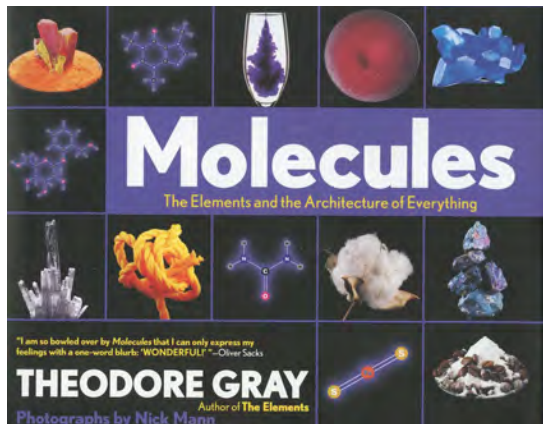


# Molecules



Rheannon is tired of coding and robotics so it's time to move on to other STEM activities. All children love to build structures with wooden or cardboard blocks. I decided to introduce Rhea to building "Molecules". The book I selected to provide guidance is [Molecules: The Elements and the Architecture of Everything](#), by Theodore Gray. It is also available as an iPad app. The iPad app has informative embedded videos. There is one showing polar and nonpolar fluids (e.g., water

and oil) separating. Another video shows nonpolar hexane molecules infiltrating large chain oil molecules thereby dissolving it. In my opinion, the best part of this book is presenting molecular structures for common everyday chemicals that we use.

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## The Bark of the Willow

Both generic names, acetaminophen (used in the United States) and paracetamol (used elsewhere), are shortenings of the full chemical name para-acetylaminophenol. It's just a matter of choosing which letters to leave out. This chemical, like aspirin, is sold under dozens of brand names, for example Tylenol in the United States and Panadol in the United Kingdom.

Acetaminophen





Ibuprofen is a weak organic acid, like aspirin, and it shares the same six-member benzene ring. But in many situations, it's more effective than aspirin as a painkiller and inflammation reducer.

















Naproxen sodium is a newer, over-the-counter painkiller that shares the same acid structure as aspirin, but instead of a single benzene ring, it boasts an elegant double ring.





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I purchased the [Duluth labs Organic Chemistry Molecular Model Student Set](#) from Amazon to build molecules. This set includes a large selection of atoms and bonds. The atoms are color coded and match the molecular pictures in the book.


INSIDE THE BOX					
NAME	BONDS (ANGLE)	COLOR	DIAMETER (MM)	QUANTITY	IMAGE
H-Hydrogen	1	White	17	22	
Halogen	1	Green	17	4	
Metal	1	Gray	17	1	
C-Carbon	4 (109.5°)	Black	23	14	
O-Oxygen	2 (105°)	Red	23	6	
N-Nitrogen	3 (107°)	Blue	23	2	
N-Nitrogen	4 (109.5°)	Blue	23	2	
S-Sulfur	4 (109.5°)	Yellow	23	1	
S-Sulfur	6 (90°)	Yellow	23	1	
P-Phosphorus	4 (109.5°)	Purple	23	1	
<b>Small Connector</b> (compact single covalent bonds)		White	11	28	
<b>Medium Connector</b> (single covalent bonds)		White	27	30	
<b>Long Connector</b> (double or triple covalent bonds)		Gray	43	12	
<b>Molecular Tool</b>				1	

**DISASSEMBLY INSTRUCTIONS**

For easy disassembly of your molecules, use the Molecular Tool to quickly remove bonds from the atoms. Bonds may initially be tight fitting but will loosen up after use to make secure connections for many years to come.

To get more visual examples of how to use your molecular set and build common organic compounds, visit [ModelMolecular.com](http://ModelMolecular.com)

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We started off building simple inorganic molecules, such as water H<sub>2</sub>O and carbon dioxide CO<sub>2</sub>, before moving onto organic molecules (e.g., CH<sub>4</sub>). I discussed bond angles with Rhea.

