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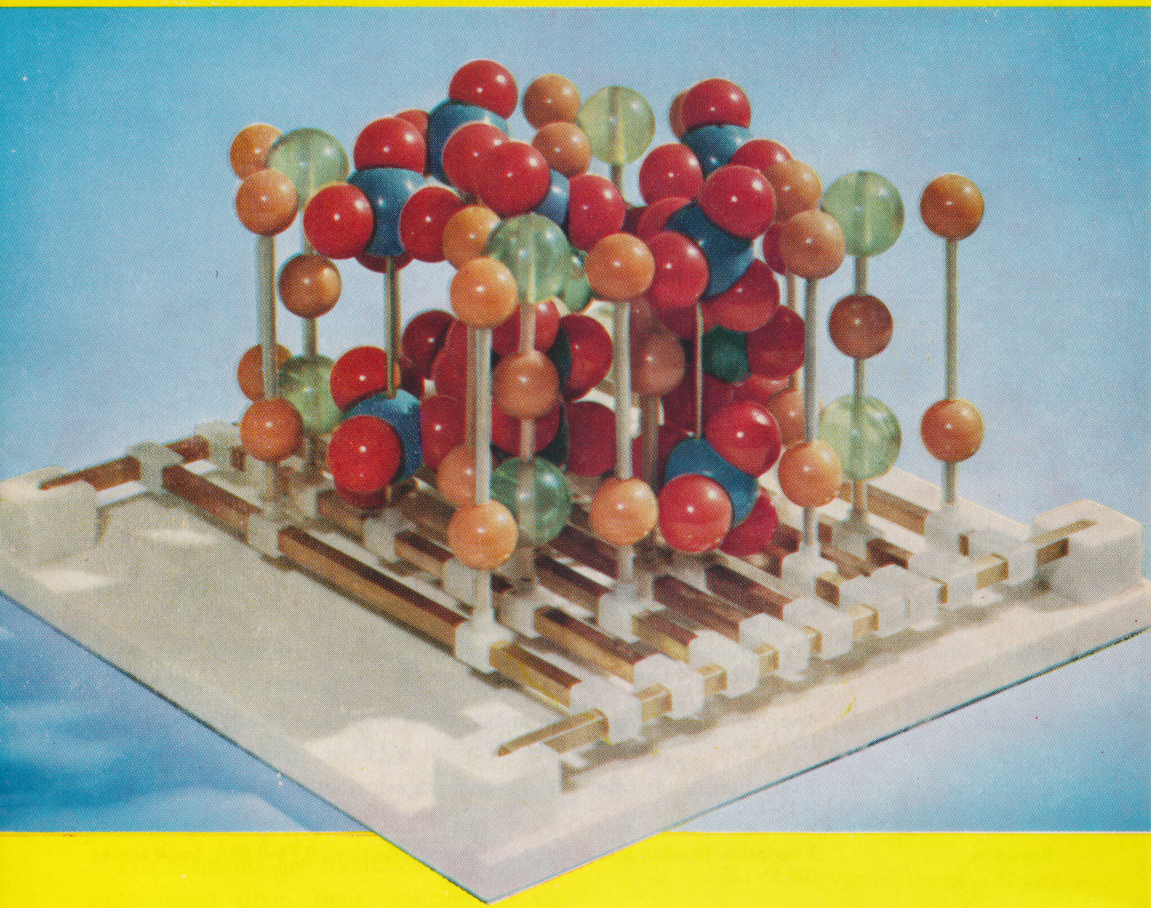
Catalin Visual Aids for Science



A comprehensive system of modelling molecular and ionic configurations.

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CATALIN COVALENT MODELS

The Catalin Covalent series of Stuart Models was initially designed by the National Chemical Laboratory and now incorporates sixteen elements in fifty-three varieties according to the number of bonds, bond length contributions and bond angles. The atoms are in the form of truncated spheres, the diameters of which are based upon the Van-der-Waals Radii and are joined by simple hard rubber pegs which permit approximately 5° of strain.

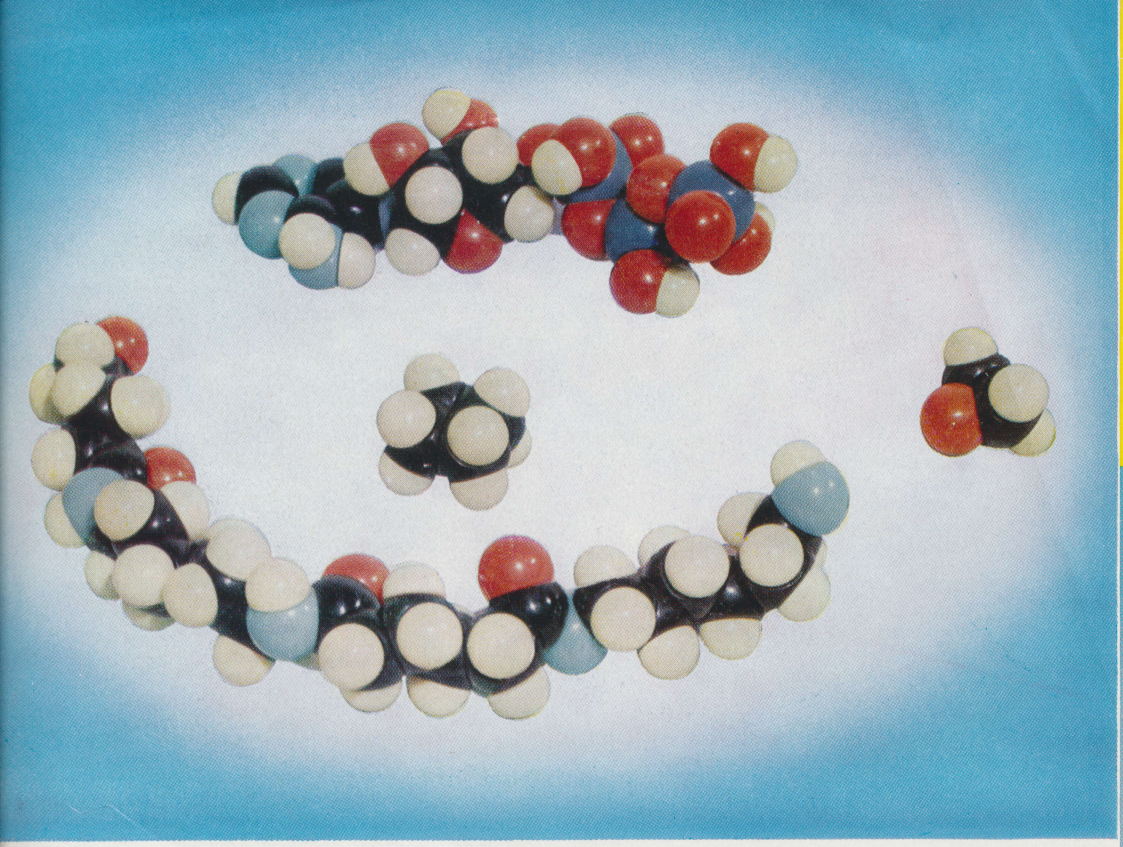
Each atom is precision made to dimensions derived from up to date information and molecular structures resulting from their use are sterically accurate.

Because of their scale, compact representations of quite large molecules can be made. The rigidity and strength of such models can be controlled by construction on wire skeletons.

Molecules and complex ions may be incorporated into crystal structures built on the Catalin Adjustable Base by drilling the atoms.

RANGE OF COVALENT ATOMS

Hydrogen	
Carbon	13 varieties including block aromatic rings with bonds ranging from 2–4 and bond length contributions from 0.60–0.77Å, with bond angles varying from 60°–180°.
Nitrogen	8 varieties. Bonds ranging from 1–4, bond length contributions from 0.55–0.70Å and angles from 90°–180°.
Oxygen	8 varieties. Bonds ranging from 1–3, bond length contributions from 0.57–0.74Å and bond angles ranging from 60°–180°.
Sulphur	4 varieties. Bonds ranging from 1–6, bond length contributions from 0.94–1.04Å and bond angles from 90°–109.5°.
Phosphorus	3 varieties. Bonds from 3–5, bond length contribution 1.10Å, bond angles 101°–120°.
Boron	3 varieties. Bonds 3 and 4, bond length contributions 0.74–0.88Å, bond angles 109.5°–120°.
Silicon	2 varieties—tetrahedral and octahedral.
Transition metals	3 varieties—tetrahedral, square coplanar and octahedral.
Halogens	4—fluorine, chlorine, bromine and iodine.
Arsenic	Trivalent and tetrahedral.
Aluminium	Tetrahedral.
Gold	Linear.



APPLICATIONS

Catalin Covalent models are well established as a research tool in the field of organic chemistry, and Catalin Ionic models have found increasing employment in many branches of research, notably in the ceramics, electrical, photographic and metallurgical industries.

In presenting accurate space filling models of structures in the teaching of chemistry, at all stages of the curriculum, many concepts are clarified and interest stimulated.

Because of the direct relationship that exists between structure and the properties of matter Catalin models can help to provide a background to physics teaching. In more advanced studies the portrayal of structure defects on the adjustable base is a significant aid to clarification.

The adjustable base can be likened to a three dimensional abacus and thereby employed to demonstrate many aspects of mathematics.

CATALIN IONIC MODELS

The Catalin system of ionic modelling described in Technical Education, Vol. 2, No. 12 (1960), J. E. S. Whitney, consists in positioning scale model ions in their appropriate spatial arrangement by means of vertical rods which are infinitely adjustable with respect to each other in a horizontal plane.

The range comprises thirty-six elements in various oxidation states providing forty-one model ions. Their dimensions are based on the Pauling Crystal Radii, cations being fabricated in opaque and anions in transparent material in order to emphasise charge difference.

Packing and crystal lattice models may be rapidly constructed, layer by layer, in any desired aspect. Models involving complex ions or molecules may be constructed with the appropriate covalent atoms drilled to locate upon the rods in the desired orientation.

By the use of drilled atoms representative complex ions and water of crystallisation can be incorporated in appropriate positions and orientations.

The standard base is of such a size that it can accommodate several unit cell or space lattice models simultaneously. It also permits adequate movement when demonstrating such features as cleavage, lattice distortion or aspect.

RANGE OF SPHERICAL IONS

(Scale; 1 cm = 1 Å approx)

ION	STATE	RADIUS A
Lithium	+	0.60
Sodium	+	0.95
Potassium	+	1.33
Caesium	+	1.69
Copper	+	0.96
Copper	2 +	0.80
Silver	+	1.26
Gold	+	1.37
Magnesium	2 +	0.65
Calcium	2 +	0.99
Strontium	2 +	1.13
Barium	2 +	1.35
Zinc	2 +	0.74
Cadmium	2 +	0.97
Mercury	2 +	1.10
Aluminium	3 +	0.50
Lanthanum	3 +	1.04
Carbon	4 —	2.60
Ammonium	+	1.48
Hydroxyl	—	1.57
Silicon	4 +	0.41
Titanium	4 +	0.68
Tin	4 +	0.71
Lead	4 +	0.84
Lead	2 +	0.94
Nitrogen	3 —	1.71
Phosphorus	3 —	2.12
Arsenic	5 +	0.47
Antimony	5 +	0.62
Bismuth	5 +	0.74
Oxygen	2 —	1.40
Sulphur	2 —	1.84
Selenium	2 —	1.98
Fluorine	—	1.36
Chlorine	—	1.81
Bromine	—	1.95
Iodine	—	2.16
Iron	2 +	0.75
Iron	3 +	0.60
Cobalt	2 +	0.72
Nickel	2 +	0.69

As an aid to the teaching and study of chemistry and related sciences Catalin Models are invaluable because they eliminate the problem of conveying a three dimensional concept in a single plane.

Widely used throughout the world, they provide the most comprehensive system of structure modelling available, embracing a wide range of covalent atoms and ions made to the same scale.

The elements are identified by a colour code based upon their position in the Periodic Table and conforming where possible to the system proposed by the Crystallographic Panel of The Institute of Physics.

All model atoms and ions are fabricated from durable CATALIN cast phenolic resin and are self coloured.

COLOUR CODE

Group	*Colour of Elements*
I & IA	Varying shades of Orange.
IB	Varying shades of Yellow.
II & IIA	Varying shades of Brown.
IIB	Varying shades of Beige.
III & IIIA	Varying shades of Maroon.
IV	Varying shades of Grey & Black.
V & VB	Varying shades of Blue.
VI & VIB	Varying shades of Red.
VII & VIIB	Varying shades of Green.
VIII	Varying shades of Violet.

Both the Covalent and Ionic Models are supplied in the form of Student and Standard Sets and in addition a covalent supplementary set is available to cover more advanced or specialised study. The individual items may also be purchased separately and in the covalent series standard packs are available each containing a definite number of a specific atom as follows:

Atoms	*No. of atoms per pack*
Hydrogen	10
Carbon	
Paraffinic	4
Olefinic	4
Aromatic	6
Acetylenic	2
Heterocyclic	4
Block Benzene	1
Block Naphtalene	1
Distorted Benzene	1
108° Unsaturated	2
90° Saturated	4
90° Unsaturated	4
90° Distorted	2
60° Saturated	3
Nitrogen	
Nitrile	2
Amino	2
Quaternary	2
Planar	2
Azide	2
Imide	2
108° Unsaturated	3
90° Saturated	2
Oxygen	
Ether	3
Carbonyl	2
90° Lactone	2
60° Epoxide	3
140° Silicate	6
Co-ordination Ether	4
Co-ordination Carbonyl	4
Ionic Carbonyl	2
Phosphorus	
Trivalent	2
Pentavalent	2
Phosphate	4

Atoms	*No. of atoms per pack*
Silicon	
Silicate	2
Octahedral	2
Sulphur	
Sulphide	2
Sulphate	2
Thione	1
Octahedral	2
Halogens	
Fluorine	2
Chlorine	2
Bromine	2
Iodine	2
Boron	
Trivalent	3
Tetravalent	3
Borazole	3
Transition Metal	
Octahedral	2
Tetrahedral	2
Planar	2
Gold	
Linear	2
Arsenic	
Tetrahedral	2
Trivalent	2
Aluminium	
Tetrahedral	4

With these standard packs it is possible to build up a set to suit a definite requirement in teaching or study and to add to it as and when required. The standard packs also provide a convenient means of supplementing an existing set. For fuller details please write to:

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