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### Lords of the Rings

03 Mar 2007 Ole Hendrickson

The German chemist Friedrich August Kekulé claimed to have had a dream in which he saw a serpent swallowing its own tail - an ancient symbol of great mystical power. Kekulé was then able to visualize the benzene molecule as a 6-carbon ring. In an 1865 paper he proposed a structure for benzene in which the six carbon atoms in the ring have alternating single and double bonds.

While Kekulé got the ring structure right, his bonding theory was wrong. We now know that benzene's carbon atoms are linked through doughnut-shaped clouds of shared electrons that occur above and below the hexagonal ring. Rather than being linked only to their neighbors, the six carbon atoms are joined by a greater shared power.

The extra stability of benzene - and other compounds derived from it - is hugely important to chemists. Many industrial chemicals contain 6-carbon rings.

However, the stability of these compounds has its downside. Many are slow to break down in the environment. They accumulate in body tissues and in food chains. Governments have given them a name - persistent organic pollutants, or POPs for short - and have created an international treaty to phase out the worst ones. Some POPs were responsible for the near-extinction of bald eagles and peregrine falcons. They have pushed cancer rates in industrialized nations like Canada to unprecedented levels.

The seductive power of ring compounds has caused great harm to people and the planet.

They include insecticides such as DDT and lindane, the fungicide pentachlorophenol, the herbicide 2,4,5-T, dioxins, polychlorinated biphenyls (PCBs), the detergent additive nonylphenol, the flame retardant polybrominated diphenyl ether (PBDE), phthalates used in PVC and other plastics, and solvents such as phenol, toluene, and benzene itself.

Historians of science argue about whether Kekulé was actually the first to propose a ring structure for benzene. However, his dream of a serpent swallowing its tail reminds us that important scientific discoveries involve imagination as well as logic.

It also reminds us that scientific knowledge can be both a blessing and a curse.

Modern industry is manufacturing and releasing thousands of potentially toxic organic chemicals. Governments are perpetually playing catch up, trying to identify the ones that pose the greatest risk.

Now that the power of the rings has been unleashed, what do we do? We cannot, like Frodo, throw the master ring into Mount Doom. But we can act as responsible consumers by choosing products that do not contain toxic synthetic chemicals. We can ask governments to ban them.

We can convince ourselves and others that action is important by knowing some basic facts. Most POPs have ring structures. Most contain chlorine. The more chlorine they contain, the more they persist. They are fat soluble, not water soluble, which allows them to accumulate in our bodies. PCBs remain in the environment for decades and concentrate in food chains by factors of up to 70,000-fold.

POPs travel long distances in the atmosphere, but do not remain there permanently. Instead, they volatilize from hot regions only to condense and accumulate in colder regions. One might think that Canada's northern regions, and high mountains such as the Rockies, are free from pollution. Unfortunately, the Arctic, its animals, and people who live there and hunt its animals, have some of the highest levels of POP contamination of any place in the world.

We Canadians, proud to live in a northern nation, should lead the world in the fight against persistent organic pollutants.

*Ole Hendrickson is an ecologist and member of the Ottawa River Institute, a non-profit charitable organization supported by volunteers, local donors and a grant from the Ontario Trillium Foundation. There is no charge for membership in the Ottawa River Institute. We welcome new members who share our [vision](http://www.ottawariverinstitute.ca/become-a-member.htm) Join on-line at [www.ottawariverinstitute.ca/become-a-member.htm](http://www.ottawariverinstitute.ca/become-a-member.htm)*

## **How well do you know this place?**

01 Jul 2005 Barb Davey

In 1981 a magazine called CoEvolution Quarterly (now known as Whole Earth Review) published a list of questions aimed at bioregional knowledge titled "Where You At?" Inspired by those questions, I've developed the following bioregional quiz. It's unlikely any individual can answer all the questions, but they are good questions for getting to know a place. Even though I've lived most of my life in this bioregion, and consider myself something of an environmentalist, I can't answer all the questions.

Bioregional Quiz:

1. How and where is your electricity generated?
2. Where does your tap water come from?
3. Where is the food you eat produced?
4. Name five edible plant species native to the bioregion.
5. Who lived here before colonization? Where are those people now?
6. Where does your garbage go?
7. Where are your recyclables processed?
8. What are the major causes of pollution in your community?
9. When was the moon last full?
10. When did you last go for a walk instead of watching television?
11. What are the names of the people on your street?
12. Where is your local food bank?

13. Where does the fuel used to heat your home come from?
14. Where is your coffee grown?
15. How many factory farms are there in the bioregion?
16. Where can you buy local produce in season?
17. When was your community established?
18. How did the geological features of the region form?
19. When is the first snowfall in your area?
20. When is the last frost?
21. How long is the growing season?
22. When does the corn ripen? When do the first strawberries ripen?
23. Where do the wild blackberries grow?
24. When do the trout spawn and the deer rut?
25. Where can you buy locally produced dairy, eggs, and meat?

How about quizzing family and friends when you get together this summer. Or, why not host a workshop on this topic? Divide into small groups and see how many questions you can answer together.

Whether your bioregion is the Ottawa River watershed, or a smaller watershed within the Ottawa River basin, or another place altogether, getting to know it better is a good step toward living in a sustainable manner.

*Barb Davy is a member of the Ottawa River Institute, a non-profit charitable organization aimed at fostering sustainable communities and ecological integrity in the Ottawa River Watershed.*

## **Forced to gamble**

09 Jun 2005 Ole Hendrickson

The pundits say this shows that Parliament can work. It really is possible to identify national priorities, and get to work on them.

If only it were so easy.

Give the politicians credit where credit is due. They've admitted that there won't be a magic bullet cure for cancer, and it's time to get serious about prevention. Canada is behind many other countries in reaching this conclusion. Better late than never, as they say.

So what comes next? The pundits say the Parliamentary motion is just a first step. We'll need a fully fleshed-out program, with big bucks attached.

Companies that make money through early diagnostic tests and screening programs will line up at the trough. Catch it early, and your survival rate improves dramatically.

Yes, but what about attacking the root causes of cancer? Do we even agree on what they are?

Smoking, we all agree. There is a broader set of "lifestyle" factors like obesity and exercise that appear to be linked to just about any disease you can name. Even being poor seems to be a cause of cancer.

And then there's pollution.

Lurking beneath this brave talk about a national cancer strategy is Canada's dysfunctional approach to environmental protection. Our regulatory systems permit the release of a staggering array of cancer-causing substances.

Let's say you live in a normal residential area. When you fill your car with gas, benzene - a known carcinogen - is released. Other carcinogens are released when you turn on the engine and step on the gas. You or your neighbours may use herbicides on your lawn that are known carcinogens. Your kitchen cabinets may contain phenol-formaldehyde glue, a known carcinogen. And so forth...

Companies legally manufacture and sell all these chemical substances. Most have been through regulatory screening. They are not acutely lethal at the levels to which we're exposed.

What happens when a new company moves into your neighbourhood that uses carcinogens in its manufacturing processes? The regulators go to work again. Allowable exposure levels are calculated, the company gets a permit, and starts releasing more carcinogens to the local environment - on top of the ones to which you're already exposed.

The regulators cite scientific studies showing the new substances are being released at a safe level. Each has been carefully studied for its toxic and carcinogenic properties. At the level being emitted, there's only one chance in a million that a member of the public will die from cancer.

Yet people do die. Cancer rates go up. New cancers appear.

The studies don't deal with exposure to hundreds or thousands of carcinogens. Nor can they address the scenario of a new company coming in and making a significant addition to the existing mix. Each individual situation is different. All the studies in the world couldn't keep up.

You generally can't trace any particular cancer to any particular source of carcinogens. But this need not doom us to being unwilling participants in an experiment in which others gamble with our lives.

There is a quiet debate among scientists and policy makers about something called the "precautionary principle". Instead of using scientific uncertainty as an excuse to delay action and allow continued release of harmful substances, why not take positive action against known carcinogens?

Although this is not popular in industry circles, many countries are moving in this direction. But Canada, a laggard in developing a cancer strategy, is also a laggard on the precautionary principle.

We've kicked smoking, now it's time to kick the cancer habit.

*Ole Hendrickson is an ecologist and a member of the Ottawa River Institute, a non-profit charitable organization aimed at fostering sustainable communities and ecological integrity in the Ottawa River Watershed.*

## Save the genes

30 May 2005 Ole Hendrickson

Every individual that ever lived on the planet, from bacteria in boiling hot springs to your mother and father, has used this same basic chemical substance of DNA to pass along traits to its offspring. Genes, though made of the same basic building blocks, are essentially infinite in their variation.

Some genes are particularly important from the standpoint of how well adapted an individual is. These genes have different varieties. Each variety codes for a different type of the same enzyme. One enzyme type may work best in a particular circumstance, another in another circumstance, and so forth. In sexual reproduction, the different genes and corresponding enzyme types get shuffled together and re-dealt. Apart from identical twins, no two individuals are alike.

The diversity of genes within and among species is a vast repository of information that increases the chances of survival, maintains the stability of ecosystems, and underpins the life-support goods and services we take for granted.

Some of the functions that genes code for are so essential they can't be tinkered with. When it comes to making copies of your DNA - reassembling new strands by matching up to the old ones - enzymes from hot springs bacteria will do the job just fine. Indeed, this is the basis for a billion-dollar industry of amplifying tiny bits and fragments of DNA that has, among other things, helped free wrongfully convicted persons and locate real criminals.

Curiously, we have segments of "nonsense" DNA that don't seem to serve any purpose in terms of producing enzymes. These have the highest degree of variation from individual to individual, and are useful in matching individuals to their DNA.

Most DNA that does code for enzymes is carrying out fairly mundane and routine tasks in terms of cell functioning. About 70% of human genes are the same as fruit fly genes. It works, so don't mess with it. Life is wonderful, messy and exuberant. Reproduction is a way of producing more and more genetic variation, but within certain limits. Strong barriers prevent exchange of genes across species - though these have now been breached by genetic engineering.

Some people have suggested that evolution is coming to an end. Nothing could be further from the truth. As long as there is birth and death there is evolution.

But geneticists are concerned about climate change. The world may be changing faster than species can adapt. It is not that evolution is ending, but that it will happen too fast. Too many species will disappear. The normal functions of ecosystems that we take for granted - production of clean air, water, and food; stabilization of the climate - will be disrupted.

The best insurance policy for adapting to climate change is to retain natural areas where evolution can proceed unimpeded: well-designed networks of protected areas between which species can move freely. Climate change and loss of natural habitats represent a double whammy. We need to deal with both, at the same time, in a thoughtful and intelligent way.

Some of the world must be set aside for nature. Genes and the species that contain them represent both the history and future of humans and all other life on the planet.

*Ole Hendrickson is an ecologist and a member of the Ottawa River Institute, a non-profit, charitable organization based in the Ottawa Valley.*

## **Global dimming**

14 May 2005 Ole Hendrickson

Professor Gerry Stanhill was the first to notice the effect. Working with data from Israel, the British scientist was surprised to find that the average sunlight at ground level had declined by 22% since the 1950s. Data for other parts of the world showed a similar trend.

When he published his study in 2001, people joked about it. Journalists coined the term "global dimming".

But other scientists took it seriously. They confirmed that the world was getting cloudier, as amounts of fine particles of carbon and sulphur in the atmosphere were increasing. These particles come from burning fossil fuels (particularly coal), driving a badly-tuned diesel truck, or burning tropical forests.

Tiny water droplets condense around these pollutant particles. But these droplets tend to remain small. They don't fall back to the earth. They form long-lasting clouds that block the sun but bring no rain.

With global warming, average global temperature has gone up more than 0.6 degrees Celsius. Warmer air holds more moisture. All other things being equal, this should bring more rainfall. But some of the additional moisture in the atmosphere is simply trapped in clouds created by pollution.

Some scientists have suggested that global dimming has contributed to recent droughts in Africa and Asia. Warmer temperatures without more rain mean poor harvests and increased risks of famine. "My main concern is global dimming is also having a detrimental impact on the Asian monsoon," says Professor Veerabhadran Ramanathan, professor of climate and atmospheric sciences at the University of California, San Diego. "We are talking about billions of people."

New evidence, just published, indicates that global dimming is ending. Researchers argue that this trend reversed about a decade ago, partly as a result of the collapse of communist economies in Eastern Europe and the consequent decrease in industrial pollutants. Countries are reducing sources of particulate matter: phasing out coal-burning power plants, getting oil-burning cars off the road, removing sulphur from gasoline, and so forth.

So, the world is not on course to grow darker and darker, while the soil becomes parched and plants wither. Although air pollution is still growing in limited parts of Asia, Africa, and South America, the overall trend is positive.

This is good news. But scientists also warn that the end of global dimming could accelerate global warming.

Global dimming explains a puzzling fact about climate change. At the rate greenhouse gases are being released into the atmosphere, the world should be heating up faster than it is. The shading effect of clouds has been offsetting a portion of the greenhouse effect.

There are good reasons to continue to decrease particulate pollution. It has serious health costs. Hospital admissions and death rates go up during smog alerts. But as we reduce particulate pollutants, we must also redouble our efforts to reduce greenhouse gases.

Australian Peter Cox, one of the world's leading climate modelers, explains:

"We're going to be in a situation unless we act, where the cooling pollutant is dropping off while the warming pollutant is going up." He adds, "That means we'll get reducing cooling and increased heating at the same time and that's a problem for us."

Some scientists suggest that predictions of global warming need to be revised upwards to take into account global dimming. In a worst case scenario, global temperature could rise 10 degrees Celsius by 2100, making much of the world uninhabitable.

We must try harder to cut back our use of fossil fuels.

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## **Run, Walk & Roll!**

07 May 2005 Janet McNeill

What most may *not* know is that there is a new element to this event, and it's all about cancer prevention. It's called the Second Annual Run, Walk & Roll for Cancer Prevention - an undertaking that is "piggy-backing" on race weekend events in Ottawa.

*Cancer prevention.* A bit of a new twist for those of us familiar with the many events that fundraise for "the cure." More and more is being written now about the pressing need to supplement research efforts into cures and improved methods of treatment, with efforts to prevent cancer *before* it starts.

For example, in 1995 an Ontario Task Force on the Primary Prevention of Cancer produced a report entitled "Recommendations for the Primary Prevention of Cancer." In 1999, the "Everyday Carcinogens: Stopping Cancer Before It Starts" conference took place in Hamilton. Dr. Sandra Steingraber, biologist and author of "Living Downstream - An Ecologist Looks at Cancer and the Environment" was the keynote speaker (proceedings of this excellent conference can be viewed at the Canadian Environmental Law Association Web site [www.cela.ca](http://www.cela.ca)).

And now, we have the Second Annual Run, Walk and Roll for Cancer Prevention!

Why prevention, and why now? A growing body of research indicates that our skyrocketing rates of cancer could be greatly reduced by taking action to remove toxic substances from our air, water, food, homes and workplaces. Many of us choose to put toxic things into our bodies, in one way or another - cigarette smoke, unhealthy food items, and so on - but by the same token, many toxins are uninvited, unwanted guests. These come to us in the air, from polluted water sources, and in many cleaning products, cosmetics, health and beauty aids, lawn care chemicals and fertilizers, and so on. Since a majority of cancers are caused by carcinogens (i.e., not genetics), and many carcinogens are substances whose existence we can choose to avoid, reduce and/or eliminate, many cases of cancer are clearly *preventable*.

The Run, Walk & Roll for Cancer Prevention is an optimistic event that promises to be inspiring and fun! Participants can choose from the full roster of Race Weekend events (see [www.ncm.ca](http://www.ncm.ca) for a list), and so far, 120 keen folks have signed up to raise money for the RW&R. Proceeds will go toward the New Society Publishers' book "Cancer: 101 Solutions to a Preventable Epidemic," work to build a national coalition that will take action on cancer prevention, and a major cancer prevention conference to be held in 2006. Groups that raise a minimum of \$2000 in sponsorships can have 40% of the money they raise refunded to put toward their own local cancer prevention initiatives - such as pesticide by-law campaigns. All donations over \$10 made to the RW&R will be eligible for charitable receipts from the sponsoring group WHEN (Women's Healthy Environments Network), a group based in Toronto, and participants who raise \$500 will be able to have their National Capital race fee refunded.

You can find plenty of information about the Run, Walk & Roll for Cancer Prevention at [www.whenvironments.ca](http://www.whenvironments.ca) - including good materials about prevention under the tab that says "More on prevention." You can also call me (613-584-2101 or 1-888-268-2097) about participation, registration and/or sponsorship.

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## **Celebrate the solstice**

01 Dec 2002 Lynn Jones

Winter solstice has been celebrated for thousands of years. No one knows for sure how many. Some say it is the world's oldest holiday. It occurs on December 20<sup>th</sup> or 21<sup>st</sup>, and is the shortest day and longest night of the year. For us in the Earth's northern hemisphere, it is a very welcome turning point from increasing darkness to increasing light.

The word "solstice" is a Latin word that means "sun stands still". The name comes from the fact that, at the time of the winter solstice (and also its opposite, the summer solstice on June 21<sup>st</sup>) the sun appears to rise and set at the same point on the horizon, for several days, before beginning to move in the opposite direction. Here is a quote from a wonderful website on the winter solstice ([www.candlegrove.com](http://www.candlegrove.com)) by Teresa Ruano, which explains the reason for the solstice:

"The Earth leans slightly on its axis like a spinning top, frozen in one off-kilter position. Astronomers have pinpointed the precise angle of the tilt. It's 23 degrees and 27 minutes off the perpendicular to the



plane of orbit. This planetary pose is what causes all the variety of our climate; all the drama and poetry of our seasons, since it determines how many hours and minutes each hemisphere receives precious sunlight."

Because of the Earth's tilt, for one half of the year, as we go part way around the sun, we are angled away from the sun and receive less direct sunlight. As the orbit continues, we reach a point where the hemisphere that it tilted toward the sun changes and the seasons are reversed.

Winter solstice is that new beginning for us in the Northern Hemisphere, of the half of the year during which we are tilted closer to the sun. . . a wonderful reason to celebrate, and full of symbolism of rebirth and renewal.

For ancient peoples, the winter solstice was very important. There is evidence of the solstice having been observed by many peoples on every continent. Many ancient architectural structures were built all over the planet to align with the sun on solstices and equinoxes. These include tombs, temples, cairns and observatories.

I was curious about how the winter solstice was experienced by the Ottawa Valley's first people, the Algonquins. I asked Kirby Whiteduck, the Ottawa River Institute's advisor from the Pikwakanagon Algonquin First Nation, whether he had come across any such information during the research for his book about Algonquin traditional culture. He told me the sun was very important to the Algonquins and was frequently called on as a witness to many of their ceremonies. However, to date he has not found any records of specific practices of solstice observance among the Algonquin people.

This year, the Winter Solstice will occur at 8:15 p.m. (EST) December 21<sup>st</sup>, 2002. Any time from a few days before to a few days after is good for a solstice celebration.

Ideas for celebrating include: having a solstice bonfire, telling stories about the importance of the sun, and baking a poppyseed cake and decorating it to resemble the sun. Since the holidays tend to be very busy, it's best to keep the solstice celebration simple. How about a beautiful walk outdoors or some quiet time indoors enjoying the dark and silence followed by lighting a candle to signify and celebrate the sun's return? Happy solstice to all!