Graphic Representations of the Periodic System During One Hundred Years

EDWARD G. MAZURS

THE UNIVERSITY OF ALABAMA PRESS
University, Alabama 35486

ISBN 0-8173-3200-6
Library of Congress Catalog Card Number—73-8051

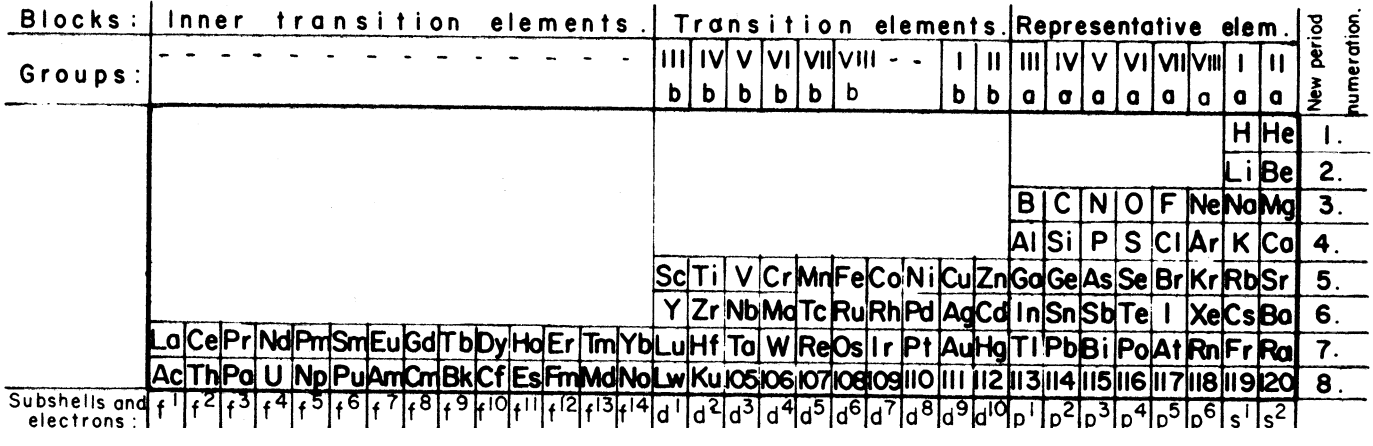
Manufactured in the United States of America

Type IIIC3-6

Left-step series table with group IIa on the right side of the table (Fig. 103). The table is obtained by cutting the spiral (Fig. 97) between group IIa and the inner transition elements. It is analogous to Mendeleev's medium-size table type IIC2-6 (Fig. 71) originated in 1869. This very good, modern table was originated by Janet in 1927 (1). Acceptance of this table requires the revision of the numeration of the periods. This matter is discussed in the Introduction to the Electronic Configuration Tables. The new division of periods was used by Janet (1), Simmons (8), von Auwers (9), Hakala (10), Klechkovskii (as a sum of $n+l$) (11), Lepsius and Asunmaa (12), Neville Smith (13), Farré-Torá (15), Tokarev (16), Neubert (17), and Mills (18). The subshells and electrons can be shown on this table in proper order; therefore, this table can be used as an electronic configuration table, as was done by Simmons (8), Hakala (10), Klechkovskii (11), Farré-Torá (15), and Tokarev (16). LeRoy's table (2) differed slightly from Janet's table in that he started the series with group IV instead of III. Sadikov refers to Lautié (6). Klechkovskii in 1961 (11) and Tokarev in 1966 (16) drew the periods in vertical columns. In his scheme, Klechkovskii in 1969 (11, p. 8) drew the 9th period with 50 elements by including eighteen 5g elements. Mills (18) in 1972 used special arrows to designate the symbols of elements which do not agree with the theoretical electron configuration. This approach is similar to my suggestion in subtype IIIC4-3c in 1969.

Blocks:	Inner transition elements.															Transition elements.											Representative elem.								New period numeration.
Groups:	- - - - - - - - - - - - - -															III b	IV b	V b	VI b	VII b	VIII b			I b	II b	III a	IV a	V a	VI a	VII a	VIII a	I a	II a	
																																H	He	1.
																																Li	Be	2.
																										B	C	N	O	F	Ne	Na	Mg	3.
																										Al	Si	P	S	Cl	Ar	K	Ca	4.
																Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	Rb	Sr	5.
																Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	Cs	Ba	6.
	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn	Fr	Ra	7.
	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lw	Ku	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	8.
Subshells and electrons:	f^1	f^2	f^3	f^4	f^5	f^6	f^7	f^8	f^9	f^{10}	f^{11}	f^{12}	f^{13}	f^{14}	d^1	d^2	d^3	d^4	d^5	d^6	d^7	d^8	d^9	d^{10}	p^1	p^2	p^3	p^4	p^5	p^6	s^1	s^2			

FIG. 103. Janet 1927. Type IIIC3-6.


Blocks:
Inner transition elements.
Transition elements.
Representative elem.
Groups:
III b IV b V b VI b VII b VIII b I b II b
III a IV a V a VI a VII a VIII a I a II a
New period
Enumeration.
H He
Li Be
B C N O F Ne Na Mg
Al Si P S Cl Ar K Ca
Sc Ti V Cr Mn Fe Co Ni Cu Zn Ga Ge As Se Br Kr Rb Sr
Y Zr Nb Mo Tc Ru Rh Pd Ag Cd In Sn Sb Te I Xe Cs Ba
La Ce Pr Nd Pm Sm Eu Gd Tb Dy Ho Er Tm Yb Lu Hf Ta W Re Os Ir Pt Au Hg Tl Pb Bi Po At Rn Fr Ra
Ac Th Pa U Np Pu Am Cm Bk Cf Es Fm Md No Lw Ku 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120
1. 2. 3. 4. 5. 6. 7. 8.
Subshells and electrons:
f1 f2 f3 f4 f5 f6 f7 f8 f9 f10 f11 f12 f13 f14
d1 d2 d3 d4 d5 d6 d7 d8 d9 d10
p1 p2 p3 p4 p5 p6
s1 s2

Type IIIC3-6.

(1) Charles Janet. *La structure du noyau de l'atome, considérée dans la classification périodique des éléments chimiques.* Beauvais: Novembre, **1927** (table I and scheme p. 15).
———*Essais de classification hélicoidale des éléments chimiques.* Ibidem: Avril, **1928** (table VI-11).
———*La classification hélicoidale des éléments chimiques.* Ibidem: Novembre, **1928** (table I-1, X-22).
———*Considérations sur la structure du noyau de l'atome.* Ibidem: Decembre, **1929** (table II-5, III-3).
———The helicoidal classification of the elements. *Chem. News,* **138,** 372-374; 388-393 (**1929**) (table pp. 372, 374, 390, 393).
———*Concordance de l'arrangement quantique, de base, des électrons planétaires des atomes, avec la classification scalariforme, hélicoidale, des éléments chimiques.* Beauvais: Novembre, **1930** (table 2, 14, 16).
Cited by A. Quintana y Mari. La clasificación helicoidal de los elementos químicos. *Quím. e Industr.* (Barcelona) 8(94), 287-292 (**1931**) (table Fig. II).

(2) Royce H. LeRoy. Teaching the periodic classification of elements. *School Sci. Math.* **27,** 793-799 (**1927**) (table p. 796).

(3) S. A. Korff. A periodic classification of the hardness and meltingpoints of the elements. *Science* **67,** 370-371 (**1928**) (table p. 370).

(4) V. Romanoff. Le système périodique de Mendeléeff par représentation graphique. *Rev. sci.* (Paris) **72,** 661-665 (**1934**) (table p. 662).
———Représentation synoptique du système périodique de Mendeléeff et de la théorie de Bohr. *Compt. rend. 17. Congr. Chim. Ind.* (Paris) **II,** 2059-2062 (**1937**) (table p. 2060).

(5) Germán E. Villar. Existe en el sistema periódico una pléyada de 15 elementos radioactivos semejante a la de las tierras raras? *Boletin Fac. Ing. Agrimens., Univ. Montevideo* 3(5), 231-234 (**1938**) (table p. 232).
———La incorporación de electrones *f* en las envolventes extranucleares de los Lantánidos y de los Actínidos. *Ibidem* **6**(5), 149-162 (**1957**) (table p. 151).

(6) Raymond Lautié. Sur la classification et la correspondance des éléments chimiques et de leurs composés. *Bull. Soc. Chim. France* (Mém.) [5] **6,** 677-683 (**1939**) (table p. 680).

(7) V. S. Sadikov. Novaia klassifikatsiia khimicheskikh elementov. *Priroda* (Moscow) **29**(7), 66-68 (**1940**).

(8) L. M. Simmons. A modification of the periodic table. *J. Chem. Educ.* **24,** 588-591 (**1947**) (table p. 589).
———The display of electronic configuration by a periodic table. *Ibidem* **25,** 658-661 (**1948**) (table p. 659).

(9) O. von Auwers. Periodisches System nach Quantenzahlen. *Physik. Blätter* **4,** 423-425 (**1948**) (table p. 424).

(10) Reino W. Hakala. Letter to the editor. *J. Chem. Educ.* **25,** 229 (**1948**) (scheme).
———The Periodic Law in mathematical form. *J. Phys. Chem.* **56,** 178-181 (**1952**) (table p. 179).

(11) V. M. Klechkovskii. $(n+l)$-gruppy v posledovatel'nom zapolnenii elektronnykh konfiguratsii atomov. *Dokl. Akad. Nauk SSSR* **80**(4), 603-606 (**1951**) (table p. 605).
———O posledovatel'nosti v zapolnenii elektronnykh urovnei atomov. *Zh. Eksper. i Teoret. Fiz.* **23**(1), 115-122 (**1952**) (table p. 121).

——— Konfiguratsionnyi indeks elektronnoi struktury normal'nykh atomov. *Izv. Timir. Sel'skokh. Akad.* **40**(3), 161-176 (**1961**) (table p. 173).

——— *Raspredelenie atomnykh elektronov i pravilo posledovatel'nogo zapolneniia* $(n+l)$*-grupp.* Moskva: Nauka, **1968** (table p. 15).

——— K teorii Periodicheskoi Sistemy elementov D. I. Mendeleeva. *Vopr. Istor. Estestvozn. Tekhn.* **4**(29), 3-16 (**1969**) (scheme p. 8).

(12) Richard Lepsius und S. K. Asunmaa. Prinzipielle Betrachtungen im Periodischen System der Elemente. *Naturwissenschaften* **39**, 490-491 (**1952**) (scheme p. 491); **41**, 221-227 (**1954**) (table p. 224); **43**, 324 (**1956**) (scheme).

(13) Neville Smith. Letter to the editor: The periodic table. *Chemistry & Industry* 1673-1674, **1955** (scheme p. 1674).

(14) Knud Aage Nissen. *Comments on the representation of the periodic table.* Copenhagen: Niels Bohr legatet, **1956.**

(15) Ortega G. Barraza, Calero A. De Lope, F. Farré-Torá. *Clasificación electronica de los elementos,* **1964** (only the table).
Francisco Farré-Torá. Classificación cuantica de los elementos químicos. *Univ. Nacl. Auton. de Mexico, Escuela Nacl. Preparatoria, Dept. de Química,* **1966/67** (table p. 8 and separate table).
——— Estructuración de los elementos y clasificación periódica. *Ibidem* **1967/68**, 2.

(16) B. V. Tokarev. Regulo de $n+l$ grupoj kaj ĉefaj interrilatoj en Perioda Sistemo de D. I. Mendelejev (in Esperanto). *Scienca Revuo* **16**(3/4), 121-130 (**1966**) (table p. 126/127).

(17) D. Neubert. Double shell structure of the Periodic System of the elements (in English). *Z. Naturforsch.* **25 A**, 210-217 (**1970**) (table p. 211).

(18) Robert Mills. Systematic table of the elements. *Am. J. Phys.* **40**(8), 1169-1170 (**1972**) (table p. 1169).