The Molecular Anthology competition

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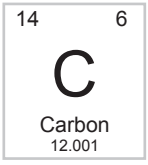
The *Molecular Anthology* competition was run by the Manawatu Branch of the NZ Institute of Chemistry as part of the activities of the 2011 International Year of Chemistry.

In the first stage of the competition, members of NZIC and the public were invited to nominate molecules or materials which, in their opinion, have changed New Zealand society. A brief description for each entry was placed on a web-site (*http://molecularanthology.massey.ac.nz*), which could help people to judge the impact of the molecule in our lives. The 39 entries received included molecules like caffeine, cholesterol, insulin, phosphate, Vitamin B-12 and water. Some less well known molecules were also nominated; examples included 2-isobutyl-3-methoxypyrazine, a compound with a very strong aroma; and Bi-2223, a semiconductor material.

In mid-July the second stage started and the web-site was opened for voting until late August. Overall, 395 votes were received. Carbon, with 87 votes, attained the first place. What a coincidence that carbon is a part of the IYC2011 logo! Caffeine was second, with 70 votes, while 1080 and keratin shared third place with 39 and 36 votes, respectively. While we thank everyone who made this project possible, our special gratitude goes to Ms Judith Edwards[1] who helped us to set up the Molecular Anthology web-site.

The descriptions of the winning molecules from the people who submitted them initially are given below.

First Place: Carbon



Carbon

I beg yo*ur pardon, Mrs Hawarden,*
But there's a problem in your garden.

It's about a kind of stuff called carbon.
Without it, all our lives would harden.

It's the very core of life, you see -
This essential building block called C.

There's lots of it down under ground.
And it helps the sea make that swishing sound.

It's in the soil, and every tree
And my dad says it makes me, me.

The air we breathe holds quite a bit
Of a relative Dad calls CO-shit.

Earthquakes make trouble with every jolt,
But it's no good to look for fault.

When the earth makes shakes,
It's very scary but carbon isn't airy-fairy!

It's a bigger problem anyhow:
The world's too warm, right here, right now.

The puzzle that we most need to play
Is getting some carbon out of the way.

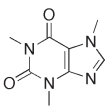
Spike and Frank O'Connor
12 May 2011

The nomination for carbon included a poem written by a dad (Frank) and a son (Spike). Here is the story that Frank told:

"The first line comes from a poem from my childhood, the second line is a twist on that poem's second line and we created our own entirely from there. So the credit should read Spike and Frank O'Connor… Spike turned nine this April, has an insatiable curiosity about the natural world (visible and otherwise), names David Attenborough as his favourite television personality and seems to have his grandfather's ability to piece things together to understand interrelationships from different fields of knowledge. This grandfather is a Massey Alumnus, from '49, and went on to a PhD from Cornell, time with DSIR then to a Chair at Lincoln.

"In Spike's second year, he often asked me to draw him a picture and make up a story. 'Fish' was Spike's first word, so they were included. Then he began to ask for drawings of taniwha and other animals doing particular things. A year passed and Spike began to draw his own pictures and to suggest words for my poems which began to grow alongside. In a book getting prepared for publication, Frank made the drawings and polished these poems; Spike tested rhythms, after suggesting rhymes and the antics of the taniwha. We did the same with this poem – he wanted the earthquakes included, for example, to add something from his own experience and feelings to the poem."

Second Place: Caffeine



On the far side of the river valley the road passed through a stark black burn. Charred and limbless trunks of trees stretching away on every side. Ash moving over the road and the sagging hands of blind wire strung from the blackened lightpoles whining thinly in the wind. A burned house in a clearing and beyond that a reach of

1. Involvement with this project was one of the last contributions Judith Edwards made to the chemists at the Institute of Fundamental Sciences at Massey University; she passed away on 4 December 2011.

meadowlands lay abandoned. Farther along were billboards advertising motels. Everything as it once had been save faded and weathered.

"One can only speculate on Cormac McCarthy's inspiration for the post-apocalyptic world that he envisioned in *The Road*. But it's a fair bet that he would have been in a better mood, had he started his day with a freshly brewed cup of coffee.

"Caffeine is an alkaloid synthesized from purine nucleotide precursors by a number of plant species. It is well known for its stimulatory effects on the human central nervous system, and it has been consumed for thousands of years. According to legend, sometime around 3,000 BCE a few leaves from a tea tree blew into a bowl of water that had just been boiled for the Chinese emperor, Shennong. He took a sip, and was pleasantly surprised by the flavour and restorative properties of the concoction.

"Here in New Zealand, tea has also been the caffeinated drink of choice for much of our recent history. From colonial times until the 1970s, the average Kiwi consumed around 3 kg of tea per year. Tea bags were introduced in 1969, but this advance in technology wasn't enough to stop the rise of coffee culture – first through the introduction of instant coffee (in the 1960s), and then through the proliferation of coffee roasters, espresso machines and trendy cafés with snobby baristas.

"As our most widely consumed psychoactive drug, it is difficult to conceive of a molecule that has had a bigger effect on the minds (and hearts, and tongues, and nostrils, and stomachs, and bladders) of New Zealanders. It is impossible to imagine our society functioning without it: from smoko in the shearing shed, to lattes in the boardroom, caffeine permeates our culture. Life without it would indeed be faded and weathered.

"But thankfully, caffeine-containing drinks remain legal! Though as chemists, it is worth remembering that caffeine is also considerably more soluble in ethanol (150 g L^{-1}) than it is in water (20 g L^{-1}). It's something to keep in mind, for your next departmental Christmas party…"

Wayne Patrick

Dr. Wayne Patrick is a Senior Lecturer in Biochemistry at the Institute of Natural Sciences, Albany Campus, Massey University and one of the recently announced recipients of the prestigious 2011 Rutherford Discovery Fellowships. In Patrick's laboratory, tools from functional genomics, directed evolution, microbiology and enzymology are used to address a fundamental question in molecular evolution, *viz*., "Where do new enzymes and metabolic pathways come from?" His web-site *http://patricklab.massey.ac.nz/* has more about his research interests.

Third Place: Keratin and 1080

Keratin

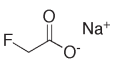
"New Zealand is globally known for its high-quality merino wool. Keratins are fibrous proteins which comprise the structure and large portions of the cell composition of living organisms. There are two primary keratins: the alpha-keratins and the beta-keratins. While both fulfil similar roles, they differ slightly in structure, composition and properties. The alpha-keratins are slightly basic or neutral and form a right-handed helical structure; the beta-keratins are slightly acidic and also form a right-handed helical structure. Keratins, as fibrous proteins, are elongated molecules in which the secondary structure forms the dominant structure. These proteins are the biological structural component of skin (soft keratins) and of nails, claws, hair, horn, feathers, and scales (hard keratins). Keratin from wool is a reactive, biocompatible, and biodegradable material. Pure keratin comprises up to 90% by weight of wool. Merino wool is typically 3-5 inches in length and is very fine.

"Man has used natural animal products, hides, furs and – eventually – wool throughout the ages for warmth and protection from the environment. Today wool continues to be popular for use in both apparel and textiles. This continued use and development of wool as a textile material over such a long period strongly suggests that this fibre has something special to offer. As long as there is grass for sheep to eat, they will produce wool. Like the South Island landscape where the Merino sheep thrive, the fibre itself results in garments ranging from practical and rugged, to the exquisitely beautiful. New Zealand Merino wool is used internationally in a variety of market segments: luxury suiting, fashion knitwear, active outdoor and lifestyle products. The finest Australian and New Zealand Merino wools are known as 1PP which is the industry benchmark of excellence for Merino wool that is 16.9 microns and finer."

Marianna Bulgarella

Marianna's interests in the natural world led her to pursue a career in Biological Sciences. As an undergraduate student at Patagonia National University in Argentina, she studied thermal physiology of guanacos, a camelid species. Later, she obtained a PhD degree at the University of Alaska Fairbanks, focusing on the population genetics and adaptation to high-altitude in the crested duck, a waterfowl species endemic to the Andes of South America. Her research interests include evolutional biology, population genetics, and physiological adaptation. Currently, she is a Postdoctoral Fellow at Massey University studying local adaptation in tree weta.

1080



"A controversial molecule with a very strong tie to New Zealand is a compound referred to as "1080" (read ten-eighty) after a catalogue number. The scientific name of the compound is sodium 2-fluoroacetate and it is a compound that is highly toxic to mammals.

"Before the arrival of humans to New Zealand there were no native mammals (bar some species of bats and cetaceans) and since the introduction of mammals by man the native fauna has been greatly threatened.

"Owing to threat from introduced mammals, the near absence of native mammals, the limited toxicity of 1080 to birds and its rapid decomposition, this compound is widely used in New Zealand, particularly in the South Island. However, in addition to wildlife-threatening rodents and possums the compound also kills dogs, cats and livestock: this issue combined with misunderstanding makes the use of fluoroacetate controversial among the farming community.

"This contention is manifest on road signs that bear the graffiti "ban 1080", which is enigmatic to tourists driving along New Zealand's beautiful tolkeinesque countryside: after all, "1080" is just a number to most people. In fact, this compound is unknown in the rest of the world, making it a compound with a strong link to New Zealand, which accounts for 80% of the global usage of 1080."

Matteo Ferla

Matteo is a PhD student in the biochemistry laboratory of Dr. Wayne Patrick doing enzyme evolution. He is half Italian and half English and has been in NZ for two years.