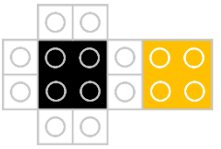

# Organic Chemistry



## rick y rick

## Compound 1

Dmitry Vostokov

Organic Chemistry Brick by Brick, Compound 1: Using LEGO® to Teach Structure and Reactivity

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# Preface

During the Summer of 2018, I was thinking about the possibility of teaching artificial chemistry to early secondary school pupils before official Chemistry subject years. Before, I used bricks to represent some simple data structures and software logs[1]. Out of this synthesis, in November 2018, the idea of using a baseplate representation of chemical structures was born. Initially, I made about 250 LEGO models of various organic structures, later annotated and made their pictures available for download, described the proposal in greater detail, and extended presentation possibilities to include polymers and inorganic materials[2]. After almost two years passed since the initial invention, I decided to produce a consistent book series, including chemical reactions in addition to structures. In comparison to free slides that were created to showcase the possibilities, the book is organized differently, uses several baseplate representations including 3D models, incorporates lessons learned during modeling of machine learning[3] and category theory[4] concepts, and aims to teach organic chemistry from the ground up.

For this part (I call it "compound" according to chemical terminology), I used the following books as a reference:

- Basic Principles of Organic Chemistry, 2nd edition by Roberts and Caserio
- Fundamentals of Organic Chemistry, Volume 1, 2nd edition by A.N. Nesmeyanov and N.A. Nesmeyanov.

These were my favorite textbooks during my secondary school years in the 1980s. I plan to add more references to subsequent compounds as I have accumulated a substantial library in recent years.

Some basic chemistry knowledge at a secondary school level is preferable but not necessary to follow this book.

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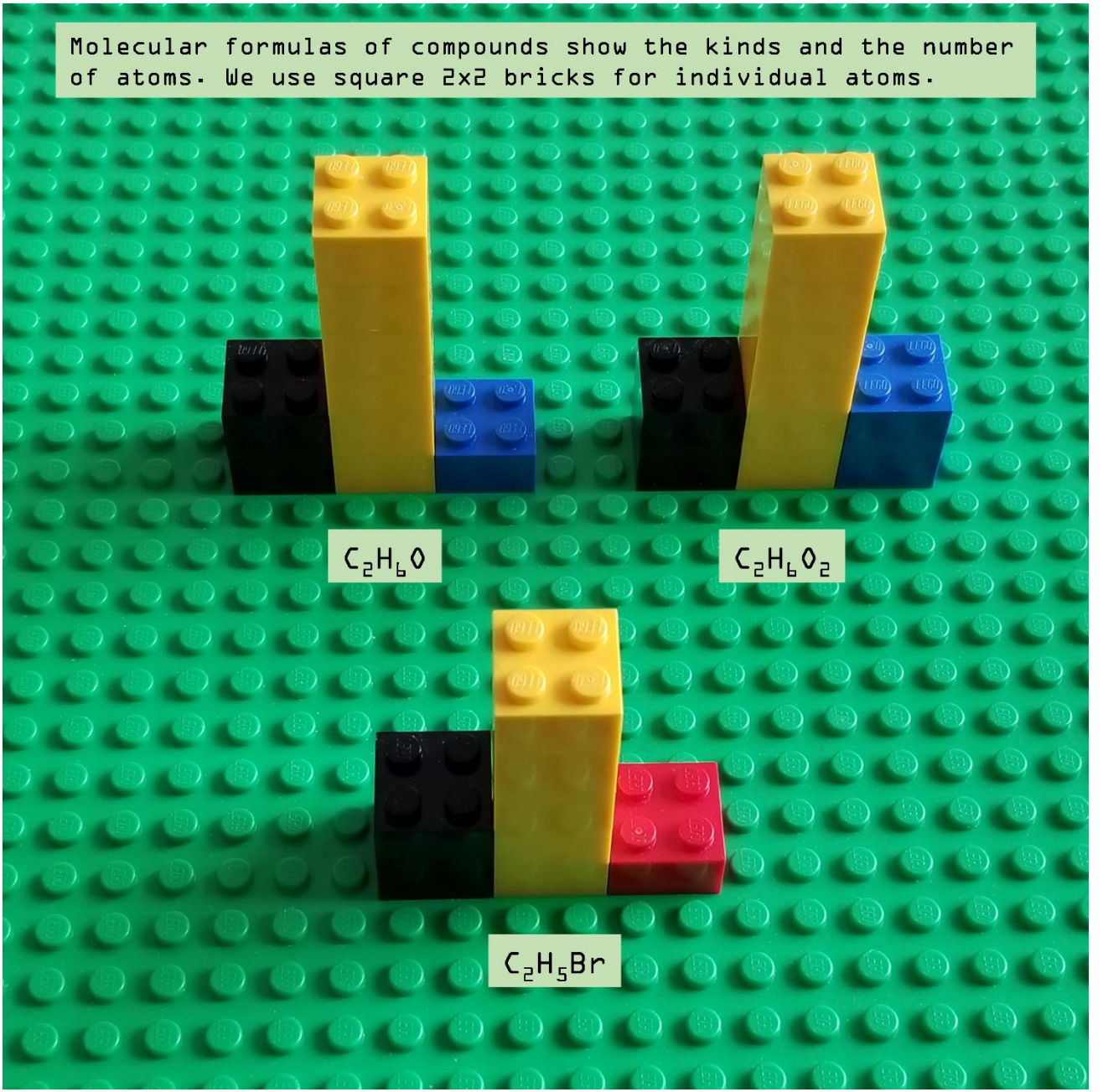
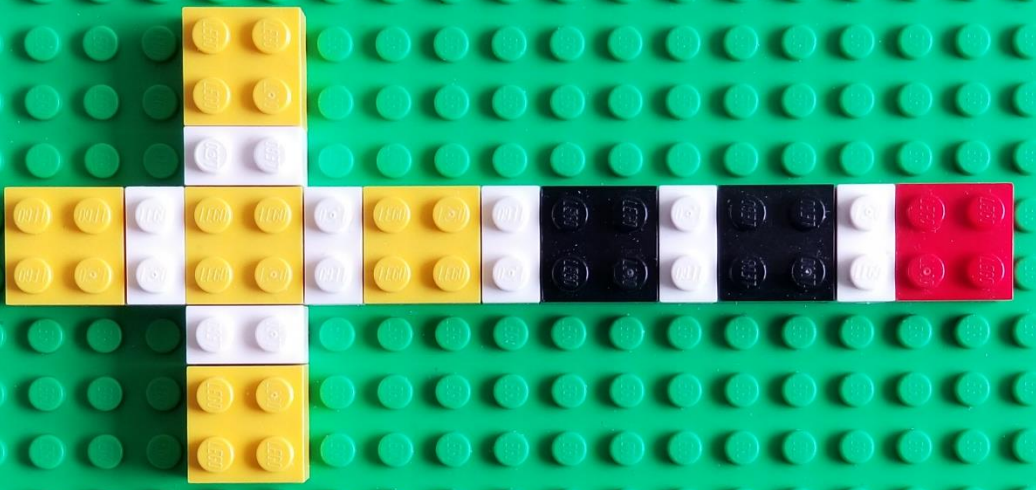
[1] https://www.dumpanalysis.org/lego-log-analysis
[2] https://www.opentask.com/chemistry-brick-by-brick-series
[3] https://www.dumpanalysis.org/machine-learning-brick-by-brick-series
[4] https://www.dumpanalysis.org/visual-category-theory


Molecular formulas of compounds show the kinds and the number of atoms. We use square 2x2 bricks for individual atoms.
$C_2H_6O$
$C_2H_6O_2$
$C_2H_5Br$

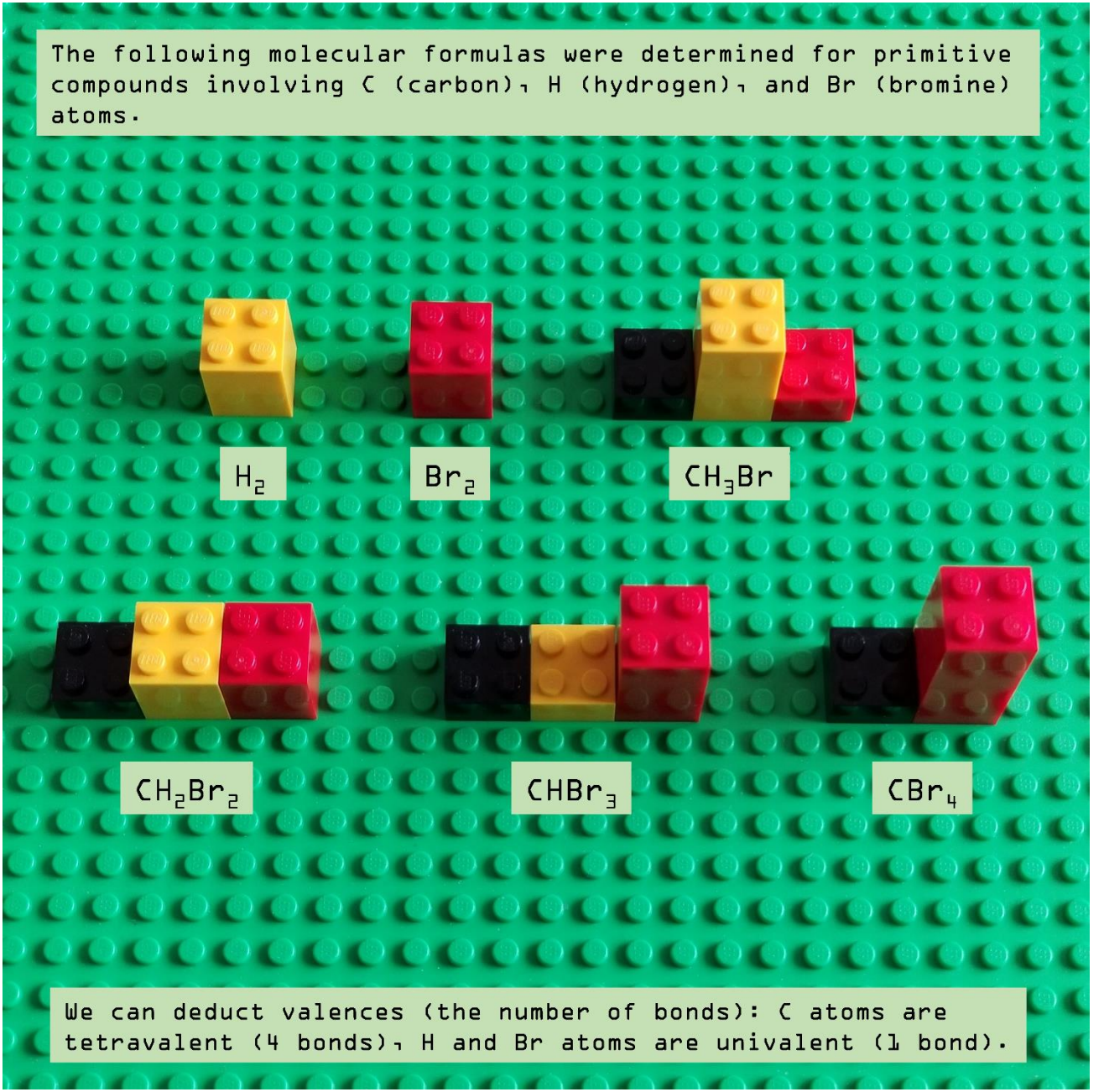
We can hypothesize different possible structural formulas for molecular formula $C_2H_5Br$. We use 2x1 bricks for chemical bonds.



```
      H
      |
H-H-H-C-C-Br
      |
      H
```

Is this structure valid?

The following molecular formulas were determined for primitive compounds involving C (carbon), H (hydrogen), and Br (bromine) atoms.




We can deduct valences (the number of bonds): C atoms are tetravalent (4 bonds), H and Br atoms are univalent (1 bond).

Based on the number of valences, we can propose the following structural formula for $C_2H_5Br$.