	727·4	0	225530	443·4	1	444·1	0
139237	718·2	10			227635	439·3	1	439·7	0
139958	714·5	1			230415	434·0	2		
143308	697·8	1			232775	429·6			
144238	693·3	1			232775	429·6			
145454	687·5	8	688·6	0	235626	424·4	1		
149477	669·0	10	669·6	4	243724	410·3	10	410·1	6
152671	655·0	10	655·9	5	247647	403·8	10	403·8	6
			651·0 C	0	252334	396·3	1		
			646·4	3	255167	391·9	1		
155618	642·6	3	642·5 C	0	267237	374·2	1		
156789	637·8	3	638·0	1	271223	368·7	1		
157654	634·3	5			279564	357·7	1	358·0	3
158228	632·0	2	632·7	0	283768	352·4	1	352·9	0
159134	628·4	2	629·0 O_1	0	290698	344·0	1	344·7	2
160591	622·7	1			293686	340·5	1	341·0	4
161394	619·6	3						334·9	0
163666	611·0	3			301750	331·4	1	331·8	3
165153	605·5	1			304136	328·8	1		
165837	603·0	1			304971	327·9	1		
166666	600·0	2	600·9 O_1 C	1				324·7	2
168492	593·5	3						322·1 O Mg	1
169233	590·9	4						299·7	0
170503	586·5	6						280·9	0
172295	580·4	1						269·7	0

TABLE III.—Titanium.

Author. Wave No.	Author. Spark A.U.	Author. I.	Author. Wave No.	Author. Spark A.U.	Author. I.	Author. Wave No.	Author. Spark A.U.	Author. I.
48202	2074·6	5	77760	1286·0	3	131666	759·5	5
48349	2068·3	5	78660	1271·3	1	142227	703·1 C ?	8
48487	2062·4	1	79076	1264·6	10	143719	695·8 ?	1
48719	2052·6	1	80205	1246·8 C ?	5	147623	677·4	1
49239	2030·9	1	80645	1240·0 H	1	148699	672·5 O ?	1
49488	2020·7	1	81420	1228·2	1	150648	663·8	1
50095	1996·2	1	81940	1220·4 C ?	1	155231	644·2 O	3
50221	1991·2	1	83403	1199·0	2	159949	625·2 O ?	3
51298	1949·4	1	84076	1189·4 N ?	1	162153	616·7	3
51501	1941·7	1	84538	1182·9	1	172206	580·7	1
51645	1936·3	1	87405	1144·1	1	176554	566·4	1
51746	1932·5	1	87735	1139·8 O ?	1	190259	525·6 O ?	3
53356	1874·2	1	89246	1120·5	10	199084	502·3	1
54648	1829·9	1	89518	1117·1	1	201450	496·4	1
54780	1825·5	1	89815	1113·4	10	204625	488·7	1
55760	1793·4	1	97031	1030·6 O ?	1	206697	483·8	1
56689	1764·0	1	98445	1015·8	2	210704	474·6	1
57146	1749·9	1	100251	997·5	1	212993	469·5	1
57998	1724·2	1	101071	989·4	1	214823	465·5	1
58910	1697·5 H	1	105208	950·5	2	224366	445·7	1
59025	1694·2 C ?	1	105820	945·0 C ?	1	230309	434·2 O ?	1
59837	1671·2	20	107227	932·6	1	232558	430·0 O ?	1
64156	1558·7	20	107735	928·2	1	235682	424·3	2
65185	1534·1	1	108342	923·0	1	239006	418·4	1
66020	1514·7	1	108861	918·6	1	252717	395·7 O	1
66631	1500·8	3	111346	898·1 O ?	1	259740	385·0	1
66849	1495·9 N ?	1	112347	890·1	1	267165	374·3 O ?	1
68115	1468·1	3	113199	883·4	1	275103	363·5	1
69575	1437·3	10	114025	877·0	1	278396	359·2 O ?	1
70294	1422·6 C ?	2	114811	871·0	1	281611	355·1 O ?	1
71266	1403·2 Si IV.	40	115554	865·4	1	289436	345·5 O ?	1
71984	1393·4 Si IV.	40	119904	834·0 O ?	15	292569	341·8	1
72233	1384·4	1	120802	827·8	1	299401	334·0	1
72480	1379·7 N ?	1	121418	823·6	1	304507	328·4 O ?	1
72738	1374·8	1	122160	818·2 Si IV.	10	311042	321·5 O ?	1
76185	1312·6	1	122760	814·7 Si IV.	10	316556	315·9	1
76406	1308·8 C ?	1	124704	801·9 O ?	3	327332	305·5 O ?	1
76687	1304·0	1	125549	796·5 O ?	3	359195	278·4	1
76994	1298·8	5	127943	781·6	20	395570	252·8	1
77262	1294·3	5	130787	764·6 O ?	5	445633	224·4	4

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY A MATHEMATICAL, PHYSICAL & ENGINEERING SCIENCES

TABLE IV.—Vanadium.

Author.			Author.			Author.		
Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.
48038	2081·7	1	70701	1414·4	1	138236	723·4	5
48188	2075·2	30	70811	1412·2	1	141723	705·6	1
48450	2064·0	1	72119	1386·6	1	143062	699·0 C ?	1
48563	2059·2	1	73855	1354·0	2	146092	684·5 N ?	10
48657	2055·2	2	74047	1350·5	1	149120	670·6 N ?	1
49008	2040·5	1	75115	1331·3	1	149835	667·4	1
49070	2037·9	1	75256	1328·8 C	1	154416	647·6	1
49164	2034·0	2	76482	3107·5	1	163292	612·4	1
49615	2015·5	1	76658	1304·5	1	164150	609·2 O ?	1
49990	2000·4	1	77555	1289·4 C ?	1	166889	599·2 O ?	1
50088	1996·5	1	79796	1253·2 H	1	167673	596·4	1
50213	1991·5	1	82563	1211·2	1	169348	590·5	1
50472	1981·3	1	85800	1165·5	1	172503	579·7 O ?	1
50666	1973·7	1	86475	1156·4	2	175809	568·8	1
50911	1964·2	1	86693	1153·5	2	176991	565·0 C	1
50994	1961·0	1	89734	1114·4	1	181324	551·5	1
52576	1902·0	2	89920	1112·1	3	182648	547·5	1
54744	1826·7	1	91625	1091·4	1	184026	543·4 C	1
54849	1823·2	1	93502	1069·5	1	184843	541·0 O ?	1
55568	1799·6	1	94572	1057·4	1	186150	537·2 O ?	8
55754	1793·6	1	96890	1032·1 O ?	1	190295	525·5 O ?	5
55991	1786·0	1	97135	1029·5	1	192790	518·7 O ?	1
56536	1768·8	1	97201	1028·8	1	193986	515·5 O ?	1
56912	1757·1	1	97561	1025·0 H ?	1	196967	507·7 O ?	2
57376	1742·9	1	97905	1021·4	1	199283	501·8	1
59098	1692·1	1	99443	1005·6	1	202593	493·6 C	1
59207	1689·0	1	100301	997·0	1	207039	483·0	10
59347	1685·0	1	100614	993·9	1	221976	450·5 C	1
59517	1680·2	1	101000	990·1	1	224467	445·5	1
59773	1673·0	1	101204	988·1	1	230415	434·0 O ?	1
60121	1663·3	1	101781	982·5	1	234467	426·5	1
60259	1659·5	1	104844	953·8	1	238379	419·5 C ?	1
60901	1642·0	1	108944	917·9	1	243013	411·5	1
62426	1601·9	1	109278	915·1 N ?	1	245158	407·9	1
62964	1588·2	1	109637	912·1	1	248201	402·9	1
63331	1579·0	1	110011	909·0	1	251762	397·2	1
65083	1536·5	1	111359	898·0 O ?	1	263366	379·7 O ?	1
65342	1530·4 H ?	1	112625	887·9	1	267094	374·4 O ?	1
65595	1524·5	1	113740	879·2	1	268889	371·9 C	1
65664	1522·9	1	115754	863·9	1	273823	365·2	1
66173	1511·2	1	117440	851·5	1	288350	346·8 O ?	1
67746	1476·1	1	120977	826·6	1	320102	312·4 C	1
68055	1469·4	1	122730	814·8 Si IV. ?	1	349040	286·5	1
68785	1453·8	4	128419	778·7	1	397141	251·8	1
69575	1437·3	4	129299	773·4 N ?	1	418585	238·9 O ?	1
70092	1426·7	3	131978	757·7	1	446628	223·9	1
70452	1419·4	2	135153	739·9	1			

TABLE V.—Chromium.

Author.			Author.			Author.		
Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.
52540	1903·3	1	82495	1212·2	1	108696	920·0	1
54054	1850·0	2	82610	1210·5	1	109278	915·1 N ?	1
54416	1837·7 C	1	83167	1202·4	1	112969	885·2	40
54774	1825·7	1	83675	1195·1 C ?	1	114364	874·4	1
55054	1816·4	40	83914	1191·7	1	114548	873·0	1
55479	1802·5	1	84746	1180·0	1	114890	870·4	1
55599	1798·6	1	85499	1169·6	1	118977	840·5	3
57395	1742·3	1	85682	1167·1	1	127943	781·6	1
57571	1737·0	1	86588	1154·9	1	128205	780·0	1
58569	1707·4	1	86821	1151·8 O ?	1	130634	765·5 O ?	1
60295	1658·5	1	87291	1145·6	1	138812	726·4 C ?	1
60503	1652·8	1	88028	1136·0	1	139841	715·1	1
62364	1603·5 H	1	89582	1116·3	1	140430	712·1	1
62723	1594·3 N ?	1	89977	1111·4	1	141143	708·5	1
62830	1591·6 N ?	1	90596	1103·8	1	141784	705·3	1
63115	1584·4	1	92541	1080·6	1	143369	697·5	1
63283	1580·2	1	93032	1074·9	1	144676	691·2 C	1
63440	1576·3	1	93484	1069·7 C ?	1	146349	683·3 C	1
64935	1540·0	1	93659	1067·7	1	151515	660·0 N ?	2
65257	1532·4	1	93994	1063·9	1	153374	652·0	1
65407	1528·9 C ?	1	94554	1057·6	1	153775	650·3	1
65815	1519·4	1	94976	1052·9	1	156961	637·1	1
66916	1494·4 N ?	1	95566	1046·4	1	158353	631·5	1
67286	1486·2	1	95960	1042·1	1	160514	623·0	1
68176	1466·8	1	96135	1040·2	1	163586	611·3	1
69493	1439·0 ?	3	96590	1035·3	1	172771	578·8	1
70333	1421·8 C ?	1	96890	1032·1 O ?	1	179759	556·3	1
71839	1392·0	1	97125	1029·6	1	185460	539·2 O ?	1
73567	1359·3	1	97800	1022·5	1	192678	519·0 O ?	1
74113	1349·3	1	98164	1018·7	5	196040	510·1	1
74571	1341·0	1	99562	1004·4	5	203666	491·0	1
75689	1321·2	1	99751	1002·5	1	211864	472·0	1
76272	1311·1	1	99910	1000·9	1	214454	466·3 H	1
77459	1291·0	1	103029	970·6 H ?	1	216497	461·9	1
78889	1267·6	1	103189	969·1	1	225530	443·4	1
79637	1255·7	1	103488	966·3	1	258799	386·4 C ?	1
79738	1254·1 H ?	1	104330	958·5	1	262812	380·5 O ?	1
80386	1244·0	1	106270	941·0	1	268384	372·6 C ?	1
80652	1239·9	1	107562	929·7	1	281849	354·8 O ?	1
82041	1218·9	1	108050	925·5	3			

TABLE VI.—Manganese.

Author.			Takamine and Nitta.		Author.			Takamine and Nitta.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Spark A.U.	I.
49300	2028·4	2			52010	1922·7	1	1922·3	3
49507	2019·9	1						1920·2	4
49697	2012·2	1			52124	1918·5	1	1918·7	2
49838	2006·5	1						1918·0	2
50013	1999·5	1						1917·0	1
			1993·7	4	52233	1914·5	1	1914·8	1
			1992·8	5				1911·1	3
			1990·9	2	52378	1909·2	1	1908·5	2
			1990·0	2	52513	1904·3	5		
50261	1989·6	1	1989·2	4				1899·2	1
			1986·4	2	52690	1897·9	1	1898·5	1
			1985·4	4				1897·1	1
			1982·5	2				1893·2	2
50525	1979·2	1	1978·7	2	52854	1892·0	4	1892·0	2
50612	1975·8	1	1975·4	2	52863	1891·7 C ?	1		
50749	1970·5	1	1971·0	1	53008	1886·5	1		
			1969·8	3	53124	1882·4	1		
			1969·0	2	53208	1879·4	1		
			1963·7	2				1877·3	1
			1962·8	2				1876·0	1
			1961·6	2				1875·3	1
			1958·2	4	53447	1871·0	1	1872·2	1
			1955·7	2	53568	1866·8 Al ?	2	1867·5	1
			1954·2	2				1865·3	1
			1953·1	3				1864·0	1
51230	1952·0	2	1952·2	3				1862·2	4
51298	1949·4	1	1951·0	2	53714	1861·7	3	1861·2	1
51356	1947·2	1	1947·9	2				1860·2	1
51451	1943·6	1	1944·2	3	53842	1857·3 S.O.?	1	1857·5	1
			1942·6	4				1854·2	4
	1940·4 S.O.?	1	1940·9	3	53955	1853·4 Al ?	4	1853·0	1
			1938·8	2				1852·5	1
51637	1936·6	1	1936·0	2				1851·1	1
			1934·5	2				1850·1	1
51744	1932·6	1	1933·0	2				1844·6	1
			1930·8	2	54259	1843·0	1	1843·3	1
			1925·8	3				1842·5	1
			1924·7	2					

Table VI (continued).

Author.			Author.			Author.		
Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.
54336	1840·4	1	87359	1144·7	1	152812	654·4	1
54687	1828·6	2	89429	1118·2	5	154369	647·8	2
55515	1801·3	3	89807	1113·5	5	155400	643·5	1
55710	1795·0	3	92387	1082·4	1	156128	640·5	1
55891	1789·2	10	95703	1044·9	1	157928	633·2	1
	1784·7 H	10	97003	1030·9	2	160154	624·4 O ?	1
56240	1778·1	1	97314	1027·6	2	162232	616·4 O ?	1
56398	1773·1	1	98280	1017·5	1	163532	611·5	1
56491	1770·2 C ?	1	98795	1012·2	2	170590	586·2 C ?	3
56619	1766·2	1	99118	1008·9	2	172503	579·7 O ?	3
56731	1762·7	1	100100	999·0 H ?	2	180180	555·0 O ?	1
56815	1760·1 Hg ?	1	100756	992·5 N ?	1	191902	521·1	1
56967	1755·4 Hg.?	1	103040	970·5	1	196850	508·0 O ?	1
57339	1744·0	1	103928	962·2	1	210084	476·0	1
57498	1739·2	1	104613	955·9	1	213675	468·0	1
59063	1693·1	1	107631	929·1	1	225938	442·6	1
60285	1658·8 C ?	2	107991	926·0	1	229095	436·5	1
62150	1609·0 H	1	112032	892·6	30	230309	434·2 O ?	1
62309	1604·9	1	116266	860·1	1	232775	429·6	1
63553	1573·5 ?	5	117371	852·0	1	235682	424·3	1
67204	1488·0	1	124224	805·0	1	239866	416·9	1
67632	1478·6	1	124813	801·2	1	242836	411·8	1
69228	1444·5	1	132820	752·9	1	245942	406·6	1
69551	1437·8	5	133958	746·5	1	253485	394·5 O ?	1
84531	1183·0	1	133355	738·8 H	1	281611	355·1 O ?	1
84753	1179·9	1	142349	702·5	2	303214	329·8 O ?	1
85434	1170·5	1	150331	665·2	1	321130	311·4	1
	1159·0 O	2						

Table VII.—Cobalt.

Author.			Takamine and Nitta.		Bloch.		Ainslie and Fuller.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Spark A.U.	I.	Arc A.U.	I.
48389	2066·6	1						
48508	2061·5	3					2061·5	5
49157	2034·3	1						
49373	2025·4	1					2026·2	7
49801	2008·0	1						
			1999·0	4				
			1999·3	2				
			1996·2	2	1996·44	1		

TABLE VII (continued).

Author.			Takamine and Nitta.		Bloch.		Ainslie and Fuller.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Spark A.U.	I.	Arc A.U.	I.
50153	1993·9	1	1994·7	2	1994·67	1		
			1993·3	2	1992·52	1		
			1990·8	2				
50274	1989·1	1	1989·0	3	1988·85	3		
			1986·5	3	1986·38	1		
50383	1984·8	1	1984·32	2	1984·16	1		
			1983·2	2	1983·24	1		
50497	1980·3	1	1980·3	2	1980·62	1		
			1979·1	4	1979·32	1		
			1978	2	1978·18	1		
			1976·3	3	1976·35	3		
			1974·2	5	1974·13	3		
			1971·1	3	1971·09	1		
			1969·6	5	1969·25	4		
			1968·3	2	1968·15	2		
50857	1966·3	1						
			1962·8	4	1962·84	2		
			1960·6	3	1960·61	1		
			1958·6	2	1958·58	5		
			1956·7	6	1956·58	5		
			1955·3	5	1955·04	3		
			1954·3	4	1953·99	4		
			1953·4	3	1953·06	1		
			1952·4	2	1952·30	1		
			1951·3	2	1951·31	1		
51279	1950·1	1	1950·5	1				
			1949·8	6	1950·09	3		
			1948·5	1				
			1946·2	1	1946·00	2		
			1944·8	1	1944·43	1		
			1943·7	2	1943·46	1		
			1942·0	1				
51509	1941·4	1	1941·6	2	1941·64	2		
			1940·2	8	1940·52	6		
			1939·4	2	1939·41	3	1939·5	2
			1937·0	1				
51632	1936·8	1	1936·6	4	1936·85	1		
			1936·2	1	1936·26	2		
			1935·5	1				
			1934·5	2	1934·21	2		
			1934·0	2				
			1933·8	2				
	1933·0 S.O.	1	1933·0	1	1932·41	1		
			1930·3	1	1930·20	1		
			1929·7	1				
			1929·0	2	1929·06	2	1929·5	9
51867	1928·0	2	1928·0	6	1927·86	4		
			1927·12	2	1926·97	1		

TABLE VII (continued).

Author.			Takamine and Nitta.		Bloch.		Ainslie and Fuller.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Spark A.U.	I.	Arc A.U.	I.
			1925·5	1				
			1924·9	2				
			1924·0	1				
			1923·5	1				
			1922·6	1	1922·62	1		
			1922·0	1				
			1920·2	1				
			1918·3	3	1918·44	3		
52162	1917·1	1	1916·8	3	1916·98	2		
			1915·7	1				
			1914·5	1				
			1913·5	1				
			1912·5	1			1912·2	3
			1911·5	1				
			1910·1	3	1910·16	1		
			1909·2	1				
			1908·3	3				
			1907·7	1	1907·85	1		
			1907·5	1				
			1906·0	1				
52493	1905·0	1	1905·1	1				
			1903·0	1				
52598	1901·2	3	1901·0	1	1900·83	1		
			1900·1	1				
			1899·6	1				
			1896·1	1				
			1895·2	3	1895·47	1		
			1893·7	1			1893·8	4
			1891·4	2				
			1890·1	1				
52935	1889·1	2	1889·7	1				
			1888·2	2				
			1887·7	1				
			1886·3	1				
53048	1885·1	2	1884·9	1				
			1884·0	1				
			1882·4	1				
			1881·2	3	1881·52	1		
			1880·7	1				
			1880·0	1				
53225	1878·8	2	1878·5	2				
			1876·6	2				
	1874·4 S.O.	2	1874·5	1				
			1874·3	2				
			1873·7	1	1872·94	1		
			1872·0	1				
			1871·2	4				
			1867·9	1				

TABLE VII (continued).

Author.			Takamine and Nitta.		Bloch.		Ainslie and Fuller.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Spark A.U.	I.	Arc A.U.	I.
53622	1864·9	1	1866·6	3				
			1863·0	2				
			1862·4	2				
			1862·1	2				
			1861·5	3			1861·4	1
			1859·9	2				
			1854·2	2				
53952	1853·5 Al ?	1	1853·7	1				
			1853·4	2			1853·0	10
			1852·0	3				
			1850·8	1				
54063	1849·7	1	1849·0	1				
			1847·0	1				
			1846·3	1				
			1845·1	4	1845·5	2		
54206	1844·8	1	1844·0	1				
			1843·5	1				
			1842·5	2				
			1839·0	1				
			1838·4	3				
54451	1836·5 Hg ?	1	1836·3	1				
			1834·7	1	1835·1	3		
			1834·0	1				
54630	1830·5	1	1828·0	1	1830·5	3		

TABLE VII (continued).

Author.			Bloch.		Ainslie and Fuller.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Arc A.U.	I.
54747	1826·6 Hg ?	1	1825·5	1		
			1823·1	2		
54903	1821·4 Hg ?	1	1821·2	2		
			1818·5	1	1819·8	2
55142	1813·5	1	1812·6	2		
			1808·2	1		
			1804·4	2		
55602	1798·5	3	1800·4	1		
			1797·8	2		
			1791·6	1		
			1790·4	4		
			1789·0	1		
			1786·9	3		
			1782·6	3		
			1781·4	1		
			1780·0	1		
			1777·1	1		
56414	1772·6	1	1772·8	5		
			1769·8	1		
56574	1767·6	1	1768·2	1		
56928	1756·6 Hg ?	1	1756·3	1		
			1754·2	1		
			1751·5	2		
57192	1748·5	2	1748·0	1		
57491	1739·4	2	1739·0	1	1740·3	1
			1735·8	1		
57720	1732·5	1	1733·0	1		
			1730·2	1		
57937	1727·0	1	1726·3	1		
			1723·6	3		
			1720·1	1		
			1718·0	2		
58248	1716·8 C	8	1715·9	2		
58486	1709·8	3			1710·9	2
			1707·2	4		
			1702·8	2		
			1698·3	2		
58945	1696·5	2	1696·1	3		
			1693·5	1		
			1691·7	1		
59210	1688·9	2	1689·6	2		
			1686·9	2		
			1683·2	3		
			1679·8	1		
			1677·3	1		
			1674·2	1		
			1672·9	1		
			1670·7 H	1	1669·9	7
			1668·7	1		
			1666·7	2		
			1665·6	2		
			1661·4	2		

TABLE VII (continued).

Author.			Bloch.		Author.			Bloch.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Spark A.U.	I.
60368	1656·5 C ?	1						1557·4	1
60753	1646·0	1	1645·8	2				1555·2	1
			1642·4	2				1552·8	2
60924	1641·4	1	1641·0	1				1545·8	1
			1639·3	1	64784	1543·6	2	1544·2	1
			1636·5	2				1542·2	3
			1633·2	1				1540·8	1
61297	1631·4	2	1631·8	3				1539·2	1
			1628·2	2				1538·0	2
61482	1626·5	1	1625·9	1				1587·1	1
			1624·5	3				1535·4	2
			1622·7	2				1534·1	3
			1621·0	1				1532·4	1
			1618·8	2	65338	1530·5	1	1530·9	1
			1615·9	1				1529·5	1
61935	1614·6 C	1	1614·1	1				1528·5	2
			1612·2	3	65509	1526·5	1	1526·4	2
			1609·3	1				1525·6	2
			1606·7	2				1524·1	2
62364	1603·5 H	2	1603·9	1				1523·2	1
			1599·4	1	65707	1521·9	1	1521·7	2
			1596·8	2				1520·6	1
			1594·5	2	66033	1514·4	1	1513·2	2
62755	1593·5 O	8	1593·1	2				1511·6	1
62909	1589·6 N ?	1	1590·4	1				1507·7	1
			1588·0	1				1505·6	2
			1586·0	1				1504·5	1
			1583·2	3	66582	1501·9	2	1502·3	3
			1581·9	3				1500·8	2
			1581·1	1				1499·0	2
63267	1580·6	8	1579·8	3				1497·2	1
			1578·3	1				1495·2	1
			1576·8	3				1492·1	2
			1575·7	3				1490·4	1
			1574·2	2	67263	1486·7	1	1486·8	1
63573	1573·0	10	1572·4	2				1475·8	1
			1571·3	1				1472·8	1
			1570·2	1				1468·4	2
63816	1567·0	1	1567·4	1	68176	1466·8	1	1465·6	2
			1564·9	1				1462·6	2
			1563·2	1				1459·5	1
			1558·9	1				1455·6	1

TABLE VII (continued).

Author.			Author.			Author.		
Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.
69180	1445·5	1	109589	912·5	1	160979	621·2	1
70348	1421·5	1	111321	898·3 O ?	1	162075	617·0 O ?	2
72270	1383·7 C ?	1	113276	882·8	1	163747	610·7 O ?	4
72955	1370·7	1	115554	865·4	2	164582	607·6 O ?	4
73438	1361·7 C ?	2	117055	854·3	1	168237	594·4 C ?	1
73719	1356·5 C ?	1	120802	827·8	1	169233	590·9	1
74493	1342·4 O ?	1	121227	824·9	1	170300	587·2	1
75809	1319·1	1	122220	818·2 Si IV.?	1	192938	518·3 O ?	1
76283	1310·9	1	124906	800·6 C ?	1	196850	508·0 O ?	1
78691	1270·8	1	125565	796·4 O ?	2	205719	486·1	1
80574	1241·1 H ?	1	126630	789·7 O ?	3	212540	470·5	1
86858	1151·3	1	128816	776·3 N ?	1	243605	410·5	1
88113	1134·9 N ?	1	129651	771·3 N ?	1	251636	397·4	1
88684	1127·6	3	134282	744·7	1	258131	387·4	1
89445	1118·0	2	135575	737·6 H	1	266951	374·6 O ?	1
91374	1094·4	1	137174	729·0 H	1	26906	370·5	1
92242	1084·1 N ?	1	143575	696·6	1	271739	368·0	1
99661	1003·4	1	147167	679·5 H ?	1	275786	362·6	1
100888	991·2 N ?	1	153046	653·4	1	278474	359·1 O ?	1
103445	966·7	1	155255	644·1 O ?	3	280348	356·7	1
105219	950·4	1	158831	629·6 O ?	1	292398	342·0	1
106678	937·4	5						

TABLE VIII.—Arsenic.

Author.			Bloch.		Author.			Bloch.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Spark A.U.	I.
48204	2074·5	12						1850·6	2
48490	2062·3	1						1847·7	2
48567	2059·0	1						1844·3	3
48998	2040·9	3			54283	1842·2	1	1841·6	2
49227	2031·4	10			54496	1835·0	3		
49366	2025·7	1						1831·1	1
50018	1999·3	4			55494	1802·0	5	1805·6	5
50181	1992·8	3			55617	1798·0	1		
50976	1961·7	2						1789·2	2
51382	1946·2	1						1781·4	2
51862	1928·2	5			56233	1778·3 Al ?	5		
52430	1907·3	5			56351	1774·6	1		
53081	1883·9	2						1772·5	1
53353	1874·3	5						1758·2	3
53536	1867·9	1			57153	1749·7	3		
53720	1861·5 Al ?	2			57376	1742·9	20	1741·6	2
53920	1854·6 Al ?	5	1854·4	2				1739·4	2

TABLE VIII (continued).

Author.			Bloch.		Author.			Bloch.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Spark A.U.	I.
57703	1733·0	15	1732·8	1				1621·5	1
57810	1729·8 Bi ?	1	1728·8	1	61920	1615·0 C ?	1	1616·7	2
58160	1719·4	1						1614·8	1
58817	1700·2	10	1701·1	1	62050	1611·6	1	1612·3	2
59112	1691·7	1			62267	1606·0 Al ?	1	1608·7	1
59844	1671·0	5						1600·6	1
60147	1662·6 Hg ?	5			62743	1593·8 N	1	1593·4	2
60190	1661·4	5	1660·8	4				1588·3	1
			1644·0	1	63492	1575·0	1	1574·7	2
61020	1638·8	3						1571·7	1
61218	1633·5 H ?	3	1634·0	1				1565·0	1
			1630·9	1				1558·4	1
61584	1623·8	1							

Author.			Author.			Author.		
Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.
65660	1523·0	2	88113	1134·9 N	1	113199	883·4	3
66814	1496·7	1	89518	1117·1	1	113895	878·0	8
70751	1413·4	1	90375	1106·5	10	114456	873·7	8
71911	1390·6	1	91449	1093·5	20	116577	857·8 C ?	3
73540	1369·8	3	92464	1081·5	50	119104	839·6	1
74206	1347·6	1	93861	1065·4	1	120861	827·4	5
74543	1341·5	1	95247	1049·9	1	122579	815·8 Si ?	2
76570	1306·0 Sb ?	20	97097	1029·9	1	123716	808·3	3
77000	1298·7	1	99098	1009·1	10	124657	802·2 O	3
77682	1287·3	10	99820	1001·8	10	128766	776·6 N	3
78889	1267·6	40	101564	984·6	10	131510	760·4 O	3
79145	1263·5 Al ?	40	102062	979·8	2	133887	746·9 N	3
79491	1258·0	2	102575	974·9	2	134862	741·5	2
80463	1242·8 N	25	103082	970·1	2	139276	718·0 O	2
81413	1228·3 S.O.?	1	103810	963·3	10	143349	697·6	1
81793	1228·6	3	104145	960·2 C ?	5	144467	692·2	1
82727	1208·8	30	104603	956·0	8	146585	682·2	1
83577	1196·5 O ?	2	104954	952·8	8	153775	650·3	1
84660	1181·2	2	105374	949·0	1	160051	624·8 O	2
85368	1171·4	15	106236	941·3	3	162920	613·8	3
87055	1148·7 O	5	107910	926·7	8	184638	541·6 O ?	1
87466	1143·3	1	109051	917·0 N	8	188964	529·2	1
87789	1139·1 O ?	1	109517	913·1	1			

TABLE IX.—Molybdenum.

Author.			McLennan and Lewis.		Author.			McLennan and Lewis.	
Wave No.	Spark A.U.	I	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Spark A.U.	I.
50078	1996·9	1						1810·6	
50363	1985·6	1			55252	1809·9	20	1809·7	
50787	1969·0	1			55872	1789·8	1	1789·0	
51258	1950·9	1			55960	1787·0	1		
51477	1942·6	1			56060	1783·8	1		
51824	1929·6 S.O.?	1			56287	1776·6	2		
52157	1917·3	1			56402	1773·0 S.O.?	2	1774·6	
52715	1897·0	1			56529	1769·0 Al	2	1767·0	
52868	1891·5	1						1763·9	
52975	1887·7	1			56902	1757·4	2	1759·7	
53112	1882·8	1						1754·4	
53801	1858·7	1						1749·3	
			1854·0					1746·7	
			1851·9		57382	1742·7 As ?	2	1742·2	
			1843·2		57600	1736·1	2	1737·3	
54321	1840·9	1						1731·9	
54582	1832·1 Hg ?	1	1831·3		58391	1712·6	1	1712·4	
54690	1828·5	1						1672·4	
54936	1820·3 Hg ?	1	1820·8		60165	1662·1	1		
			1818·6		60456	1654·1 H	2	1655·6	
			1813·6					1652·7	

Author.			Author.			Author.		
Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.
60787	1645·1	2	91358	1094·6 S.O.?	3	144592	691·6	8
61584	1623·8	3	103114	969·8	1	147124	679·7	2
62668	1595·7 H	1	103616	965·1	1	148965	671·3 N	10
62854	1591·0 N	1	104330	958·5	3	149813	667·5 H?Ca?	10
63004	1587·2	1	105597	947·0	1	150534	664·3	2
65694	1522·2	1	107735	928·2	2	151860	658·5 O	10
65941	1516·5	1	111297	898·5 O	1	156715	638·1	1
66199	1510·6	1	111857	894·0	3	159719	626·1 O	1
68032	1469·9	1	112867	886·0	3	175901	568·5 O ?	1
68362	1462·8	2	113314	882·5	3	180634	553·6	1
70522	1418·0 S.O.?	1	113999	877·2	1	182582	547·7	10
72993	1370·0	1	114286	875·0	1	184945	540·7 O	10
73502	1360·5	2	117440	851·5	1	190913	523·8	1
75855	1318·3	3	121773	821·2 S.O.?	1	199322	501·7	1
76959	1299·4	1	124704	801·9	2	201329	496·7	1
77767	1285·9	2	126678	789·4	2	204625	488·7	1
78604	1273·7	2	127992	781·3	1	224467	445·5	1
78511	1272·2	3	131579	760·0 O	1	232019	431·0 O ?	1
78952	1266·6	2	135007	740·7	1	235516	426·6	1
82535	1211·6	1	139431	717·2 O ?	1	243250	411·1	1
83347	1199·8 N	1	141143	708·5	2	260892	383·3	1
86252	1159·4	1	142227	703·1 O? C?	1	265182	377·1	1
87146	1147·5 O	1	143575	696·5	10	267738	373·5 O	1
88826	1125·8	1						

TABLE X.—Cadmium.

Author.			McLennan, Young and Ireton.		Bloch.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Spark A.U.	I.
49179	2033·4	2				
49346	2026·5	1				
50123	1995·1	1			1994·78	3
50444	1982·4	1				
					1976·85	2
50872	1965·7	2			1965·44	1
					1956·81	1
51440	1944·0	1			1943·85	1
					1942·61	1
51554	1939·7	1			1938·01	2
51661	1935·7	1				
					1921·55	2
					1919·30	1
					1914·50	1
					1900·70	6
					1898·28	1
					1896·64	1
					1887·78	1
					1884·08	2
53370	1873·8	15			1873·37	6
					1867·73	1
					1865·34	1
53879	1856·0	15			1856·10	6
					1855·32	6
54233	1843·9	10	1844·6	10	1844·9	
54696	1828·3	2				
54834	1823·7	1				
			1808·4	1		
55432	1804·0	1				
			1793·2	5	1793·2	
			1789·1	4	1789·0	
			1781·0	2		
56398	1773·1	8	1773·2	4	1773·1	
56536	1768·8	8	1769·0	4	1768·8	
56951	1755·9	1				
57212	1747·9	5	1747·9	10	1747·7	
57587	1736·5	1				
58079	1721·8 C ?	5	1721·8	5	1721·7	
58545	1708·1	10	1707·1	8	1707·2	
58976	1695·6	3				
59242	1688·0 C ?	1				
59506	1680·5	2				
59609	1677·6	2	1678·3	1	1678·7	
60379	1656·2 C ?	2	1655·7	1	1656·1	
60522	1652·3	2	1651·8	1	1652·3	
60669	1648·3	1				
60838	1643·7 H ?	1				
60983	1639·8	2				
61384	1629·1	10	1628·6	1	1628·5	
61538	1625·0 Pb ?	1				
61641	1622·3	1				
			1605·8	1	1606·7	
62399	1602·6 H ?	20	1601·5	2	1601·5	
62762	1593·3	5				
63187	1582·6	2				
63710	1569·6	4	1568·3	1		

TABLE X (continued).

Author.			Author.			Author.		
Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.
64226	1557·0	3	84998	1176·5 C ?	1	172891	578·4	1
65612	1524·1 H ?	5	88285	1132·7 S.O.?	1	175285	570·5	1
66028	1514·5	20	90025	1101·8	1	176429	566·8	1
66525	1503·2 H ?	3	94706	1055·9	1	177620	563·0	1
66800	1497·0	2	97924	1021·2 H ?	1	178699	559·6	1
67417	1483·3	2	98213	1018·2	1	180930	552·7	1
67586	1479·6 H ?	5	101112	989·0 S.O.?	1	182893	546·5	1
67912	1472·5	8	109937	981·0	1	184638	541·6	1
68190	1466·5	8	105075	951·7	2	188501	530·5 C ?	1
69789	1432·9	5	106202	941·6	2	190985	523·6	1
69950	1429·6	5	112486	889·0	5	192678	519·0	1
70373	1421·0 S.O.?	20	113520	880·9	1	198610	503·5	1
70587	1461·7	20	115633	864·8	2	200682	498·3	1
70892	1410·6	2	118092	846·8	10	202061	494·9	1
71857	1396·9	20	119303	838·2 S.O.?	15	203087	492·4	1
72627	1376·9	5	125266	798·3 S.O.?	2	208073	480·6	1
73014	1369·6	20	126566	790·1 O ?	2	216269	462·6	1
74300	1345·9	2	128254	779·7 O ?	3	222519	449·4	1
75455	1325·3	3	130293	767·5	1	228102	438·4	1
75683	1321·3	2	140076	713·9	1	234962	425·6	1
76994	1298·8	2	140706	710·7	2	238436	419·4	1
77304	1293·6	1	143410	697·3	1	241371	414·3	1
77797	1285·4	1	154488	647·3	1	245881	406·7	1
78040	1281·4	1	155376	643·6 O ?	1	248077	403·1	1
78351	1276·3	1	156297	639·4	1	250376	399·4	1
79039	1265·2 Al ?	1	157307	635·7	1	251762	397·2	1
80064	1249·0 S.O.?	1	158353	631·5	1	255885	390·8	1
80431	1242·3	1	160256	624·0	1	261506	382·4	1
81129	1232·6	1	166334	601·2	1	270856	369·2	1
81786	1222·7	1	167364	597·5 O ?	1			
82775	1208·1	1	169348	590·5	1			

TABLE XI—Tin.

Author.			Bloch.		McLennan, Young and Ireton.		Ainslie and Fuller.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Spark A.U.	I.	Arc A.U.	I.
49032	2039·5	50					2041·2	2
49145	2034·8	5						
50003	1999·9	2						
50383	1984·8	1						
50490	1980·6	2						
50531	1979·0	4						
50723	1971·5	1						
51512	1941·3	2					1941·0	1
52285	1912·6 S.O.?	15						
52593	1901·4	10			1899·8	10	1899·8	20
52846	1892·3	1						
52946	1888·7	2						
53050	1885·0	1						
53447	1871·0	3						
53536	1867·9	1						
54540	1833·5	3						
54621	1830·8	3	1830·3	5	1831·1	3	1831·4	6
54759	1826·2	2						
54885	1822·0	8						
55215	1811·1	40	1810·1	6	1811·0	8	1811·2	20
55506	1801·6	2						
56136	1781·4	2						
56243	1778·0	5						
56705	1763·5	1						
56876	1758·2 S.O.?	10	1757·0	5	1757·3	5	1756·6	16
57169	1749·2	2						
							1741·3	1
57521	1738·5 Hg	1						
57834	1729·1 Bi ?	1						
57971	1725·0	8						
58685	1704·0	2						
58803	1700·6	3	1699·0	3	1699·2	1	1699·5	10
58962	1696·0 S.O.?	6						
			1665·3	1				
			1656·9	1				
61414	1628·3	1						
61633	1622·5	1						
61958	1614·0 S.O.?	5						
63508	1574·6 H	2	1574·6	2				
63686	1570·2 H	20	1570·6	3				
65164	1534·6	3						
65424	1528·5	1						
65716	1521·7	3						
66644	1500·5 H	1						
66832	1496·3 N ?	3						
			1489·6	3			1489·2	6
67764	1475·7	40	1475·6	4	1475·2	1	1475·2	15
68913	1450·1 H ?	30						
69551	1437·8	60	1437·9	2			1437·3	4
70462	1419·2	2						
70882	1410·8	40						
							1402·4	4
			1401·1	2			1400·5	4

TABLE XI (continued).

Author.			Author.			Author.		
Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.
72098	1387·0	40	94554	1057·6	10	139567	716·5	1
72987	1370·1	40	94967	1053·0	5	148810	672·0 N	1
73519	1360·2	3	95822	1043·6	50	149566	668·6 Ca ?	1
73790	1355·2	2	98107	1019·3	50	156079	640·7 C ?	1
74234	1347·1	50	101338	986·8	3	160256	624·0	1
75358	1327·0	50	103231	968·7	1	161525	619·1	5
77256	1294·4	15	103928	962·2	2	162707	614·6	2
78351	1276·3 Hg ?	1	104624	955·8	30	165180	605·4	3
78623	1271·9	1	109926	909·7	10	185736	538·4 O	2
79101	1264·2 Al ?	3	110254	907·0	10	192456	519·6	1
79416	1259·2 H ?	20	110828	902·3	50	197746	507·5	8
79917	1251·3	60	111520	896·7	1	199203	502·0	8
80451	1243·0 N	20	112082	892·2	10	226244	442·0	1
81255	1230·7 S.O.?	10	112575	888·3	3	231321	432·3	1
81726	1223·6	10	113830	878·5	1	236183	423·4	1
82651	1209·8 S.O.?	40	115527	865·6	1	240500	415·8	1
84055	1189·7 N	40	119474	837·0	8	244200	409·5	5
86341	1158·2	60	120875	827·3	8	247525	404·0 C? Ca?	1
86655	1154·0	2	124782	801·4 O	3	249066	401·5	1
86934	1150·3	2	127535	784·1	10	255428	391·5	2
88316	1132·3	40	129032	775·0 N	10	259336	385·6 C ?	2
91844	1088·8	15	131666	759·5	8	267881	373·3 C ?	2
92047	1086·4	15	132979	752·0	10	276625	361·5 C ?	2
94180	1061·8	10	136893	730·5	1	281136	355·7 O	2

TABLE XII.—Antimony.

Author.			Young and Ireton.			Takamine and Nitta.		Bloch.
Wave No.	Spark A.U.	I.	Arc A.U.	Spark A.U.	I.	Arc A.U.	Spark A.U.	Spark A.U.
47939	2086·0	4						
48368	2067·5	4						
48707	2053·1	4						
49327	2027·3	3						
49687	2012·6	1						
50579	1977·1	2						
50834	1967·2	1						
			1931·0	1930·8	2	1931·1	1931·1	1930·83
			1926·6	1926·6	5	1926·6	1926·6	1926·61
				1922·6	4		1922·6	1922·68
52176	1916·6	1						
52460	1906·2	1						
52651	1899·3	1	1899·2		3	1899·7	1899·7	
52918	1889·7	1	1890·5	1891·0	3	1891·3	1891·3	
53158	1881·2	1	1882·1	1882·5	2		1882·6	
				1878·1	2		1878·4	1877·91
			1870·7	1870·8	10	1870·4	1870·4	1870·58
			1867·8		8	1867·3	1867·3	

TABLE XII (continued).

Author.			Young and Ireton.		
Wave No.	Spark A.U.	I.	Arc A.U.	Spark A.U.	I.
53882	1855·9	1			
53987	1852·3	1			
54186	1845·5	1			
54360	1839·6	1			
54627	1830·6	1	1829·4		5
55099	1814·9	1	1814·2	1814·3	2
55258	1809·7	5	1810·2	1810·1	2
55651	1796·9	2	1799·9	1800·0	2
			1788·0	1788·1	1
56073	1783·4	20			
			1780·6	1780·5	2
56712	1763·3	1	1762·6	1762·3	10
57215	1747·8	5			
57372	1743·0 As ?	1			
57521	1738·5 Hg?	1			
57747	1731·7	2		1730·7	7
57984	1724·6	5		1725·3	7
				1717·1	2
58387	1712·7	3		1712·0	9
			1702·3		
58817	1700·2 H ?	1	1699·0		4
				1678·1	2
59701	1675·0	2		1674·2	7
59945	1668·2 H ?	2		1667·2	3
60147	1662·6 Hg ?	2			
60430	1654·8 As ?	1			
60931	1641·2	5	1640·8		3
61140	1635·6 H ?	1		1635·0	2
61275	1632·0	1	1631·5		2
			1613·9		1
62201	1607·7 H ?	1	1607·5	1607·7	1
62574	1598·1	5	1600·6	1601·0	8
63068	1585·6	8	1585·2	1585·4	8
63351	1578·5 S.O.?	1			
			1574·9		
63837	1566·5	8	1566·1	1566·3	8
64358	1553·8 H ?	5	1554·6	1554·7	2
64893	1541·0	3	1540·7	1540·7	2
			1535·8		2
			1533·5		4
65574	1525·0	1			
66002	1515·1	20	1514·1	1514·1	4
66366	1506·8 S.O.?	20		1506·4	3
			1504·9	1504·8	2
			1495·6		4
67002	1492·5 N	1	1493·3		4
67866	1473·5	1			
68032	1469·9	1			
68217	1465·9	1			
68371	1462·6	1			
69147	1445·2 S.O.?	1			
69531	1438·2	30	1438·7		4
			1437·0		1

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY A MATHEMATICAL, PHYSICAL & ENGINEERING SCIENCES

TABLE XII (continued).

Author.			Author.			Author.		
Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.
69915	1430·3	1	91996	1087·0	8	142308	702·7 O	1
70240	1423·7	1	92345	1082·9	8	143184	698·4	2
70977	1408·9	1	94643	1056·6	1	144718	691·0	2
71818	1392·4	1	95039	1052·2	1	146327	683·4 C ?	1
72031	1388·3	4	95420	1048·0	10	147059	680·0 C ?	1
72213	1384·8	4	95997	1041·7	10	147732	676·9	1
72495	1379·4 N	2	96862	1032·4	2	148412	673·8 O	1
73438	1361·7 C ?	1	97513	1025·5 H ?	2	151378	660·6 N	1
73621	1358·3	1	98184	1018·5	1	152323	656·5 O	1
74388	1344·3 O	1	98844	1011·7	10	155304	643·9 O	1
75284	1328·3	1	100695	993·1	2	156128	640·5	1
75901	1317·5	2	101307	987·1	2	158705	630·1 O	1
76523	1306·8	30	101947	980·9	10	159642	626·4 O ?	1
77160	1296·0	1	102407	975·5	10	160591	622·7	1
77537	1289·7	2	102944	971·4 H ?	1	163532	611·5	1
77733	1285·8	1	103445	966·7	1	166168	601·8	1
79026	1265·4	1	1052·8	950·5 As ?	2	174825	572·0	1
80373	1244·2	1	105887	944·4	1	177683	562·8 O	1
81255	1230·7 O	1	109385	914·2	1	180310	554·6 O	1
81559	1225·1	30	111483	897·0	1	182582	547·7	1
82014	1219·3	2	116144	861·0	6	185391	539·4O	1
82576	1211·0	10	116945	855·1	1	188147	531·5	1
82974	1205·2	10	122684	815·1 Si ?	1	191314	522·7	1
83403	1199·0 N	10	123609	809·0 C ?	1	193424	517·0 O ?	1
83808	1193·2	10	124270	804·7	5	195542	511·4	1
85361	1171·5	10	125455	797·1 O	1	201532	496·2	1
85638	1167·7	10	126807	788·6	1	209074	478·3	1
86044	1162·2	10	129651	771·3 N	1	215889	463·2	1
86813	1151·9 O	10	130822	764·4 O? N?	4	219298	456·0	1
87222	1146·5	8	136612	732·0 H ?	3			
91366	1094·5 S.O.?	1	138313	723·0	3			

TABLE XIII.—Tellurium.

Author.			McLennan and Lewis.		Author.			McLennan and Lewis.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Spark A.U.	I.
48790	2049·6	1			56783	1761·1 Hg ?	2	1761·0	1
48759	2050·9	1			57003	1754·3	1		
50010	1999·6	5			57172	1749·1 S.O.?	5	1750·3	1
50234	1990·7	4						1748·3	1
50391	1984·5	5			57333	1744·2	1	1744·8	5
51093	1957·2	2			57465	1740·2	1	1742·3	5
51195	1953·3	2			57677	1733·8	1		
52043	1921·5	1			57737	1732·0	1	1732·7	1
52233	1914·5	1			57914	1726·7	5	1728·4	1
52615	1900·6	1			58153	1719·6	1	1721·9	1
53353	1874·3	2			58309	1715·0	3	1717·1	1
			1851·4	3				1712·3	2
54115	1847·9 H ?	1	1848·7	3				1707·4	2
			1843·7	5				1699·3	1
54321	1840·9 S.O.?	2						1688·1	1
54422	1837·5	1						1682·5	1
54573	1832·4 Hg	1			59556	1679·1 N	20	1677·7	1
54780	1825·5	10	1826·7	1				1675·0	1
54954	1819·7 Hg ?	10	1820·6	5				1670·8	1
55115	1814·4	1			60190	1661·4	1	1662·5	1
55528	1800·9	3			60332	1657·5 C	1	1656·8	1
55682	1795·9	1	1794·9	2	60500	1652·9	1		
55878	1789·6	5	1788·8	1	60814	1644·4 H ?	1	1644·7	1
			1776·2	1	61080	1637·2	2	1638·5	1
56392	1773·3	5			61244	1632·8	1	1634·4	1
			1771·6	1					

Author.			Author.			Author.		
Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.
62759	1593·4 N	1	77453	1291·1	10	89566	1116·5	10
63068	1585·6	1	78784	1269·3	8	90375	1106·5	10
63980	1563·0	1	79618	1256·0	1	91802	1089·3	8
64956	1539·5	2	79834	1252·6	1	92439	1081·8	8
65552	1525·5	3	80250	1246·1	1	93967	1064·2	10
66208	1510·4 S.O.?	5	81753	1223·2	15	95721	1044·7	2
68456	1460·8	15	82048	1218·8	15	97371	1027·0	2
68752	1454·5	1	82474	1215·5	15	97771	1022·8	5
69094	1447·3	8	84168	1188·1	5	98668	1013·5	2
70852	1411·4	5	85179	1174·0	15	99305	1007·0	10
71695	1394·8	4	85682	1167·1	20	99651	1003·5	10
73621	1358·3	1	86964	1149·9	10	100847	991·6 N	5
74377	1344·5	15	87413	1144·0	5	101266	987·5	5
75256	1328·8	1	87850	1138·3 O	1	101719	983·1	5
77094	1297·1	10	89047	1123·0	15	103008	970·8	8

TABLE XIII (continued).

Author.			Author.			Author.		
Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.
103627	965·0	5	113077	812·5	10	154416	647·6	2
104167	960·0	1	126534	790·3	2	155763	642·0 C ?	2
104888	953·4	6	128866	776·0 N	2	157729	634·0	2
105541	947·5	1	130429	766·7	2	161031	621·0	1
106157	942·0	6	131874	758·3	2	162999	613·5	1
107411	931·0	8	132485	754·8	2	165344	604·8	1
107805	927·6	8	133636	748·3	3	167112	598·4 O	1
108696	920·0 H ?	1	135062	740·4	1	175963	568·3 O	1
110926	901·5	5	135685	737·0	1	179404	557·4	1
112032	892·6	4	136277	733·8	1	180115	555·2	1
114364	874·4	3	140351	712·5	1	188786	529·7	1
116795	856·2	4	143164	698·5	1	193648	516·4 O	1
117426	851·6	2	152999	653·6	2	196464	509·0	1

TABLE XIV.—Cerium.

Author.			Author.			Author.		
Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.
48308	2070·0	1	64973	1539·1	1	119246	838·6	2
48459	2063·5	1	65206	1533·6	1	120424	830·4	20
48569	2058·9	1	67979	1493·0 N	3	123092	812·4	1
48735	2051·9	1	68264	1464·9	1	126342	791·5	1
49120	2035·8	1	72854	1372·6	20	135007	740·7	5
50095	1996·2	1	74554	1341·3 H? O?	1	147841	676·4	1
50085	1996·6	1	75086	1331·8	20	149321	669·7	1
50309	1987·7	1	76214	1312·1	1	155473	643·2 O	1
50658	1974·0	1	77291	1293·8	1	158378	631·4	1
50792	1968·8	1	80893	1236·2	1	159337	627·6	1
50916	1964·0	1	81466	1227·5	1	160798	621·9	1
51896	1926·9	1	86475	1156·4	1	164204	609·0 C ?	1
51975	1924·0	1	87176	1147·1 O	1	167140	598·3 O	1
52232	1914·5	1	88652	1128·0 O	5	172562	579·5	1
52590	1901·5	1	91878	1088·4	5	183688	544·4 C ?	1
52734	1896·3	1	92541	1080·6	5	189286	528·3	1
53481	1869·8 Hg ?	1	94144	1062·2 H	10	192456	519·6	1
54597	1831·6	1	95502	1047·1	2	193311	517·3 O	1
55586	1799·0 Hg ?	1	95997	1041·7	3	194780	513·4	1
57237	1747·1	1	97656	1024·0	2	204248	489·6	1
58139	1720·0	2	98415	1016·1	2	206441	484·4 O	1
58719	1703·0	1	103691	964·4	1	209556	477·2	1
58969	1695·8	1	107863	927·1	1	210482	475·1	1
61489	1626·3	1	109182	915·9 N	1	222222	450·0	1
61629	1622·6	1	109781	910·9	1	223464	447·5	1
61831	1617·3	1	113340	882·3	1	224972	444·5	1
62266	1606·0 Al	1	116009	862·0	2	227480	439·6	1
62948	1588·6	1	117343	852·2	2	230256	434·3 O	1
63247	1581·1	1	117564	850·6	2	250815	398·7	1
63467	1575·6	1	118189	846·1	2			

TABLE XV.—Platinum.

Author.			Bloch.		Takamine and Nitta.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Spark A.U.	I.
49632	2014·8	2				
49818	2007·3	2				
49972	2001·1	2				
					1999·2	2
					1996·9	2
					1995·2	3
50198	1992·1	3			1991·7	1
					1991·0	1
					1989·8	5
					1988·7	1
					1987·5	5
50357	1985·8	1			1984·2	1
					1983·2	5
					1979·3	4
50545	1978·4	2			1978·5	2
					1976·5	1
					1971·5	4
					1970·0	1
50774	1969·5	1			1969·5	2
					1968·9	3
50947	1964·4	2			1965·3	2
					1963·0	1
					1962·0	1
					1961·3	1
					1958·3	3
					1954·6	4
					1952·7	2
					1951·4	2
					1949·5	4
					1948·3	2
					1946·2	2
					1943·8	5
					1941·3	3
					1939·2	6
51618	1937·3	2			1937·1	4
					1934·0	2
					1933·7	2
					1933·0	2
					1931·8	1
					1931·5	1
					1930·3	2
					1929·3	4
					1928·5	4
					1927·7	4
51918	1926·1 H	2			1926·3	1
					1925·5	3
					1919·7	1
52115	1918·8	1			1918·1	2

TABLE XV (continued).

Author.			Bloch.		Takamine and Nitta.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Spark A.U.	I.
					1917·5	2
52224	1914·8	1			1914·5	1
					1913·5	1
					1912·1	2
52314	1911·5	1			1911·2	5
					1908·7	2
					1903·9	3
52562	1902·5	1			1903·2	1
					1901·6	2
52656	1899·1 S.O.?	1			1898·7	1
					1898·0	1
					1897·0	2
52750	1895·7	1			1895·8	4
					1894·6	3
					1893·9	3
52868	1891·5	2			1891·0	1
					1889·2	6
53081	1883·9	3			1882·4	3
53217	1879·3	1			1878·6	3
53310	1875·8 Hg	1				
53418	1872·0	2			1872·5	1
					1871·5	1
					1871·0	1
					1870·6	2
					1869·7	1
					1866·5	5
					1865·4	1
					1862·3	1
					1860·2	1
53864	1856·5	1			1856·8	1
					1855·5	1
					1851·7	1
					1845·5	1
					1844·6	1
54285	1842·1	1	1843·0	1	1842·0	1
54374	1839·1	1			1839·5	1
			1838·5	2	1837·6	1

TABLE XV (continued).

Author.			Bloch.		Author.			Bloch.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Spark A.U.	I.
54504	1834·7	1	1834·7	2				1676·2	
			1833·0	1				1673·9	1
54596	1831·6 Hg	1						1669·8	3
			1824·8	2	59970	1667·5	2	1666·2	3
54884	1822·0 Hg	1	1820·2	2				1664·7	2
55026	1817·3	1	1817·8	2				1662·5	1
			1815·1	2				1660·1	1
			1811·8	1				1659·1	1
			1807·7	1	60313	1658·0 C	2	1657·6	2
55447	1803·5	1	1805·6	1				1655·8	3
			1801·5	1				1654·3	1
			1792·8	3				1652·5	1
55940	1787·6	2	1785·5	3				1650·6	1
56097	1782·6	2	1782·7	2				1648·2	2
56211	1779·0	1	1780·5	3				1646·2	1
			1777·9	1				1644·4	2
			1776·1	4				1642·0	2
56328	1775·3	1	1774·8	1				1639·5	1
			1770·1	2				1637·3	1
			1768·5	1				1634·6	1
			1765·6	1				1631·1	1
			1762·9	2				1629·5	1
56763	1761·7	2	1760·0	2				1627·4	1
			1757·9	1	61527	1625·3 S.O.?	2	1626·0	2
			1755·8	1				1624·2	3
			1753·8	2				1621·8	3
			1751·2	1				1618·2	1
			1747·4	1				1617·0	1
57405	1742·0 As ?	2	1740·9	4	61908	1615·3	1	1615·1	1
57603	1736·0	1	1736·8	2				1613·7	1
			1735·1	2				1610·9	2
57763	1731·2	3	1731·3	1				1608·6	2
			1730·0	1	62254	1606·3 Al	1	1605·9	3
			1728·7	1	62414	1602·2	1	1602·8	1
			1726·0	2				1601·8	1
58004	1724·0	1	1724·4	1				1600·4	1
			1722·9	2	62593	1597·6	3	1596·6	4
			1721·6	2				1593·5	1
58153	1719·6	2	1719·7	2				1591·6	1
			1718·2	1	62972	1588·0	1	1588·8	1
58271	1716·1 C ?	2	1716·8	2				1587·2	2
			1714·0	1				1584·7	1
			1712·7	1	63203	1582·2	2	1582·3	2
58473	1710·1 H	1	1711·1	1				1580·6	2
			1708·9	2				1579·1	2
58596	1706·6	1	1705·8	2				1577·6	1
58699	1703·6	1	1704·8	2	63467	1575·6	1	1574·8	1
58816	1700·2	1	1699·6	1				1573·0	1
58951	1696·3	2	1696·6	2	63661	1570·8	1	1571·0	1
59077	1692·7	1	1694·2	1				1568·9	1
			1690·3					1567·0	1
			1686·9	2	63857	1566·0	1	1565·3	1
			1684·4	2				1563·9	1
59506	1680·5	3	1679·8					1560·5	1

TABLE XV (continued).

Author.			Bloch.		Author.			Bloch.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Spark A.U.	I.
64254	1556·3	1	1558·8	1				1509·9	3
			1553·1	1				1507·5	1
			1550·8	1				1505·5	1
			1549·6	1				1502·6	1
			1548·3	1				1498·4	1
			1545·6	3				1496·2	2
			1543·9	1	66880	1495·2 N	2	1494·8	2
64952	1539·6	2	1538·7	3				1492·8	3
65095	1536·2	1	1536·9	1				1491·5	1
			1534·6	1				1487·3	1
			1532·5	1	67303	1485·8 ?	3	1484·2	3
			1529·7	1				1482·4	1
65440	1528·1 S.O.?	2	1527·1	3	67558	1480·2	1	1478·6	1
65612	1524·1	1	1524·8	1	67874	1473·3	4	1474·5	2
			1523·2	2				1472·1	3
			1521·8	1				1468·7	1
			1520·5	1	68198	1466·3 C ?	4	1466·5	2
			1516·9	1				1464·6	2
			1515·9	1				1463·1	1
			1513·5	1	68418	1461·6	4	1461·0	3
66150	1511·7	2	1512·5	1					

Author.			Author.			Author.		
Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.
72030	1388·3	1	99462	1005·4	1	151883	658·4 O	1
72296	1383·2	2	99820	1001·8	1	155714	642·2 C ?	1
72579	1377·8	3	100553	994·5	2	158553	630·7 O	1
72944	1370·9	1	102891	971·9	1	160900	621·5	1
73716	1358·4	1	104004	961·5 C ?	2	163585	611·3	2
74046	1350·5	1	104976	952·6	1	170503	586·5 C ?	1
74426	1343·6 O	1	106906	935·4	3	171673	582·5	1
74610	1340·3	1	107503	930·2	3	175013	571·1	1
77718	1286·7	5	109301	914·9 N	1	182615	547·6	1
80645	1240·0	1	111607	896·0	2	190548	524·8	1
80806	1236·6	1	112045	892·5	2	198412	504·0	1
81175	1231·9	2	112536	888·6	2	202183	494·6 C ?	1
81599	1225·5	5	113778	878·9	2	203873	490·5	1
82007	1219·4	2	114311	874·8	2	206398	484·5 O	1
82433	1213·1	3	115634	864·8	2	208550	479·5	1
83438	1198·5	3	120772	828·0	2	210703	474·6	1
84203	1187·6	2	124223	805·0	3	219298	456·0	1
86790	1152·2 O	1	126582	790·0 O	2	220074	454·4	1
87336	1145·0	1	127942	781·6 S.O.?	2	220994	452·5	1
87665	1140·7	1	130446	766·6	2	234356	426·8	1
89429	1118·2	3	139159	718·6 O	3	236798	422·3	1
90579	1104·0	1	140154	713·5	3	239234	418·0	1
91987	1087·1	1	142251	701·7	3	246244	406·1	1
92584	1080·1	2	143657	696·1	3	249625	400·6 C ?	1
94741	1055·5	3	146134	684·3 N ?	1	256147	390·4	1
97049	1030·4 O ?	2	148500	673·4 O	2			

TABLE XVI.—Gold.

Author.			Bloch.		Takamine and Nitta.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Spark A.U.	I.
49035	2039·4	2				
49864	2005·0	1				
49951	2001·6 Cu ?	1			2000·2	8
50090	1996·4	1			1996·0	2
					1991·8	8
50301	1988·0 Cu ?	2			1989·2	4
					1984·5	1
50566	1977·6	2			1977·5	8
50712	1971·9	1			1972·7	2
					1957·5	1
					1955·7	1
					1954·5	1
51258	1950·9	1			1951·8	3
					1948·0	1
51405	1945·3	1			1946·0	1
					1944·1	1
					1938·8	1
51639	1936·5	1			1937·5	2
					1935·0	2
					1934·0	1
					1931·5	2
					1930·6	1
					1929·1	1
					1924·5	5
52069	1920·6	1			1920·7	6
					1918·8	6
52211	1915·3	1				
52298	1912·1	1				
52513	1904·3	1			1904·1	3
52689	1897·9	1				
52801	1893·9	1				
52884	1890·9	2			1890·2	4
					1886·0	4
					1884·6	1
					1880·3	1
					1879·2	4
					1871·3	2
53604	1865·5	1				
53734	1861·0	1			1861·8	4
					1858·4	2
					1857·0	1
					1852·0	1
			1850·4	2	1850·9	1
54112	1848·0	2			1849·6	2
54229	1844·0	1	1844·5	2	1844·0	1
			1836·3	1		
			1830·5	2		
			1822·5	3		
			1810·4	1		
			1805·9	2		

TABLE XVI (continued).

Author.			Bloch.		Author.			Bloch.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Spark A.U.	I.
55475	1802·6 Cu	1						1574·7	2
			1800·8	4				1571·9	1
55737	1794·1	1	1794·0	4				1569·8	1
55969	1786·7 Cu	1	1786·7	1				1567·4	1
			1783·6	3				1566·2	1
56141	1781·2	1			64000	1562·5	5	1562·2	3
56331	1775·7 Cu	1	1775·7	4	64263	1556·1	1	1556·4	2
56593	1767·0	8	1767·8	1				1554·7	2
			1762·0	2				1552·8	1
			1756·5	3				1550·8	1
57126	1750·5	1	1749·6	2				1548·2	1
57283	1745·7 Cu ?	1	1745·7	2				1543·3	1
57438	1741·0 Cu	1	1740·2	3				1542·1	1
57770	1731·0 Cu	2						1540·3	1
57903	1727·0 Cu ?	1	1726·8	2				1538·4	1
			1725·8	2	65078	1536·6	1	1536·8	2
			1720·5	1	65201	1533·7	1	1533·9	3
58207	1718·0 Cu	1	1717·2	2				1531·9	1
			1715·8	1				1529·7	1
58435	1711·3 Cu	2	1710·1	2				1526·0	1
			1707·0	1	65724	1521·5	1	1521·2	2
58837	1699·6 Cu	2	1700·5	3	65858	1518·4	1	1518·9	2
			1698·8	3	66102	1512·6	1	1513·2	2
59101	1692·0 Cu ?	2	1693·9	6				1511·0	2
			1684·7	1				1509·2	2
			1676·8	1	66396	1506·1	1	1504·3	1
59740	1673·9 S.O.?	2	1673·6	6	66577	1502·0	2	1503·0	1
			1667·8	1	66622	1501·0	2	1500·8	3
			1665·3	3				1497·0	1
			1657·5	2	67181	1488·5	5	1488·1	3
			1653·0	3	67792	1475·1 Sn	1		
			1646·5	1	67980	1471·0 S.O.?	2	1470·6	1
60819	1644·2 H ?	1	1644·3	1	68422	1461·5	2		
60960	1640·4	1	1638·9	3				1459·3	1
61124	1636·0 H ?	1	1636·6	1	68714	1455·3	1	1454·5	1
			1633·5	1				1452·4	1
			1629·2	3	68932	1450·7H?Sn?	3	1450·0	2
			1624·4	1				1447·7	1
61640	1622·3 S.O.?	5	1622·0	4				1445·5	1
61814	1618·0	1	1617·2	2				1442·2	1
61973	1613·6 C ?	1	1613·5	2	69468	1439·5 S.O.?	2	1440·5	2
			1611·9	3				1438·7	2
			1607·4	1				1437·1	2
62492	1600·2 C ?	2	1600·3	3	69657	1435·6 S.O.?	3	1435·0	3
			1598·7	1	69808	1432·5 C	1	1432·1	2
			1595·8	1	69959	1429·4	3	1429·8	2
			1593·4	2				1427·6	2
			1592·7	2				1425·8	1
			1589·5	3	70576	1416·9	1	1416·1	1
			1587·3	1	70721	1414·0	2	1413·9	1
63103	1584·7	1	1584·7	1	70937	1409·7	1	1411·9	1
			1582·1	1	71209	1404·3	3	1404·1	1
			1579·4	1				1401·8	2
63419	1576·8	1	1576·9	1					

TABLE XVI (continued).

Author.			Author.			Author.		
Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.
71890	1391·0	1	101884	981·5	1	151998	657·9 O?Cu?	3
72176	1385·5 Cu ?	3	102511	975·5	20	152555	655·5 O ?	3
72542	1378·5 N	1	103498	966·2	1	154035	649·2 Cu ?	1
73453	1361·4 C ?	1	104210	959·6	1	155014	645·1 O	2
73806	1354·9	1	106517	938·9	3	156079	640·7	1
75964	1316·4	2	106986	934·7	1	157903	633·3	1
76242	1311·6 S.O.?	1	107712	928·4	1	158378	631·4	1
78474	1274·3 C ?	1	108365	922·8 O	4	159311	627·7	1
78665	1271·2	1	111172	899·5 O	1	161004	621·1	1
79497	1257·9	1	113058	884·5 C	5	162866	614·0	1
80360	1244·4	1	115700	864·3	5	163719	610·8 O ?	1
80671	1239·6	1	117027	854·5	4	164771	606·9 Cu ?	1
81234	1231·0 O	1	117855	848·5 C ?	1	166057	602·2 Cu ?	1
82651	1209·9 Sn ?	2	118483	844·0 Cu ?	5	167280	597·8 O?Cu?	1
84033	1190·0 N ?	2	118863	841·3 C ?	1	168747	592·6	1
85448	1170·3	1	119075	839·8	1	170068	588·0 Cu	1
85785	1165·7	3	119474	837·0	1	171086	584·5 Cu	1
86490	1156·2	4	119574	836·3 Cu	1	172801	578·7	1
87796	1139·0 S.O.?	5	120250	831·6	5	175438	570·0	1
88214	1133·6	3	121802	821·0	2	176149	567·7 O?Cu?	1
88613	1128·5 O ?	3	123304	811·0	3	177493	563·4 O	2
89174	1121·4	3	129215	773·9 O	2	179726	556·4 Cu	1
89686	1115·0 O	2	129416	772·7 N	2	180538	553·9 O?Cu?	1
89831	1113·2	1	130225	767·9 Cu	2	183318	545·5	1
89984	1111·3	1	138217	723·5 Cu	2	185116	540·2 O?Cu?	1
90130	1109·5	3	138908	719·9 Cu	2	188040	531·8 Cu	1
91149	1097·1	1	139236	718·2 O	2	189573	527·5 Cu	1
92336	1083·0	1	140567	711·4 C?Cu?	1	190985	523·6 Cu	1
92841	1077·1 C ?	1	141043	709·0	1	192975	518·2 O	1
93676	1067·5	1	142653	701·0 Cu ?	1	198176	504·6 Cu	1
94634	1056·7	1	144508	692·0 Cu ?	2	205254	487·2	1
94993	1052·7	1	144969	689·8	2	212359	470·9	1
97030	1030·6 O	1	146520	682·5 C? Cu?	3	212630	470·3	1
97656	1024·0	2	148478	673·5 O	1	215982	463·0	1
98357	1016·7	1	149476	669·0 Ca ?	1	218340	458·0	1
99552	1004·5	1	150421	664·8	3			
101358	986·6	3	151263	661·1	3			

TABLE XVII.—Thallium.

Author.			McLennan, Young and Ireton.		Ainslie and Fuller.		Bloch.		Takamine and Nitta.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Arc A.U.	I.	Spark A.U.	I.	Spark A.U.	I.
51679	1935·0	1								
									1930·4	2
52042	1921·5	1								
52372	1909·4	3							1908·2	2
52826	1893·0	2							1892·3	6
									1890·2	4
53171	1880·7 S.O.?	1							1880·7	4
									1871·2	2
53714	1861·7 Al ?	1							1860·0	2
54374	1839·1	1								
			1837·4	1			1837·4	2		
54513	1834·4	2								
54680	1828·8	1	1827·8	8	1827·3	2	1827·9	6		
54960	1819·5	1								
55096	1815·0 S.O.?	2	1814·6	10	1814·2	6	1814·5	8		
55420	1804·4	1					1804·6	1		
							1801·5	1		
							1798·1	2		
55754	1793·6	2	1792·5	7	1792·2	8	1792·6	4		
55975	1786·5 H ?	1								
56589	1767·1	1								
56960	1755·6	1								
57146	1749·9	1					1749·8	1		
57263	1746·3	1								
							1742·6	1		
57510	1738·8	1								
58400	1712·3	1								
58565	1707·5	1								
59715	1674·6	1								
60208	1660·9	1	1660·0	3	1660·0	6	1660·2	3		
							1657·2	2		
					1653·8	6				
60797	1644·8	2					1644·1	1		
61072	1637·4	1								
62418	1602·1	1					1601·5	1		
62519	1598·5 S.O.?	2	1597·0	1			1596·9	1		
63087	1585·1 S.O.?	1	1583·9	1						
			1572·3	2			1572·4	1		
63738	1568·9 H	2	1568·8	2			1568·9	2		
64008	1562·3 C ?	10	1561·8	3	1561·8	14	1561·9	2		
64131	1559·3	20	1558·9	3	1559·0	16	1558·9	4		
64358	1553·8	1								
64549	1549·2	1								
64977	1539·0 H	4	1538·4	2	1538·5	4	1538·6	1		
65138	1535·2	1								
66273	1508·9 H ?	10	1508·0	2	1508·2	4	1508·5	1		
			1506·6	2			1507·1	1		
66631	1500·8 H	10	1500·1	3	1499·8	6	1500·1	2		
67042	1491·6	10	1492·0	2	1491·0	2	1491·7	1		
67649	1478·2	10			1478·0	4	1478·1	2		
			1477·2	2			1477·2	1		

TABLE XVII (continued).

Author.			Author.			Author.		
Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.
68951	1450·3	2	92081	1086·0 N	1	120641	828·9	1
69681	1435·1	3	92455	1081·6	5	122399	817·0	3
70751	1413·4	3	92678	1079·0	5	124610	802·5 O	1
71357	1401·4	1	93101	1074·1	5	126262	792·0	2
71839	1392·0	1	93667	1067·1	5	129265	773·6 N	2
72532	1378·7 N	1	93896	1065·0	5	130480	766·4	1
72923	1371·3	2	94634	1056·7	5	140114	713·7	2
73126	1367·5	2	95328	1049·0	5	141783	705·3	1
73599	1358·7	2	95803	1043·8	5	143451	697·1	4
74107	1349·4	1	97181	1029·0	5	150966	662·4	3
74377	1344·5 O ?	1	99939	1000·6	1	161420	619·5	1
74799	1336·9	10	100806	992·0 N	1	163666	611·0	2
75075	1332·0	8	101194	988·2	1	165152	605·5	1
75889	1317·7	2	103167	969·3	1	182348	548·4	1
76411	1308·7	5	103573	965·5	1	183351	545·4	1
77718	1286·7	1	104909	953·2	1	186985	534·8	1
78179	1279·1	1	105909	944·2	1	188323	531·0 C	1
78560	1272·9	1	106405	939·8	1	193723	516·2 O ?	1
78964	1266·4	10	108049	925·5	1	199084	502·3	1
80866	1236·6	1	108636	920·5 O	1	203832	490·6	1
81599	1225·5	1	109218	915·6 N	2	204918	488·0	1
82754	1208·4	1	109721	911·4	1	208986	478·5	1
84588	1182·7	2	111056	907·8	2	212134	471·4	1
85462	1170·1	1	111656	895·6	1	213728	467·9	1
85675	1167·2	1	112447	889·3	1	214915	465·3	1
87443	1143·6	1	115167	868·3	1	222717	449·0	1
87873	1138·0 O	3	117453	851·4	1	228154	438·3	1
88198	1133·8 N ?	2	119660	835·7	1	250438	399·3	1
88464	1130·4	1	120019	833·2 O	1	253485	394·5	1

TABLE XVIII.—Lead.

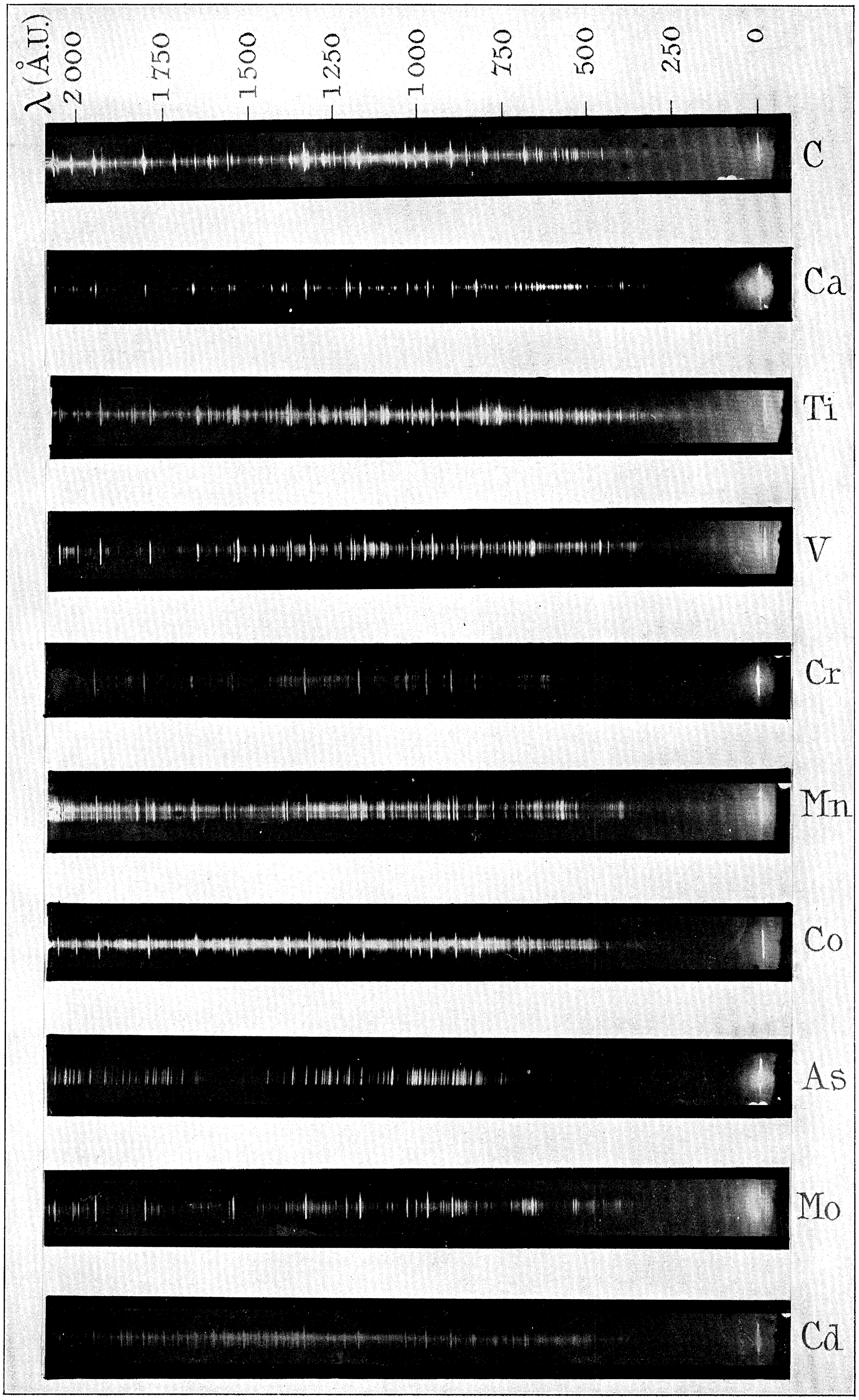
Author.			McLennan, Young and Ireton.		Ainslie and Fuller.		Bloch.	
Wave No.	Spark A.U.	I.	Spark A.U.	I.	Arc A.U.	I.	Spark A.U.	I.
48215	2074·0	20						
48513	2061·3	20	2060·9	4	2060·5	8		
48607	2057·3	30	1971·9	1				
50939	1963·1	2						
			1958·3	4				
					1925·8	2		
					1913·7	4		
52388	1908·8	4						
			1904·8	4	1904·2	2		
			1898·3	1	1898·7	2		
					1895·5	2		
			1890·0	4				
53650	1863·9	15	1863·0	1				
54013	1851·4	1						
54347	1840·0 Hg ?	10						
54489	1835·2	10						
54597	1831·6 Hg ?	10						
54680	1822·8	8	1822·1	10	1821·7	14	1821·7	10
55666	1796·4	4	1796·3	10	1796·5	10	1796·3	10
56129	1781·6	8						
56274	1777·0	5						
56490	1770·2 Al ?	8						
57123	1750·6	2						
					1744·2	1		
57444	1740·8	6			1741·1	2		
57860	1728·3	8						
			1726·2	3	1726·2	10	1726·5	1
57984	1724·6	3						
58278	1715·9	3						
58459	1710·6	3	1710·8	3			1710·9	2
59084	1692·5	1						
59178	1689·8	1						
59438	1682·4	8	1682·0	7	1682·5	12	1682·1	4
59833	1671·3	8	1671·3	7	1671·6	12	1671·6	4
60222	1660·5	8						
60812	1644·4	1						
60938	1641·0	1						
61527	1625·3	3						
61969	1613·7	1						
62107	1610·1	1						
62313	1604·8	1						
62558	1598·5	1			1597·6	3		
63399	1577·3	1						
64379	1553·3	30	1554·8	3	1555·8	12	1553·2	3
65223	1533·2 C ?	3						
66067	1513·6	5						
					1511·7	4		
66693	1499·4 H ?	3						
					1494·7	1		
					1492·7	1	1439·7	3
69730	1434·1	20			1434·0	5	1434·4	3
					1431·9	5		
							1406·5	2

TABLE XVIII (continued).

Author.			Author.			Author.		
Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.
72004	1388·8	2	105663	946·4	1	175561	569·6	2
74151	1348·6	10	107909	926·7	20	179275	557·8	1
76132	1316·5	30	110217	907·3	20	180472	554·1 O	1
77489	1290·5	3	111869	893·9	15	182448	548·1	1
78951	1266·6	20	112422	889·5	20	188857	529·5	2
79974	1250·4	30	113186	883·5	15	197511	506·3	1
81114	1231·6	20	113791	878·8	2	201450	496·4	2
82406	1213·5	8	117274	852·7	5	207253	482·5	1
82460	1212·7	10	117481	851·2	8	209073	478·3	2
83112	1203·2	20	123137	812·1	3	210526	475·0	2
85778	1165·8	20	124781	801·4	1	215192	464·7	1
87896	1137·7	8	127942	781·6	2	219925	454·7	1
88261	1133·0 Sn ?	5	132520	754·6	3	222568	449·3	1
89285	1120·0 C ?	10	133600	748·5	4	230946	433·0 O?Hg?	1
91810	1088·2 Sn ?	2	134934	741·1	2	235682	424·3	1
95849	1043·3	5	138945	719·7	1	240963	415·0	1
97200	1028·8	30	141123	708·6 H ?	3	243962	409·9	1
99542	1004·6	10	154297	648·1	1	245098	408·0	1
101368	966·5	2	174641	572·6	2	278241	359·4 O ?	1
104865	953·6	10						

TABLE XIX.—Bismuth.

Author.			McLennan, Young and Ireton.			Bloch.	
Wave No.	Spark A.U.	I.	Arc A.U.	Spark A.U.	I.	Spark A.U.	I.
49446	2022·4	1					
49598	2016·2	1					
49918	2003·3	1					
50469	1981·4	2					
52557	1902·7	1	1902·6	1902·6	10		
53999	1851·9	2					
54127	1847·5	1					
54540	1833·5	2					
			1823·6	1823·6	5	1823·5	8
55045	1816·7	3					
						1811·1	
						1796·2	
			1791·5		7	1791·8	7
			1787·1	1787·3	7	1787·0	7
56126	1781·7	1					
			1776·7	1776·7	7	1776·7	7
						1757·9	
						1749·7	
57264	1746·3	4					
57817	1729·6	4					
						1682·2	
						1671·0	
60569	1651·0	2					
62039	1611·9	1	1611·7	1611·5	2	1611·4	2
62189	1608·0	1		1609·9	2	1609·6	2
				1606·6	1	1606·3	1
62395	1602·7 H ?	1		1601·6	2	1601·4	2
62826	1591·7	1	1592·1	1592·0	2	1591·7	2
63044	1586·2 Sb ?	1					
				1574·1	1	1573·9	1
63922	1564·4	1		1564·1	1	1564·0	1
64450	1551·6	1				1553·3	
64994	1538·6 H ?	1	1538·7	1538·3	2	1538·5	1
				1537·0	1	1537·3	1
65172	1534·4	2	1533·7	1533·7	6	1533·7	3
65411	1528·8	1					
65716	1521·7	1	1521·3			1521·2	
66477	1504·5	1				1503·5	
			1497·6		2		
67182	1488·5	1					
67263	1486·7	1					
68357	1462·9	2	1462·5		1		
68662	1456·4	2	1455·4		5		
69004	1449·2 C ?	1					
69551	1437·8 Sb ?	2	1436·8		4		



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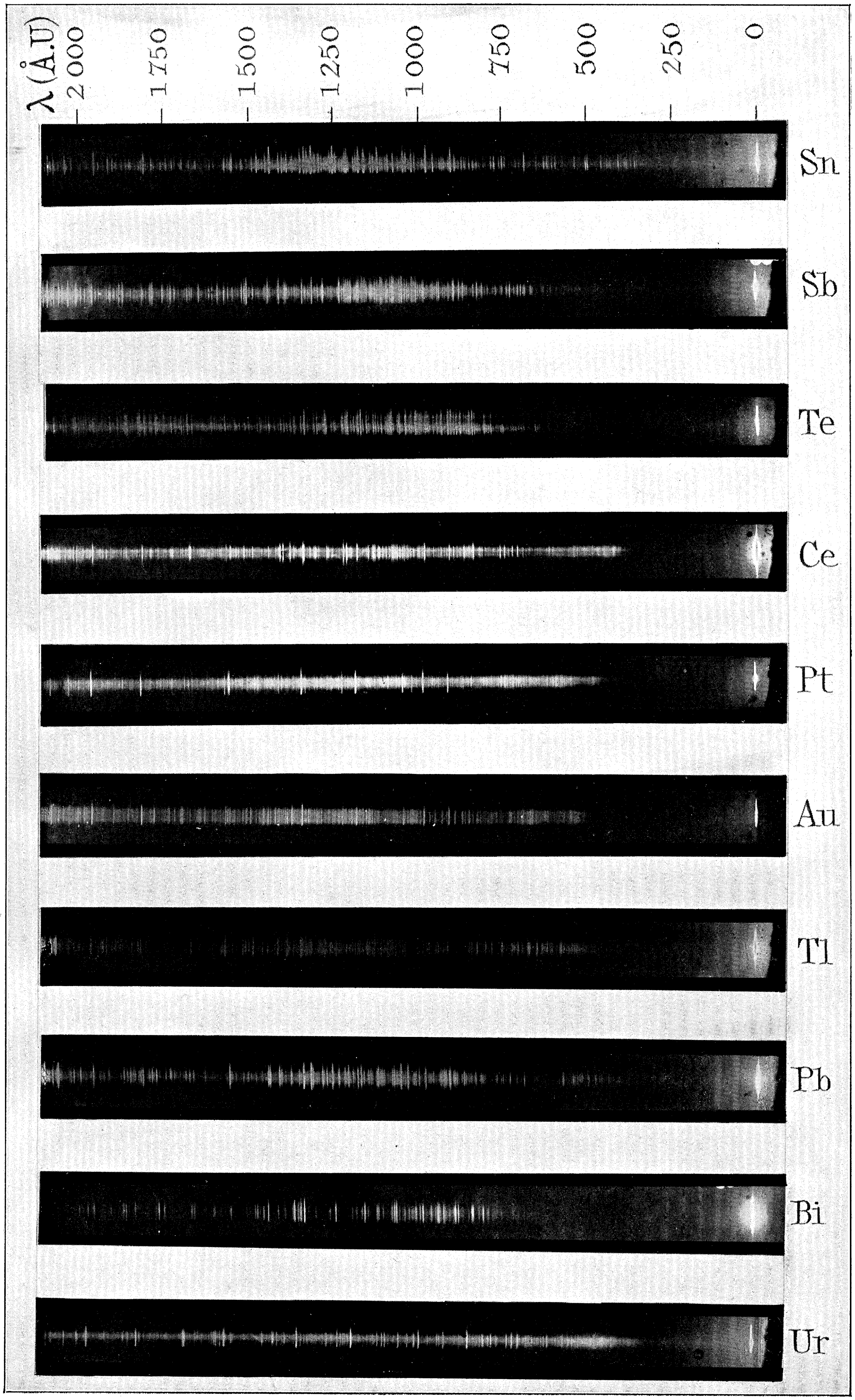

λ (Å.U)
2000
1750
1500
1250
1000
750
500
250
0
Sn
Sb
Te
Ce
Pt
Au
Tl
Pb
Bi
Ur

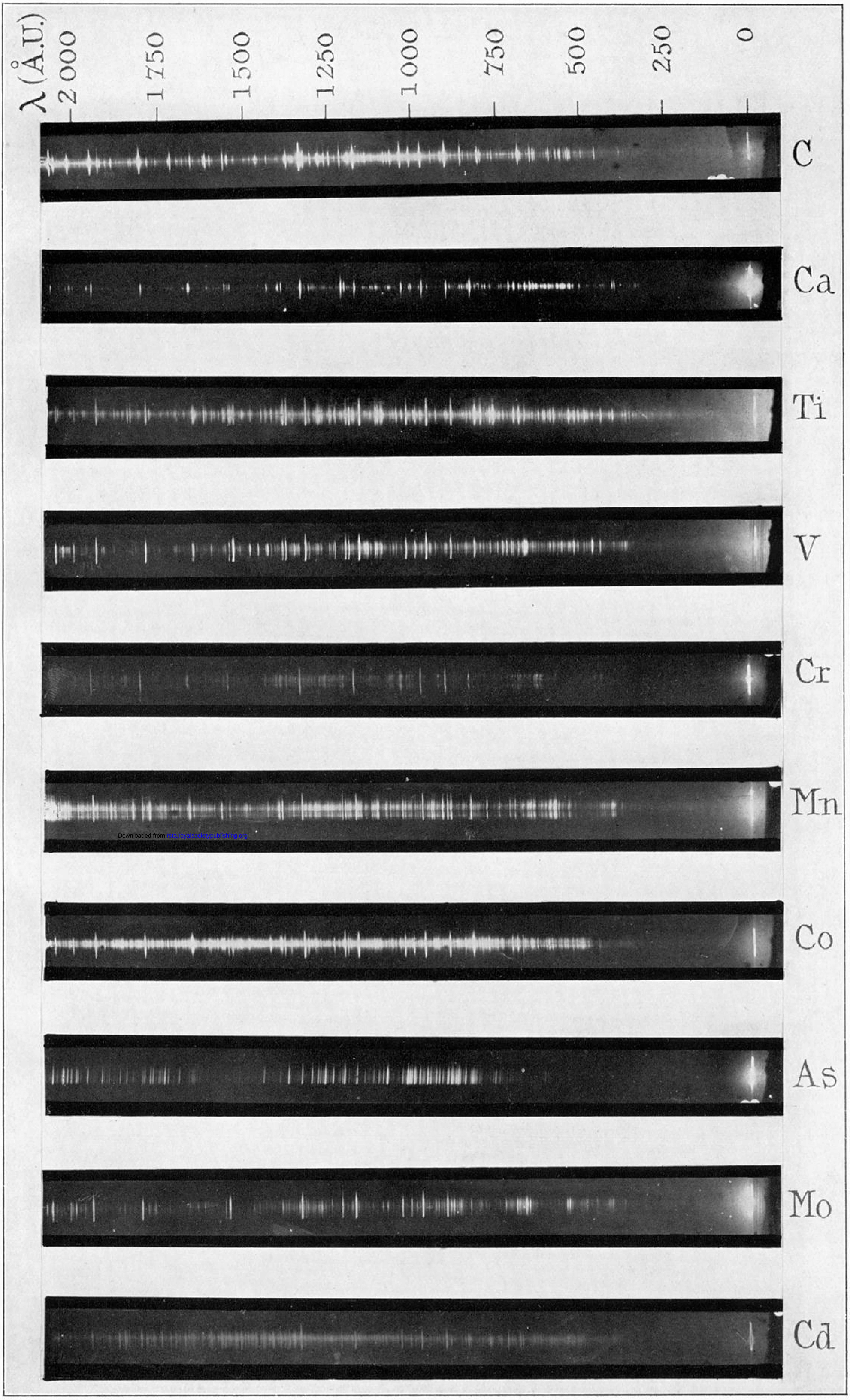
TABLE XIX (continued).

Author.			Author.			Author.		
Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.
70195	1346·4	10	92166	1085·0 N	1	110840	902·2 Sn ?	1
75188	1330·0Hg?Ba?	5	94464	1058·6	3	112397	889·7	1
75364	1326·9	5	95093	1051·6	10	114077	876·6	1
75907	1317·4	15	95630	1045·7	10	124409	803·8 H ?	1
76552	1306·3	10	97267	1028·1	1	126342	791·5	2
80283	1245·6	1	97924	1021·2	1	128254	779·7	1
80580	1241·0	1	99236	1007·7	1	129066	774·8	1
81626	1225·1 Sb ?	10	101122	988·9	2	131062	763·0	1
83577	1196·5	1	103370	967·4	3	132188	756·5	1
85646	1167·6 Sb ?	1	106056	942·9	2	135556	737·7	1
85948	1163·5	1	108143	924·7	2	139295	717·9 O ?	1
87596	1141·6	1	108554	921·2	2	142349	702·5 O ?	1
87750	1139·6 O ?	10	109123	916·4 N ?	1	149098	670·6	1
88590	1128·8 O ?	1	110205	907·4 Sn ?	2			

TABLE XX.—Uranium.

Author.			Author.			Author.		
Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.	Wave No.	Spark A.U.	I.
49778	2008·9	5	74074	1350·0	1	125612	796·1 O ?	2
50368	1985·4	5	76764	1302·7 C ?	1	126582	790·0 O ?	5
50474	1981·2	5	76988	1298·9	1	130941	763·7	5
50981	1961·5	1	77423	1291·6	1	132820	752·9 Sn ?	1
52562	1902·5	3	77973	1282·5	1	133779	747·5	1
53231	1878·6	1	78180	1279·1	1	139237	718·2 O ?	10
54395	1838·4	1	78598	1272·3	1	148810	672·0	1
54561	1832·8	5	79064	1264·8	1	149663	668·3 Ca ?	1
55985	1786·2 H ?	1	79936	1251·0 S.O.?	2	150263	665·5	1
56351	1774·6	1	80373	1244·2	1	152207	657·0	1
56779	1761·2	1	80600	1240·7	1	153163	652·9	2
56970	1755·3	1	80834	1237·1	1	157580	634·6	1
57212	1747·9 Cd ?	1	81064	1233·6	1	157705	630·1 O ?	1
58140	1720·0	1	81446	1227·8	1	159974	625·1 O ?	1
58630	1705·6 H ?	1	81633	1225·0	1	163934	610·0 O ?	2
59151	1690·6	1	82590	1210·8	1	172087	581·1	1
60602	1650·1	1	83229	1201·5	1	190223	525·7 O ?	2
61117	1636·2	3	83424	1198·7	1	197083	507·4 O ?	1
61252	1632·6	1	86700	1153·4	1	212134	471·4	1
61448	1627·4	1	87108	1148·0 O ?	1	216216	462·5	1
61981	1613·4	1	88090	1135·2 N ?	1	225785	442·9	1
63032	1586·5	5	89888	1112·5	2	228363	437·9	1
63303	1579·7 S.O.?	5	99721	1002·8	1	232937	429·3	1
63464	1575·7 H ?	10	100200	998·0 C ?	1	235793	424·1	1
66089	1513·1	1	101010	990·0 N ?	10	238663	419·0	1
66265	1509·1	1	111297	898·5	1	243309	411·0	1
66578	1502·2	1	112108	892·0	1	247525	404·0 C?Ca?	1
66751	1498·1	1	114521	873·2	1	248818	401·9	1
68306	1464·0	1	115447	866·2	1	251004	398·4	1
70294	1422·6	1	120831	827·6	1	251762	397·2	1
70998	1408·5 H ?	3	121389	823·8 C ?	1	267094	374·4 O ?	1
73411	1362·2	1						

PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY A MATHEMATICAL, PHYSICAL & ENGINEERING SCIENCES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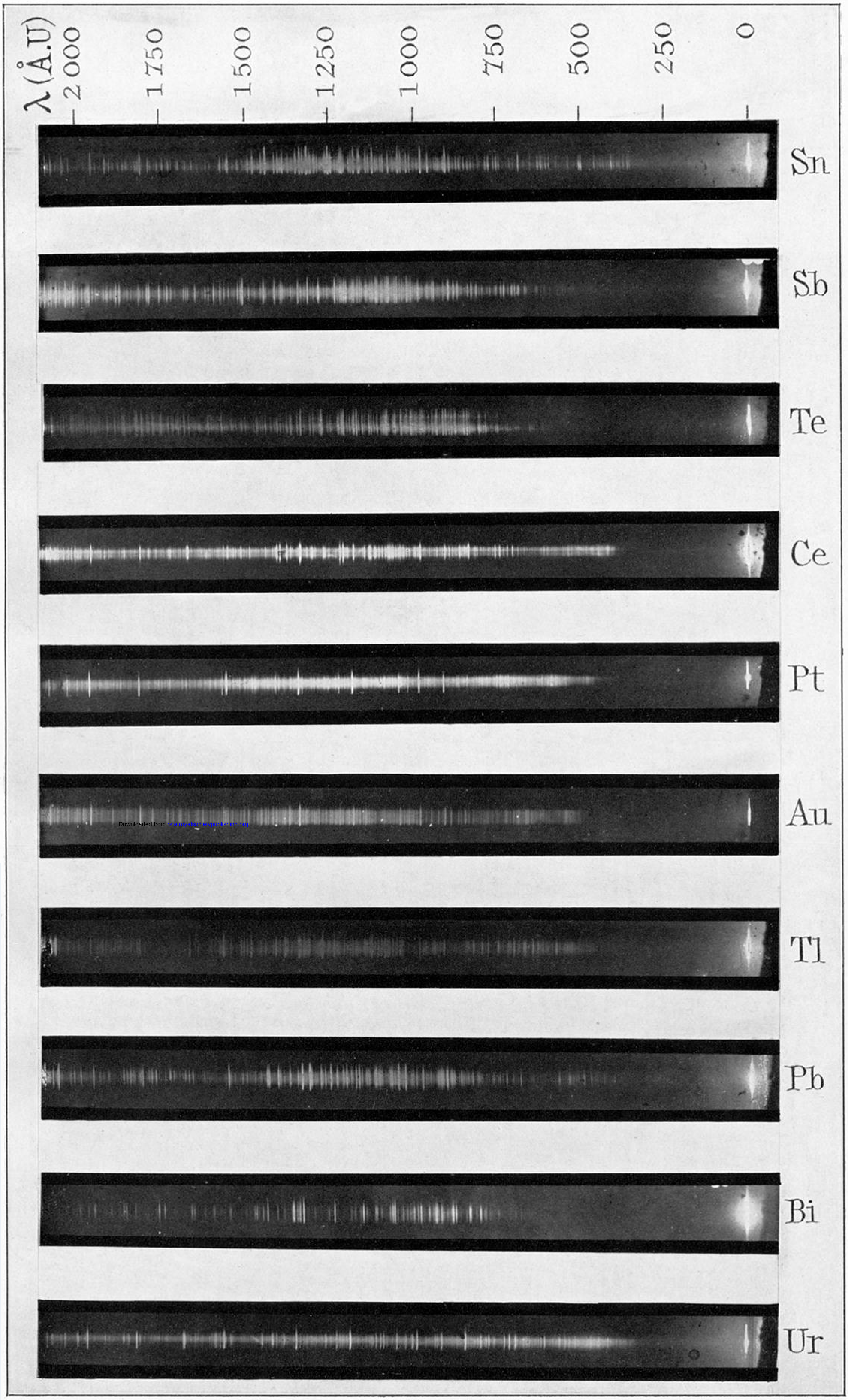
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