

THE QUARRY

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Deadly Traffic

The email blipped onto my phone as I boarded a flight from Diqing to Kunming in China's south western Yunnan province. I tapped the little aeroplane icon and walked down the jet bridge. Later, as the Himalayas passed below, stereoscopic and horizon-wide, I read, 'A mystery virus is sickening people in Wuhan. Stay away from markets.' It was 14 Jan 2020 and I was on my way home to an Australia still smoke-dazed from its worst bushfire season ever. Given the many discussions I'd had with my brother, a biomedical engineer researching HIV at Massachusetts General Hospital, the email should have alarmed me. Perhaps it was getting up at an ungodly hour to reach the airport, or the brief but disconcerting concern that my visa wasn't valid, that left me

exhausted and unconcerned. I, like the rest of the soporific world, pushed the message out of my mind. The truth is that for all of us this story started long before now.

On the morning of my eleventh birthday, I had met an African Spitting Cobra and a dinosaur. To my brothers and me, the scaly creature rustling from the veldt on its hind legs with its giant claws tucked against its chest was a velociraptor. The snake, also scaly but slimmer and agile, didn't stay; it swam off, a gold flash in the grass. The dinosaur turned its inquisitive snout in our direction and sniffed our scent on the dawn air. We three crouched, entranced as we watched the creature continue its purposeful progress. That was the first and last time I saw a pangolin. The beauty of other animals over the years: a cheetah downing its prey in a swirl of dust, the iridescent joy of a hovering sunbird, or the silver gleam of a diving otter, never dimmed the privilege I felt at glimpsing the elusive scaly anteater.

Pangolins, native to Asia and Africa, subsist on ants and termites, a preference sufficient to make them lovable. Pangolins are ant devourers extraordinaire. They possess the elongated sticky tongues of other myrmecophages and their tough, keratin-lined stomachs must, for ants, be comparable to the voracious maw of the sarlacc in *The Return of the Jedi*. Ant venom has the questionable distinction of being the only acid named after an animal. Formic acid packs a punch but the scaly exterior of the pangolin is ideally suited to its diet. Pangolins are the only mammals that boast of such armour which they put to good use defending themselves by curling into a tight ball and swinging their sharp tail to ward off predators. This defensive tactic accounts for their name, which derived from Malay, *pengguling*, means 'one who rolls up,' but it also leaves them vulnerable to poaching. Humans, unlike leopards, overcome it with ease and our appetite for the keratin scales which protected pangolins for millennia, now renders them the most trafficked animal in the world.

Keratin is a remarkable protein, as lustrous as hair and as tough as hooves; it constitutes rhino horn as well as pangolin scales. Despite being ubiquitous, the protein has resulted in these two animals being listed on Appendix I of the Convention on International Trade in Endangered Species (CITES) list. This means that they may not be hunted or traded for any reason other than scientific purposes. No study has ever found keratin to have therapeutic properties.

Chinese friends explain that pangolins' mythical appearance makes them prized. What my child-eyes believed was a dinosaur is perceived in China as a small dragon. When rolled up, pangolins resemble fabled dragon eggs.

The rarer pangolins become, the more they cost, paradoxically increasing the demand for pangolin meat. For a host to provide expensive pangolin, or other rare wild animal meat, for guests or employees shows generosity and improves face. Along with the perceived healing properties of the scales, this has skyrocketed the [1] price of pangolins. As recently as 2018, the Chinese government, in Implementation of the Rural Revitalization Strategy, encouraged farming of wild animals for sale in wet markets as a path out of poverty for millions of rural poor. The practice was further encouraged on Chinese television and by internet celebrities. According to Beijing University's Professor Lü Zhi, wild animal farming is largely unregulated and many animals for sale are wild-caught 'laundered' animals. Particularly vulnerable are species near impossible [2] to breed in captivity like pangolins.

It's autumn in Hangzhou city with hawkers shouting their wares: framed red jianzhi [1], jade and silver bangles, and wood carved croak-frogs. With leaves already tinged yellow, the ancient ginkgo trees lining the street shade the afternoon warmth. A brisk walk uphill is required to reach my destination, the local Traditional Chinese Medicine (TCM) centre. Along the way, aromas of frying oil, meat and spice assail my nostrils, smells that become an assault as I pass the local 'stinky tofu' dealer. Wooden benches cluster about the entrance where the TCM patients wait. Inside it is cool, cavernous, and quiet, the air is redolent of spices and dried plants: the reassuring scents of ancient knowledge. White-coated doctors staff the heavy counters where meticulous drawers, brass-labelled with artistic hanzi [2], stretch into the gloom. Atop the cabinets reside china-blue medicine jars guarding secret balms interspersed with glass jars of animal feti, snakes and pickled roots. Time is spent unravelling each person's concern. Despite many years of absorbing western medicine, the gravitas of history and the spell of mythology overwhelm me and remind that the Western scientific approach can neglect with patients.

I ask whether pangolin scales are available. The prompt denial seems more to deflect this waiguo ren [3] than to communicate the truth. The Chinese name for pangolin scales, chuan shan ji, means 'piercing through a mountain', which epitomises their perceived strength and explains why they remain listed in hundreds of TCM

formulations. These formulations are used to improve lactation, menstrual disturbances and arthritic pains deemed due to cold, or damp. As unscientific prescriptions go, the notion that pangolin scales act as galactagogues is no more unlikely than the advice that fenugreek, nettle, blessed thistle and ginger improve breast-milk flow than we would like to admit. The latter remedies remain touted in Australia without any corroborating trial evidence.

Zootherapy, the use of animals for healing, was a world-wide phenomenon prior to the ascent of scientific medicine. As recently as 2011, World Health Organisation (WHO) statistics reveal that 80% of people in developing nations still rely on traditional medicines for their primary healthcare. Many modern medications derive from natural remedies, humble aspirin being one of the more notable. In Latin America, 584 animal species, ranging from the slimy -- slugs, snails, and worms, to the magnificent -- pumas, manatees and tapirs, are listed as having medicinal properties. The most renowned TCM practitioner of the Tang Dynasty (608-907), Sun Simiao, in his ethical treatise, *Da Yi Jing Cheng- The Sincerity of Great Physicians*, wrote of animal usage, ‘if you kill an animal or take a life to save another life, it moves away from the original meaning...the lives of animals and humans are equal.’ Today, TCM has drifted from this principle and, though practitioners may be reluctant to prescribe endangered animal parts, the raw ingredients remain readily available in shops. It may be easier to buy a whole pangolin shell than to obtain prepared medicine containing pangolin scales. Purchasers can then simply prepare the scales for personal use. The meteoric rise of an enormous, cashed up Chinese middle class, coupled with the Communist Party’s ambition to elevate TCM to the status of Western medicine, has left vulnerable species on the edge of extinction; a precipice they were already pushed toward by climate change and habitat destruction.

On my January flight home, I was unaware the plane was tracking north-east of the main pangolin smuggling route from Myanmar into China. The poor of Myanmar, a strife-torn country with one of the largest income gaps in the world, are easily exploited by wildlife smuggling chains. The smuggling routes stretch from Mandalay northwards through the border town of Muse and the poorly policed, casino hub of Mongla, before crossing into China near Ruili. Investigators from the environmental group *Sustainable Asia* report that smugglers take pangolins only as far as Ruili due to stringent police road checks in China. From Ruili, transportation becomes the buyer’s

responsibility. To circumvent this, many Chinese keen to sample Pangolin and other wild meat travel to Yangon in Southern Myanmar. There, a restaurant opposite the international airport openly serves these delicacies. It is possible that one of these trafficking routes, fanning out across the vastness below my plane, facilitated the transmission of Covid-19 into our world.

I hadn't been home long before I started receiving panicked emails and messages from friends in China. People, many people, were dying, and my friends were terrified and angry. News of doctors and academics being silenced abounded. The world's slumber was disturbed by a new, deadly, crown virus that had started in a wildlife market in Wuhan.

Neither zoonoses nor plagues are a novelty, despite the virus initially being called 'novel'. Zoonoses and coronaviruses are devastatingly familiar to doctors and epidemiologists. In medieval times, the plague was deemed miasmatic, caused by 'bad air'. Now, the commonly accepted theory is that the plague was a zoonosis, an infection that crosses the species barrier from animal to human. The plague bacterium, aptly named *Yersinia pestis*, was ably assisted by fleas in its transitional leap from rats to humans. Tuberculosis came to us from cows, psittacosis from parrots, and rabies from any animal that bites. We risk disease if we live too close to animals either by domesticating them, encouraging their overpopulation or by driving them from their homes by natural habitat destruction. In the last decade, 75% of new diseases have been zoonotic; the barrier between human and animal has always been gossamer thin.

The route Covid-19 [\[3\]](#) took to reach our lungs may never be fully elucidated. The market where it is believed to have started has been disinfected before reopening. However, scientists rapidly identified and sequenced the genome of the causative coronavirus, a member of the virus group that caused recent deadly epidemics like SARS (2003) and MERS (2012), and which has long annoyed us with the common cold. Bats have evolved to co-exist with coronaviruses for millennia, but humans virtually never catch the virus from bats. For this leap, an intermediate host is needed to facilitate the gene mutations that help the virus attach to human cells, which it does using its corona, or crown, of surface 'bubbles'. For SARS, the intermediate host was the civet; for MERS, it was camels. As urbanisation destroys their habitat, bats come into closer contact with intermediate animal hosts. The market atmosphere of stressed wild animals in crowded cages further increases the likelihood of the gene leap

occurring. Covid-19 shares 77% of its RNA with a bat coronavirus, while its receptors share 99% of their RNA with a pangolin coronavirus.

The road to the Covid-19 pandemic is pathed with ironies. China had, as recently as 2019, planned an outright ban on pangolin trade. Since 1989, pangolins have been on China's level II protection list, which bans eating pangolin meat but allows scientific research and medicinal use. The elevation to stage I protection, banning all use, would come into effect in Jan 2020. After the SARS epidemic in 2003, China placed a ban on the sale of wild animal meat, but it was only temporary. China is not alone in selling wild animals in wet markets; the phenomenon is common in South East Asian and many African countries.

In the United States, repeated warnings concerning the likelihood of a pandemic were met with the shuttering of the Pandemic Preparedness Unit in 2018. The same year Luciana Borio, then director for medical and biodefense preparedness at the National Security Council, told a symposium that “the threat of pandemic flu is our number-one health security concern”. When President Trump said on March 6, 2020 that the pandemic was an “unforeseen problem...that came out of nowhere” ^[4], he had never been further from the truth.

The tragic tale of pangolins encapsulates the perfect storm of the Covid-19 pandemic: the environmental destruction and climate change leave bats and pangolins vulnerable; the poverty and inequity encourage poaching to help people to survive; and the greed strips every resource from our environment at the lowest cost and sells it to the highest bidder ^[4]. Over ^[5] the years, my heart has wrenched each time I read of another border-police haul of illegal pangolin scales. I have felt grief that my children would never see this elusive and gentle creature wending its way through a honeyed African dawn. How much more I should have worried.

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Endnotes

[1] Papercuts – a Chinese traditional art form that dates back to the 6th century ACE

[2] Chinese characters

[3] Foreigner

[4] Quotes from 'We were warned' *The Atlantic* March 18, 2020.