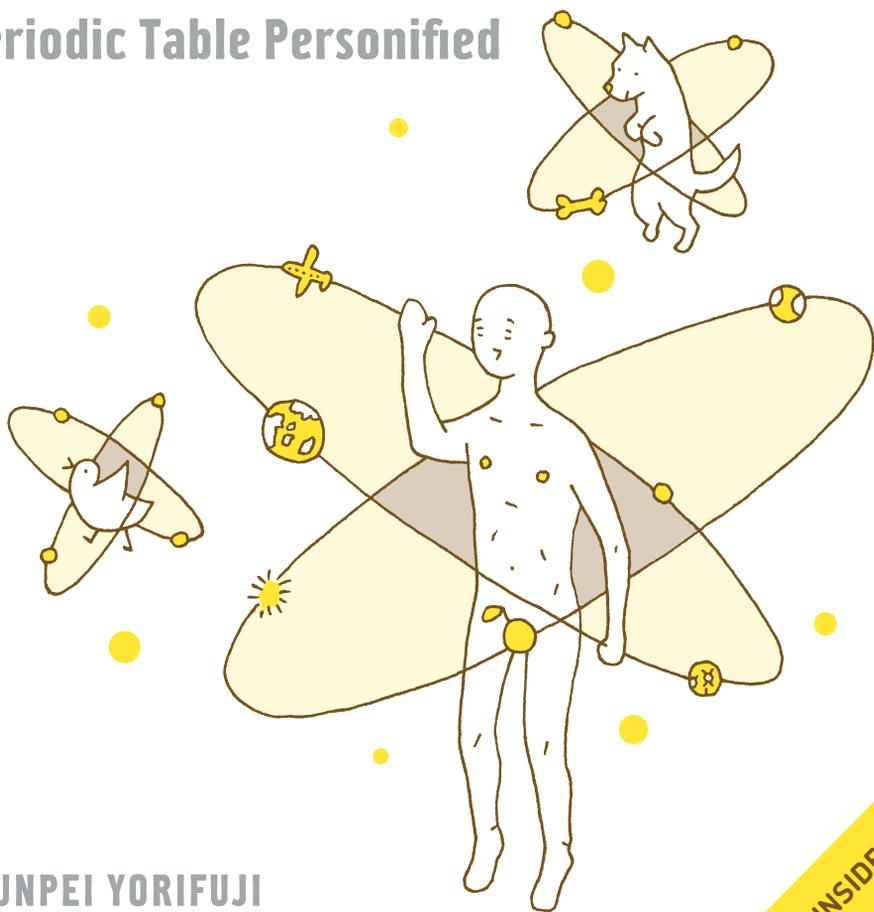


# Wonderful Life with the Elements

The Periodic Table Personified

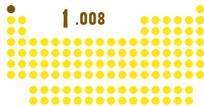


BUNPEI YORIFUJI

POSTER INSIDE!

1

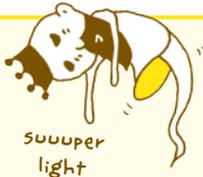
水素  
Hydrogen



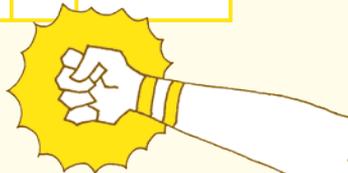
1

氢

H



A special element that doesn't fit into any category



The sun is hydrogen heaven!

Multipurpose



Gaseous

Heh

It's actually really dangerous.

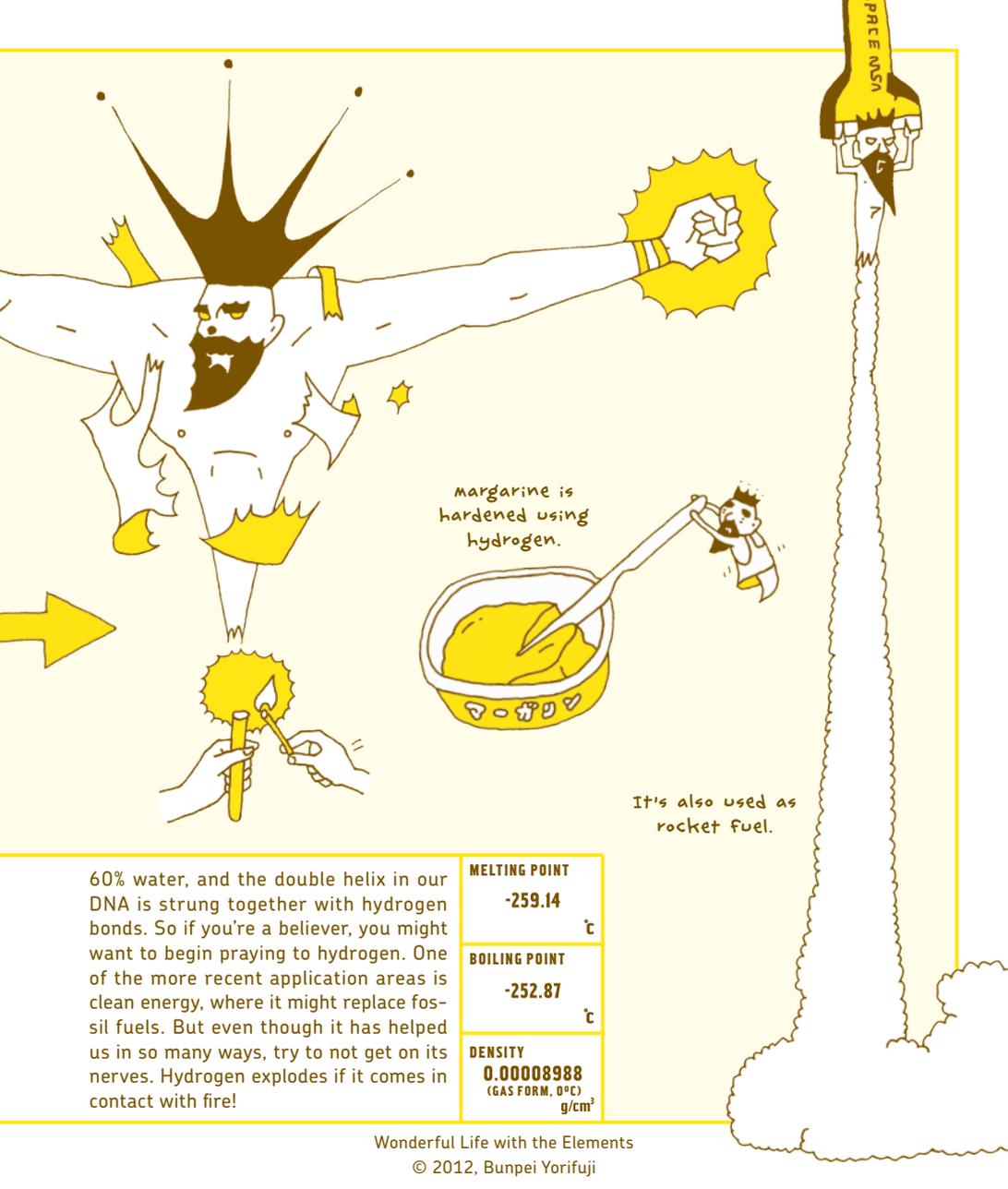


Into the light...

**THE GOD ELEMENT  
THAT MAKES UP THE  
UNIVERSE**

[haidrɒdʒən]  
**DISCOVERY YEAR : 1766**

Hydrogen was by far the most common element in the first few minutes after the Big Bang, along with small amounts of deuterium and helium. These gases eventually formed the first stars. In a sense, hydrogen is the element that gave birth to all life. One of the most basic building blocks of all life on Earth, water, is made up of oxygen and hydrogen. Our bodies are also made of over



margarine is  
hardened using  
hydrogen.

It's also used as  
rocket fuel.

60% water, and the double helix in our DNA is strung together with hydrogen bonds. So if you're a believer, you might want to begin praying to hydrogen. One of the more recent application areas is clean energy, where it might replace fossil fuels. But even though it has helped us in so many ways, try to not get on its nerves. Hydrogen explodes if it comes in contact with fire!

**MELTING POINT**

**-259.14**

°C

**BOILING POINT**

**-252.87**

°C

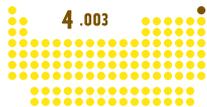
**DENSITY**

**0.00008988**

(GAS FORM, 0°C)

g/cm<sup>3</sup>

2

ヘリウム  
Helium

1

18

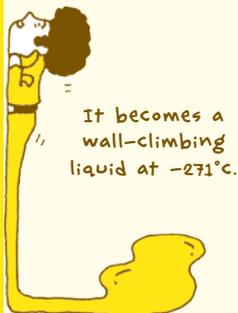
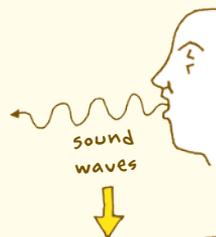
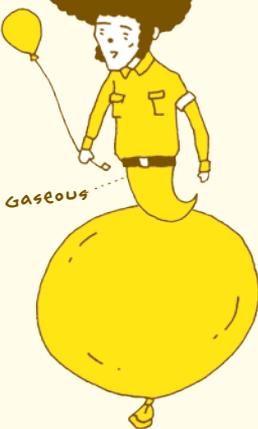
氦

He

Found in zeppelins



Noble gas



**THE LIGHTEARTED GAS  
THAT RAISES OUR SPIRITS  
AND OUR VOICES**

[hē:liəm]  
**DISCOVERY YEAR : 1868**

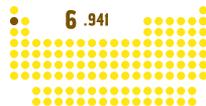
Children know it from funny voices and balloons. This ancient element could be found along with hydrogen minutes after the Big Bang. And without these two, no other elements could have been formed. They are the only two elements that are lighter than air, so maybe they're kind of like the leaders, looking down on all the others? But helium, unlike hydrogen, is one cool cookie and doesn't explode easily at all.

MELTING POINT  
**-272.2**  
(PRESSURIZED) °C

BOILING POINT  
**-268.934**  
°C

DENSITY  
**0.0001785**  
(GAS FORM,  $0^{\circ}\text{C}$ ),  
g/cm<sup>3</sup>

3

リチウム  
Lithium2  
—  
1

鋳

Li



### THE POWER SOURCE OF THE MOBILE AGE

[liθiəm]  
DISCOVERY YEAR : 1817

Lithium, the lightest metal, was also born at the time of the Big Bang, so hydrogen, helium, and lithium are actually triplets. But there was so little lithium at the time, it couldn't do much. Today, however, it is an essential component in both lithium ion batteries and mobile devices. It's light, powerful, and easy to recharge, and it doesn't really deteriorate. It can also be found in seawater, so we won't run out anytime soon.

MELTING POINT  
180.54

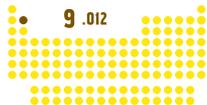
°C

BOILING POINT  
1340

°C

DENSITY  
0.534  
(0°C)  
g/cm<sup>3</sup>

4

ベリリウム  
Beryllium2  
—  
2

铍

Be



**SUPER TALENTED!  
ELITE AND LEGENDARY!**

[berilium]

DISCOVERY YEAR: 1797

It's the elite metal with skills galore: It weighs two-thirds what aluminum does, it resists heat with a melting point of 1278°C, and it can create springs that can withstand over 20 billion contractions. Yet it still leads a tragic life due to the fact that its particles form a deadly poison. Since it's hard to forge anything without first powdering the materials, it has not been adopted in mass production.

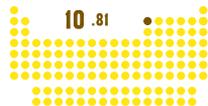
MELTING POINT  
1278 ± 5  
°C

BOILING POINT  
2970  
(PRESSURIZED) °C

DENSITY  
1.847  
g/cm<sup>3</sup>

5

ホウ素  
Boron



2

13

硼

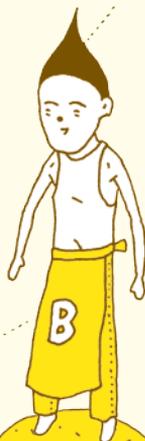


B

Heat-resistant glass



The boron family



solid

stab

Dehydrates cockroaches using poisonous bait



Fake snow in movies



Disinfecting properties



HELPING OUR DAILY LIVES  
IN SO MANY WAYS

[bō:ran]

DISCOVERY YEAR: 1892

We mostly use boron in compounds. For example, the technical term for the heat-resistant glass Pyrex is *borosilicate glass*, created by adding boron oxide to keep the glass from swelling and shrinking. Harder diamonds can be created by combining boron with carbon. Finding new boron combinations is a great way for a chemist to show off; two Nobel prizes have been awarded for boron compound research.

MELTING POINT  
2300

°C

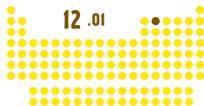
BOILING POINT  
3658

°C

DENSITY  
2.34  
(TYPE B)  
g/cm<sup>3</sup>

6

炭素  
Carbon



2

14

碳

C

A friend from ancient times



charcoal

In calligraphy ink



炭

The carbon family



Solid

Multipurpose

Appears in many different forms

Water purification



Activated charcoal



Air purification

**PART OF EVERY LIVING THING**

[Ká:rbən]

**DISCOVERY YEAR: ANCIENT**

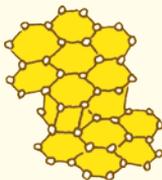
Carbon is the building block of all life. One could argue that the food chain should instead be called something like “the carbon tug-of-war.” Carbohydrates, proteins, and all the other nutrients that we require are made up of carbon compounds. The same is also true of our cells, DNA, and the plants we eat. (Plants create their carbohydrates from carbon dioxide through a process called



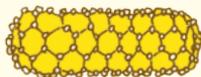
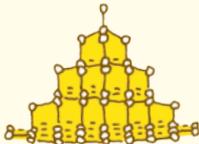
Its properties  
change  
depending on  
how it binds  
together.



pencil  
graphite



Diamonds



carbon  
nanotubes



All living  
things

There are over 10,000,000  
different naturally occurring  
carbon compounds.

*photosynthesis.*) The fourth most abundant element in the universe, carbon comes in many forms, from the graphite in our pencils to diamonds. The forms are so different that it's hard to believe that they're made from the same element. It appears today in oil, plastics, clothes, and medicines. It has also drawn a lot of recent attention with the advent of carbon nanotube research.

**MELTING POINT**  
**3550**  
(DIAMOND) °C

**BOILING POINT**  
**4827**  
(SUBLIMATION) °C

**DENSITY**  
**3.513**  
(DIAMOND)  
g/cm<sup>3</sup>



Fullerene,  
used in tennis  
rackets and  
golfclubs

## ELEMENT FRIENDS

Among the 118 elements, certain groups of elements have similar properties, and some of them even reinforce each other's reactions. There are elements who play well with others and others who just want to pick a fight...



Na

K

Rb

Cs

### THE FOUR EXPLOSIVE ALKALI EMPERORS

These four elements may seem like a peaceful bunch, but if you get them wet, you'll see just how explosive their tempers can be! Their pure forms must be kept submerged in oil to prevent the violent reaction caused by contact with water. From least explosive to most explosive they are Sodium, Potassium, Rubidium, and Cesium.



Au

Ag

Cu

### THE THREE SAGES OF WEALTH AND PROSPERITY

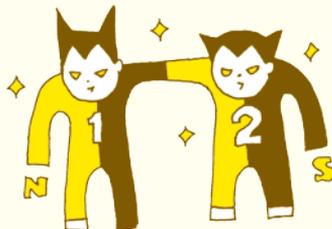
Gold, silver, and copper are all abundant, easy to work with, and corrosion resistant, which makes them an exceptionally accomplished team of metals. This is why they have been used since ancient times as currency, raw materials, and prized possessions. The well-known set of Olympic medals is just one example of many.

**Si****Ge****Sn****THE DIGITAL  
SEMICONDUCTOR TRIO**

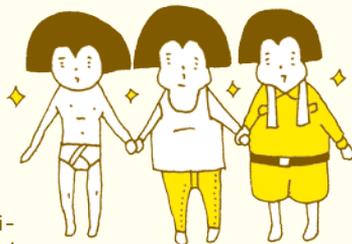
Silicon, germanium, and tin are the three main elements used in semiconductor construction. They are the elite few that helped Japan become one of the leading countries in electronics. It is thanks to them that we have access to computers and other digital devices today.

**Ca****Sr****Ba****THE CASBAH BROTHERS**

Sometimes elements with very similar properties and very regularly spaced atomic weights form groups of three in the table of elements. These groups are called “triads.” Calcium, strontium, and barium form one of these groups, and since their starting letters are *Ca*, *S*, and *Ba*, I thought “the Casbah brothers” might be a good family name for them.

**Nd****Sm****THE STRONGEST MAGNET COMBO  
IN THE WORLD**

Neodymium and samarium are engaged in an eternal struggle for the title of “world’s best magnet.” That honor currently goes to neodymium, but samarium magnets are both more heat resistant and more rugged, which makes them the better choice in many applications.



## TROUBLESOME ELEMENTS

Elements that aren't that dangerous by themselves can gain unimaginable destructive power when paired with a few others. I thought we could have a look at a few of the groups that have been stirring up trouble in the world these last few decades.



### $As_2O_3$ ( $As_4O_6$ )

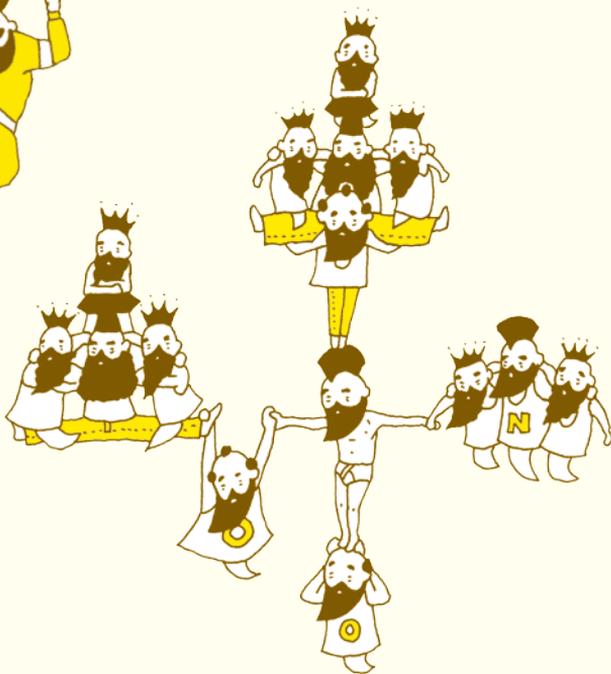
#### ARSENIC TRIOXIDE

Arsenic trioxide was used in the assassination of Napoleon and in the infamous Wakayama curry poisoning in the summer of 1998.

### $C_2H_8NO_2PS$

#### METHAMIDOPHOS

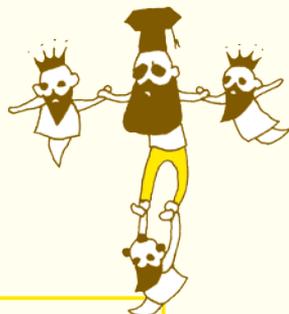
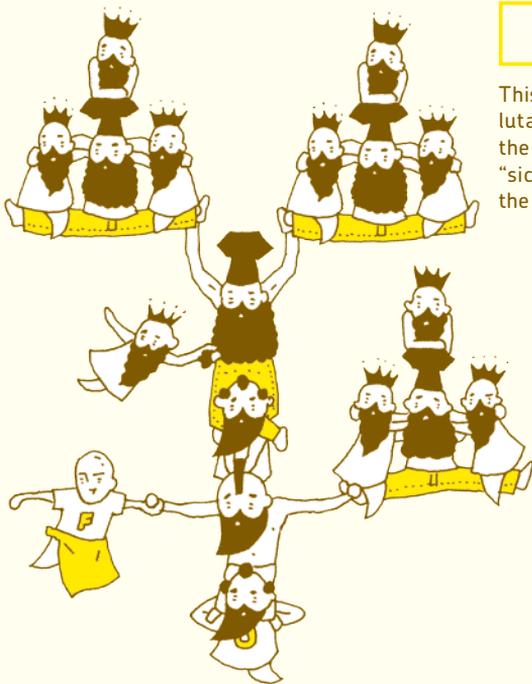
Methamidophos became famous in Japan when trace amounts of the poison were found in foodstuffs imported from China. It is made up of a multitude of elements.



# C<sub>4</sub>H<sub>10</sub>O<sub>2</sub>FP

## SARIN

Even though sarin is made up of some very familiar elements, it is an extremely potent nerve gas.



# CH<sub>2</sub>O

## FORMALDEHYDE

This harmful indoor air pollutant was named as one of the elements responsible for “sick building syndrome” in the 1980s.



# KCN

## POTASSIUM CYANIDE

The classic poison used throughout history has a surprisingly simple chemical formula.