

# THE GEO-SAMPLER

Here at the GeoSampler, we're noticing a hint of fall in the air. And that got us to thinking about what else was in the air around here. Is it a faint whiff of beer, wings and football season or a smattering of helium that's giving us a little lift? So being the curious sort, we went back to basics and a quick refresher on the things scientific.

## SOMETHING IN THE AIR

It's all around us. Everywhere we look, yet we never seem to see it. Air. The stuff that fills our bicycle tires and that we so enjoy a fresh breath of. At its very essence, colorless, tasteless and odorless. It's a gas.

Actually, air is a combination of gases—"gas" being a word invented by a 17th Century chemist, probably based on the Greek word for "chaos." He was trying to describe an unseen principle that, he believed, existed in all matter.

It turns out, he was pretty close to correct. Actually, gas describes a state of matter. One of the four classic states of matter, gas exists between the liquid and plasma states. A number of gases are found in the periodic table—the lightest known as hydrogen. The heaviest gas at room temperature is Tungsten Hexafluoride—nearly 10 times heavier than air.

There are a plethora of gases, from inert to reactive, perfect, ideal and real. But the real royalty of gases, *the noble gases*, are few and all occur naturally. They are helium, neon, argon, krypton, xenon, and the radioactive radon.

Helium is the most common gas in the universe, but is fairly rare here on Earth. So it was with much hoopla that large reserves of helium were discovered under the American Great Plains. That led to the establishment of the National Helium Reserve in 1925. And a good thing it was. America was plumb helium crazy. By 2000, the consumption of helium within the U.S., still the top producer in the world, had risen to above 15 million kg per year.

Much in the news these days, the term natural gas is a bit confusing. While it is formed naturally, it is actually a mixture of

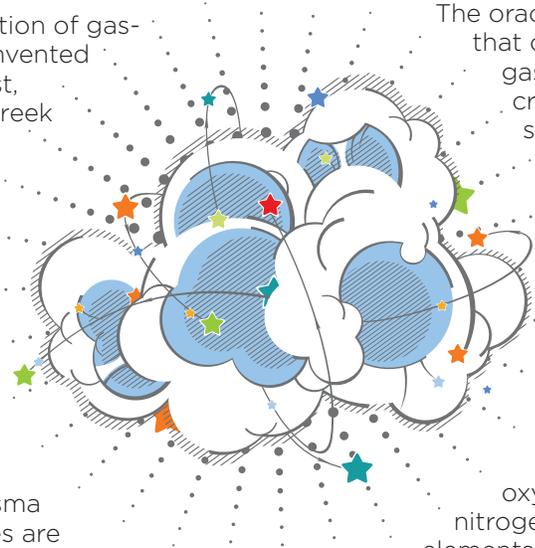
gases, principally methane, and is a fossil fuel. In 1000 B.C., the flame from a naturally occurring gas well was ensconced in a Greek temple, and was credited with providing prophesies to the Oracle at Delphi.

The oracle probably knew that centuries later, that gas would inspire the creation of the Bunsen burner.

Seems gases are not only everywhere around us, they are pervasive within us. At any point in time our bodies contain all gases in the air around us—some oxygen (21%), lots of nitrogen (78%), and trace elements of a bunch of others like krypton, neon and helium.

Not to be outdone by the Big Bang, the human body also generates a number of gases. The simple act of breathing involves a complex exchange of gases resulting in the expulsion of carbon dioxide into the environment. Occasionally a large amount of gas or air is swallowed instead of inhaled, causing the stomach to distend and resulting in a rejection of that gas back through the mouth. An eructation. The belch. And lest you underestimate this gaseous wonder, just know that the loudest belch on record was measured at 118.1 decibels. That's similar in volume to a jet engine at takeoff.

In another rather complex gas producing exchange, intestinal bacteria sometimes interacts with foods (primarily sugars and polysaccharides) to produce hydrogen and/or methane. And as most anyone who has taken a long trip in a small car, that gas has to go somewhere. And so continues the great cycle of gas.



**Never do card tricks for the group you play poker with.**



### Proverbial Wisdom

A first grade teacher collected old well known proverbs and had her 1st grade students complete the second half of the proverb.

As You Shall Make Your Bed So Shall You... Mess It Up.

Better Be Safe Than... Punch A 5th Grader.

Strike While The... Bug Is Close.

Don't Bite The Hand That... Looks Dirty.

You Can't Teach An Old Dog New... Math.

If You Lie Down With The Dogs, You'll... Stink In The Morning.

The Pen Is Mightier Than The... Pigs.

An Idle Mind Is... The Best Way To Relax.

Where There's Smoke, There's... Pollution.

A Penny Saved Is... Not Much.

Don't Put Off Tomorrow What... You Put On To Go To Bed.

Laugh And The Whole World Laughs With You, Cry And... You Have To Blow Your Nose.

You Get Out Of Something What You... See Pictured On The Box.

When The Blind Leadeth The Blind... Get Out Of The Way.

There Is No Fool Like... Aunt Eddie.



**NQA-1**  
COMPLIANT

# IF LOVE IS LIKE OXYGEN, WHAT IS OXYGEN LIKE?

We could talk all day about the virtues of our favorite gases. But when it comes down to it, without oxygen, it would be a pretty short discussion.

First discovered in 1774 by self-taught, amateur chemist and full time English clergyman Joesph Priestley, oxygen is the most abundant chemical element, by mass, in our biosphere, air, sea and land. Oxygen is the major component of the world's oceans. All major classes of structural molecules in living organisms, such as proteins, carbohydrates, and fats, contain oxygen, as do the major inorganic compounds that comprise animal shells, teeth, and bone.

More factoids about the Big O:

- You can survive—
  - 3 weeks without food
  - 3 days without water/drinking
  - 3 minutes without air
  - Only 2 breaths of air without oxygen

When the oxygen content in the air is 0%, human beings will lose consciousness at the second breath, without warning signals (pain, dizziness, etc.).

■ Due to slightly unbalanced electron spin in its atoms, oxygen is susceptible to magnetism. In this respect, oxygen is a paramagnetic gas. Liquid oxygen is strongly paramagnetic—it can be lifted by strong magnets.

■ Liquid O<sub>2</sub> is quite heavy. While the O<sub>2</sub> we breathe is “light as air,” liquid O<sub>2</sub> is heavier than water—9.5 lbs/gal vs. 8.3 lbs/gal for water.

■ Oxygen is the third most abundant element found in the sun, and it plays a part in the carbon-nitrogen cycle, the process once thought to give the sun and stars their energy. Oxygen under excited conditions is responsible for the bright red and yellow-green colors of the Aurora Borealis.

■ Oxygen enrichment of steel blast furnaces accounts for the greatest use of the gas. Large quantities are also used in making synthesis gas for ammonia and methanol, ethylene oxide, and for oxy-acetylene welding.

■ The gas costs 5 cents/ft<sup>3</sup> in small quantities, and about \$15/ton in large quantities.



## Shale, Shale, the gang's all here.

*Speaking of gas, the industry is abuzz with talks of Marcellus Shale. Geographically located in the heart of the region, Geotechnics is uniquely positioned to help firms with testing needs, whether in the lab or in the field. Let us know how we can help you make the most of your project. Just contact Randy O'Rourke at (412) 823-7600.*



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