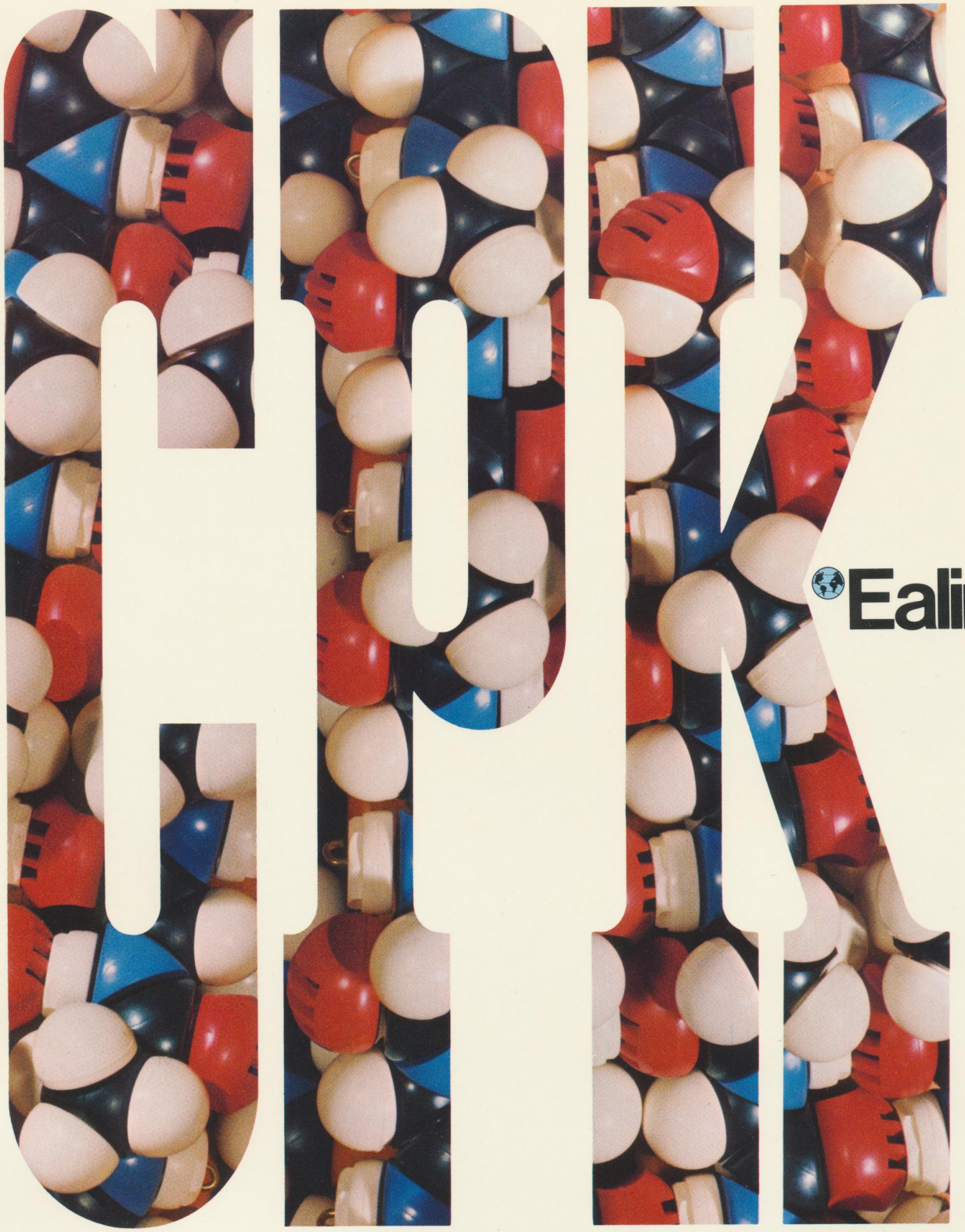

Ealing

CPK PRECISION MOLECULAR MODELS AND KENDREW SKELETAL MODELS 1975-76

PURCHASING INFORMATION

Prices

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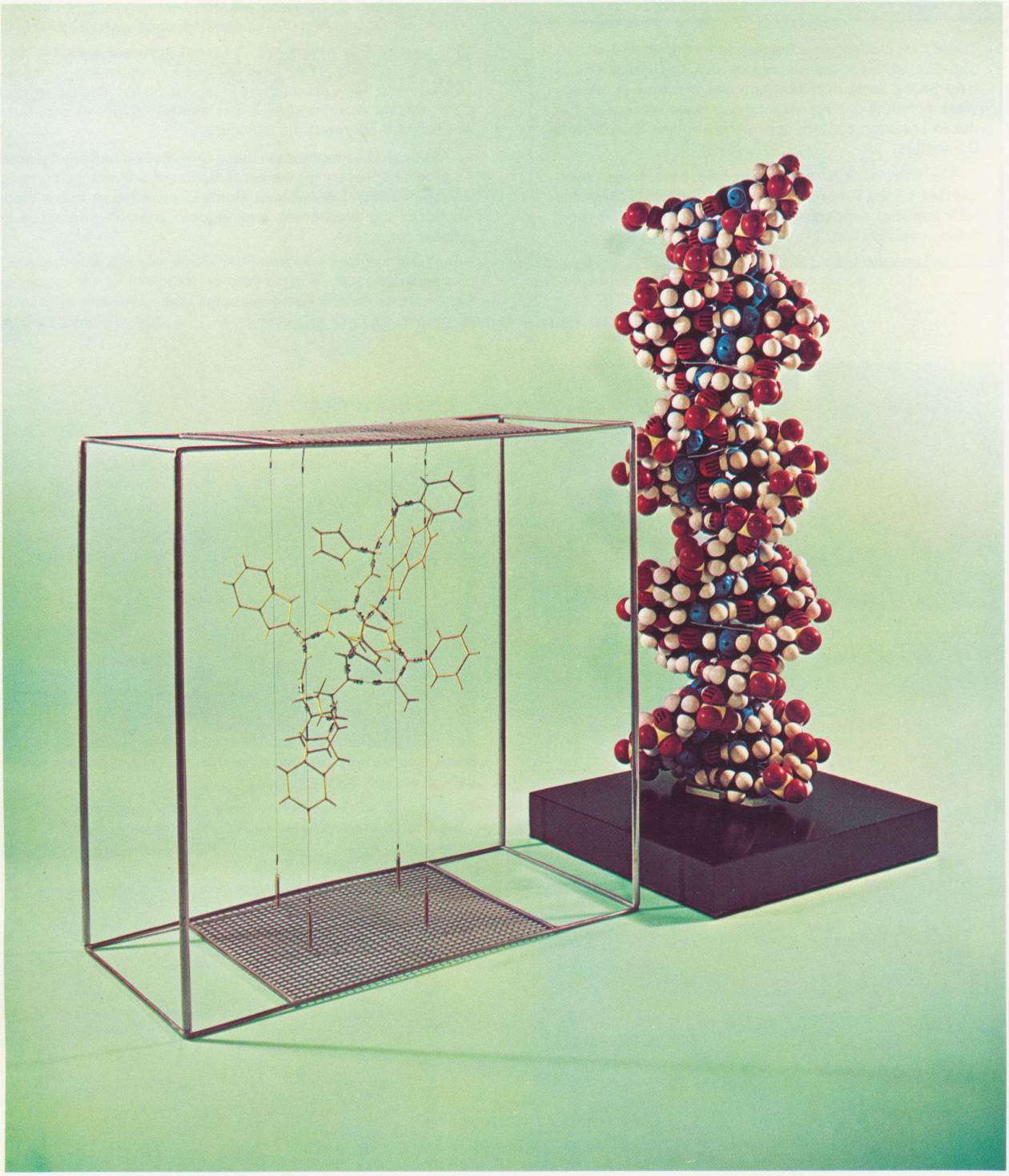
EALING PRECISION MOLECULAR MODELS

CPK SPACE-FILLING ATOMS ... Pages 2 to 24
KENDREW SKELETAL MODELS ... Pages 25 to 30



CPK PRECISION MOLECULAR MODELS

Improved versions of the Corey-Pauling Models designed at the California Institute of Technology in the late 1940's — with new connectors by Dr. Walter Koltun.

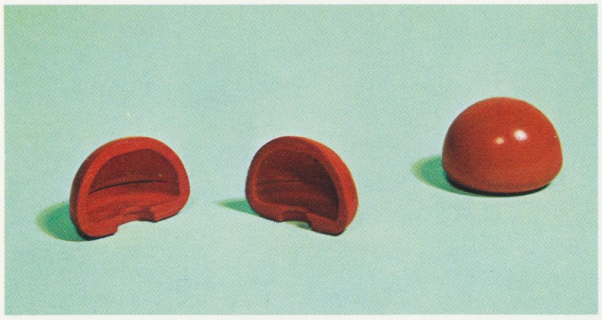
These CPK Models were developed by the Atomic Models Sub-Committee of the Biophysics and Biophysical Chemistry Study Section of the National Institute of Health, Washington, D.C. Over 40 scientists from more than two dozen research centers contributed to the work of this Committee.

The CPK designs which emerged have been implemented by the American Society of Biological Chemists with financial support from the United States National Science Foundation.

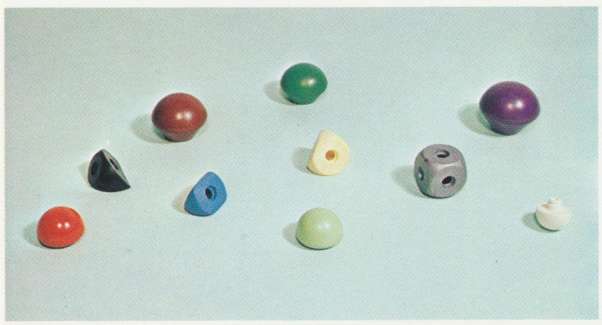
CPK space-filling atoms are the most accurate available with a 1.25cm/Å scale. They have achieved a reputation for excellence among basic researchers in biochemistry. Photographs of CPK models corroborating experimental molecular structure are found throughout the literature.

Although the emphasis in these CPK Models has been placed on atoms necessary for the construction of proteins and nucleic acids, a variety of additional atoms is provided to make them useful to the biochemist and organic chemist interested in smaller molecules.

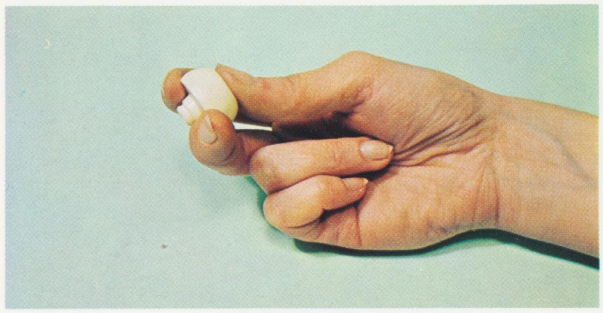
CPK Atoms are made from engineered plastics



The CPK atoms are hollow and, except for hydrogen, are injection molded in Implex, a hard and durable modified acrylic polyester.



The color is an integral part of the plastic and cannot be worn away. The surfaces are satin finished and are, therefore, easily lighted and photographed.



Hydrogen has an elastically compressable polyethylene shell.

CPK Connector Links are strong, various and flexible

The connectors are made of Texin, a hard, rubber-like elastomer which is strong but resilient and flexible.

Since bond distances and angles for particular atoms are known to vary even in similar structures, two special links in addition to the standard link are provided to increase or decrease the normal bond distance by + 0.08Å or − 0.05Å.

Two other links for restricting rotation have splines or raised keys which fit into mating key-ways in certain of the atom sockets to prevent or hinder rotation.

A special "gluing" link is also available for permanently connecting atoms at standard bond distances.

The various link types are color coded to aid identification.

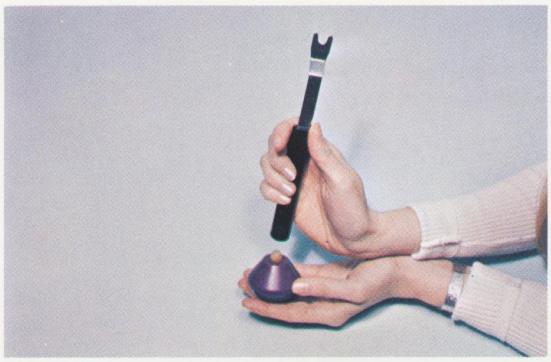
For full specifications of the Connector Links see pages 11 and 12.

CPK Radii and Bond Angles are current

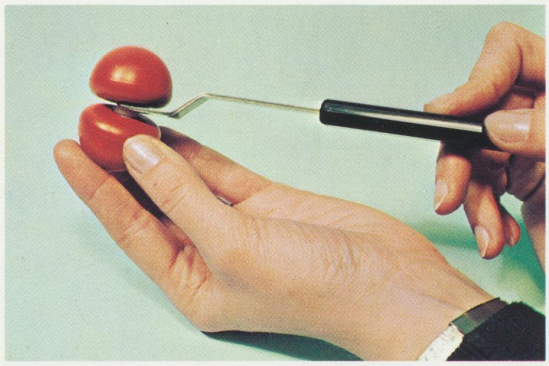
Covalent and van der Waals radii and bond angles are represented in the CPK Models as they occur in most biomolecular structures and these data agree generally with those published by Corey and Pauling.

However, several changes reflecting recent observations have been incorporated.

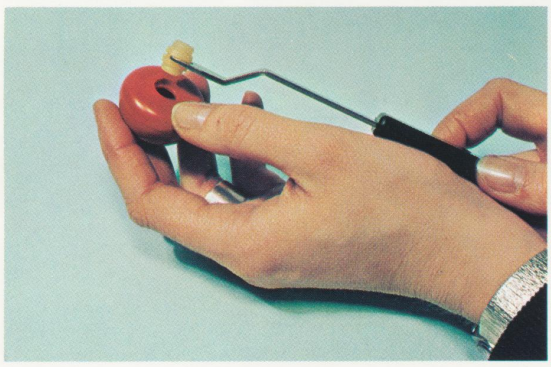
Assembly and Taking Apart Are Easy



To assemble the models, a connecting link is placed in the well on the end of the handle of the 67-7120 Construction Tool. The connecting link is then pressed into the female socket of the atom. The second atom is simply pressed onto the first with a slight twist and the bond is made. The 67-7120 Construction Tool is listed on page 12.



To separate the atoms, the blade of the 67-7120 Construction Tool is merely inserted between the atoms and they are pried apart.



To remove a connecting link the forked end of the 67-7120 Construction Tool is slipped around the center of the link and the tool is pried upward.

General Specifications

Accuracy — Bond angles ±0°30′; Covalent radii ±0.01Å; van der Waals radii ±0.03Å.

Density — Less than 1.0 gram/ml for a molecule as a whole without sacrifice in strength. The CPK atoms are hollow plastic and weigh only about ⅓ as much as the original Corey-Pauling Models.

Scale — 1.25cm/Angstrom. Large enough to maintain high accuracy, yet small enough to permit a molecule of, for example, 20x40x100 Angstroms to be built on a table top.

Hydrogen Bonding — Linear and non-linear bonded hydrogen species provide functional H-bonds to the appropriate species of nitrogen and oxygen. H-bond distance is adjustable. See characteristics of the Individual Atoms on pages 8 to 10.

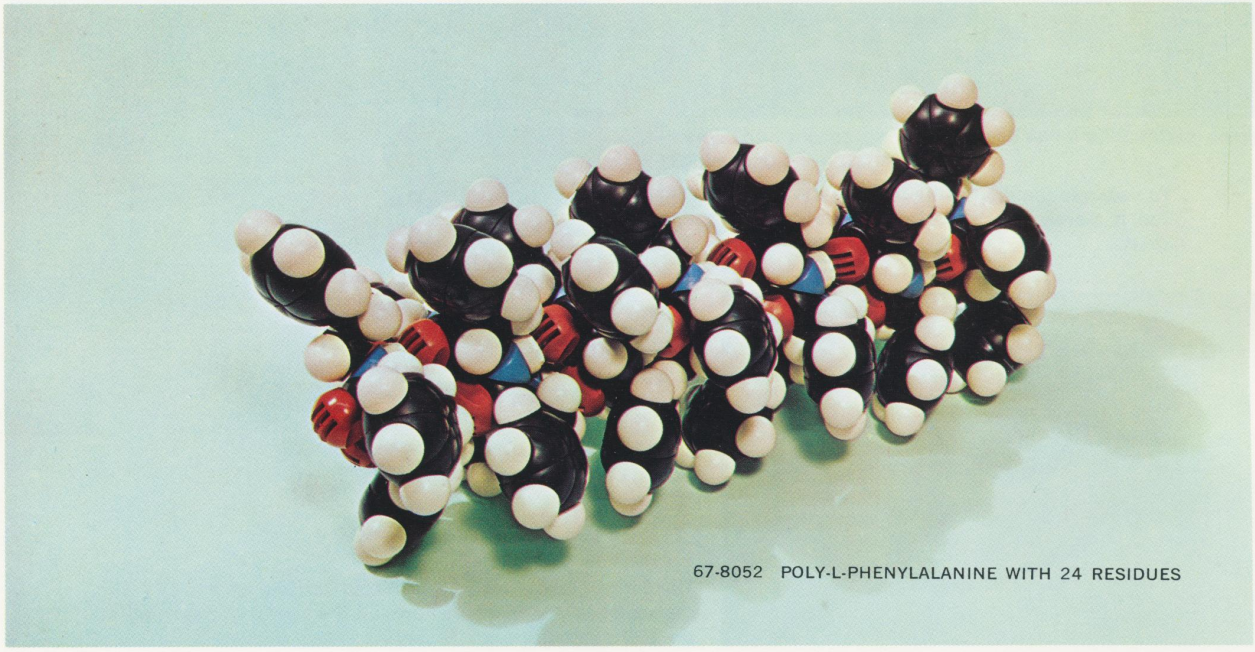
Restricted Rotation — The rotation of certain atoms may be prevented with a special keyed link. (See 67-7039 Connector Link, Locking on page 11.) The rotation of tetrahedral carbons in C-C bonds may be hindered with a special carbon link to produce the threefold rotational potential characteristic of such bonds. (See 67-7047 Connector Link, Carbon on page 11.)

Special Atoms Species — By using the 67-7088 Socket, offered on page 12, a user may construct additional atom species as required and use them with the regular CPK Models.

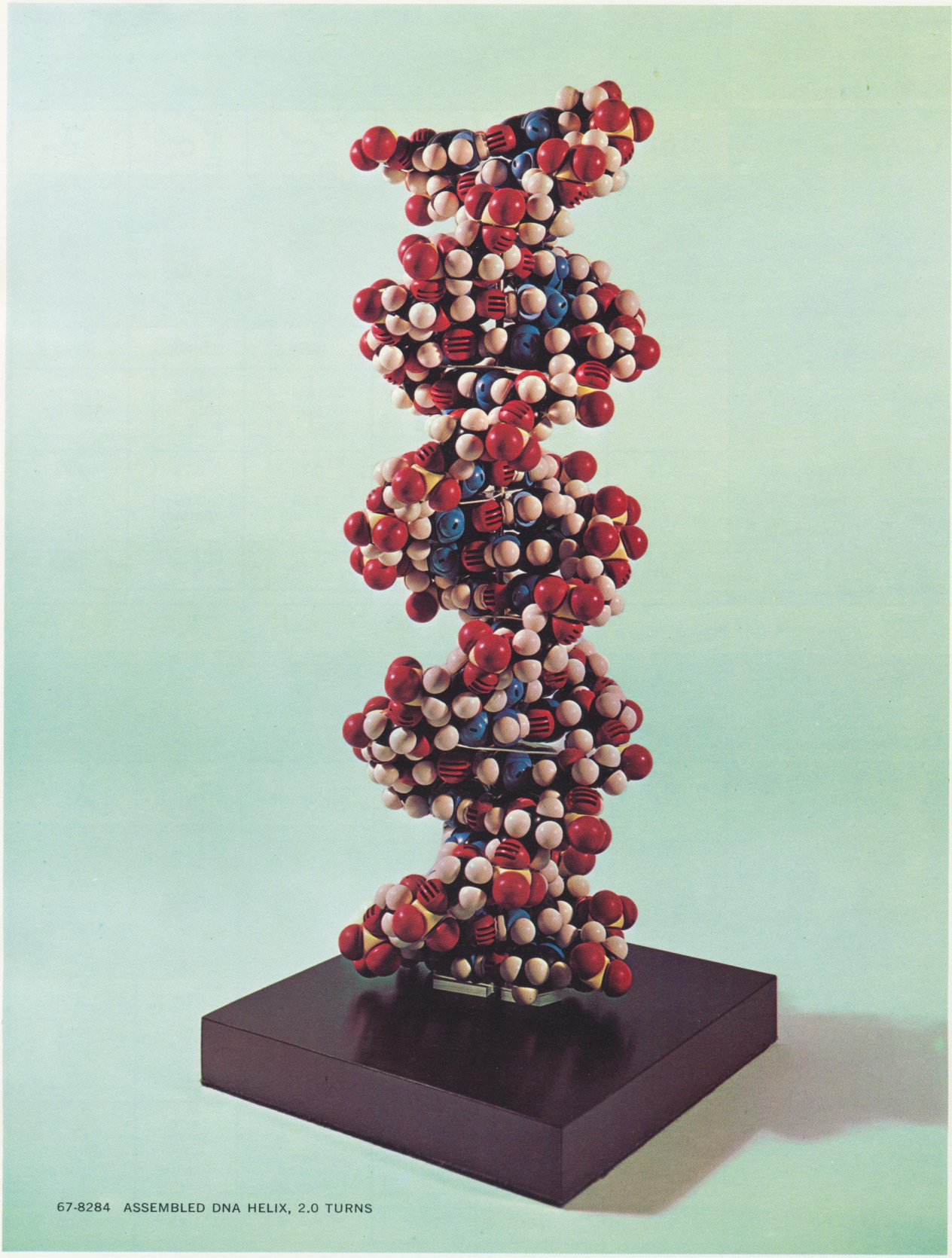
Connector Links — The marked superiority of the CPK Models derives largely from Dr. Koltun's new connector links.
Dr. Koltun's analysis of the engineering problems involved led him to new plastic materials in combination with new link designs which satisfy four critical requirements simultaneously:

- Hold atoms together with great tenacity. A force of 5-7Kg. is required to separate them. This force is readily furnished by the levering blade of the 67-7120 Construction Tool listed on page 12.
- Permit distortions of bond angles to vary up to ±8° with negligible loss in bond strength.
- Develop sufficient rotational friction to assure that large, extended side chains, often attached by a single bond, will remain indefinitely in proper steric orientation.
- Allow bond distances to be shortened or lengthened.

See pages 11 and 12 for a detailed description of the connector links.

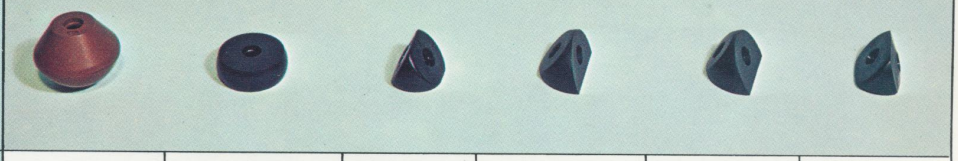


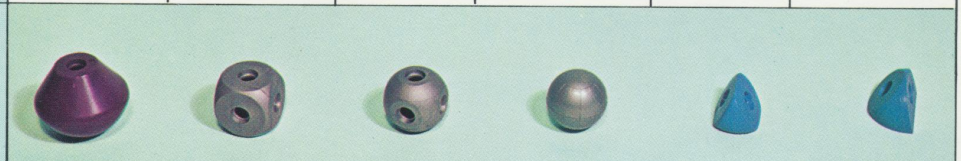
67-8052 POLY-L-PHENYLALANINE WITH 24 RESIDUES



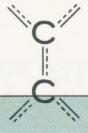
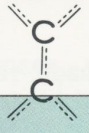
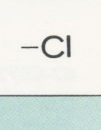
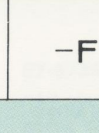
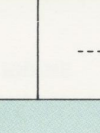
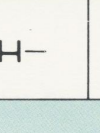
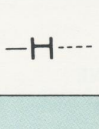
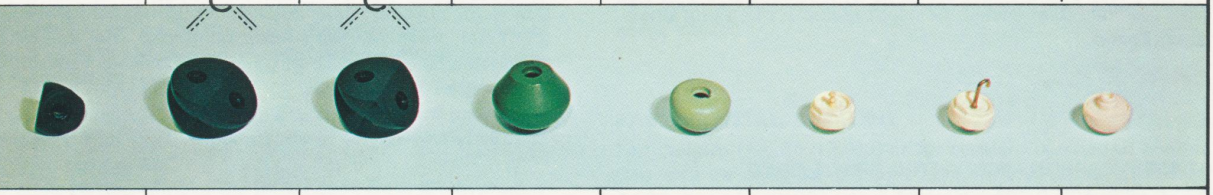
67-8284 ASSEMBLED DNA HELIX, 2.0 TURNS

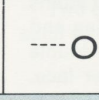
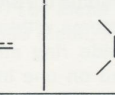
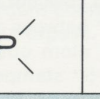
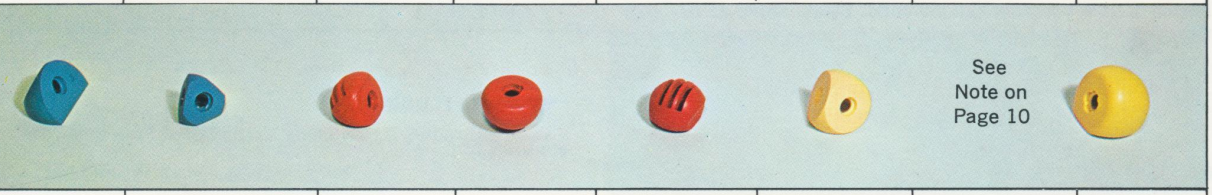
To order atoms see page 14.
For detailed characteristics of the various atoms see following pages.

ATOM SPECIES	BROMINE	C-ACETYLENIC TRIPLE BOND	C-AMIDE	C-AROMATIC-5	C-AROMATIC-6	C-ETHYLENIC DOUBLE BOND
CATALOG NUMBER	67-6510	67-6593	67-6536	67-6551	67-6569	67-6585
Bond Arrangement	–Br	–C≡	>C=	–C<	–C<	>C=
Model Outline						
Color	Brown	Black	Black	Black	Black	Black
Bond Angle	—	180°	115° 120° 125°	108° 126°	120°	125° 15′ 109° 30′
Covalent radii, Å — Single Bond	1.14	0.70	{0.72 {0.75	0.73	0.73	0.73
Covalent radii, Å — Double Bond	—	—	0.67	0.68 (partial)	0.69 (partial)	0.67
Covalent radii, Å — Triple Bond	—	0.60	—	—	—	—
Van der Waals radii, Å	1.95	1.60	1.50	1.70	1.70	1.60

ATOM SPECIES	IODINE	METAL, COVALENT	METAL, IONIC	METAL, ALL PURPOSE	N-AMIDE‡	N-AROMATIC-5‡
CATALOG NUMBER	67-6734	67-6973	67-6981	67-6999	67-6791	67-6825
Bond Arrangement	–I	–M–	–M–	Non-specific	>N=	–N<
Model Outline						
Color	Violet	Silver	Silver	Silver	Blue	Blue
Bond Angle	—	90°	90°	Non-specific	123° 123° 114°	108° 126°
Covalent radii, Å — Single Bond	1.35	1.32	1.32	—	{0.70 {0.70	0.73
Covalent radii, Å — Double Bond	—	—	—	See note on Page 9	0.60 (partial)	0.68 (partial)
Covalent radii, Å — Triple Bond	—	—	—		—	—
Van der Waals radii, Å	2.15	1.70*	1.46*	—	1.45	1.70

*Radius of sphere for constructing atom, all bond angles equal.
‡For nitrogen conversion, see 67-7112 Amine Cap, page 9.

C-TETRAHEDRAL	C-FUSED 5-6 RINGS	C-FUSED 6-6 RINGS	CHLORINE	FLUORINE	H-BOND, BAY-ONET TYPE	H-BOND, HOOK TYPE	HYDROGEN
67-6577	67-6601	67-6619	67-6650	67-6676	67-6684	67-6726	67-6692
							
							
Black	Black	Black	Green	Pale Green	White	White	White
109° 30′	120° 120° 108° 108°	120° 120° 120° 120°	—	—	—	—	—
0.77	—	0.69	0.99	0.57	0.33	0.33	0.33
—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—
—	1.70 1.70	1.70 1.70	1.80	1.35	1.00	1.00	1.00

N-AROMATIC-6‡	N-TETRAHEDRAL‡	O-SINGLE BOND	O-DOUBLE BOND	O-INDENTED DOUBLE BOND	PHOSPHORUS TETRAHEDRAL	SULFUR, TETRAHEDRAL	SULFUR, DIGONAL
67-6833	67-6841	67-6874	67-6890	67-6916	67-6924	—	67-6957
							
						See Note on Page 10	
Blue	Blue	Red	Red	Red	Pale Yellow	—	Yellow
120°	109° 30′	110°	—	—	109° 30°	—	104°
0.73	0.70	0.66	—	—	0.96	—	1.04
0.69 (partial)	—	—	0.57	0.57	—	—	—
—	—	—	—	—	—	—	—
1.70	—	1.35	1.35	1.35	—	—	1.70

‡For nitrogen conversion, see 67-7112 Amine Cap, page 9.

For detailed characteristics of the various atoms see following pages.

CHARACTERISTICS OF THE INDIVIDUAL ATOMS

To be used in conjunction with the chart on previous two pages.

67-6510 BROMINE

"Br" stamped near socket. Covalent radius 1.14Å along single bond. Brown.

67-6593 CARBON, ACETYLENIC TRIPLE BOND

Covalent radius 0.60Å along triple bond; this face marked "C≡"; second socket notched. Covalent radius 0.70Å along single bond. Black.

67-6536 CARBON, AMIDE

Covalent radii stamped on each face of this atom as follows: 0.72Å to amide nitrogen; 0.67Å to oxygen, 0.75Å to chain carbon; bond angle 115° between amide nitrogen and chain carbon; bond angle 120° between oxygen and chain carbon; bond angle 125° between oxygen and amide nitrogen; also used for general planar carbon, e.g., carboxylate carbon. Sockets notched. Black.

67-6551 CARBON, AROMATIC-5

For constructing unsaturated five-member rings such as imidazole, pyrazole, and C-8 carbon in purine. Covalent radius 0.68Å to atoms within ring and covalent radius 0.73Å to atoms outside ring; bond angle 108° between atoms within ring and 126° between single bonded atom outside ring and double bonded ring atoms; symbol "5" stamped on one inner face. Partial double bond sockets notched. Black. Same as 67-6825 Nitrogen Aromatic-5 listed on page 10 except for color.

67-6569 CARBON, AROMATIC-6

For constructing six-membered rings such as benzene, pyridine, and pyrimidine. Covalent radius 0.69Å within ring and covalent radius 0.73Å to single atoms outside ring; symbol "6" stamped on one inner face. Partial double bond sockets are notched. Black.

67-6585 CARBON, ETHYLENIC DOUBLE BOND

Covalent radius 0.67Å along the double bond; this face marked "C=" and connector socket is notched; covalent radius 0.73Å along single bonds; bond angle 125° 15′ between the double and single bonds; bond angle 109°30′ between single bonds. Black.

67-6577 CARBON, TETRAHEDRAL

Connector sockets triple notched for simulation of restricted rotational potential. For special connector link see 67-7047 Connector Link, Carbon on page 11. Covalent radius 0.77Å; bond angle 109°30′. Black.

67-6601 CARBON, SPECIAL FOR FUSED 5-6 RINGS.

A special double-atom unit representing the carbons common to both rings. The 120° face bonds in the six-member ring; the 108° face bonds in the five-member ring, e.g. purines and indoles. Black.

67-6619 CARBON, SPECIAL FOR FUSED 6-6 RINGS

A special double atom unit representing the carbons common to fused 6-membered unsaturated rings, e.g. anthracene, phenanthrenes, naphthalenes. The unit is stamped "6-6" for identification. Covalent radius 0.69Å with a bond angle of 120°. Black.

67-6650 CHLORINE

"Cl" stamped near socket. Covalent radius 0.99Å along single bond. Green.

67-6676 FLUORINE

Covalent radius 0.57Å along single bond. Pale Green.

67-6684 H-BOND, BAYONET TYPE, HYDROGEN

Indentation radius 1.35Å about a center 1.66Å from spherical center of hydrogen atom; using upper sets of barbs on shank lengthens H-bond either by 0.20Å or by 0.40Å. Connector link incorporated.

The bayonet connector link fits the slot in the top of the 67-7112 Amine Cap (for details of the Amine Cap see opposite page) the slots of the 67-6874 Oxygen, Single Bond or the slots of the 67-6916 Oxygen, Indented Double Bond. If the bayonet type connector breaks it is a simple matter to replace it with a 67-7062 Connector Link, Bayonet H-Bond Replacement which is offered separately (see page 11). White.

67-6726 H-BOND, HOOK TYPE, HYDROGEN

Indentation radius 1.35Å about a center 1.66Å from spherical center of hydrogen atom. This hook type hydrogen has been designed to add substantial structural strength to the CPK hydrogen bonding system. White.

To connect the 67-7112 Amine Cap (for details of the Amine Cap see below) to the hydrogen body of the 67-6726-H-Bond, Hook Type, Hydrogen:

(1) unscrew and remove the metal hook from the hydrogen body:

(2) the Amine Cap has a connector link as part of it. This connector link is hollow. Place a 67-7187 Screw for Amine Cap (see page 12) in the hollow connector link with the end of the screw protruding from the slot in the top of the Amine Cap and use a slim screwdriver to turn this screw into the hole in the hydrogen body from which the hook was removed.

The 67-6874 Oxygen, Single Bond and the 67-6916 Oxygen, Indented Double Bond both have strong ribs to accept the metal hook of this 67-6726 H-Bond, Hook Type, Hydrogen. When the metal hook is placed over the rib of either of these oxygen atoms the 67-7138 Hydrogen Wrench (see page 12) then fits over the eight sided face of the basic hydrogen body and this body is turned until the hook is brought up securely against the oxygen atom.

Note that one or more 67-7096 H-Bond Spacers (see page 12) can be put on over the hook to increase the bond distance by 0.2Å for each spacer used.

67-6692 HYDROGEN

Single bond; shell is elastically compressible; a connector link is incorporated. White.

67-6734 IODINE

"1" stamped near socket. Covalent radius 1.35Å along single bond. Violet.

67-6973 METAL, COVALENT

For chelates (Fe, Co, Ni, Cu) or for covalent octahedral bonds. Can also be used for planar configurations. Covalent radius 1.32Å, bond angle 90°, van der Waals radius 1.70Å. Silver.

67-6981 METAL, IONIC

For ionic octahedral bonds. Can also be used for planar configurations. Covalent radius 1.32Å, bond angle 90°, van der Waals radius 1.46Å. Silver.

67-6999 METAL, ALL PURPOSE

A sphere with a diameter corresponding to 2.7Å. Lines of longitude and latitude are embossed at 30° intervals over the surface of the sphere. An indent is at one pole of the sphere. With the aid of the lines of latitude and longitude the user may orient the sphere in any direction required by a particular construction.

This Metal Atom has a special connector. It is the 67-7161 Metal Atom Connector Link (see page 12) and consists of a connector link one half the length of a normal link plus a self-tapping screw. A 1/16″ hole must be drilled in the sphere in order to accommodate the self-tapping screw.

Two 67-7161 Metal Atom Connector Links are included with each 67-6999 Metal, All Purpose. Silver.

67-7112 AMINE CAP

Hemisphere with hollow connector link inserted into flat face and a small slot in curved surface. Blue.

The slot in the top of the Amine Cap accepts the bayonet of the 67-6684 H-Bond, Bayonet Type, Hydrogen for temporary connections and the 67-6726 H-Bond, Hook Type, Hydrogen, after the hook has been removed and replaced by a 67-7187 screw, for permanent connections. For details see 67-6726 above.

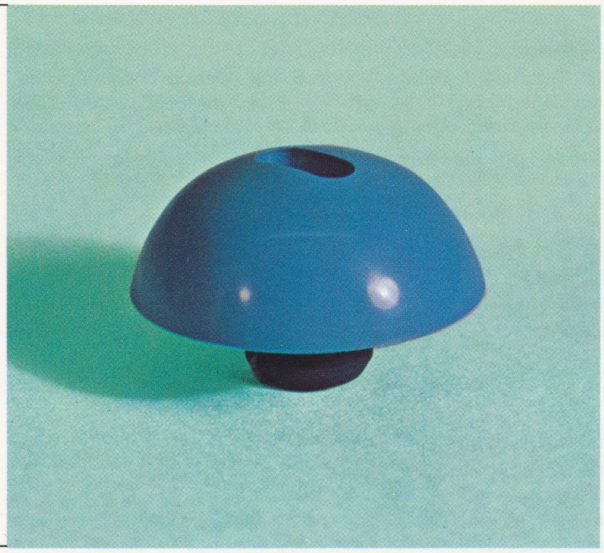
The Amine Cap is also used with:

67-6791 Nitrogen, Amide to convert to azo nitrogen.

67-6825 Nitrogen, Aromatic-5 to convert to azo nitrogen.

67-6833 Nitrogen, Aromatic-6 to convert to azo nitrogen.

67-6841 Nitrogen, Tetrahedral to convert to amino nitrogen.



Continued

CHARACTERISTICS OF THE INDIVIDUAL ATOMS (continued)

67-6791 NITROGEN, AMIDE

Covalent radii stamped on each face of this atom as follows: 0.60Å to amide carbon, 0.70Å to hydrogen bond hydrogen; 0.70Å to chain carbon. Bond angle 123° between amide carbon and H-bond hydrogen; 114° between chain carbon and H-bond hydrogen. One face has an "H" stamped to facilitate construction of transpeptide linkages. Also used for general planar trigonal nitrogen as in NO_2 and with the 67-7112 Amine Cap as azo nitrogen. For details of the 67-7112 Amine Cap see page 9. Blue.

67-6825 NITROGEN, AROMATIC-5

For use in five-membered rings such as in imidazole or in positions 7 and 9 in purine rings. Covalent radius 0.68Å to atoms within ring and covalent radius 0.73Å to atoms outside ring; bond angle 108° between atoms within ring and 126° between single bonded atom outside ring and double bonded ring atoms; symbol "5" stamped on one inner face. Partial double bond sockets notched. 67-7112 Amine Cap converts Nitrogen, Aromatic-5 to azo nitrogen. (For details of Amine Cap see page 9). Blue.

67-6833 NITROGEN, AROMATIC-6

For use in six membered rings such as pyridine and pyrimidine. Covalent radius 0.69Å within ring and covalent radius 0.73Å to single atoms outside ring; symbol "6" stamped on one inner face. Partial double bond sockets notched. 67-7112 Amine Cap converts Nitrogen, Aromatic-6 to azo nitrogen. (For details of Amine Cap see page 9). Blue.

67-6841 NITROGEN, TETRAHEDRAL

Connector sockets notched for simulation of restricted rotational potential. Covalent radius 0.70Å; bond angle 109°30′. 67-7112 Amine Cap converts Nitrogen, Tetrahedral to amino nitrogen. (For details of Amine Cap see page 9). Blue.

67-6874 OXYGEN, SINGLE BOND

Triple slotted to accept 67-6684 H-Bond, Bayonet Type, Hydrogen and 67-6726 H-Bond, Hook Type, Hydrogen for H-bonding. Center slot extends ±48°, side slots ± 35° at ± 15° displacement from center line. Covalent radius 0.66Å, bond angle 110°. Red.

67-6890 OXYGEN, DOUBLE BOND

Also serves as negatively charged oxygen. Covalent radius 0.57Å. Red.

67-6916 OXYGEN, INDENTED DOUBLE BOND

With indented sides; indentations on radii of 1.15Å about centers spaced laterally 2.1Å from spherical center of atom. Three slots on the surface of the atom and parallel to the long axis of the indentations accept 67-6684 H-Bond, Bayonet Type, Hydrogen and 67-6726 H-Bond, Hook Type, Hydrogen for H-bonding. All three slots extend ±48° and the side slots are displaced ± 15° from the center line. Connector socket is notched. Covalent radius 0.57Å. Red.

67-6924 PHOSPHORUS, TETRAHEDRAL

Covalent radius 0.96Å, bond angle 109°30′. See note below. Pale Yellow.

SULFUR TETRAHEDRAL

Sulfur, Tetrahedral is represented by 67-6924 Phosphorus, Tetrahedral when used with the 67-7021 Connector Link, Long (see page 11) resulting in a covalent radius of 1.04Å; double bond face not differentiated. In other words to receive Sulfur, Tetrahedral order one 67-6924 Phosphorus, Tetrahedral and one 67-7021 Connector Link, Long.

67-6957 SULFUR, DIGONAL

Notches every 90° in sockets. Covalent radius 1.04Å; bond angle 104°. Yellow.

CONNECTOR LINKS

To order these Connectors see page 14.

These Connectors are made of Texin, a hard, rubber-like elastomer which is strong but resilient and flexible.

67-7005 CONNECTOR LINK, STANDARD
Provides standard bond distance. Off-White.

67-7013 CONNECTOR LINK, SHORT
Shortens bond distance by 0.05Å. Blue.

67-7021 CONNECTOR LINK, LONG
Lengthens bond distance by 0.08Å. Red.

67-7039 CONNECTOR LINK, LOCKING
Provides standard bond distance and has locking splines that mate with keyways in the female socket of the atoms to prevent rotation. Gray.

67-7047 CONNECTOR LINK, CARBON
Provides standard bond distance and has locking splines at each end placed 180° out of phase that restrict rotation of 67-6577 Carbon Tetrahedral. Black.

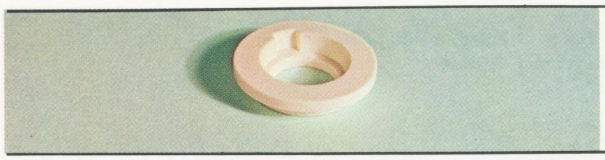
67-7054 CONNECTOR LINK, GLUING
For constructing permanent structures at standard bond distance using trichlorethylene "glue" or Tester's Polystyrene Cement. Black.

67-7062 CONNECTOR LINK, BAYONET H-BOND REPLACEMENT
This is the connector that is supplied with the 67-6684 H-Bond, Bayonet Type, Hydrogen atom described on page 8. It is for replacement if the tip of the connector supplied with the atom breaks.

Continued

MISCELLANEOUS ACCESSORIES

To order these items see page 14.

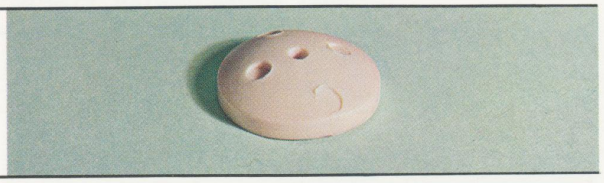


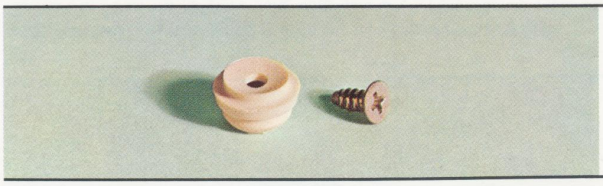
67-7088 SOCKET

Standard female socket to be mounted on special atom species fabricated by the user. This socket takes all of the Connector Links listed on the preceding page. White.

67-7096 H-BOND SPACER

For use with the 67-6726 H-Bond, Hook Type, Hydrogen described on page 9. One or more of these Spacers can be put on over the hook of the 67-6726 to increase the bond distance by 0.2Å for each spacer used.



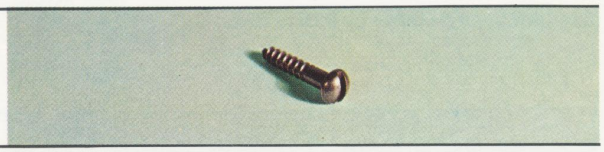


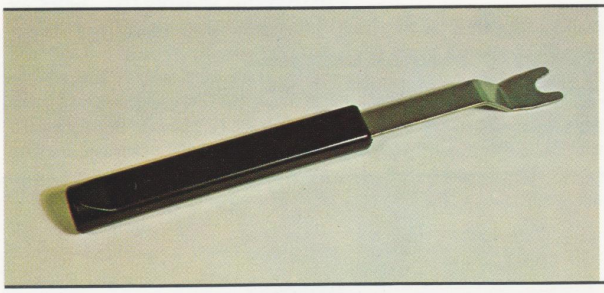
67-7161 METAL ATOM CONNECTOR LINK

Supplied with self-tapping screw. For use with 67-6999 Metal, All Purpose, as described on page 9. White. Note that two of these Connectors are supplied with each 67-6999 Metal, All Purpose.

67-7187 SCREW FOR AMINE CAP

This screw is used to connect the 67-7112 Amine Cap to the 67-6726 H-Bond, Hook Type, Hydrogen when the hook is removed. For details see page 9.



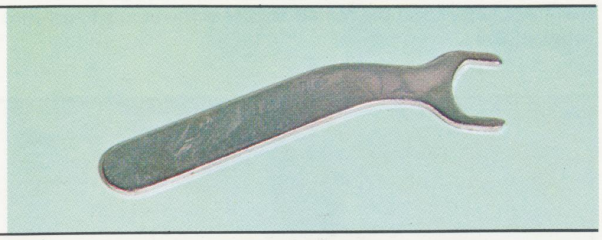


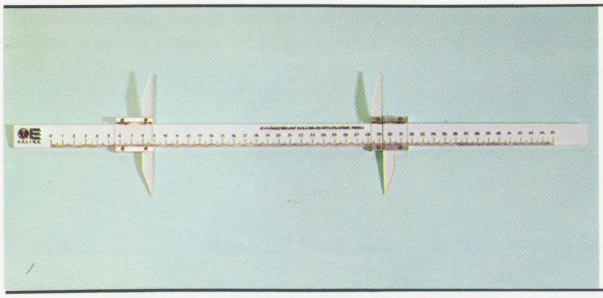
67-7120 CPK MODEL CONSTRUCTION TOOL

To assemble the models, a connecting link is placed in the well on the end of the handle of the Construction Tool. The connecting link is then pressed into the female socket of the atom. The second atom is simply pressed onto the first with a slight twist and the bond is made. To separate the atoms, the blade of the Construction Tool is merely inserted between the atoms to pry them apart. A connecting link may be completely removed by slipping the forked end of the Construction Tool around the center of the link and the Tool is pried upward.

67-7138 HYDROGEN WRENCH

This Wrench is for use with the 67-6726 H-Bond, Hook Type, Hydrogen. When the hook of that atom is placed in the slot of the 67-6874 Oxygen, Single Bond or 67-6916 Oxygen, Indented Double Bond atom this Wrench fits over the eight sided face of the basic hydrogen body and the body is turned until the hook is brought up securely against the oxygen atom. For details see page 9.





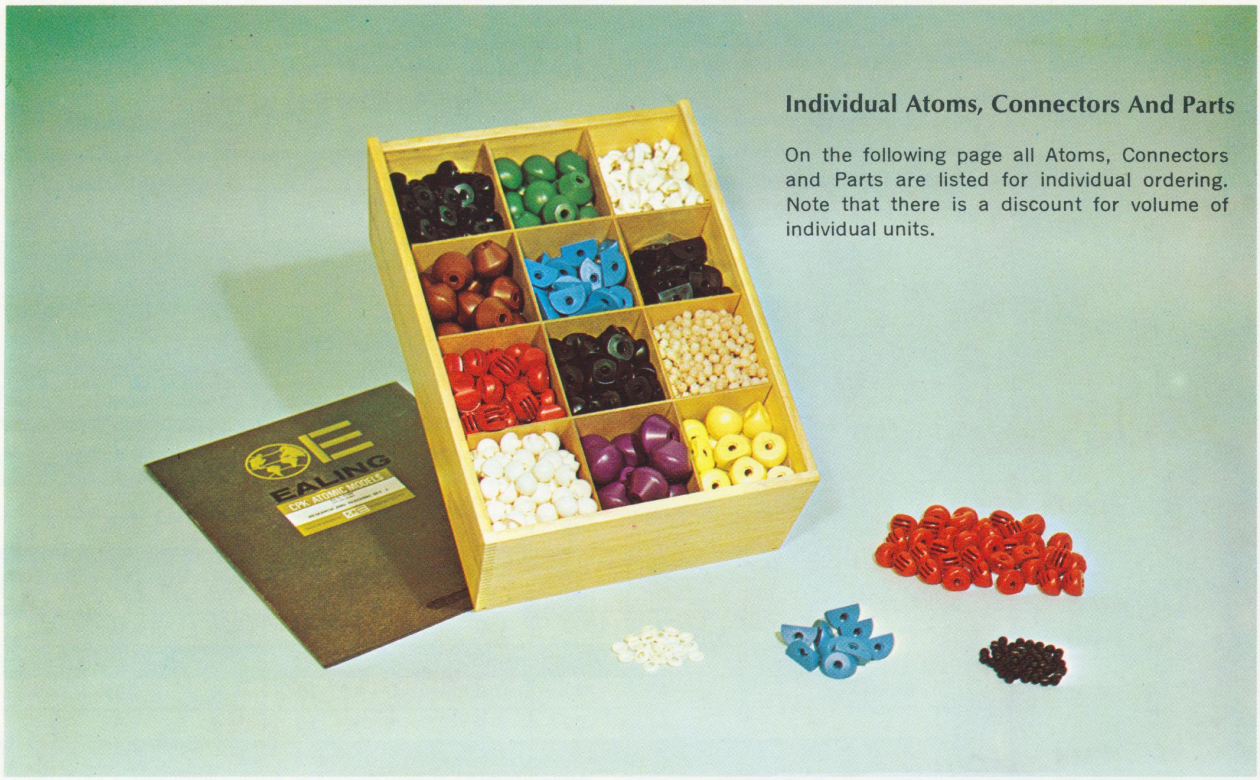
67-7146 CALIPERS WITH ANGSTROM UNIT SCALE FOR CPK MODELS

A calipers calibrated at 1.25 cm/Å (the scale of the CPK Models) which offers a convenient way to make direct measurements in Angstroms on CPK structures. Range 0 to 30Å graduated in 0.1Å with each Å numbered. Sturdy bar engraved with black filled graduations. Accurate measurement is attained by two spring loaded cursors with long transparent plastic jaws. One cursor is reversible to enable both internal and external measurements to be made. Overall length 26 inches (64cm).

67-7179 "MOLECULES IN THREE DIMENSIONS"

A 20 page pamphlet subtitled "A Guide to the Construction of Models of Biochemically Interesting Compounds With CPK Models". Written by Robert A. Harte of the American Society of Biological Chemists, Inc.

CPK PRECISION MOLECULAR MODELS
Are Offered Both Individually And In Convenient Sets



Individual Atoms, Connectors And Parts

On the following page all Atoms, Connectors and Parts are listed for individual ordering. Note that there is a discount for volume of individual units.

NINE INDIVIDUAL SETS

Nine different sets are also offered on the following page. The contents of each set is indicated by reading down the column under the set listing. Each set is supplied in a convenient storage box.

The sets are:

67-6015 CPK MODELS RESEARCH AND TEACHING SET 1

For students. Contains sufficient atoms and connectors to build ATP; a twelve-residue alpha-helix backbone; or the base pairs of the nucleic acids, but not simultaneously.

67-6023 CPK MODELS RESEARCH AND TEACHING SET 2

For the smaller laboratory. This set builds 36 peptide backbone segments in helix forms; three base-pair residues of nucleic acid in double helix form; ATP; steroids; etc.

67-6031 CPK MODELS RESEARCH AND TEACHING SET 3

For the larger laboratory or department where a number of structures, once built, are likely to be left permanently assembled. Constructs 60 peptide backbone segments in helix form.

67-6114 CPK MODELS PROTEIN SET 1

For the personal use of the graduate student. Builds a 40 peptide alpha-helix backbone; purine and pyrimidine units; ATP; etc.

67-6122 CPK MODELS PROTEIN SET 2

An intermediate set. Builds 100 peptide alpha-helix backbone units with many side chains. Also builds 9 purine rings or complete nucleotides.

67-6130 CPK MODELS PROTEIN SET 3

For the laboratory where sizable segments of complete protein molecules are assembled. Builds 200 peptide helix backbone units, with many side chains or 12 nucleotides.

67-6213 CPK MODELS NUCLEIC ACIDS SET 1

This set builds 30 assorted purine and pyrimidine base units with associated pentose sugar phosphate chains or several peptide units.

67-6221 CPK MODELS NUCLEIC ACIDS SET 2

This larger set builds 100 assorted purine and pyrimidine base units; pentose sugar phosphate linkages; or up to 45 peptide units.

67-6411 CPK MODELS STEROID SET

This set will build a substantial number of steroid structures.

See next page

CONTENTS OF CPK SETS						RESEARCH AND TEACHING SETS			PROTEIN SETS			NUCLEIC ACIDS SETS		STEROID SET
					SET NUMBER	1	2	3	1	2	3	1	2	
					CATALOG NUMBER	67-6015	67-6023	67-6031	67-6114	67-6122	67-6130	67-6213	67-6221	67-6411
					PRICE EACH SET	$170.00	$445.00	$1835.00	$360.00	$918.00	$1965.00	$670.00	$2075.00	$292.00
INDIVIDUAL COMPONENTS		Individual Models Each price in quantities of												
Catalog Number	Type	1 to 9	10 to 99	100 to 999	1000 and up									
67-6510	Bromine	.90	.86	.82	.78	4	15	60	2	4	10	2	4	2
67-6593	Carbon, acetylenic triple bond	.90	.86	.82	.78	4	6	20	2	6	10	2	4	2
67-6536	Carbon, amide	.60	.57	.54	.51	12	36	60	40	100	200	15	45	10
67-6551	Carbon, aromatic-5	.68	.65	.62	.59	6	18	100	15	30	75	15	50	8
67-6569	Carbon, aromatic-6	.63	.60	.57	.54	18	36	400	25	120	300	90	300	24
67-6585	Carbon, ethylenic double bond	.73	.69	.66	.63	8	20	60	5	10	20	5	25	10
67-6577	Carbon, tetrahedral	.45	.43	.41	.39	30	60	500	75	150	200	155	525	160
67-6601	Carbon, fused 5-6 rings	.80	.76	.72	.68	4	8	20	5	9	21	15	50	2
67-6619	Carbon, fused 6-6 rings	.75	.71	.68	.65	4	8	15	2	4	6	2	4	4
67-6650	Chlorine	.90	.86	.82	.78	4	15	60	2	4	10	2	4	2
67-6676	Fluorine	.75	.71	.68	.65	4	10	70	—	2	2	—	—	2
67-6684	H-bond, bayonet type	.58	.55	.52	.49	2	5	10	4	10	30	6	20	2
67-6726	H-bond, hook type	.75	.71	.68	.65	20	50	100	40	100	300	60	200	10
67-6692	Hydrogen	.23	.22	.21	.20	40	120	1000	150	600	1500	450	1400	300
67-6734	Iodine	.88	.84	.80	.76	4	10	30	2	4	10	1	4	2
67-6973	Metal, covalent	.80	.76	.72	.68	2	4	20	2	5	10	2	5	—
67-6981	Metal, ionic	.88	.84	.80	.76	2	4	20	2	5	10	2	5	—
67-6999	Metal, all purpose	1.45	1.38	1.31	1.25	Not Supplied With Sets								
67-6791	Nitrogen, amide	.63	.60	.57	.54	12	36	60	40	100	200	20	60	4
67-6825	Nitrogen, aromatic-5	.63	.60	.57	.54	3	9	50	10	20	40	30	100	2
67-6833	Nitrogen, aromatic-6	.68	.65	.62	.59	6	18	100	15	30	60	60	180	4
67-6841	Nitrogen, tetrahedral	.73	.69	.66	.63	4	12	50	8	20	25	15	45	2
67-6874	Oxygen, single bond	.45	.43	.41	.39	10	36	150	25	50	75	155	525	10
67-6890	Oxygen, double bond	.58	.55	.52	.49	8	18	100	20	100	175	35	100	10
67-6916	Oxygen, indented double bond	.68	.65	.62	.59	12	36	100	40	100	200	35	135	2
67-6924	Phosphorus, tetrahedral	.80	.76	.72	.68	4	10	40	5	9	12	30	100	3
—	Sulfur, tetrahedral	—	—	—	—	Not Supplied Individually— See Page 10								
67-6957	Sulfur, digonal	.78	.74	.70	.67	4	8	20	4	8	20	4	9	2
67-7112	Amine Cap	.75	.71	.68	.65	4	12	40	20	50	80	45	150	5
67-7005	Connector Link, standard	—	.08	.07	.06	200	500	1500	400	1000	1500	700	1800	300
67-7013	Connector Link, short	—	.15	.14	.13	10	50	100	25	50	100	20	100	25
67-7021	Connector Link, long	—	.18	.17	.16	10	50	100	25	50	100	20	100	25
67-7039	Connector Link, locking	—	.15	.14	.13	10	50	100	100	200	500	50	200	75
67-7047	Connector Link, carbon	—	.15	.14	.13	30	60	500	40	150	300	150	550	150
67-7054	Connector Link, gluing	—	.15	.14	.13	—	50	300	50	100	500	50	100	50
67-7062	Connector Link, bayonet H-bond replacement	—	.15	.14	.13	10	25	50	20	50	150	30	100	5
67-7088	Socket	—	.15	.14	.13	—	25	100	10	10	20	10	20	25
67-7096	H-Bond Spacer	—	.15	.14	.13	30	75	150	60	150	450	90	300	15
67-7161	Metal Atom Connectors	.40	.38	.36	.34	Not Supplied With Sets— Used With 67-6999 Metal, all purpose								
67-7187	Screws For Amine Cap, pack of ten	1.00	.95	.90	.85	Not Supplied With Sets								
67-7120	Construction Tool	2.50	—	—	—	1	1	3	1	1	2	1	3	1
67-7138	Wrench, H-bond	1.95	—	—	—	1	1	3	1	1	2	1	3	1
67-7146	Calipers	60.00	—	—	—	Not Supplied With Sets								
67-7179	Pamphlet-Molecules in 3 Dimensions	1.50	—	—	—	Not Supplied With Sets								

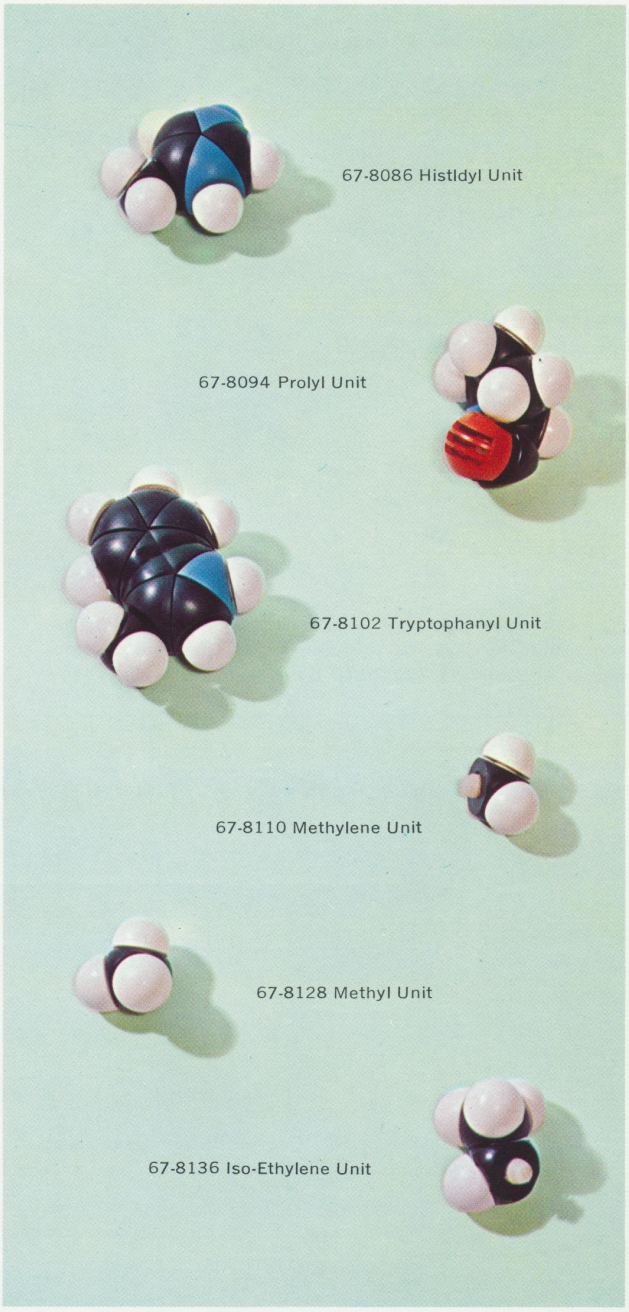
ASSEMBLED REGULAR MOLECULAR STRUCTURES OF CPK MODELS

As an aid to building various structures, the following groups of assembled units are offered:

- **Units For Side Chain Construction. These units are listed below and on the following page. The table on the following page shows the number of each units required for the 20 side chains listed.**
- **Simple Polypeptide Backbone Segments For Helix Construction. Listed on page 17.**
- **General Purpose Unit For Construction Of Aromatic Compounds. Listed on page 17.**
- **Units For The Construction Of Nucleic Acid Base Pairs And Nucleotides. Listed on page 18.**
- **DNA Helices. Listed on pages 20 and 21.**
- **Macromolecular Structures. Listed on pages 22 to 24.**

ASSEMBLED UNITS FOR BUILDING TWENTY SIDE CHAINS

See the table on the next page for the numbers of each unit required for the 20 side chains listed In the table.



67-8086 HISTIDYL UNIT

A ($C_3H_3N_2CH_2$) Unit which is the complete R-group for histidine residue. **$10.50**

67-8094 PROLYL UNIT

A (-C_5H_7NO-) Unit which is the complete proline residue ready for incorporation in a peptide chain. **$8.50**

67-8102 TRYPTOPHANYL UNIT

A ($C_9H_6NCH_2$-) Unit which is the complete R-group for tryptophan residue. **$14.00**

67-8110 METHYLENE UNIT

A (CH_2-) Unit with one empty socket and one standard link. **$1.50**

67-8128 METHYL UNIT

A (CH_3-) Unit with a standard link, in the fourth face of the Tetrahedral Carbon. **$2.00**

67-8136 ISO-ETHYLENE UNIT

A ($CHCH_3$-) Unit with one empty socket and one standard link for use in valine, leucine, and in proper steric form for isoleucine and threonine. **$3.25**

67-8144 CARBOXYLATE UNIT
A (-COO-) Unit with a standard link in the third face of the Amide (carboxylate) Carbon. **$3.50**

67-8151 AMIDE UNIT
A (-$CONH_2$) Unit with a standard link in the third face of the Amide Carbon. **$4.25**

67-8169 BENZYL UNIT
A (-$C_6H_4CH_2$) Unit with an empty socket in the para-position and a standard link in the methylene group. **$10.50**

67-8177 IONIC AMINO UNIT
An (-NH_3+) Unit with a standard link in the fourth face of the Tetrahedral Nitrogen. **$2.50**

67-8185 GUANIDINIUM UNIT
An (-$NHCNH_2NH_2$)+ Unit for Arginine. **$6.75**

67-8193 HYDROXY UNIT
An(-OH) Unit. **$1.25**

This table gives the assembled units required to construct each of the 20 side chains that can be built from these assembled structures. Note that the 67-6692 Hydrogen and 67-6957 Sulfur, Digonal listed are single atoms and should be ordered from the table on page 14.

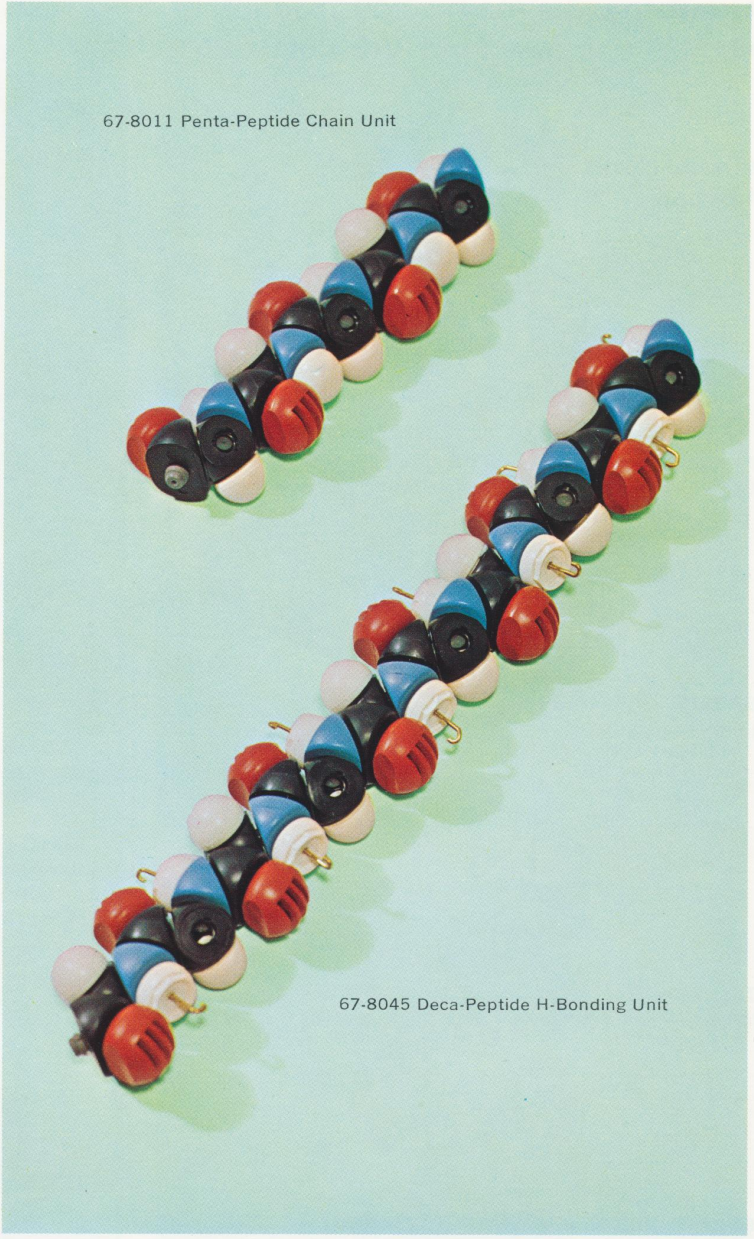
Cat. No.	Assembled Structure ↓ / Side Chain →	Alanine Ala	Arginine Arg	Aspartic Acid, Asp	Asparazine Asn	Cystine Cys	Glutamic Acid, Glu	Glutamine Gln	Glycine Gly	Histidine His	Leucine Leu	Isoleucine Ile	Lysine Lys	Methionine Met	Phenylalanine Phe	Proline Pro	Serine Ser	Threonine Thr	Tyrosine Tyr	Tryptophan Try	Valine Val
67-6692	Hydrogen*					1			1						1						
67-6957	Sulfur, Digonal*					1								1							
67-8086	Histidyl Unit									1											
67-8094	Prolyl Unit															1					
67-8102	Trytophanyl Unit																			1	
67-8110	Methylene Unit		3	1	1	1	2				1	1	4	2			1				
67-8128	Methyl Unit	1									1	1		1							1
67-8136	Iso-Ethylene Unit										1	1						1			1
67-8144	Carborylate Unit			1				1													
67-8151	Amide Unit				1			1													
67-8169	Benzyl Unit														1			1			
67-8177	Ionic Amino Unit																				
67-8185	Guanidinium Unit		1																		
67-8193	Hydroxy Unit																	1	1		

*Individual Atom see page 14.

ASSEMBLED SIMPLE POLYPEPTIDE BACKBONE SEGMENTS FOR HELIX CONSTRUCTION

67-8011 PENTA-PEPTIDE CHAIN UNIT
A chain of five peptide units in the L-alpha form (-NHCHCO-) with a 67-6692 non-bonding Hydrogen on the amino group. **$26.00**

67-8045 DECA-PEPTIDE H-BONDING UNIT
A chain of ten peptide backbone units similar to 67-8011 above but with 67-6726 H-Bond, Hook Type Hydrogen on the amino group. May be formed into either a left or right bond helix segment. **$53.00**

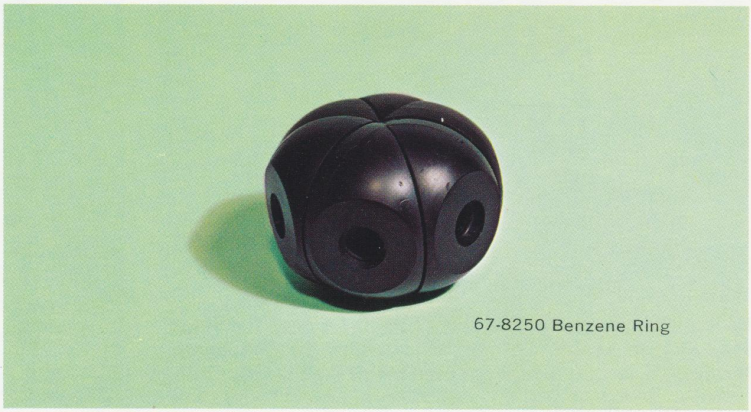


67-8011 Penta-Peptide Chain Unit

67-8045 Deca-Peptide H-Bonding Unit

ASSEMBLED GENERAL PURPOSE UNIT FOR CONSTRUCTION OF AROMATIC COMPOUNDS

67-8250 BENZENE RING
Consists of six 67-6569 Aromatic-6 Carbons formed into a C_6 ring using 67-7005 Connector Links, Standard. **$6.75**

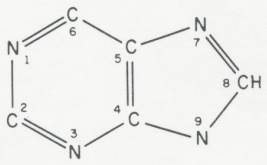


67-8250 Benzene Ring

ASSEMBLED UNITS FOR THE CONSTRUCTION OF NUCLEIC ACID BASE PAIRS AND NUCLEOTIDES

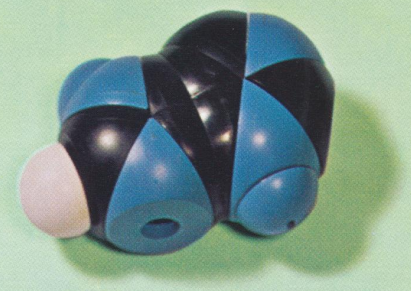
67-8201 PURINE UNIT

A Purine ring in the form:



Nitrogens in positions 3 and 7 are azo; Nitrogens 9 and 1 and Carbons 2 and 6 have empty sockets on the exterior ring faces.

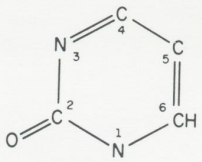
$13.00



67-8201 Purine Unit

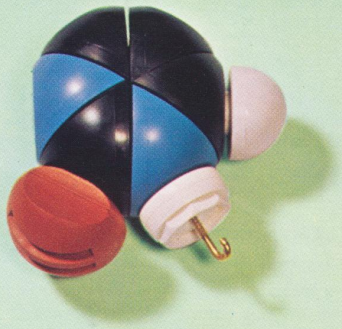
67-8219 PYRIMIDINE UNIT

In the form:



The exterior sockets at C-4 and -5 and N-3 and -1 have been left empty enabling the unit to be finished off as C, T, or U.

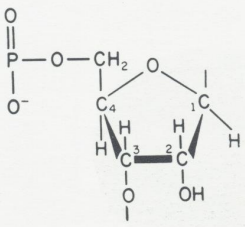
$10.00



67-8219 Pyrimidine Unit

67-8243 RIBOSE PHOSPHATE CHAIN UNIT

A pentose phosphate in the form:



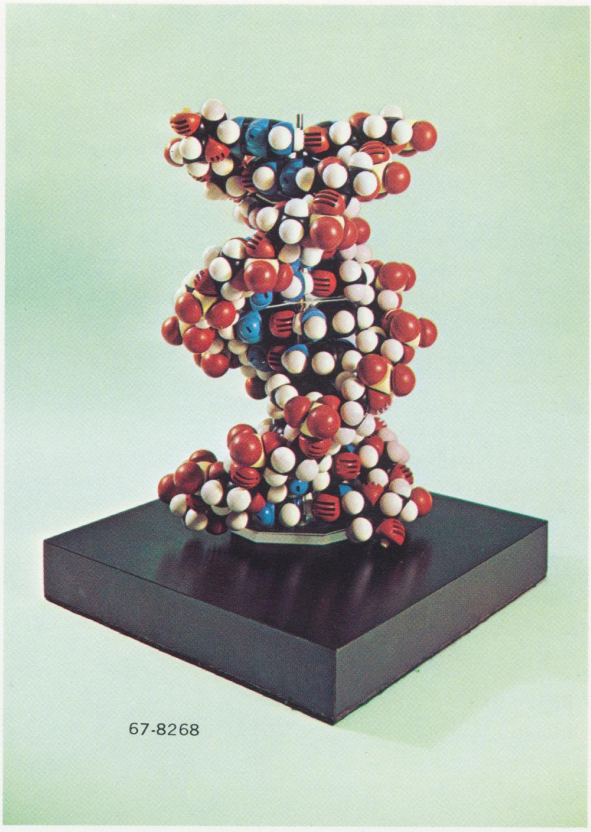
Standard connector links are exposed at C-1 and on the Single Bond Oxygen at C-3. The fourth socket in the Tetrahedral Phosphorus accepts the linkage from the next unit in the chain.

$14.25

67-8243 Ribose Phosphate Chain Unit

DNA HELICES

One or two turns of an assembled DNA helix make a unique teaching tool. Now, as a result of numerous requests from biology departments, medical schools and science museums, Ealing offers fully assembled DNA helices made with the famous CPK Atomic Models. For components to assemble your own helices, see the following page.



67-8268

Assembled Helices

Mounted on Formica Covered Base

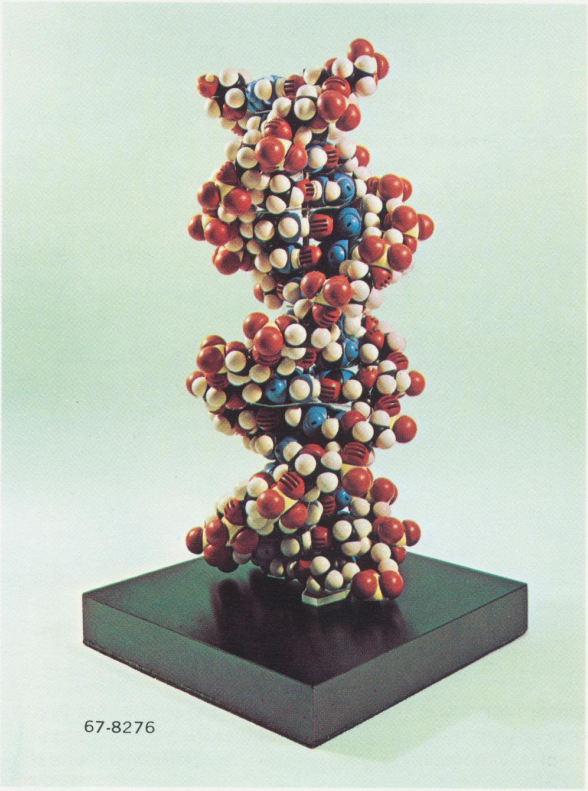
Each helix is supplied on an attractive Formica covered base large enough to provide stable support. Affixed to it is a removable plated steel rod 5/16 inch (8mm) in diameter which forms the axis of the helix. This rod is pushed through the space between the two inner H-bonds on the C-G base pairs.

Slight Distortion

Since there is a 2Å difference in the location of the hole between a base pair mounted in the C-G configuration and a base pair in the G-C, the helix is slightly distorted. This distortion is considered acceptable since it avoids boring holes into the base pairs themselves. It also makes it easy for the user to change base pairs around should this be desired.

Size of the Models

There are 10 base pairs per turn of the DNA helix. Thus, pairs 1 and 11 line up with one another. The most appropriate size for an assembled helix is 11 base pairs to start, and additional units of 5 base pairs as required. The one-turn helix is 18.5 inches high and approximately 12 inches in diameter (47cm x 30cm dia.). Allow about 17 inches (42.5cm) for each additional turn. The models are supplied with approximately equal numbers of C-G and A-T bases. There is no extra cost if you wish to specify the sequence of base pairs; merely indicate it on your order.



67-8276

Assembled Helices

67-8268	**ASSEMBLED DNA HELIX, 1.0 TURNS**	**$840.00**
67-8276	**ASSEMBLED DNA HELIX, 1.5 TURNS**	**$1175.00**
67-8284	**ASSEMBLED DNA HELIX, 2.0 TURNS**	**$1540.00**

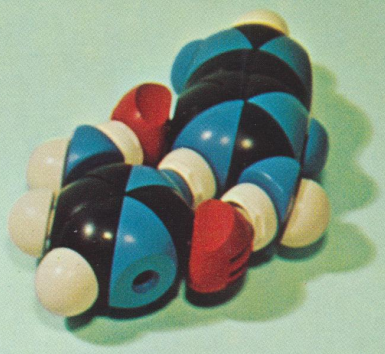
For longer helices, order 67-8284 above and as many additional half turns as required below.

67-8292	**ADD EXTRA 0.5 TURN TO 67-8284**	**$420.00**

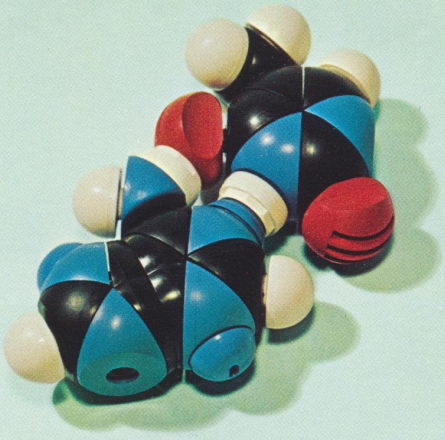
Assemble Your Own Helices

For each base pair order two 67-8300 Deoxyribose Phosphate Units. Both the sugars and base pairs are complete with connectors to link up the polymeric backbone and the base pairs. Note that for RNA the 67-8243 Ribose Phosphate Chain Unit should be ordered.

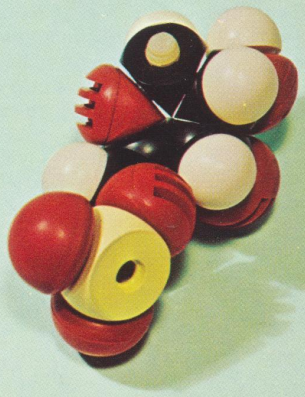
67-8300	**DEOXYRIBOSE PHOSPHATE UNIT**	**$13.25**
67-8318	**ADENINE-THYMINE BASE PAIR**	**$31.00**
67-8326	**GUANINE CYTOSINE BASE PAIR**	**$32.00**
67-8243	**RIBOSE PHOSPHATE CHAIN UNIT**	**$14.25**
67-8334	**ADENINE-URACIL BASE PAIR**	**$32.00**



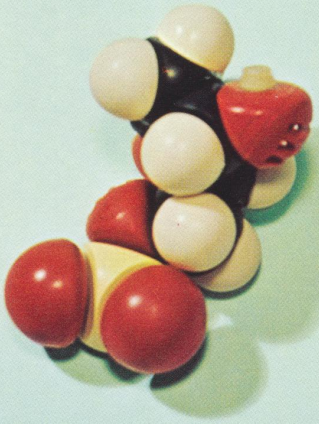
67-8326 GUANINE CYTOSINE BASE PAIR



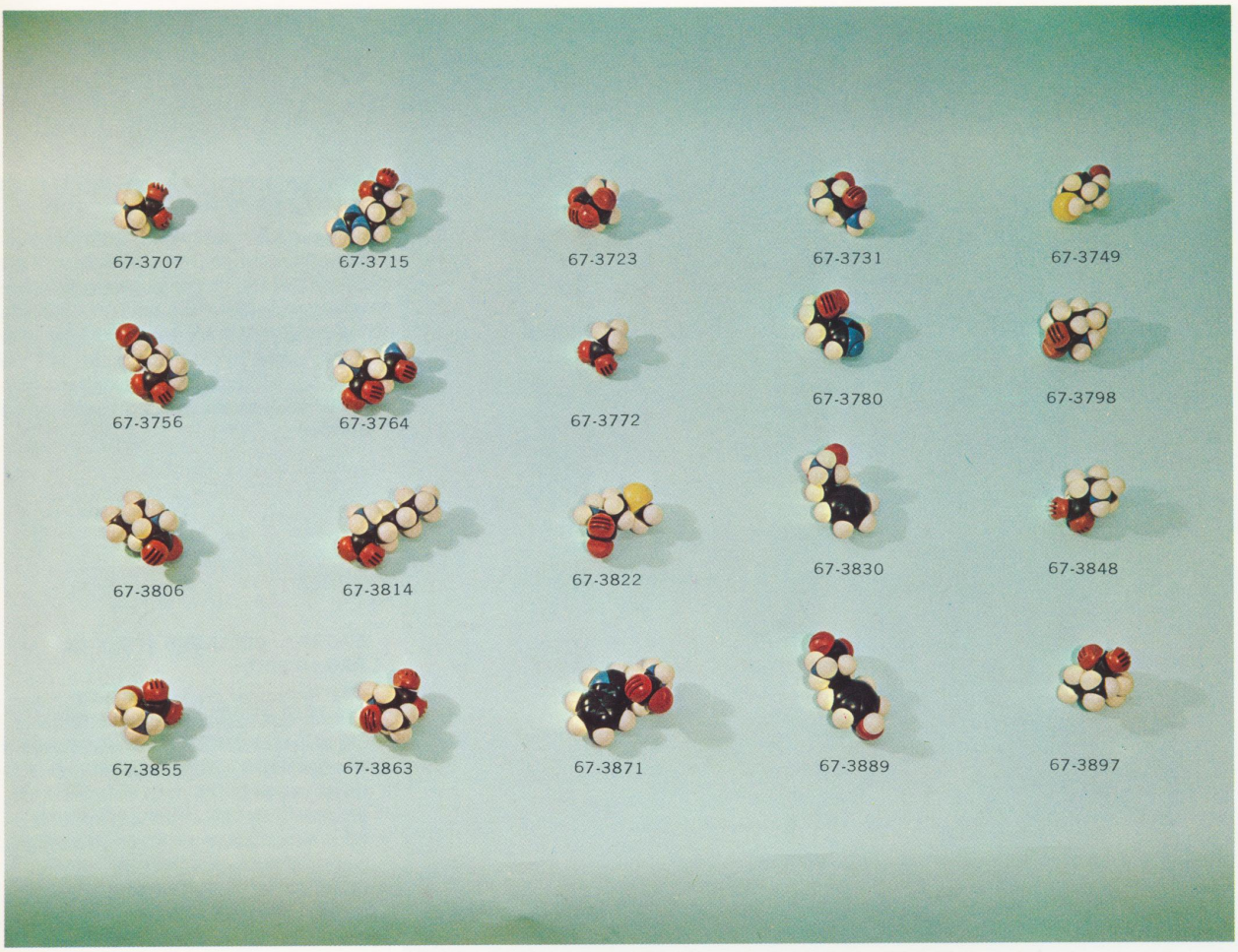
67-8318 ADENINE-THYMINE BASE PAIR



67-8243 RIBOSE PHOSPHATE CHAIN UNIT



67-8300 DEOXYRIBOSE PHOSPHATE UNIT



ASSEMBLED MACROMOLECULAR STRUCTURES OF CPK MODELS

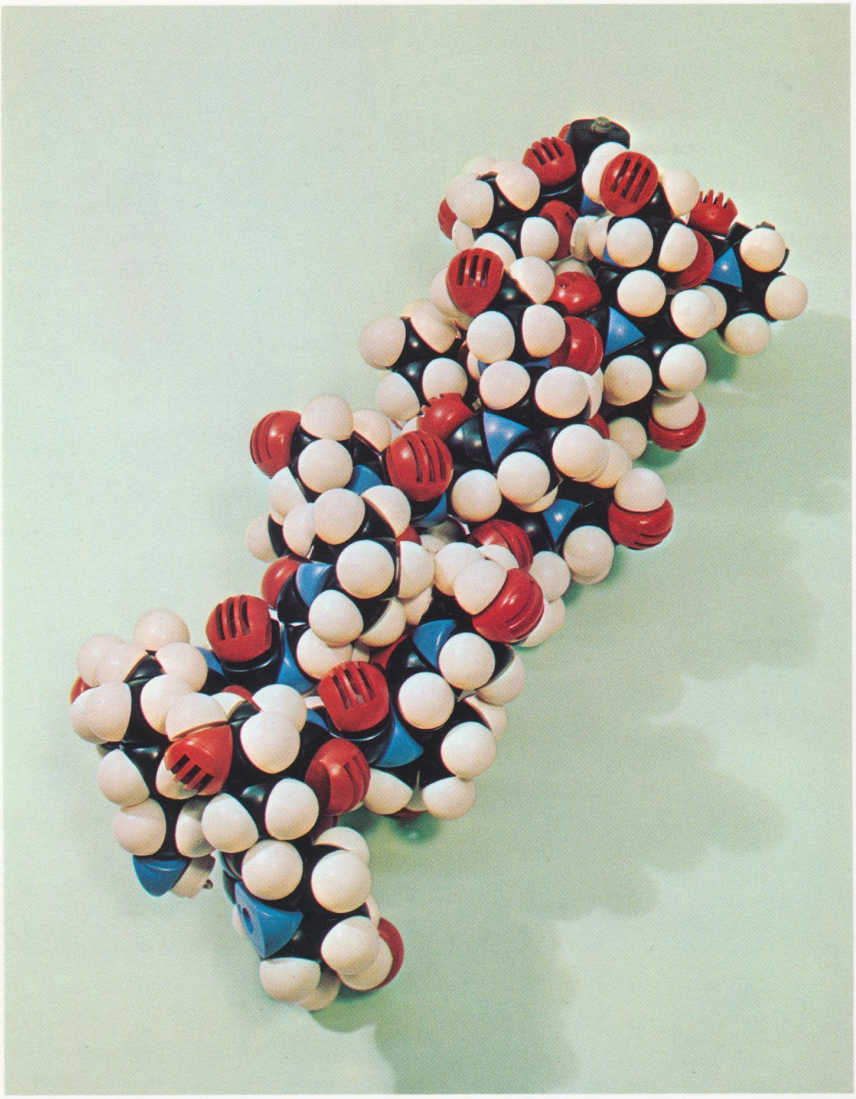
Ealing offers a series of demonstration macromolecular models to illustrate various aspects of biological molecular structure. Amino acids, polypeptides and proteins are included in the series as are alpha helices.

CPK models are uniquely designed to accurately represent this variety of protein and nucleic acid structures.

67-7948 AMINO ACIDS ASSORTMENT

This demonstration assortment contains 20 assembled amino acids in their naturally occurring L configuration. These are useful for demonstrations and displays. The assortment includes: 67-3707 Alanine, 67-3715 Arginine, 67-3723 Aspartic Acid, 67-3731 Asparagine, 67-3749 Cysteine, 67-3756 Glutamic Acid, 67-3764 Glutamine, 67-3772 Glycine, 67-3780 Histidine, 67-3798 Isoleucine, 67-3806 Leucine, 67-3814 Lysine, 67-3822 Methionine, 67-3830 Phenylalanine, 67-3848 Proline, 67-3855 Serine, 67-3863 Threonine, 67-3871 Tryptophan, 67-3889 Tryosine, and 67-3897 Valine. **$291.00**

67-3707	**ALANINE**	**$ 9.00**
67-3715	**ARGININE**	**$18.50**
67-3723	**ASPARTIC ACID**	**$12.00**
67-3731	**ASPARAGINE**	**$13.75**
67-3749	**CYSTEINE**	**$10.00**
67-3756	**GLUTAMIC ACID**	**$13.75**
67-3764	**GLUTAMINE**	**$15.25**
67-3772	**GLYCINE**	**$ 7.50**
67-3780	**HISTIDINE**	**$36.00**
67-3798	**ISOLEUCINE**	**$14.00**
67-3806	**LEUCINE**	**$13.75**
67-3814	**LYSINE**	**$15.75**
67-3822	**METHIONINE**	**$12.25**
67-3830	**PHENYLALANINE**	**$21.00**
67-3848	**PROLINE**	**$11.50**
67-3855	**SERINE**	**$ 8.75**
67-3863	**THREONINE**	**$10.25**
67-3871	**TRYPTOPHAN**	**$17.50**
67-3889	**TRYOSINE**	**$19.50**
67-3897	**VALINE**	**$11.00**

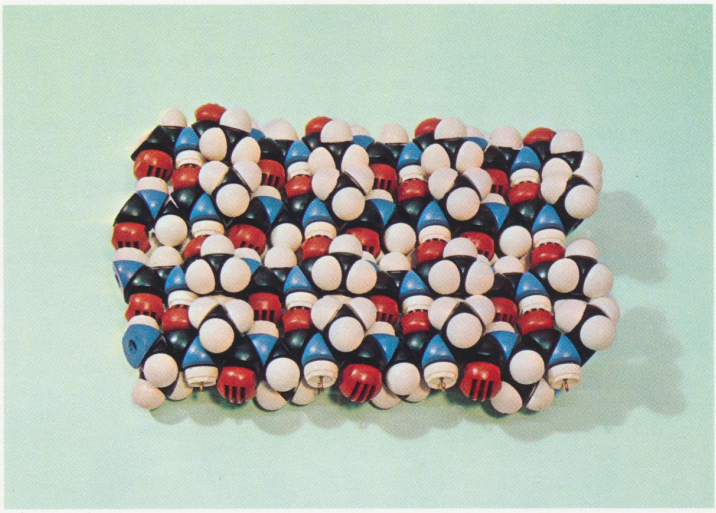


POLYPEPTIDES AND PROTEINS

Polypeptides can form regular structures by using different rotational axes of symmetry. If the polypeptide chain is organized in a two fold screw axis in which adjacent residues are related to each other by a rotation of 180°, a number of important biological structures such as the pleated sheet can be formed.

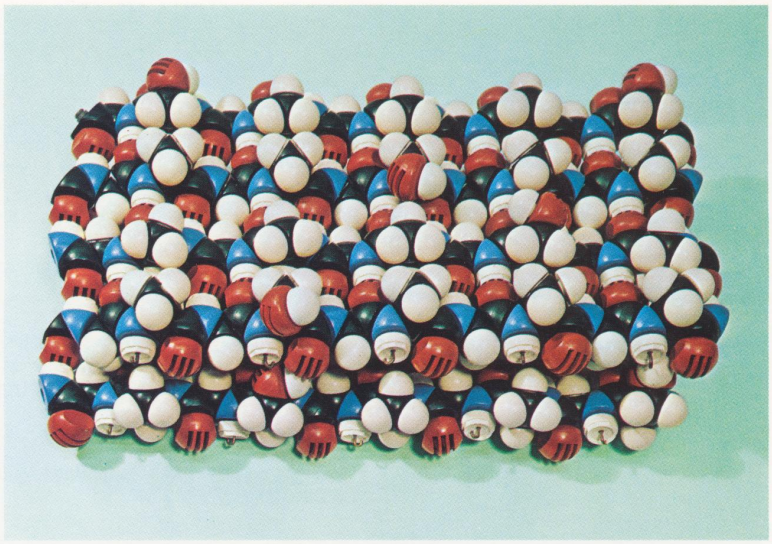
67-7997 COLLAGEN (POLY-GLY-PRO-HYPRO)

The molecular framework of collagen, the fibrous molecule of skin, connecting tissue and tendons is derived from the hydrogen bonding system found in three strands of the stacked poly-glycine II crystal structure. An assembled demonstration model of poly-gly-pro-hypro collagen with 36 residues is offered. **$910.00**



67-7963 PLEATED SHEET OF POLY-L-ALANINE

The pleated sheet is a component of many fibrous and globular proteins and can be formed both by parallel as well as antiparallel polypeptide chains. The pleated sheet of poly-L-alanine is formed from parallel chains. The poly-L-alanine pleated sheet contains 6 polypeptide chains with hydrogen bonding typical of such an array. **$475.00**



67-7971 BOMBYX-MORI SILK

The polypeptide configurations demonstrated in this model are found in a number of proteins including silk which is in fact composed of interlocking pleated sheets. The model consists of 44 residues and 7 polypeptide strands.

$1018.00

67-7989 POLYGLYCINE II, STACKED

A polypeptide chain organized in a threefold screw rotation in which adjoining amino acids are related to each other by a rotation of 120° provides the molecular framework of the synthetic polypeptides polyglycine II, and polyproline. The molecule is assembled in the stacked configuration. The model consists of 36 residues and 3 polypeptide strands.

$336.00

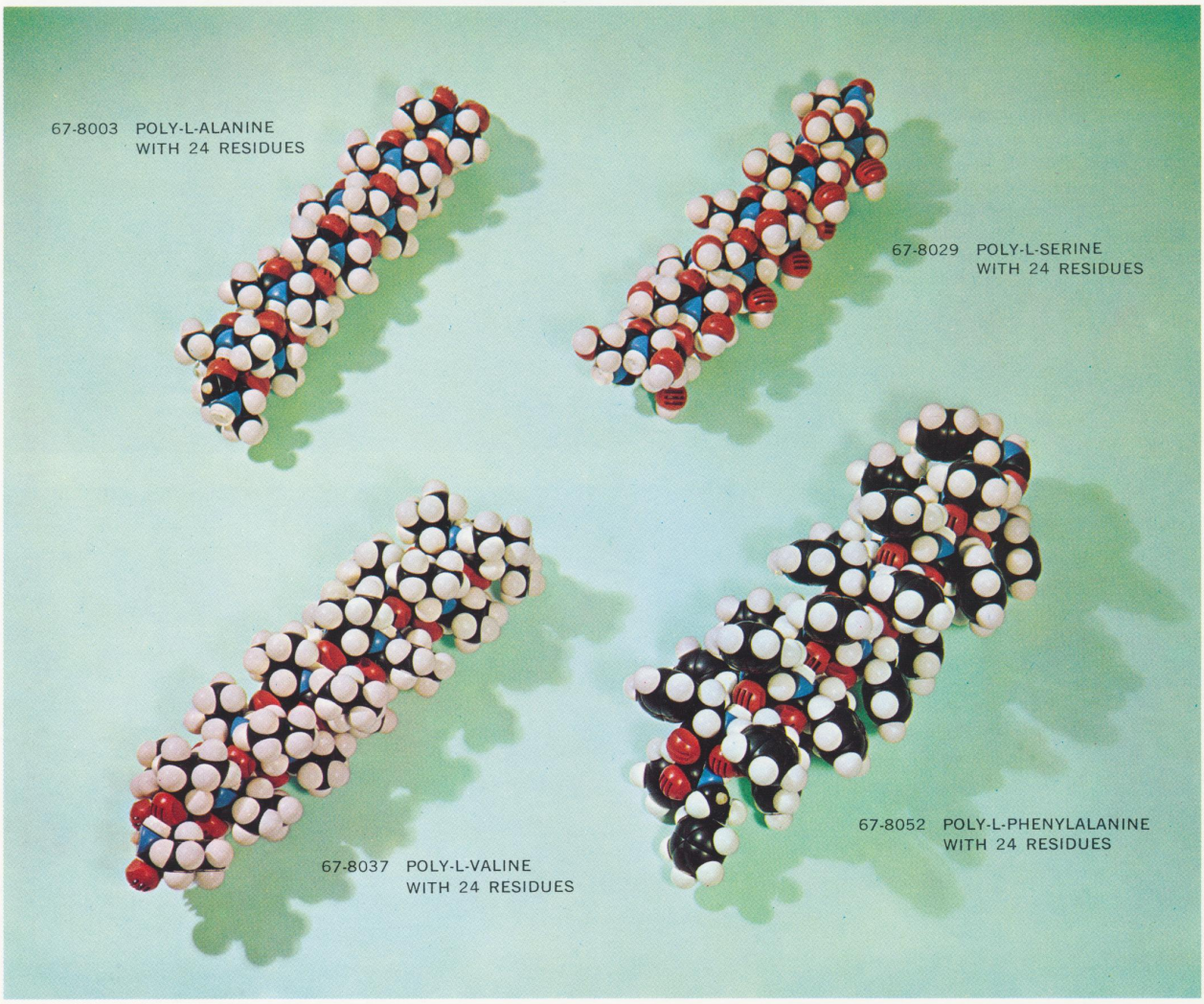
67-8060 POLYGLYCINE II, FLAT

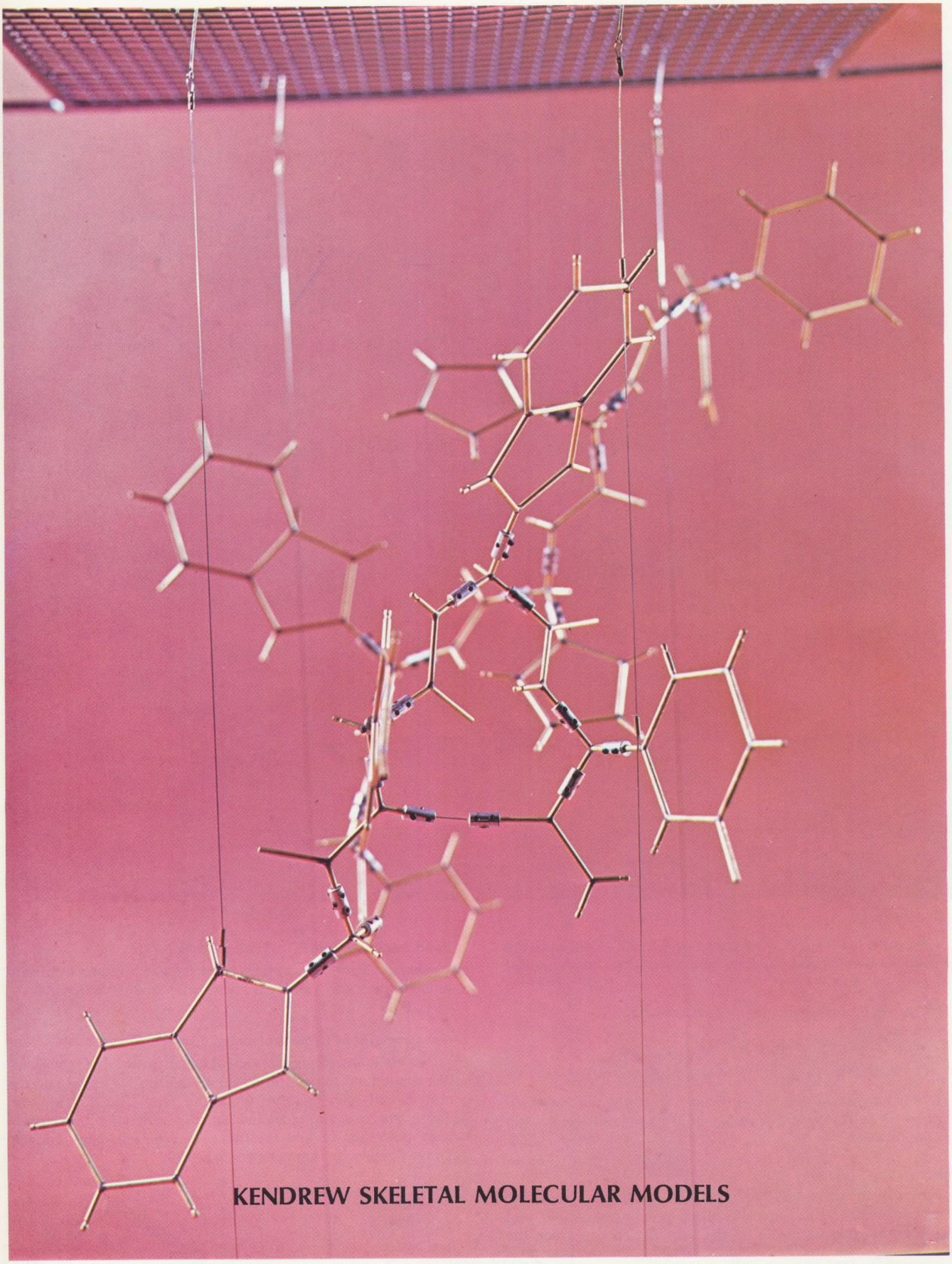
As 67-7989 except the molecule is assembled in the flat configuration. **$336.00**

ALPHA HELICES

Another symmetry element which is used to form a regular polypeptide structure is seen in the development of the alpha helix which has 3.6 residues per turn or a rotation of approximately 100° between adjoining amino acids on the polypeptide chain. The alpha helix provides the basic structural framework of hair, fingernails, keratin, and is the component of many globular proteins. The following alpha helices are offered assembled.

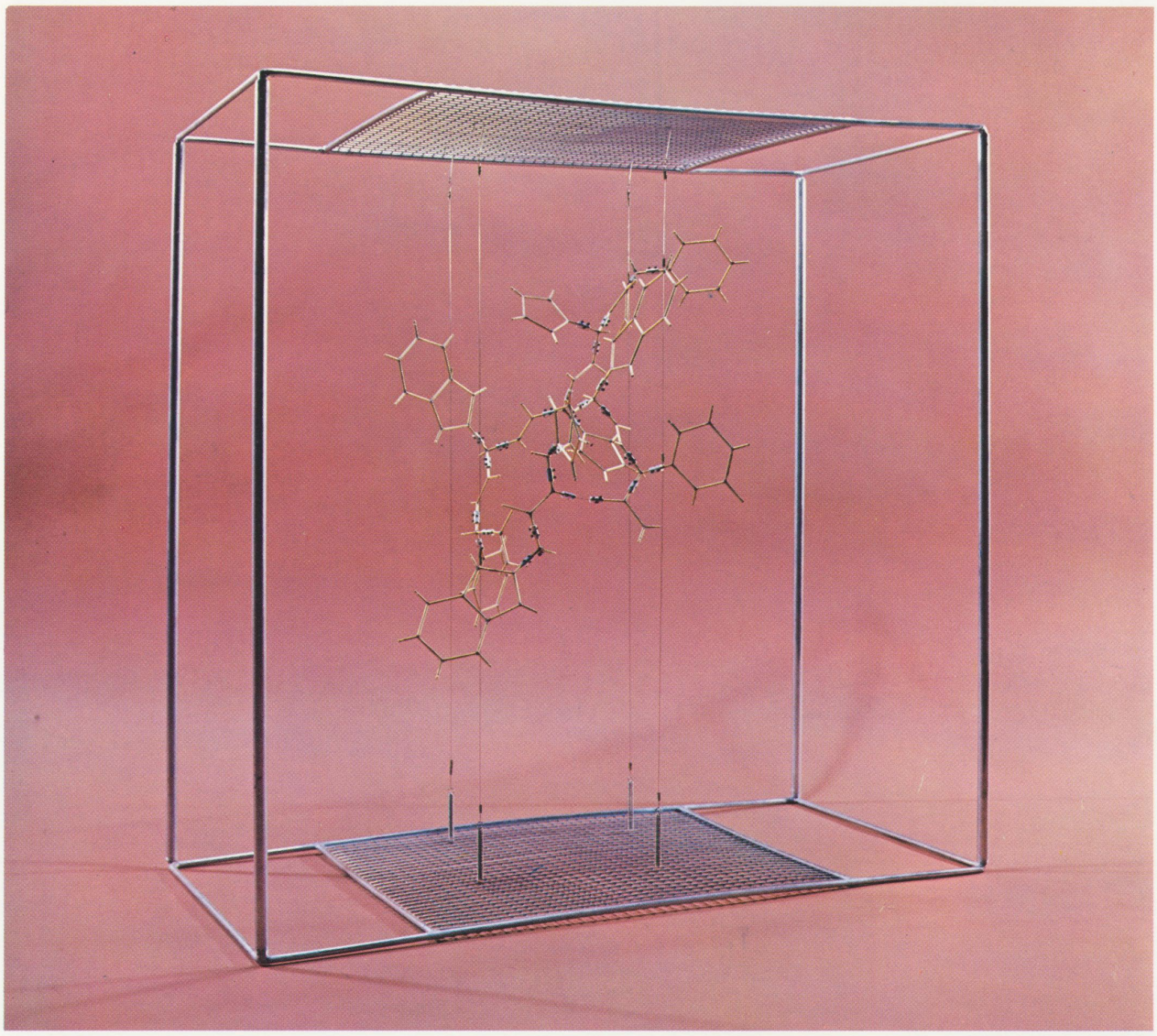
67-8003	**POLY-L-ALANINE WITH 24 RESIDUES**	**$318.00**
67-8029	**POLY-L-SERINE WITH 24 RESIDUES**	**$322.00**
67-8037	**POLY-L-VALINE WITH 24 RESIDUES**	**$383.00**
67-8052	**POLY-L-PHENYLALANINE WITH 24 RESIDUES**	**$521.00**





KENDREW SKELETAL MOLECULAR MODELS

KENDREW SKELETAL MOLECULAR MODELS



Kendrew models were developed by Dr. J. C. Kendrew in the British Medical Research Council's Laboratory of Molecular Biology, England.

- The most precise skeletal models available.
- The scale is 2cm/Å.
- These Models are constructed of rigid brass rods.
- They have proven to be particularly useful in the investigation of DNA, RNA, myoglobin and other complex protein structures.

Interatomic Distances

Interatomic distances are quickly and accurately adjusted. The connector system employs a barrel with two screws that tighten into grooves in the model rods and securely lock the models together.

Bond Angle Linking

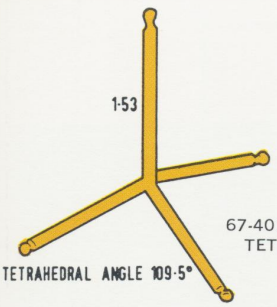
There is a set of seventeen angle gauges, ranging from 100° to 130° which are used for accurate orientation of the models.

Measurement of Large Molecules

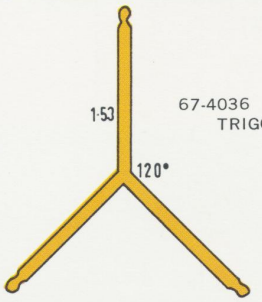
For the measurement of repeat distances in large molecules, it is convenient to use the 67-3350 Calipers. These are graduated directly in Ångstrom units and read 0 to 30Å in 0.1Å. There are two spring-loaded cursors with long transparent jaws. Both internal and external measurements can be made. These Calipers are described on page 29.

SOME TYPICAL KENDREW MODELS

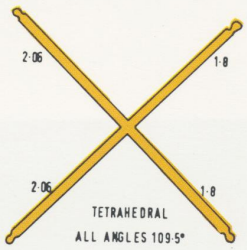
Dimensions shown are in cm.



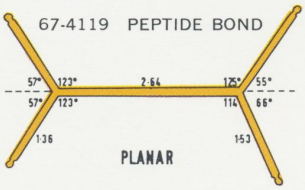
67-4010 CARBON, TETRAHEDRAL



67-4036 CARBON, TRIGONAL

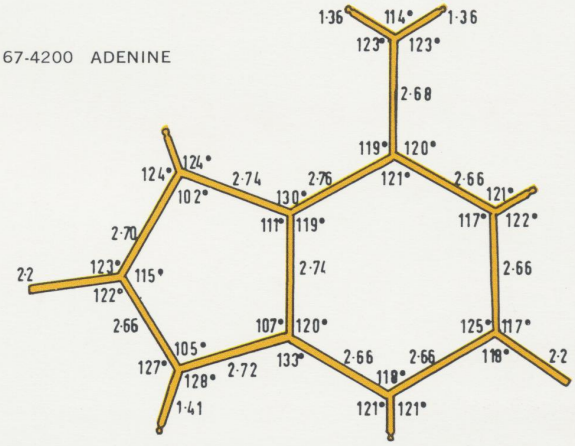


67-4085 PHOSPHORUS

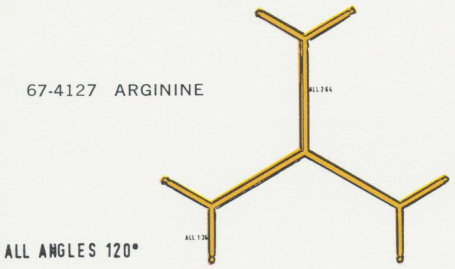


67-4119 PEPTIDE BOND

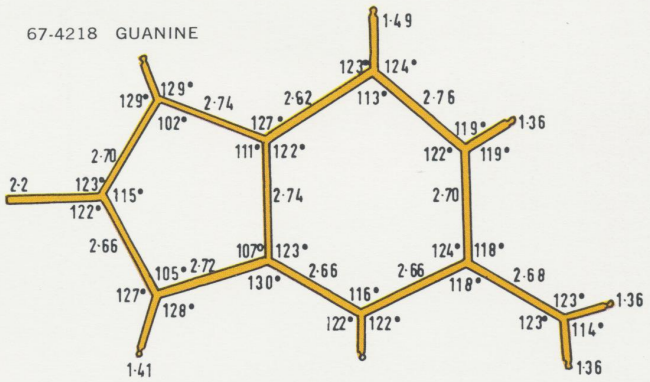
67-4200 ADENINE



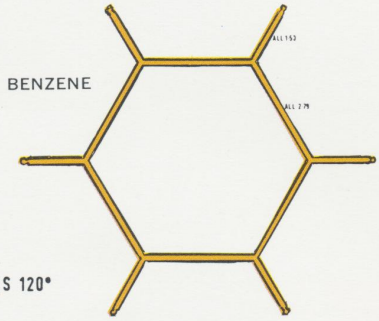
67-4127 ARGININE

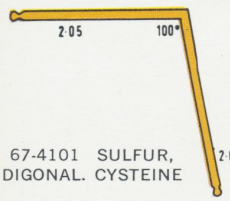


67-4218 GUANINE



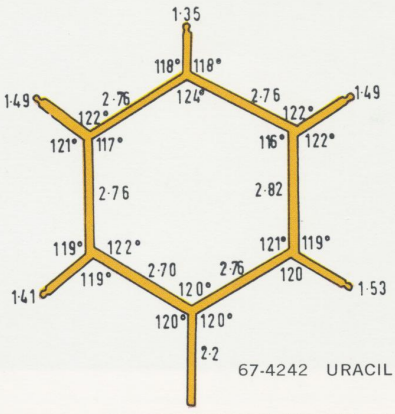
67-4135 BENZENE



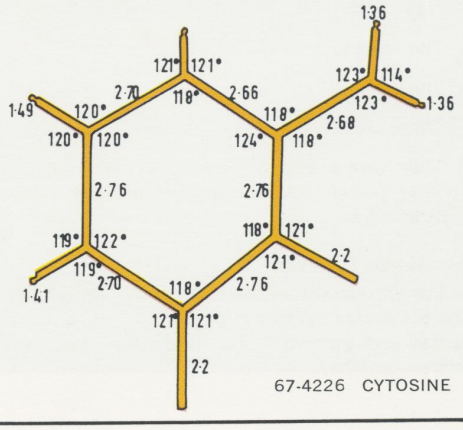


67-4101 SULFUR, DIGONAL. CYSTEINE

67-4051 OXYGEN, DIGONAL, TYROSINE



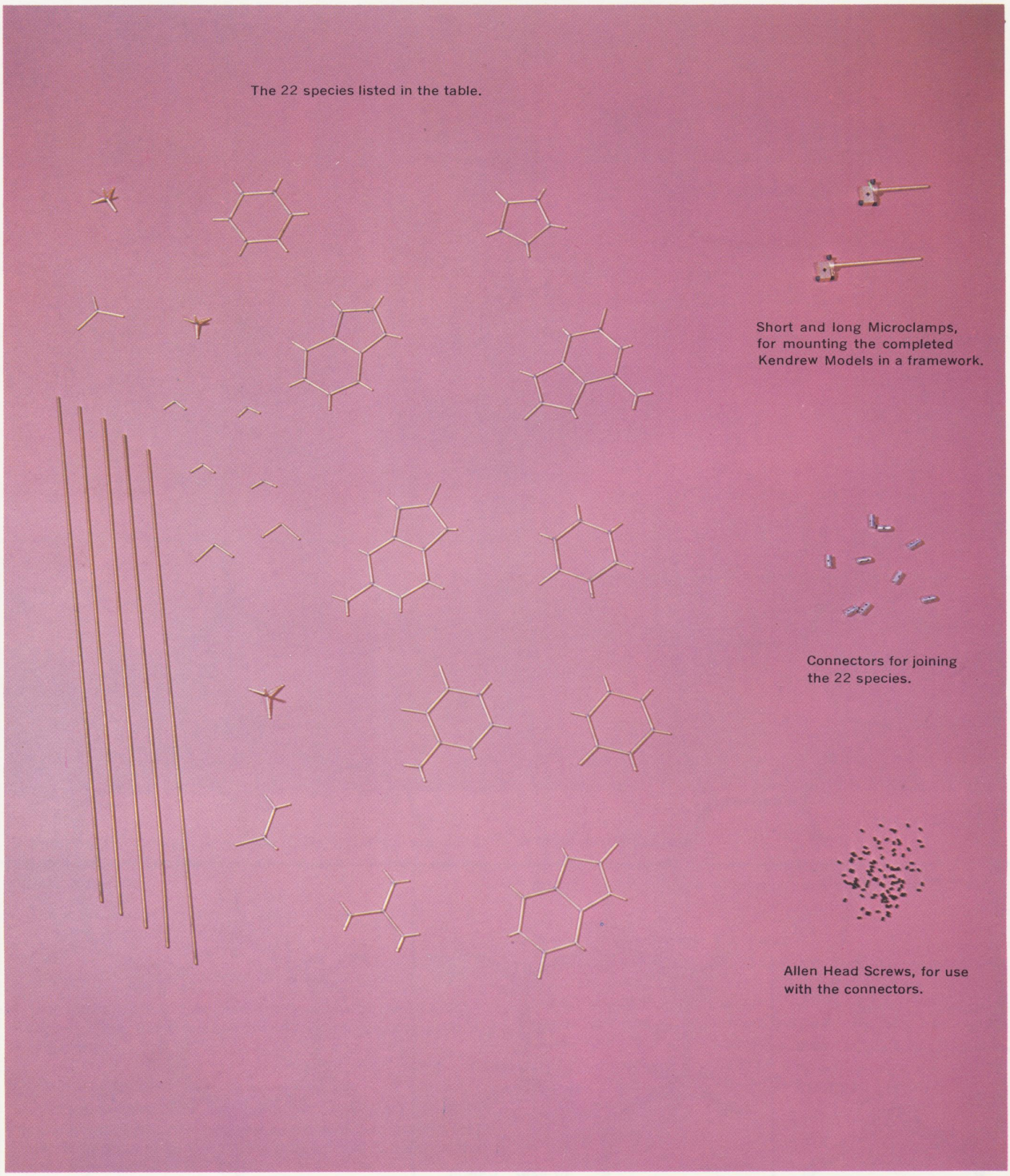
67-4242 URACIL



67-4226 CYTOSINE

To order these Models and Components individually or in sets, see the following two pages.

The Kendrew Skeletal Molecular Models are made up of the following components:

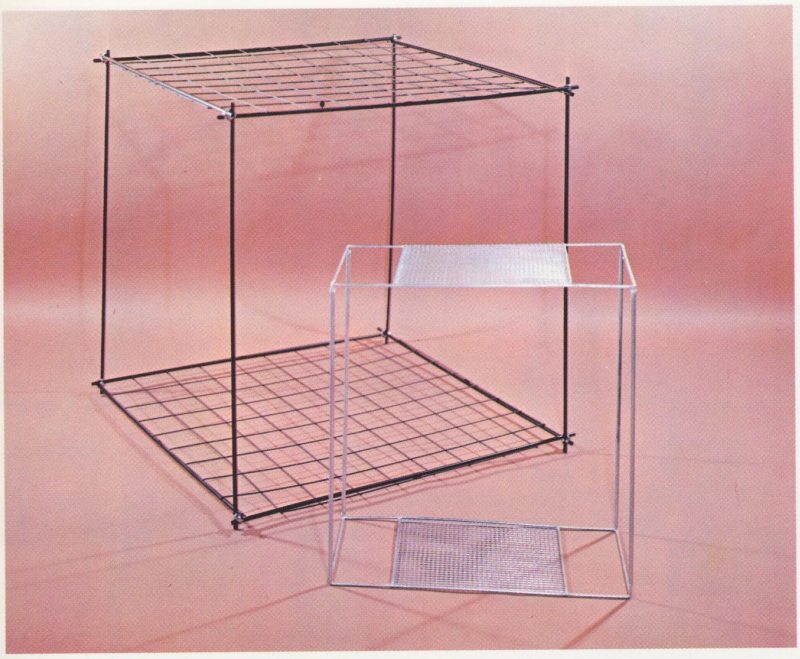


The 22 species listed in the table.

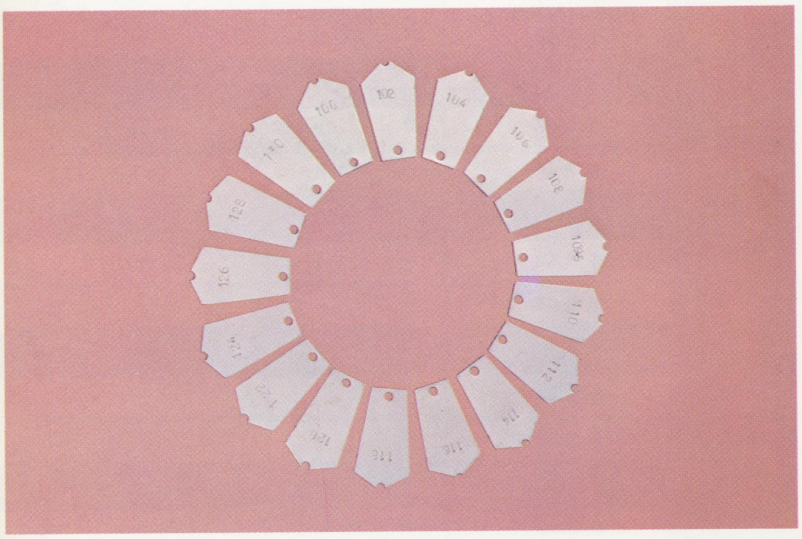
Short and long Microclamps, for mounting the completed Kendrew Models in a framework.

Connectors for joining the 22 species.

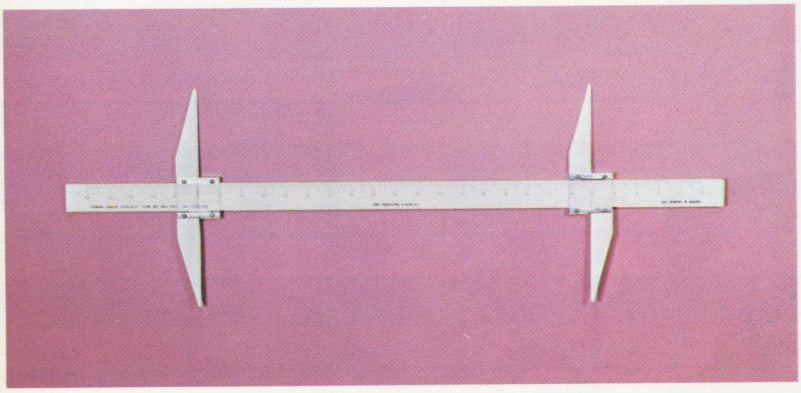
Allen Head Screws, for use with the connectors.



Two frames for orientation and support of the Skeletal Models. The large frame consists of 12 heavy duty aluminum tubes to form a cubic structure. Additional medium weight rods form a 9 x 9 decimeter grid on the "floor" and "ceiling" of the cube to which 10 additional lightweight verticals are attached. The model is affixed to the verticals with 50 polypropylene clips. The small frame consists of 24, 30cm lengths of lightweight rod and 24 clips.



The 67-4481 Set of Angle Gauges. There are 17 gauges in the set. They are 100°, 102°, 104°, 106°, 108°, 109.5°, 110°, 112°, 114°, 116°, 118°, 120°, 122°, 124°, 126°, 128° and 130°. These gauges are for the accurate orientation of the models.



67-3350 CALIPERS WITH ANGSTROM UNIT SCALE FOR KENDREW MODELS

A calipers calibrated at 2cm/Å (the scale of the Kendrew Models) which offers a convenient way to make direct measurements in angstroms on Kendrew structures. Range 0 to 30Å graduated in 0.1Å with each Å numbered. Sturdy bar engraved with black filled graduations. Accurate measurement is attained by two spring loaded cursors with long transparent plastic jaws. One cursor is reversible to enable both internal and external measurements to be made. Overall length 26 inches (64 cm).

PRICE OF INDIVIDUAL MODELS, CONNECTORS, MICROCLAMPS, GAUGES, MODEL FRAMES, MISCELLANEOUS AND SET CONTENTS TABLE

INDIVIDUAL COMPONENTS		CONTENTS OF SETS	RIBONUCLEASE	LYSOSYME
		CATALOG NUMBER OF SETS	67-4309	67-4317
		PRICE EACH SET	$1155.00	$1325.00
Catalog Number	Type	Individual Price		
67-4010	CARBON, tetrahedral	$ .82	354	400
67-4036	CARBON, trigonal, (carbonyl group)	$ .73	11	12
67-4457	HYDROGEN BONDS, (brass wire) (set of 5)	$ 1.75	—	—
67-4028	NITROGEN, tetrahedral	$ .88	11	—
67-4044	OXYGEN, digonal, (serine, threonine)	$ .60	25	17
67-4051	OXYGEN, digonal, (tyrosine)	$ .60	6	3
67-4069	OXYGEN, type 3, (pentose)	$ .67	—	—
67-4077	OXYGEN, type 4, (phosphate)	$ .67	—	—
67-4093	SULFUR, digonal, (methionine)	$ .60	4	2
67-4101	SULFUR, digonal, (cysteine)	$ .60	8	8
67-4085	PHOSPHORUS	$ 1.05	—	—
67-4119	PEPTIDE BOND	$ 1.05	139	160
67-4127	ARGENINE	$ 2.10	4	11
67-4135	BENZENE	$ 2.90	9	6
67-4143	HISTIDINE	$ 2.50	4	1
67-4150	TRYPTOPHAN	$ 5.05	—	6
67-4200	ADENINE	$ 5.20	—	—
67-4218	GUANINE	$ 5.20	—	—
67-4242	URACIL	$ 3.50	—	—
67-4226	CYTOSINE	$ 3.05	—	—
67-4234	THYMINE	$ 3.50	—	—
67-4176	INOSINE	$ 6.00	—	—
67-4408	CONNECTORS, (Pkg. of 10)	$ 4.55	65	75
67-4440	SCREWS, ALLEN HEAD, (Pkg. of 100)	$13.85	13	15
67-4432	SCREWS, CHANNEL HEAD, (Pkg. of 100)	$ 3.95	—	—
67-4283	MICROCLAMPS, SHORT 2″	$ 3.70	25	30
67-4291	MICROCLAMPS, LONG 3½″	$ 3.70	25	20
67-4481	ANGLE GAUGES, 100-130° (17 per set)	$16.50	1	1
67-9472	SKELETAL MODEL FRAME, 90cm cube	$120.00	—	—
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120	70	525	670	63
8	4	40	17	—
—	—	—	—	—
4	—	25	17	—
36	36	15	48	—
—	—	5	4	72
—	—	—	—	—
—	—	—	—	—
—	—	5	2	—
—	—	—	10	—
—	—	—	2	12
32	8	160	308	—
—	—	5	4	—
—	—	10	12	—
—	—	20	2	—
—	—	5	8	—
—	—	—	—	3
—	—	—	—	3
—	—	—	—	3
—	—	—	—	3
—	—	—	—	—
—	—	—	—	—
20	12	125	125	24
4	3	25	25	5
—	—	—	—	—
—	—	30	40	12
—	—	40	40	12
1	1	1	1	1
—	—	—	—	—
—	—	—	—	—
—	—	—	—	—

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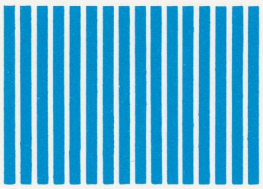

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