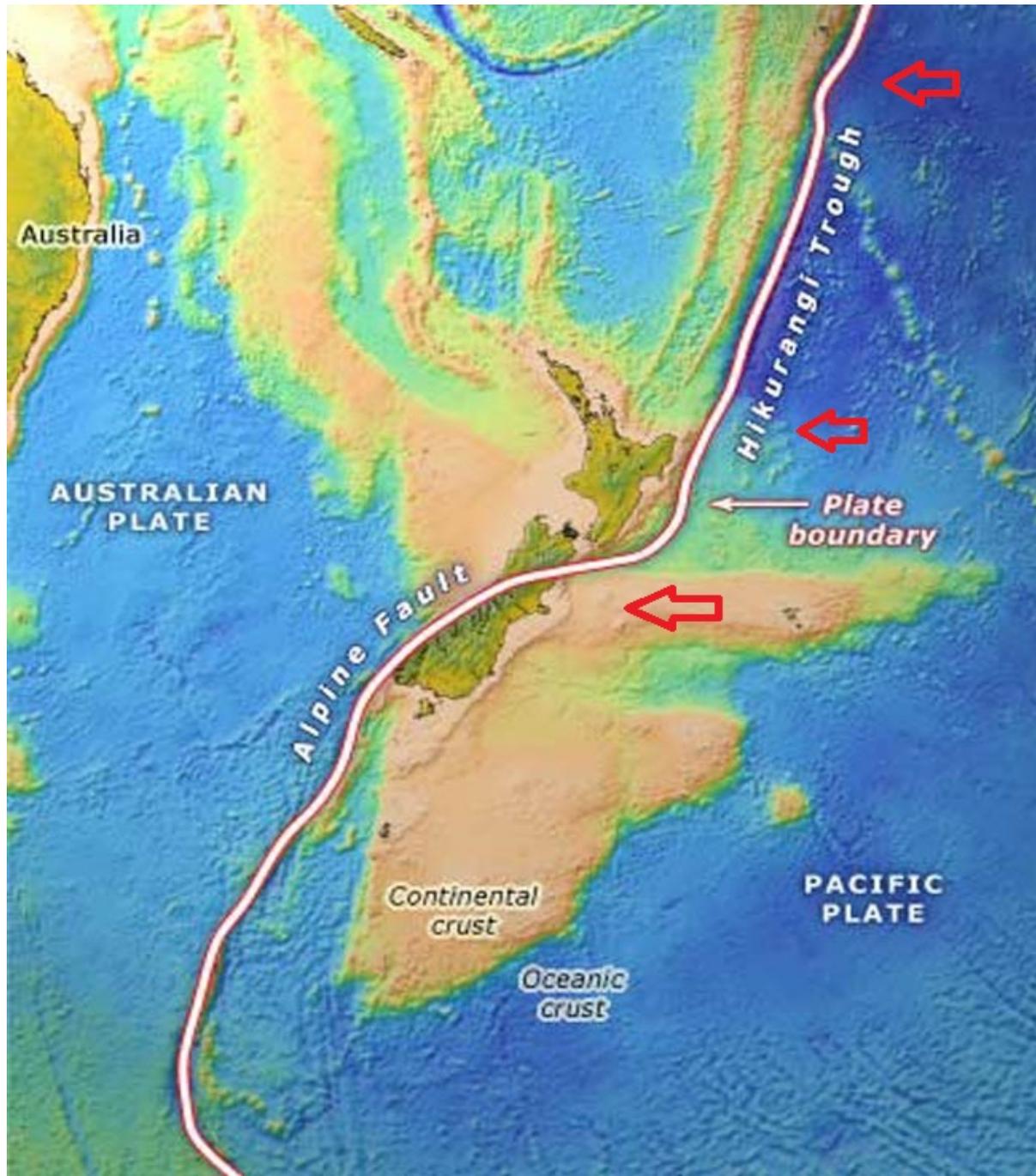


The Advantages of New Zealand



From space with color enhancement – North Island to the right

The Pacific Plate is moving west



From subduction – mountains and volcanoes

- In the Kermadec Arc and the Havre Trough there are 26 volcanoes. Except for Curtis Island, Macauley Island and Raoul Island (all small) all are submarine volcanoes.
- There are four very dormant volcanoes on the South Island. All are very small.
- There are five small volcanic and sub-antarctic islands to the south – Antipodes, Auckland, Pitt, Adams and Solander.

more volcanoes

- There are four volcanoes in the Ross Dependency of Antarctica which is administered by New Zealand. Mount Erebus (3794 meters) is active.
- The North Island volcanoes are usually divided into three groups: the Taupo Volcanic Zone, the Bay of Plenty volcanoes (White, Mayor and Whale Islands) and Taranaki (also known previously as Mount Egmont). The last is a 2518 meter high stratovolcano in the southeast. Quiet since 1755, it is very picturesque.

Taranaki



- There are sixteen other volcanoes not included in the Taupo Volcanic Zone – all are small and very dormant.
- In the heart of the North Island the Taupo Volcanic Zone has three major peaks: Tongariro (1968 m; last eruption 2012); Ngauruhoe (2291 m; last eruption 1977) and Ruapehu (2797 m; last eruption 2007). There are twenty-three other volcanoes.
- The 27th Taupo volcano is now a 616 km² (230 square mile) lake. From space it looks harmless.

Lake Taupo from space



Clouds over Lake Taupo



Another view of Lake Taupo



Two Super-Eruptions

- The Oruanui eruptions about 26,500 years ago culminated in a **VEI=8** event probably 100 times more powerful than Pinatubo in 1991. Tephra covered most of the center of North Island in depths up to 200 meters. Lake Taupo fills part of the caldera from this event.
- The Hautepe eruption (likely 1838 years ago) culminated in a **VEI=7** event.
- Both events changed the climate of Planet Earth.

Speculations

- The North Island of New Zealand has an area of 113,729 square kilometers (~44,000 square miles), which is about the same size as Luzon and Newfoundland. For Hawaiians near Kilauea, that is 11 times the size of the Big Island.
- In most directions it is about 100 miles to a coastline from Lake Taupo.
- In simulations of Taupo we see what might be called meteorological tsunamis: there doesn't seem to be a huge pyroclastic flow reaching a coast or some sort of massive slope collapse.

- Instead, in the simulations the lateral force of the explosion displaces air and generates water waves – we are seeing measurable impacts 1500 miles west along the southeastern coast of Australia (through New South Wales south to Victoria and Tasmania - roughly Brisbane to Melbourne).
- The waves seem to be different than those tsunamis generated by marine earthquakes: only the top of the water column is moving.
- We are skeptical there would be any evidence along the Wilkes Land coast of Antarctica.

- Likewise, we are NOT optimistic there would be evidence preserved from northbound waves as they crashed into New Caledonia, Fiji and Samoa.
- To our surprise, in the simulations it appears that eastbound waves from the Hautepe event do NOT reach Chile (6000 miles).
- In the simulations we are NOT seeing that the explosions would necessarily trigger activity along the boundary of the Pacific and Australian plates (offshore and not far east of Lake Taupo). As far as we know, the Pacific plate has always been moving west into the Hikurangi Trough.

- In the simulations the waves from the Oruanui event do reach Chile. There are two related problems:
- If the waves from New Zealand did reach Chile what would distinguish their deposits from a more ordinary tsunami generated by a marine earthquakes where the Nazca plate moves against the Pacific, Antarctic or Cocos plates or South America itself? Chile is often a seismic target.
- what evidence of tsunamis or tephra would be observable all these millenia later?
- **How might New Zealand influence Planet Earth?**

Geography – Areas of Inhabited Places

- South Island – 150,437 km²
- North Island – 113,729 km²
- Chatham Islands – 966 km²
- Niue – 261 km²
- Cook Islands - 240 km²
- Tokelau 10 km²
- Total 268,838 sq km = the US state of Colorado, or the countries Ecuador, Gabon and the United Kingdom (Ross Dependency is 450,000 km²).

Demographics

- North Island - 3,680,000 people
- South Island – 1,120,000 people
- Cook Islands – 17,500 people
- Niue – 1,600 people
- Tokelau - 1,500 people
- Chatham Islands – 600 people
- Ross Dependency (seasonal) 295-1370 people
- Total – 4,880,000 million people – about as many as Liberia, Georgia, Ireland and Costa Rica

Economic Measures

- Per capita gross domestic product (purchasing power parity): \$38,500 US (2017)
- GDP growth rate: 3.5% (2017); Inflation 2.2%
- Unemployment: 5%; poverty – no estimate
- Government revenues: \$73.2 billion US versus expenditures \$71.9 billion US
- Imports \$38.74 billion US versus exports of \$37.85 billion US
- Reserves \$18.32 billion US versus external debt of \$88.08 billion US

Communications

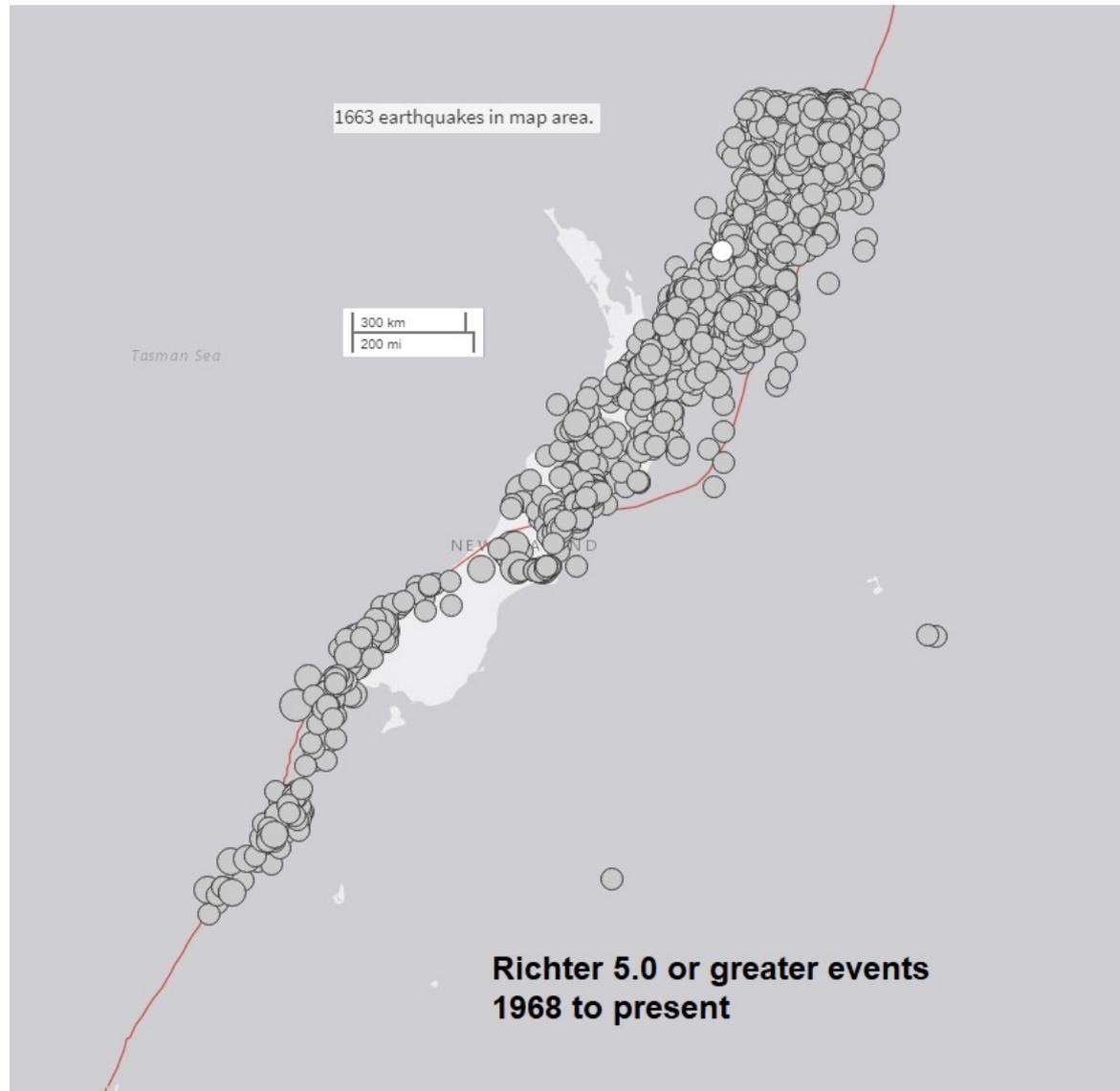
- Telephones – fixed landlines – 1,760,000
- Telephones – cellular – 5,800,000
- Internet users – 4,000,000 (how many are real and unique people is always difficult to judge)
- Personal computers 1,450,000 (85% Windows; 13% Apple; 2% LINUX)

Medical Infrastructure

<u>Measure</u>	<u>Estimate</u>
Doctors working	15,000
Patients per doctor	320
Hospital beds	14,000 (342 people / bed)
Infant mortality	0.44% (260 out of 60,000)
Malaria cases	50 (probably from travel)
HIV + adults	5,000 (2014)
Annual Deaths due to AIDS	100 (2014)
People with SWW special needs (*)	165,000
People with disabilities - total	880,000 (per Stats NZ)

* = autism,arthrogryposis,ataxia,cerebral palsy,Down Syndrome spectra

A Little More Geology

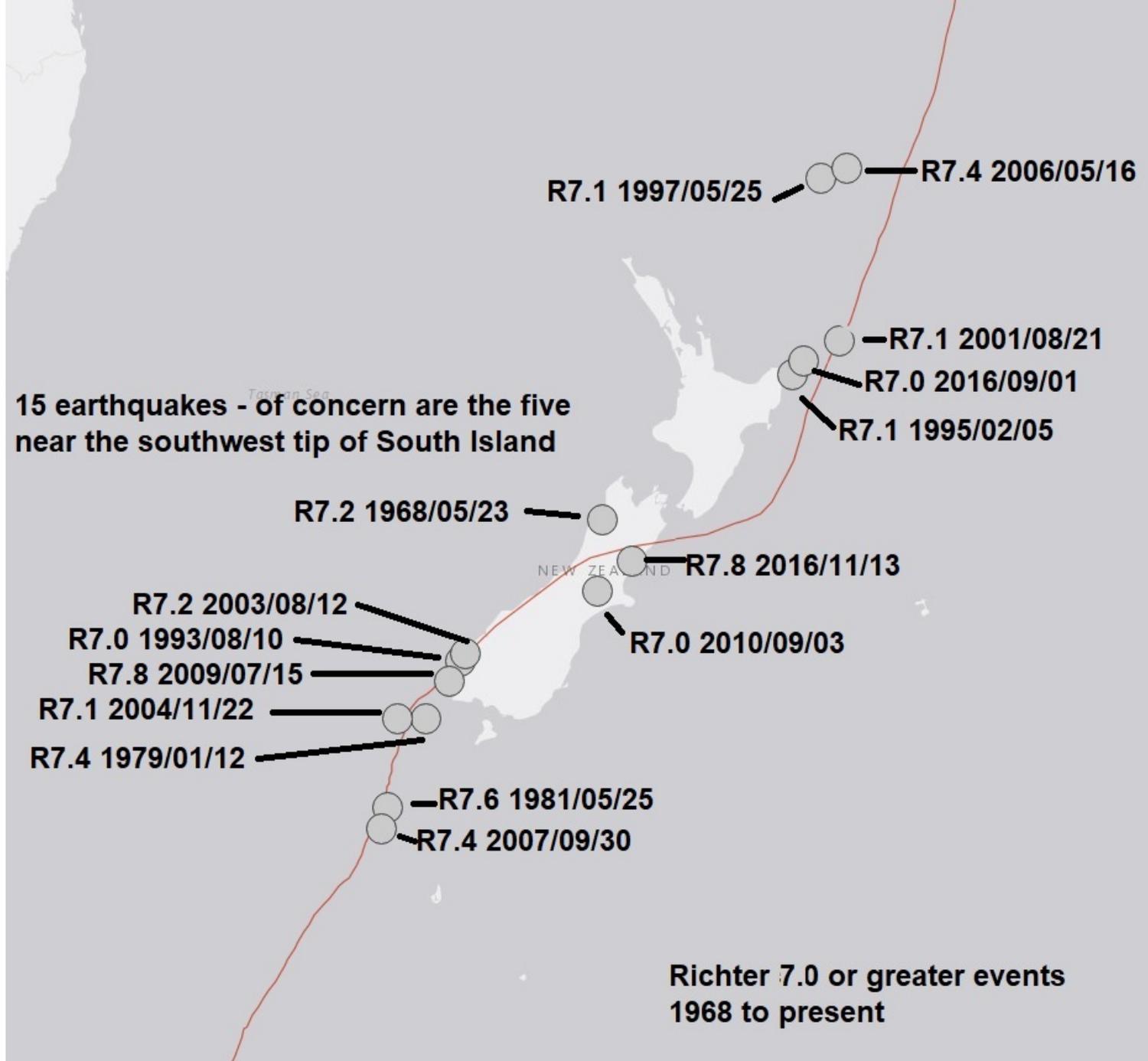


Each circle is an earthquake. Somewhere under them is New Zealand. That's a lot of activity in 50 years.

A Little More Geology (continued)



More than 2.5 Richter 6.0 or greater events per year is still a lot of activity.



A Richter 7.0 or greater every three years is serious seismic activity. It would be prudent to carefully measure stresses along the main and other faults.

Urban Concentrations

City	Population	City	Population
Auckland	1,534,700	Nelson	66,700
Wellington	412,500	Rotorua	58,800
Christchurch	396,700	New Plymouth	57,500
Hamilton	235,900	Whangarei	56,700
Tauranga	137,900	Invercargill	50,800
Napier-Hastings	133,000	Whanganui	40,300
Dunedin	120,200	Gisborne	36,600
Palmerston North	85,300	TOTAL	3,423,600

About another 14% of the population live in smaller cities – total urbanization is 84%. One factor in where to build schools.

Other Advantages

- New Zealand is responsible for an Economic Exclusion Zone larger than five million square kilometers.
- The defense forces include 5,000 Navy with 10 ships; 5,000 Air Force with 50 planes; and 7,000 Army. New Zealand is somewhat isolated, and manages to get along well with its neighbors, so defense spending is modest.
- However, Canterbury 2010, Christchurch 2011 and Kaikoura 2016 reinforced that earthquakes 'attack' without warning when and where they wish.

Languages

- Use of the English language as either a primary or secondary means of communication is nearly universal.
- 20,000 users of New Zealand Sign Language
- 150,000 users of *te reo Maori* with a specialized keyboard
- 86,000 Samoan language speakers
- 66,000 Hindi language speakers
- 52,000 Mandarin Chinese speakers
- Another 30 languages in use

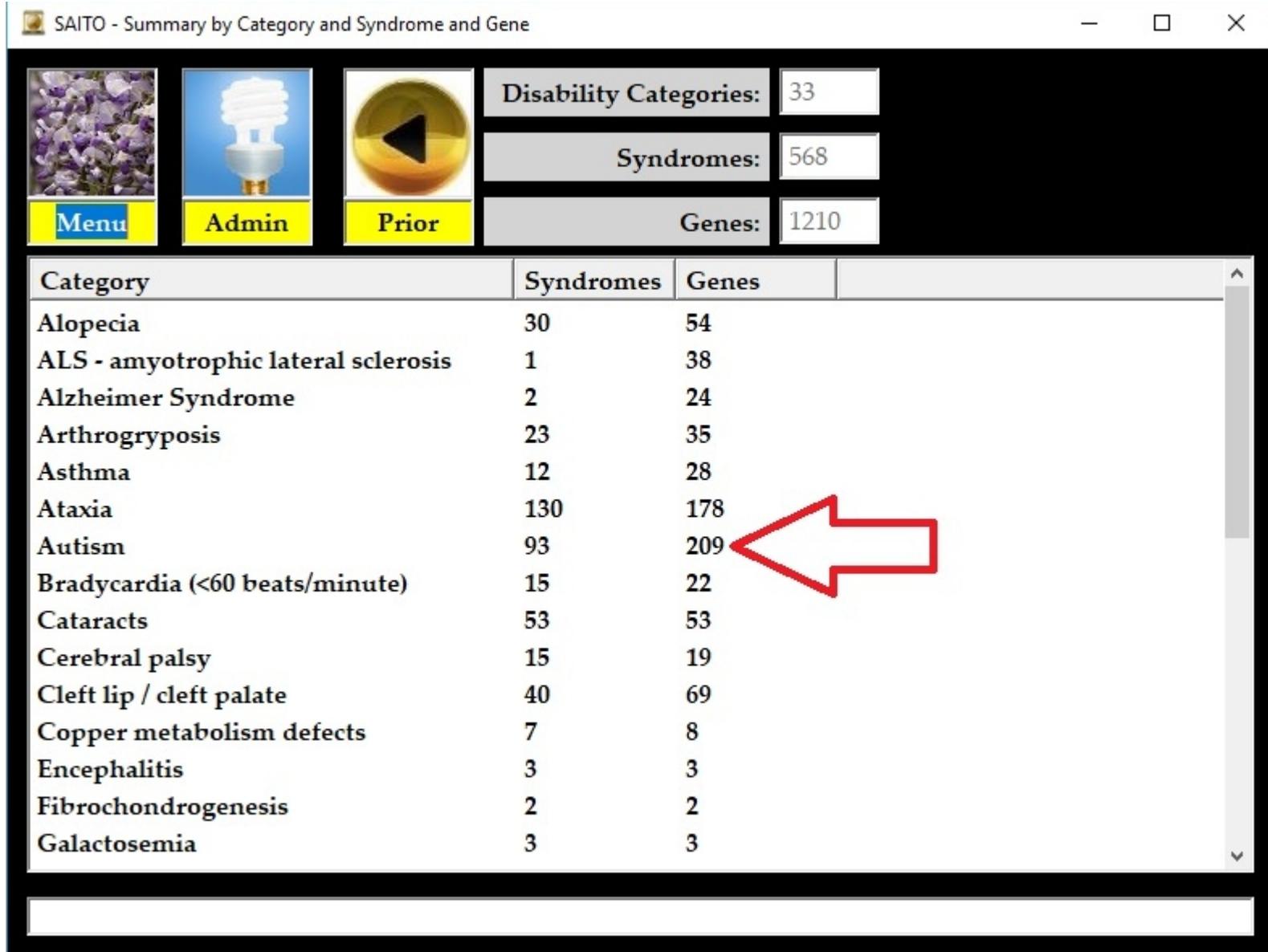
Education and Enrollments

- University of Auckland – 42,000
- Auckland University of Technology – 28,000
- Lincoln University – 7,000
- Massey University – 34,000
- University of Canterbury – 12,000
- University of Otago – 21,000
- University of Waikato – 13,000
- Victoria University of Wellington – 23,000
- TOTAL 180,000

Genetics

The Colville, Cradock, Jellicoe, Rangitoto and Tory channels are usually not barriers to movement. The Cook, Foveaux, Pitt and Tamaki Straits can be challenging and even lethal. And the Tasman Sea can be deadly (*SV Nina* in 2013). But all can be crossed by water or by air, so it can be argued that even the outlying islands of New Zealand are not truly islands in terms of population biology. That said, it is important to have a national genetic survey to determine if allele frequencies correspond to preliminary results from North America and Western Europe.

Genetics (continued) – April 2018



SAITO - Summary by Category and Syndrome and Gene

Disability Categories: 33
Syndromes: 568
Genes: 1210

Category	Syndromes	Genes
Alopecia	30	54
ALS - amyotrophic lateral sclerosis	1	38
Alzheimer Syndrome	2	24
Arthrogryposis	23	35
Asthma	12	28
Ataxia	130	178
Autism	93	209
Bradycardia (<60 beats/minute)	15	22
Cataracts	53	53
Cerebral palsy	15	19
Cleft lip / cleft palate	40	69
Copper metabolism defects	7	8
Encephalitis	3	3
Fibrochondrogenesis	2	2
Galactosemia	3	3

From our SAITO application – there are about 24,000 protein-coding genes

Genetics (continued) – May 2018

SAITO - Summary by Category and Syndrome and Gene

Disability Categories: 38
Syndromes: 634
Genes: 1340

Category	Syndromes	Genes
Alopecia	30	54
ALS - amyotrophic lateral sclerosis	1	38
Alzheimer Syndrome	3	27
Arthrogryposis	23	35
Asthma	12	28
Ataxia	131	179
Autism	97	214
Bradycardia (<60 beats/minute)	15	22
Cataracts	53	53
Cerebral palsy	15	19
Cleft lip / cleft palate	40	69
Copper metabolism defects	7	8
Diabetes	1	5
Encephalitis	4	4

Sixty-six new syndromes and 130 new genes – last month.

We do NOT find the terms 'autism' or 'autism spectrum' meaningful.

Genes

SAITO Genes by Category, Chromosome and Region

Category: Arthrogyrosis, Asperger's, Asthma, Ataxia, **Autism**, Bradycardia (<60 beats/minute)

Genes: 214

Chromosome	Region	Gene	Syndrome
14	q11.2	DHRS4L2	Autism 18 (AUTS18)
14	q13	FOXG1	FOXG1 Syndrome
14	q32.31	DYNC1H1	Mental retardation autosomal dominant 13 (MRD1...
15	p11-13	HBII-85	Prader-Willi
15	q11.2	MAGEL2	Prader-Willi
15	q11-q13	UBE3A	Angelman's Syndrome
15	q12	GABRB3	Epilepsy childhood absence 5 (ECA5)
15	q12-13.1	OCA2	Angelman's Syndrome
15	q13	HERC2	Prader-Willi
15	q13.3	CHRNA7	15q13.3 microdeletion syndrome
15	q13.3	RYR3	Autism 18 (AUTS18)
15	q13.3	up to 6	15q13.3 microdeletion syndrome
15	q21.1	GATM	Arginine glycine amidinotransferase deficiency
15	q21.2	MYO5A	Griscelli syndrome

Some of the genes linked to the autism spectrum – scattered on all 23 chromosomes and in mitochondrial DNA.

Genes (continued)

By sheer coincidence we have two students with mutations in the ADNP gene on chromosome 20. In many cases variations in this gene give rise to Helmsmoortel-van der Aa syndrome, which is in the autism spectrum. It chanced that we could measure different velocities of learning - upon further investigation by the original discoverers and others it has become clear that often one must speak not of the gene but rather of the specific mutation. Likewise, for some genes like HTT (Huntington's Disease) the quantity of polynucleotide repeats is critical. We currently track 41 such genes. In other cases different variations of the gene cross category boundaries. For example, some polymorphisms of the CD40 gene are implicated in Alzheimer's and cause effects when the subject is 50 years or older, while other polymorphisms cause an overactive thyroid that underlies Graves disease which manifests immediately (at birth, if not before) or in the early 20s. We now track 138 genes that are in more than one syndrome.

Genes (continued)

The **FOXP2** gene on chromosome 7 is somewhat controversial. Part of the confusion is that it matters whether the gene has a mutation (there are at least two significantly different ones), a micro-deletion, a repeat or is trans-located. **FOXP2** is normally located in the q31.1 region – a translocation to the q22 region causes a condition known as developmental verbal dyspraxia (DVD). Both a missense mutation causing an arginine-to-histidine substitution (R553H) and a nonsense mutation (R328X) causing a truncated protein cause speech and language difficulties. **FOXP2** also regulates at least the **SRPX2** (work underway), **CNTNAP2** (interacts with **CNTN2**) and **CTBP1** (interacts with 14 other genes) genes. **CNTN2** interacts with the **NFYB** gene which interacts with three more genes. Of those, **CEBPZ** interacts with 2 other genes, **myc** with 37 other genes and **TBP** with 27 other genes. The second generation of interactions with the **CTBP1** gene now includes over 160 other genes. So far, 188 genes linked to **FOXP2**.

Teaching

So what should happen if a new student showed up with DNA tests that indicated a q22 translocation of the **FOXP2** gene and developmental verbal dyspraxia (DVD)? We would check that some of the related genetic conditions are not present:

- 16p11.2 microdeletion
- Epilepsy
- Fragile X syndrome
- Galactosemia
- Russell-Silver syndrome

Russell-Silver syndrome has been associated with methylation involving the H19 and IGF2 genes, both on chromosome 11, but some cases of Russell-Silver involve inheritance of two copies of the the maternal chromosome 7 (maternal uniparental disomy).

Teaching (continued)

The objective would still be for the student to get better health, an inclusive social group and life goals in the form of performance-based collegiate bachelor's and master's degrees. The curriculum is similar to what a neurotypical Chinese student concentrating in Chen family style Tai Chi Chuan would study at a sports university - without essays, exams and energy drinks, of course. A daily class involves bowing and saluting, Wuji style sitting and standing meditation, eventually six Tai Chi tool sets (ruler, ball, bar, bang, bent bang and long bang), eventually nine Qigong sets, Chen Family warm-up and silk reeling exercises, and, eventually, Chen Family Tai Chi Chuan sets (6 unarmed; 10 with weapons including batons, saber, sword, staff, spear, kwan dao and long pole). Some of the Qigong routines have been used for more than two thousand years, while some of the sensors used in smart garments have existed for only two months.

Sensors

In our Internet of Things (IoT)-heavy class class we ask students to use

1. biosensors to measure blood pressure, heart rate and temperature.

Initially, we were (and are) primarily interested in getting warning of seizures. Given a high risk of diabetes, we are also interested in non-invasive blood glucose monitoring. At one time, we thought one smart watch would suffice for these measurements.

2. pressure sensors in floor mats and seat cushions to measure balance and stillness during sitting meditation and standing meditation

3. a hat or cap with an accelerometer to track head sway. Sadly, we have not found smartglasses to be useful for this - or anything else.

4. We are currently experimenting with shoe inserts and sports sleeves as garments to embed temperature sensors in order to track pain.

Sensors (continued)

5. Smart garments in the form of a pi sha with location sensors measuring x y z coordinates. The blue outer garment with yellow trim shown to the right is a pi sha. The class chooses the pi sha, pants and top colors. The weapon is a non-canonical ghost-head saber. It is taught in Choy Lay Fut, but many things about it are ... well, ghostly. Traditional Taoist shoes, oversocks and Zhuangzi Jin or Nanhua Jin (a hat after an influential Chinese philosopher who lived around the 4th century BC during the Warring States Period).



Scoring

The students follow videos of a grandmaster (typically the illustrious Chen Zhenglei) and are graded on the performance of each movement. This provides parents and physicians with a daily digital stream of scores so that changes in diet, medications, sleep and logistics can be quantitatively assessed. We combine the scores across sets to produce a velocity of learning - somewhat similar to a stock index. If the scores go up, the change was probably good.

After some discussions with former members of the famed Beijing Wushu Team we are in the process of having students here examined by doctors of Traditional Chinese Medicine with an eye toward assignment of individual homework. This has taken the form so far of extra repeats of selected sequences from the various tai chi tools, qigong and Tai Chi Chuan sets we teach.

Since we currently only see students two hours per day (seven days per week preferred) we provide parents with free software code-named HERON that acts as an electronic diary.

HERON



The HERON main menu – a bit obsessed with details. As requested.

HERON

There is currently a bewildering array of digestive system challenges that often complicate the already difficult lives of people with special needs: ulcerative colitis, Crohn's Disease, Irritable Bowel Syndrome (sub-classifications of C=constipation; D=Diarrhea; A=Alternating) and so on. See, for example, <https://cronometer.com>.

The objective would be to not only have individual diet histories (including brand, storage, preparation and so on) but the ability to share discoveries with others who have similar genotypes. One conjecture is that produce grown on the North Island might subtly differ from produce grown on the South Island due to soil and rainfall. For example, 48 inches annual rainfall at Auckland on the North Island versus 264 inches annual rainfall at Milford Sound on the South Island. (To be fair, the South Island is generally drier than the North Island). Like wine vineyards, perhaps meat, seafood, dairy and produce is an area where blockchain-style tracking would be useful.

Deeds Abide

The illustrious French mathematician Louis Augustin Cauchy (21 August 1789 – 23 May 1857) on his deathbed is alleged to have said to the Roman Catholic archbishop of Paris, “Men pass on; deeds abide”. Cauchy might have been diagnosed as autistic today. He is buried in the Sceaux cemetery south of Paris, but there is no internet image of his grave, nor is there a statue. His name is one of 72 on the Eiffel Tower and on a lot of equations – perhaps those are enough recognition.

His statement has been taken to mean it really only matters what is done as opposed to what is said. It is possible to measure the strength of a country or a culture by how it treats its weakest – the old, the very young, the poor and the disabled. So the question for New Zealand would be whether there is courage and compassion enough to launch a comprehensive DNA survey and to open a dozen small schools, and to set an example for the rest of us here on Planet Earth.