OPUNTIA 496

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About The Cover: Taken on 2021-03-06 at Stanley Park in central Calgary where the Elbow River makes a right-angle bend. The trees with the orange twigs are diamond-bark willows.

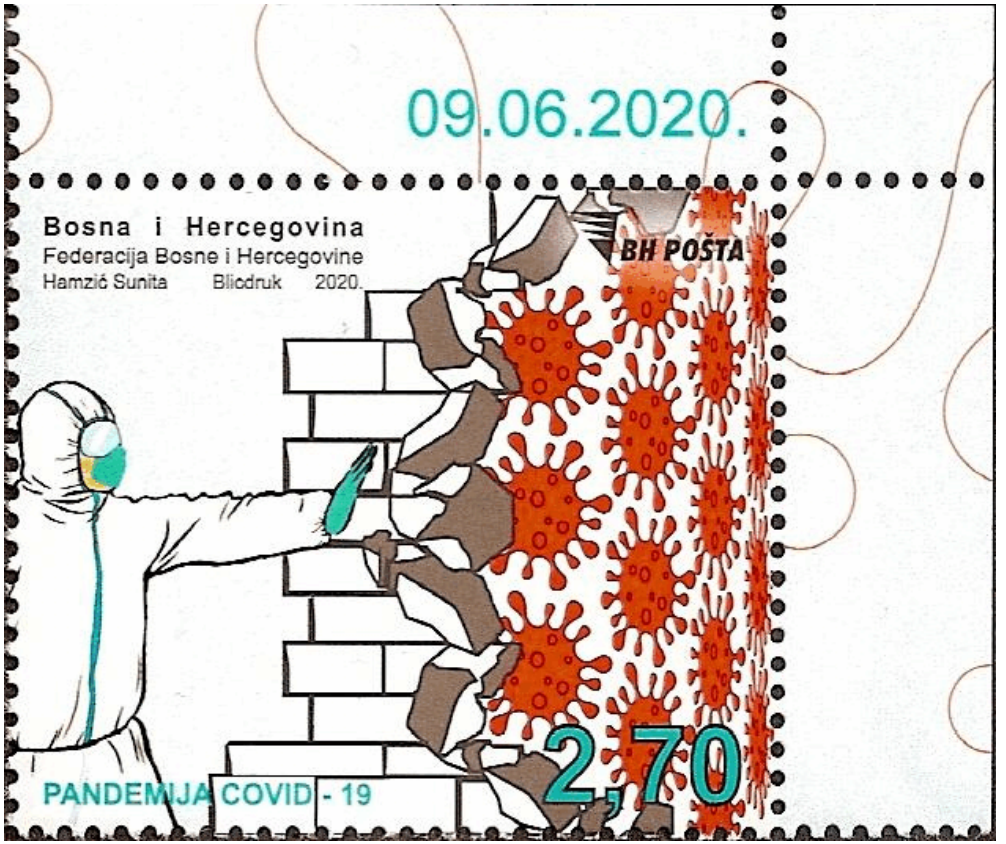
CURRENT EVENTS: PART 15

by Dale Speirs

[Parts 1 to 14 appeared in OPUNTIAs #474, 475, 479, 480, 483, 484, and 488 to 495.]

Philately.

My local stamp dealer got some more COVID-19 stamps in for me. (Stamp illustrations are not to same scale or actual size.) I finally got a copy of the Iran stamp (below) issued on 2020-03-17, the first postage stamp issued in the world about COVID-19.



Above: Bosnia had a clever design of a health worker fighting a horde of viruses.

Spain's annual national stamp show Exfilna was cancelled in 2020. Instead, they had an online show. A souvenir sheet had already been printed with a folding design, so the post office overprinted the stamp.

At left:: Overprinted stamp close-up
Middle below: Folded stamp sheet
Bottom: Unfolded sheet

Seen In The COVID-19 Literature.

Ashby, B., and A. Best (2021) **Primer: Herd immunity.** CURRENT BIOLOGY 31:R161-R185 (available as a free pdf)

Authors' extracts: *As immunity accumulates in a population, naturally during the course of an epidemic or through vaccination, the spread of an infectious disease is limited by the depletion of susceptible hosts.*

If a sufficient proportion of the population is immune, above the 'herd immunity threshold', then transmission generally cannot be sustained. Maintaining herd immunity is therefore critical to long-term disease control.

The belief that herd immunity implies low or even zero disease prevalence is one of many misconceptions. Another relates to the indirect nature of protection conferred to the individual.

Herd immunity reduces cases and therefore the likelihood of coming into contact with the pathogen, but susceptible individuals remain at risk of infection. Similarly, herd immunity prevents large-scale outbreaks from occurring because epidemic growth is unsustainable (R < 1), but infections may rise in the short term.

An important but often overlooked principle of herd immunity is that it operates at a local level, and so the distribution of immunity in the population is crucial. The threshold is based on a well-mixed population with immunity randomly distributed, but if these assumptions do not hold then localised outbreaks may still occur even if the population as a whole is above the threshold.

Speirs: Essential reading, particularly if you want to argue with anti-vaxxers.

Rathore, D.S., et al (2021) **COVID-19 lockdown: a boon in boosting the air quality of major Indian metropolitan cities.** AEROBIOLOGIA 37:79-103 (available as a free pdf)

Authors' abstract: *In India, the first phase of COVID-19 lockdown came into force on March 25, 2020, which was later continued in the next phases. The purpose of this study was to investigate the result of lockdown on air quality of major metropolitan cities: Delhi, Mumbai, Kolkata, Chennai, Bengaluru, Hyderabad, Jaipur, and Lucknow, from March 25 to May 3, 2020.*

For this study, the concentration of six criteria air pollutants (PM2.5, PM10, CO, NO2, SO2, and O3) and air quality index during the COVID-19 lockdown period was compared with the same period of the previous year 2019. The results indicate a substantial improvement in air quality with a drastic decrease in the concentration of PM2.5, PM10, CO, and NO2, while there is a moderate reduction in SO2 and O3 concentration.

During the lockdown period, the maximum reduction in the concentration of PM2.5, PM10, CO, NO2, SO2, and O3 was observed to be - 49% (Lucknow), - 57% (Delhi), - 75% (Mumbai), - 68% (Kolkata), - 48% (Mumbai), and- 29% (Hyderabad), respectively.

The value of the air quality index (AQI) also dwindled significantly during the COVID-19 lockdown period. The maximum decline in AQI was observed – 52% in Bengaluru and Lucknow.

Fazio, R.H., et al (2021) **Social distancing decreases an individual's likelihood of contracting COVID-19.** PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES USA 118:doi.org/10.1073/pnas.2023131118 (available as a free pdf)

Authors' abstract: *Past research has established the value of social distancing as a means of deterring the spread of COVID-19 largely by examining aggregate level data. Locales in which efforts were undertaken to encourage distancing experienced reductions in their rate of transmission.*

However, these aggregate results tell us little about the effectiveness of social distancing at the level of the individual, which is the question addressed by the current research. Four months after participating in a study assessing their social distancing behavior, 2,120 participants indicated whether they had contracted COVID-19.

Importantly, the assessment of social distancing involved not only a self-report measure of how strictly participants had followed social distancing recommendations but also a series of virtual behavior measures of social distancing. These simulations presented participants with graphical depictions

mirroring specific real-world scenarios, asking them to position themselves in relation to others in the scene.

Individuals' social distancing behavior, particularly as assessed by the virtual behavior measure, predicted whether they contracted COVID-19 during the intervening four months. This was true when considering only participants who reported having tested positively for the virus and when considering additional participants who, although untested, believed that they had contracted the virus.

The findings offer a unique form of additional evidence as to why individuals should practice social distancing. What the individual does matters, not only for the health of the collective, but also for the specific individual.

Edwards, D.A., et al (2021) **Exhaled aerosol increases with COVID-19 infection, age, and obesity.** PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES USA 118:doi.org/10.1073/pnas.2021830118 (available as a free pdf)

Authors' abstract: *Superspreading events have distinguished the COVID-19 pandemic from the early outbreak of the disease. Our studies of exhaled aerosol suggest that a critical factor in these and other transmission events is the propensity of certain individuals to exhale large numbers of small respiratory droplets.*

Our findings indicate that the capacity of airway lining mucus to resist breakup on breathing varies significantly between individuals, with a trend to increasing with the advance of COVID-19 infection and body mass index multiplied by age (i.e., BMI-years).

COVID-19 transmits by droplets generated from surfaces of airway mucus during processes of respiration within hosts infected by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus.

We studied respiratory droplet generation and exhalation in human and nonhuman primate subjects with and without COVID-19 infection to explore whether SARS-CoV-2 infection, and other changes in physiological state, translate into observable evolution of numbers and sizes of exhaled respiratory droplets in healthy and diseased subjects.

In our observational cohort study of the exhaled breath particles of 194 healthy human subjects, and in our experimental infection study of eight nonhuman primates infected, by aerosol, with SARS-CoV-2, we found that exhaled aerosol particles vary between subjects by three orders of magnitude, with exhaled respiratory droplet number increasing with degree of COVID-19 infection and elevated BMI-years.

We observed that 18% of human subjects (35) accounted for 80% of the exhaled bioaerosol of the group (194), reflecting a superspreader distribution of bioaerosol analogous to a classical 20:80 superspreader of infection distribution.

These findings suggest that quantitative assessment and control of exhaled aerosol may be critical to slowing the airborne spread of COVID-19 in the absence of an effective and widely disseminated vaccine.

Pifarré i Arolas, H., et al (2021) **Years of life lost to COVID-19 in 81 countries.** SCIENTIFIC REPORTS 11:doi.org/10.1038/s41598-021-83040-3 (available as a free pdf)

Authors' abstract and extracts: *Understanding the mortality impact of COVID-19 requires not only counting the dead, but analyzing how premature the deaths are. We calculate years of life lost (YLL) across 81 countries due to COVID-19 attributable deaths, and also conduct an analysis based on estimated excess deaths.*

We find that over 20.5 million years of life have been lost to COVID-19 globally. As of January 6, 2021, YLL in heavily affected countries are 2 to 9 times the average seasonal influenza. Three-quarters of the YLL result from deaths in ages below 75 and almost a third from deaths below 55. Men have lost 45% more life years than women.

The results confirm the large mortality impact of COVID-19 among the elderly. They also call for heightened awareness in devising policies that protect vulnerable demographics losing the largest number of life-years.

COVID-19 attributable deaths may over- or underestimate the true number of deaths that are due to the disease, as both policies and practices about coding the deaths are only being developed and standardized. Excess death

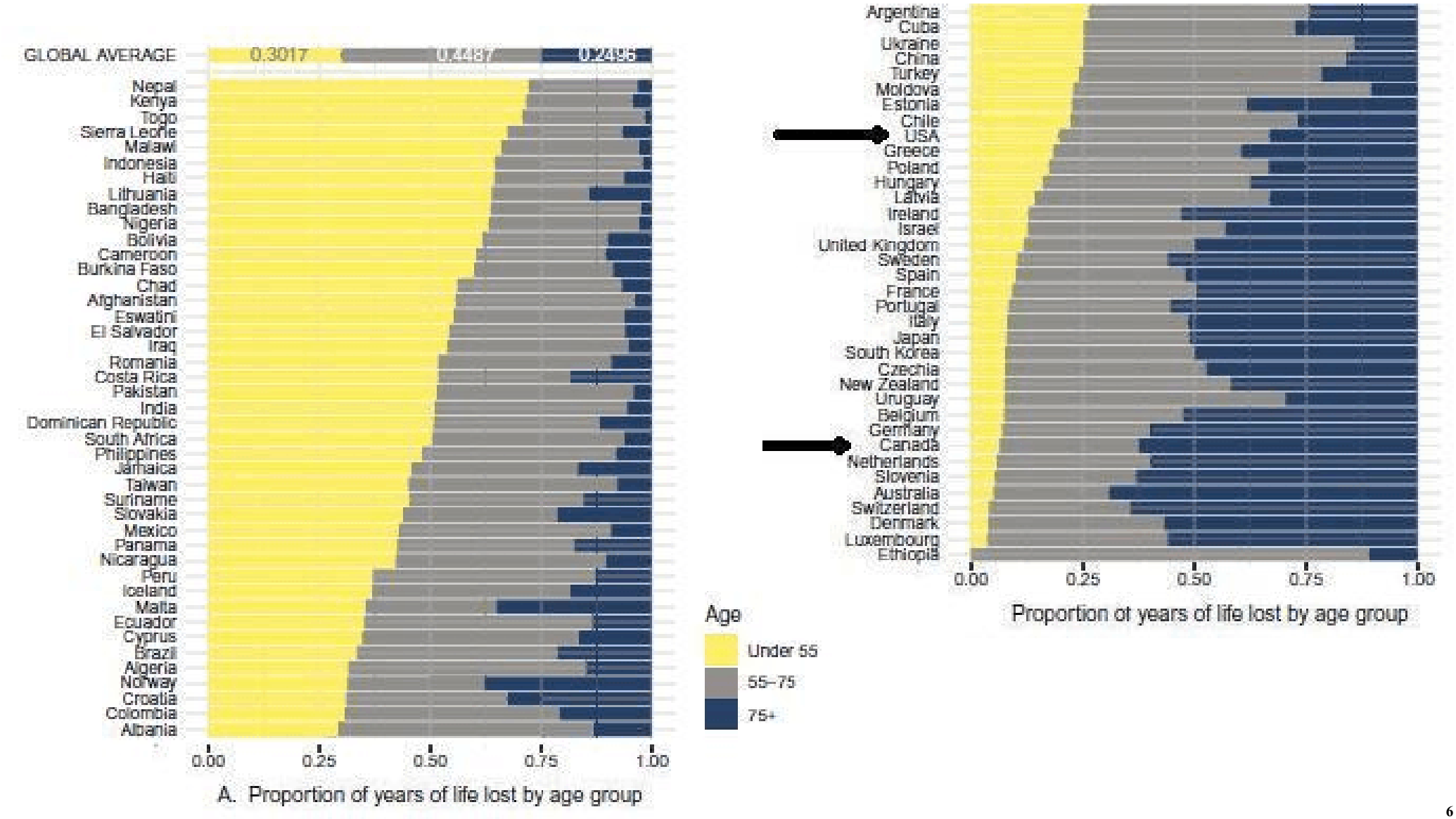
approaches that compare mortality rates during the COVID-19 outbreak to a baseline depend on correctly estimating the baseline.

The most important limitation in COVID-19 attributable death or excess death approaches, however, is that these approaches do not provide information on how many life years have been lost. Deaths at very old ages can be considered to result in fewer life years lost, when compared to deaths at very young ages.

In fact, several policy responses (or non-responses) have been motivated with the argument that COVID-19 is mostly killing individuals who, even in the absence of COVID-19, would have had few life years remaining.

We analyze the premature mortality impact of COVID-19 by calculating the amount of life-years lost across 81 countries covering over 1,279,866 deaths. We base our analysis on two large recently established and continuously growing databases and on two different methodological approaches, one based on COVID-19 attributable deaths, and, for selected countries, one based on estimated excess deaths comparing recent mortality levels to an estimated baseline.

[Chart is from this paper. I had to chop it in half because the text was so small. I also added arrows for the USA and Canada.]



Buba, K.M., et al (2021) **Model-informed COVID-19 vaccine prioritization strategies by age and serostatus.** SCIENCE 371:916-921 (available as a free pdf)

Authors' abstract: *Limited initial supply of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) vaccine raises the question of how to prioritize available doses. We used a mathematical model to compare five age-stratified prioritization strategies.*

A highly effective transmission-blocking vaccine prioritized to adults ages 20 to 49 years minimized cumulative incidence, but mortality and years of life lost were minimized in most scenarios when the vaccine was prioritized to adults greater than 60 years old.

Use of individual-level serological tests to redirect doses to seronegative individuals improved the marginal impact of each dose while potentially reducing existing inequities in COVID-19 impact. Although maximum impact prioritization strategies were broadly consistent across countries, transmission rates, vaccination rollout speeds, and estimates of naturally acquired immunity, this framework can be used to compare impacts of prioritization strategies across contexts.

Azimi, P., et al (2021) **Mechanistic transmission modeling of COVID-19 on the Diamond Princess cruise ship demonstrates the importance of aerosol transmission.** PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES USA 118:doi.org/10.1073/pnas.2015482118 (available as a free pdf)

[Fomites are objects likely to carry infection such as door handles, clothes, dishes, or furniture.]

Authors' abstract: *We find that airborne transmission likely accounted for >50% of disease transmission on the Diamond Princess cruise ship, which includes inhalation of aerosols during close contact as well as longer range.*

These findings underscore the importance of implementing public health measures that target the control of inhalation of aerosols in addition to ongoing measures targeting control of large-droplet and fomite transmission, not only aboard cruise ships but in other indoor environments as well. Guidance from health organizations should include a greater emphasis on controls for reducing spread by airborne transmission.

Several lines of existing evidence support the possibility of airborne transmission of coronavirus disease 2019 (COVID-19). However, quantitative information on the relative importance of transmission pathways of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) remains limited.

To evaluate the relative importance of multiple transmission routes for SARS-CoV-2, we developed a modeling framework and leveraged detailed information available from the Diamond Princess cruise ship outbreak that occurred in early 2020.

We modeled 21,600 scenarios to generate a matrix of solutions across a full range of assumptions for eight unknown or uncertain epidemic and mechanistic transmission factors. A total of 132 model iterations met acceptability criteria ($R2 > 0.95$ for modeled vs. reported cumulative daily cases and $R2 > 0$ for daily cases).

Analyzing only these successful model iterations quantifies the likely contributions of each defined mode of transmission. Mean estimates of the contributions of short-range, long-range, and fomite transmission modes to infected cases across the entire simulation period were 35%, 35%, and 30%, respectively.

Mean estimates of the contributions of larger respiratory droplets and smaller respiratory aerosols were 41% and 59%, respectively. Our results demonstrate that aerosol inhalation was likely the dominant contributor to COVID-19 transmission among the passengers, even considering a conservative assumption of high ventilation rates and no air recirculation conditions for the cruise ship.

Moreover, close-range and long-range transmission likely contributed similarly to disease progression aboard the ship, with fomite transmission playing a smaller role. The passenger quarantine also affected the importance of each mode, demonstrating the impacts of the interventions.

As of March 5, Canada had 881,750 COVID-19 cases, 22,192 deaths, and 2,254,088 vaccinations. Canada's population is about 38,000,000.

SHERLOCKIANA: PART 36
by Dale Speirs

[Parts 32 to 35 appeared in OPUNTIAs #470, 474, 486, and 492.]

The original Sherlock Holmes stories written by Sir Arthur Conan Doyle are referred to as the canon, while stories written by other authors are called pastiches.

Pastiches: Short Stories.

SHERLOCK HOLMES AND DOCTOR WATSON: THE EARLY ADVENTURES: VOLUME 2 (2019) was an anthology of 11 pastiches edited by David Marcum. They are set between 1881 and 1883 when Holmes and Watson were young men in their 20s. I won't review them all but will mention a few stories as samples. I reviewed Volume 1 in OPUNTIA #492, and Volume 3 will follow in a future issue.

In his editorial foreword, Marcum emphasized that most of the canon stories took place when the pair were younger men. Only two canonical stories depict them in their 50s and 60s. The majority of films and television series used middle-aged or elderly actors to portray the duo. As a result, the general public had and still has the wrong impression about their ages.

Nigel Bruce did everlasting damage to the image of Watson, portraying him as a doddering old fool. In the canon, Watson was a battle-hardened army surgeon, retired on a disability pension after the Battle of Maiwand. He was not a blithering idiot as Bruce made him out to be nor a man easily shocked by blood and gore.

"The Adventure Of The Substitute Detective" by I.A. Watson had Sherlock Holmes off stage for most of the story. Dr Watson was visited by both Inspectors Lestrade and Gregson, who had hoped to find Holmes to consult with on apparently unrelated cases.

As the adventure progressed, Watson was drawn in because he had served in India and the culprits were disgruntled veterans of the same war he was in. They were angry at how the British Army had treated them and were systematically taking it out on London, using their military training.

Everyone came together in an armed standoff at 221B. Holmes made his reappearance, having been in disguise while tracking the gang. The plot was straightforward and was used mainly as an excuse for infodumps about how the British government deliberately engineered a famine in India to control the population.

Then followed a reprint of Doyle's canon story "The Adventure Of The Resident Patient". A waste of space since the canon stories have never been out of print and anyone can read them elsewhere without trouble. The pages could have been used for another pastiche.

"The Locked Room Mystery" by D.J. Tyrer brought in Robert Louis Stevenson, who with his wife Fanny was visiting London. He was serializing a new story, barely keeping ahead with copy since he was writing the installments as fast as they were published. The papers were stolen and a ransom demanded. There was no backup copy, so he went to Holmes.

The investigation had several alarums but the circumstances convinced Holmes the theft was an inside job. So inside that it appeared that Fanny was a suspect. However in the end Holmes determined that Stevenson was perpetrating it himself as he fluctuated between a good psyche and a bad psyche.

Once the case was solved, Watson suggested it would be good for Stevenson as psychological therapy to write a novel about a man alternating between good and evil. Watson was pleased to report the book had been written and sold well.

"The Adventure Of Stonehenge In London" by G.C. Rosenquist began with the mysterious disappearance of the 9th Earl of Rendlesham from his deathbed. His eight predecessors had also vanished on their deathbeds. He had been in Proudsmarch Manor, the family's London townhouse.

Not an ordinary mansion but an ancient edifice which towered high above all else in the neighbourhood, dating back to the first earl. Holmes was called in by Lestrade, and spent his time prowling the upper floors.

He found a secret mausoleum on the top floor containing nine coffins. From each coffin extended a stone monolith through the roof as a giant tombstone. Out on the roof, they resembled a henge, although not aligned astronomically.

The butler and other staff were part of the secret burial of the earl. No offence had been committed, so the matter was passed off as another example of English eccentricity. A mystery solved but no crime.

A SHERLOCK HOLMES ALPHABET OF CASES (A TO E) was a 2017 collection of pastiches by Roger Riccard, the first volume of a set. Reviews of subsequent volumes will follow in future issues of OPUNTIA.

"The Adventure Of The Apothecary's Prescription" led off the series. A pharmacist Hector Burbage had his wife and child kidnapped by a gang who then forced him to manufacture narcotics in his shop. He got a message to Dr Watson's office in the form of a filled prescription addressed to a patient in Baker Street. Watson got the hint and took it to his old friend.

Holmes deciphered it and replied with a Latin message in the guise of a list of medicines wanted. Eventually the location of the hostages was identified. They were liberated and the henchmen killed, but the mastermind got away. He was subsequently identified as Professor Moriarty.

In the canon, Moriarty was described as pulling strings from afar and having others do his dirty work. Pastiche writers, however, generally have him as a gang leader on the street committing small crimes in person. This hardly befits his status as the Napoleon of Crime. It would be as if Bonaparte held up liquor stores instead of invading countries.

"Buffalo Bill And The Red Shirt Menace" took place in London, England, when Col. William Cody aka Buffalo Bill brought his famous Wild West show to town. The troupe numbered in the hundreds, including Annie Oakley and dozens of stunt performers who were genuine cowhands. There were about 200 aboriginals, mostly Lakota but many Pawnee. The tribes were traditional enemies and Cody had to maintain strict separation.

During a re-enactment of a stagecoach attack by aboriginals, one of the Lakota riders was wounded by a real bullet. The performers were supposed to be using blanks. The shooter could have been a cowboy who hated working with real aboriginals, or it might have been inter-tribal warfare. Cody visited 221B to ask for help.

Arrangements were made for Holmes to infiltrate the show as an English actor down on his luck and working as an extra to earn a few pence. Watson was designated as a medical inspector, which gave him carte blanche to approach anyone in the show. The author managed to work in quite a few details about the Old West without any leaden infodumps. This stretched the story into a novella without padding.

Holmes solved the case, of course. The culprit was a Pawnee settling a score with the Lakotas, but he in turn was shot dead by a cowboy who didn't like Injuns. The Wild England.

"The Curious Case Of Charlotte Musgrave" took place in the generation after the original canon story of the Musgrave Ritual. The daughter of the house Charlotte was sweet sixteen and stirring emotions and ambitions among two of the menservants who didn't know their place.

One killed the other with a club that had a horseshoe embedded on the business end, so as to make the death look like an unfortunate accident in the stables. The killer met his own end, tripping and falling from the top of a staircase.

Charlotte's peculiarity was that she believed she was protected by a pooka, a Nordic-style invisible guardian angel. Did the killer trip or was he pushed by the pooka?

To avoid scandal, Holmes told police that the first man was killed when a stranger tried to steal the horse and the animal panicked. The second death was just a fall from a height. As in the canon, the distinction was made between the law and justice, with Holmes preferring the latter. Thus the Musgrave honour was preserved. But Watson swore he saw the pooka with Charlotte.

"The Designing Woman" was set in the early suffragette years when Lady Florence Fairchild, a young widow who operated a fashion shop, came to Holmes for help. Her shop had been broken into, her latest line of dresses heaped in a pile with mannequins, and a fire started in the front showroom.

That didn't seem like the work of a serious arsonist, as the fire was quickly spotted by a passerby. A professional arsonist would have set it in a back room with more flammable materials, where the fire could grow and involve the whole building before it was discovered.

The photographer Richard Cooke, who had the only photos of the new fashions, was the next victim. Only those photos were taken and nothing else.

Fairchild's designs were new and daring, just the sort a suffragist would wear, so the thought was the attacks were political.

There were two culprits. Cooke had actually sold the photos to one of Lady Florence's competitors. He had help though, from a shop assistant who felt the suffragists were the spawn of Satan, what with those loose fashions that showed off ankles.

The final story was "The Case Of The Poached Eggplant", which had Holmes, Watson, and Watson's wife Mary helping Lloyd's of London guard a necklace once worn by Marie Antoinette.

The main gem was a large amethyst, surrounded by diamonds. Holmes was hired to foresee how possible thieves would operate between the time the necklace left the auction house and reached its buyer.

Two different attempts were made on the necklace. One failed, when a gang led by Professor Moriarty intercepted the strongbox and discovered later that it was a decoy. Mary Watson wore the necklace to the grand fete where it was handed over successfully to the buyer.

Then the ballroom lights went out. The gem was stolen but Holmes spotted the culprit, who had dropped it into a glass of wine for hiding. The man was the buyer himself, in difficult financial straits who wanted to work an insurance fraud. There was one clever twist which both the thief and Holmes realized at the last minute.

Old-Time Radio.

Sherlock Holmes was very successful on radio. He aired on several networks with several sets of actors from 1930 to 1956, encompassing the entire lifespan of old-time radio. Basil Rathbone and Nigel Bruce had a long run, but others played the parts before and after. (These and other old-time radio shows are available as free mp3s from www.otrrlibrary.org.)

"The Adventure Of The Discordant Bells" was a 1948 episode, written by Max Ehrlich. The story was set at Blandford Abbey near Beachy Head, on the southern coast of England. The bells of the Abbey were said to be cast of gold and studded with jewels, which didn't seem practical.

Gold is a soft metal that wouldn't ring out from a church tower. Any jewels would eventually be shaken off or fracture from the constant vibrations.

William Holgate was a claimant to ownership of the bells since his ancestor had cast them but was never paid. The present Lord Blandford was a stern man. He refused to honour the ancient debt, so Holgate vowed revenge. Lurking in the background was Easterly, the trustee of the Blandford estate. He made intermittent appearances throughout the episode and played the part of the sneaky little git.

His Lordship had a knack of making enemies, for he later told the elderly bellringer Oliver Mudge his services were no longer required. Alfred Griggs was engaged as the new bellringer. Mudge far over-acted his dismissal and chewed the scenery at length, if such a phrase can be used for a radio show.

Griggs reported for duty but never got the chance to ring the bells even once. On his first day, someone bwah-ha!-ha!-ed at him, strangled him, and then hung his body from the tower. The police said it was suicide. With constabulary like that, it was no wonder for Holmes to be called to the case. Lord Blandford hired Griggs' son Peter as a replacement bellringer.

Mudge had dropped out of sight so Holmes began his investigation with Holgate and went to visit him. Holgate vowed the bells would not ring again. From there, Holmes and Watson visited the abbey just in time to hear the bells clanging out of tune. They rushed into the tower and found Peter swinging from a rope as his father had. Easterly arrived a moment later, which made Holmes ask him what he was doing there. His answer was evasive.

The next day Lord Blandford took Holmes off the case on Easterly's recommendation. The Abbey would be closed and the bells removed. As they talked, the bells began clanging once more. They found Mudge in the tower, madly over-acting again as he rang the bells. I wonder if he was hunchbacked?

The biggest bell broke loose and landed on Mudge, squashing him like a bug. At least he died doing something he loved. Holmes climbed to the belfry and found the bell support had been sabotaged.

Holmes and Watson set a trap in the darkened tower and laid in wait. It was Lord Blandford, who was in financial trouble and wanted to sell the bells to clear his debts. He couldn't just go ahead and do it because the town folk would

be in an uproar. He therefore planned the murders to create a curse that would justify closing the tower. Instead, he was the next to swing on a rope, only at a gallows, not the tower.

"The Guy Fawkes Society" was a 1948 episode written by Howard Merrill. The dynamic duo (if I may coin a phrase) returned to 221B from a late supper to find a corpse on the doorstep. His throat had been slit. With his blood the murderer had written on the wall "*Guy Fawkes lives*".

Holmes quickly deduced the dead man was a Parliamentary messenger, later named as Pickering. Off they went to the Parliament buildings, pausing along the way to tell a constable walking his beat that there would something of interest to him on Baker Street.

The investigation went hither and yon through the less reputable parts of London. Holmes retraced Pickering's last route to find out why he went to 221B and was followed by at least one killer. Supposedly Holmes was in disguise as an anarchist but his snippy upperclass accent was conspicuous down in the East End. "*My, you have a fancy way of talking*", said one tavern wench.

She introduced him to a conspiracy of like-minded revolutionaries. The leader said he was Douglas Stuart, the rightful heir to the throne. He didn't actually bwah-ha!-ha! but did get in a lengthy rant about how one day he would show all of Britain the truth and restore the Jacobites to the throne. He mentioned in passing that he got most of his gang from the asylum where he once was confined.

An infodump from Holmes then followed, explaining the history of Guy Fawkes. The actors were all Brits but this series aired to an American audience who didn't know about the 1605 Gunpowder Plot. That allowed the listeners to easily guess Stuart's plan.

It didn't work the first time and not again for the second go-around. With Holmes inside the group, and Watson and the police surrounding the warehouse, his identity was exposed by Stuart. It looked like the end for Holmes but of course he was booked for the series while Stuart was just a supporting character.

Holmes used embers from his pipe to set on fire a carriage parked outside the building. The flames brought the law. The rest was epilogue.

Revival Radio.

THE NEWLY DISCOVERED CASEBOOK OF SHERLOCK HOLMES was a radio comedy series that aired on BBC in early 1999 (available as free mp3s from www.otrrlibrary.org) The shows were well done spoofs of the canon performed before a live audience. All six episodes were written by Anthony Hare. Enjoyable and worth repeated listening.

Holmes was played in the style of a music hall comedian. Dr Watson narrated the episodes like a clichéd poofter but not a blithering idiot like Nigel Bruce. Mrs Hudson was a much put-upon housekeeper always grumbling about Holmes, whom she and Watson called a toffee-nose ponce.

"Holmes Strikes A Happy Medium" aired on 1999-02-13. Mrs Hudson had just returned from a seance. Watson asked her if she had made contact with the dead. She replied she certainly had, for the medium had snuffed it halfway through the seance.

Hudson didn't hang about for the police as she didn't want to miss the last bus home. The trio returned to the scene by hansom cab to meet Scotland Yard. Watson noted a cigarette case in the gutter with the initials 'PM'. The corpse had vanished, so they returned home.

The next morning Holmes analyzed the tobacco in the case at great length. The cigarettes were made by Gasper, etcetera. The morning newspapers reported the death of Lord Peregrine Muesli. Hudson recognized the name as one of the members of the seance. Holmes surmised that a cereal killer was at work. I'm surprised that joke worked verbally but it did get a good laugh.

Once more the trio left 221B, this time to visit the restaurant where Muesli died. Investigation uncovered a cigarette lighter also engraved 'PM'. Inspector Lestrade arrived and confiscated the lighter. They all had to leave to make way for a dinner meeting of the Oscar Wilde Appreciation Society.

Holmes made a wild surmise, with no evidence, that the medium had been a conduit for passing information stolen from MI-1. The trio went to a gentleman's club where the MI-1 directors lounged. After assorted music hall jokes, Holmes sang a comic song to distract everyone. They were.

The club's butler was named Percy Mafikeng, after the famous siege. Holmes protested that battle hadn't happened yet (it took place from October 1899 to May 1900) to which the butler replied he was a premature baby.

Noisy sound effects cluttered the next few scenes. The medium reappeared, but was actually Professor Moriarty in disguise. There followed a lengthy denouement with many tobacco jokes, during which the Professor made his escape using a cigarette emitting knockout gas. He'll be back next week.

"The Demon Cobbler Of Greek Street" was the final episode of the series, airing on 1999-02-20. Set in 1893, it opened on Boxing Day with Holmes and Watson digesting their festive meal. They were trying to stay awake through Mrs Hudson's interminable magic lantern show of her and her late husband at the beach.

Inspector Lestrade arrived to save them. An old gibbet outside Newgate Prison had been left as an historical site. Someone put it into use, with not one but two bodies. The first policeman on the scene was Constable Painting, who thereby supplied a batch of jokes about his name.

Watson examined the bodies and declared they were dead before being strung up on the gibbet. As Const. Painting noted, that wasn't difficult to determine since both had knives stuck in them. The dead men had work-hardened hands, so Watson figured they had been tradesmen.

"*Cobblers*" said Holmes. Watson felt insulted but Holmes clarified that he meant it was their trade. A neighbour woman named Sigourney Inebriate presented herself and identified the two cobblers. Holmes and Watson visited their shop. Among other things, they found invitations for the Cobbler's Ball, which allowed a few more risque jokes.

And so to the ball. Holmes found himself greeted as a cabaret performer, so he told a few music hall jokes and sang a ditty. Afterward, he met Tweenie Sod, a cobbler who was apparently distributing pornographic lantern slides.

Professor Moriarty, of course. He took Hudson as a hostage. The place was flooded with music hall jokes, and Moriarty once more escaped. Back to Baker Street for more lantern slides from Mrs Hudson. Non-pornographic, that is.

Television.

In 1954 and 1955, a television series SHERLOCK HOLMES was aired on NBC. It was written and produced by Sheldon Reynolds in France, where production costs were much lower. Ronald Howard was Holmes and H. Marion Crawford played Watson. Howard was relatively young and fit the canon better than the more famous Rathbone. Crawford was well into middle age but played Watson as an intelligent man, not the blithering idiot that Nigel Bruce did.

Most of the episodes were pastiches but some were based on canon stories, however loosely. Interestingly there was some continuity between episodes when characters referred back to previous events. That was unusual for the times, as most television show episodes were zero-reset.

The episodes are in the public domain and therefore available in several different box sets. The collection I'll cite here is from the metal box set issued by Allegro Corporation, "Best Of Sherlock Holmes Collection".

"The Red Headed League" was aired on 1954-12-27 and was an adaptation by Roger E. Garris of the canon story. Jabez Wilson was lured to a job away from his store by his assistant Vincent Spaulding. The idea was to get him away from his shop so Spaulding and his gang could tunnel from the basement into a bank vault next door.

Wilson's work was funded by a supposed Red Headed League. He got the job because of his red hair, something that the viewer would have to accept on faith since the black-and-white episode wouldn't show up any difference. Overall though, the episode followed the canon story reasonably well.

There were some hilarious moments. At 221B, Holmes was spouting a long infodump onto Watson, absentmindedly using a revolver as a pointer to emphasize his facts. Watson had to keep deflecting the gun barrel away from himself, Holmes evidently having forgotten the basic rule of firearms. (Never point a gun at anyone unless you intend to shoot them.)

"The Case Of The French Interpreter" aired on 1955-01-17 and was an obvious rewrite of the canon story "The Greek Interpreter". Undoubtedly it was done that way because the series was filmed in France, where Greek actors were thin on the ground.

In the canon story, a Greek interpreter named Melas came to the Holmes brothers for help. They met at the Diogenes Club where Mycroft was a member. Melas had learned that a Greek man and his sister were forcibly confined by English extortionists who wanted their wealth.

In the episode, Mycroft did not appear but Sherlock was a member of the St. Denis Club. (A subtle joke, as St Denis is the patron saint of Paris and of syphilitics.) The French interpreter was Dubec.

The rest of the episode followed the canon, only substituting French for Greeks. The ending, however, was different. In the canon, the Greek was rescued but the culprits escaped to France. In the episode, the matter was settled by gunfire in the London hideout.

Movies.

Sherlock Holmes was popular in the movies almost as soon as they were invented. Indeed, it was the movies that fixed the idea of Holmes and Watson as middle-aged or even elderly men, even through the canon stories depicted them in their 20s.

The vast majority of movies were serious canon or pastiche plots, but the temptation existed to play the duo as comedy. More often than not, such movies didn't succeed but they are out there on DVD for better or for worse.

An example was THE ADVENTURE OF SHERLOCK HOLMES' SMARTER BROTHER, a 1975 movie written and directed by Gene Wilder. The brother was not Mycroft but the hitherto unmentioned Sigerson, played by Wilder, who was extremely jealous of Sherlock's fame.

The nominal plot was the theft of government documents that could shake Europe to its foundations and embroil Britain in a war. Sherlock and Dr Watson decided to use Sigerson as a stalking horse so they could investigate more freely.

I often wondered why Wilder managed to be as successful as he was, for he certainly wasn't funny in this one. The supporting actors were a wide variety of British thespians who helped rescue the movie from its script and Wilder.

Sigerson's assistant was Sgt. Orville Sacker of Scotland Yard, played by Marty Feldman. Madeline Kahn had the romantic lead as music hall singer Jenny Hill. Professor Moriarty was acted by Leo McKern in his best Rumpolian manner. His partner in crime, opera singer Eduardo Gambetti, was played by Dom DeLuise at his funniest.

There was much to-ing and fro-ing in the chase for the stolen documents. The comedy was mostly played as slapstick and scatological, interrupted by musical numbers to showcase Kahn's singing. The movie being set in the Victorian era, instead of a car chase there was a hansom cab chase through the streets of London, which was well done.

Moriarty held an auction with foreign agents for the stolen documents. In an hilarious sequence, he had to keep converting bids in foreign currencies into pounds sterling. He did the calculations by longhand from Russian rubles and French francs, muttering to himself as he carried the 3 and added the sums. "*Good thing I'm a maths professor.*"

The grand finale was a parody of an opera, not that difficult to do admittedly. On stage was a bad translation of Verdi into English. The good guys and the bad guys fought in costume while singing arias, not an easy task.

A comedy that failed miserably was HOLMES AND WATSON: WEAPONS OF MASS DEDUCTION (2018), written and directed by Etan Cohen. The humour was coarse throughout the movie. The gags went on too long, each one played until the comedy in it was beaten into a pulp.

For once, Holmes and Watson were younger men, not played by elderly actors. Holmes was, however, a showboater, and Watson a blithering idiot, a younger version of Nigel Bruce. Mrs Hudson was a sexy woman in her 30s who had a constant stream of gentlemen callers visiting her in private. She did, however, have a Scottish accent, as per the canon.

The movie began with Professor Moriarty on trial. Holmes made a last-second appearance as a witness, whom Watson announced in the style of a carnival barker. A twist was thrown in, as Holmes demonstrated the man on trial was an imposter posing as the Professor. The real Moriarty had escaped to the USA. Inspector Lestrade was not happy.

But on to the main plot. Holmes and Watson were invited to Buckingham Palace by Queen Victoria, where a murder was uncovered. Moriarty was supposedly back in action, but Holmes was convinced this was the work of an

imposter. From there, he decided Watson was the perpetrator, which provided an excuse for some melodrama.

Thereafter followed a string of physical gags, few of which were anything more than mildly amusing at best. I did a lot of fast-forwarding of the DVD. Mrs Hudson was exposed as the criminal mastermind, the daughter of Moriarty. She had unresolved issues with Daddy.

The grand finale was on board the Titanic, just before it sailed, that is. Queen Victoria attended a ceremony on board, where Hudson had planted a bomb in the ballroom to kill her. For the record, the Queen died of old age 11 years before the Titanic was launched. Holmes and Watson saved the day and wiped out Hudson in the process.

An epilogue took the viewer to Wyoming Territory, where the real Moriarty was ensconced. All told, a lousy movie. Like Gene Wilder, the principals worked every gag to death and substituted 6th-grade toilet jokes for real humour. Not worth viewing.

WORLD WIDE PARTY ON JUNE 21

Founded by Benoit Girard (Quebec) and Franz Miklis (Austria) in 1994, the World Wide Party is held on June 21st every year. 2021 will be the 28th year of the WWP.

At 21h00 local time, everyone is invited to raise a glass and toast fellow members of the Papernet around the world. It is important to have it exactly at 21h00 your time. The idea is to get a wave of fellowship circling the planet. Rescheduling it to a club meeting or more convenient time negates the idea of a wave of celebration by SF fans and zinesters circling the globe.

At 21h00, face to the east and salute those who have already celebrated. Then face north, then south, and toast those in your time zone who are celebrating as you do. Finally, face west and raise a glass to those who will celebrate WWP in the next hour.

Raise a glass, publish a one-shot zine, have a Zoom party, or do a mail art project for the WWP. Let me know how you celebrated the day.

LETTERS TO THE EDITOR

[Editor's remarks in square brackets. Please include your name and town when sending a comment. Email to opuntia57@hotmail.com]

FROM: Lloyd Penney 2021-02-22
Etobicoke, Ontario

I've let the issues pile up again, but this time, I have an unfortunately perfect excuse. Yvonne and I were diagnosed with COVID-19, and we have spent the last couple of weeks recuperating from it. Besides these past two weeks, the other loss I can mention is weight, about 12 pounds each. Not a diet I recommend. Yvonne did a little baking today, and I have been concentrating on writing and editing.

[I guess the good news is that you won't have to stand in line for the vaccine since you now have the antigens. Best wishes for a recovery and we'll all be thinking of you and Yvonne.]

OPUNTIA #493: [Re: cover photo of postal van painted for pandemic] Hmmm, definitely not the usual Canada Post vans. We live just north of a minor sorting station on The West Mall in Etobicoke, and while we see various models of van on the street, I do not recall seeing any vans with that interesting paint job.

[Canada Post usually deploys only one such van per city, so you need luck to see one. Normally the vans are painted to publicize a forthcoming postage stamp issue. I've photographed a few in Calgary but missed others. I've only seen the pandemic van twice. The first time it drove past while I was standing on a street corner. By the time I got my smartphone out of my shirt pocket, it was out of sight. The second time, shown on the OPUNTIA cover, it was parked in front of the Central Post Office, so I got lucky.]

[Re: commemorative covers for CalVirt online stamp show] Interesting to see a crossover of a stylized COVID-19 virus and PacMan. Wonder if there will be any lawyers talking about it, or if it would be worth the mess? I am sure others have done it, too.

[I doubt the trouble of suing would be worth it because of fair use/parody copyright case law. The COVID-19 PacMan is an obvious idea that has been

around almost as soon as the first microphotographs were published of the coronavirus.]

OPUNTIA #494: We get anti-mask and anti-vaccine demonstrations here all the time. The police usually clean them up forthwith to keep traffic going. Church-based groups are anti-mask for many churches are closed to keep the spread of COVID-19 down. They say the government is keeping them away from church, and God will be angry. Yet, so many other groups are worshiping from home via Zoom. Thinly disguised politics. Seeing what we've been through, we'd be happy to get our vaccinations, but we're not old enough.

[My response to the church anti-maskers is to remind them that Jesus said to render unto Caesar what is Caesar's. In other words, don't fight the government over secular issues.]

[Re: Seen in the literature] One of the reports you list, the O'Driscoll report in NATURE, is quite timely. A group of scientists from the World Health Organization have been in Wuhan, China, looking to see if they could find the origins of the SARS-CoV-2 coronavirus somewhere there. Rumours of COVID-19 in a lab, or jumping from civet cats to humans.

This should be science-based, but has jumped to politics-based. China is less interested in finding the source of the virus, and more interested in the politics behind all the claims. I doubt we will ever know, but if we do, the Chinese government will probably become more hostile than they already are.

[Saving face is a very important concept in China, and the Communist Party is backed into a corner on the issue.]

OPUNTIA #495: The Chinook Blast lights festival looks fabulous. I wish we had something close to it here. We might, but I don't know about it. A shame about When Words Collide 2021 readercon being virtual again.

The only conventions [in metro Toronto] actually making any kind of announcements have been Anime North, shifted to July 23 to 25 of this year, and a new Trek event staged by folks from Newfoundland called Starcon.TO, shifted to the fall of 2021. Other conventions are quiet, with the exception of a small one-day comics event in Burlington, which seems to be happening with the local regional government keeping a close eye.

SEEN IN THE LITERATURE

Andersson, E.P., et al (2021) **Runaway stars masquerading as star formation in galactic outskirts.** MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY 502:doi.org/10.1093/mnrasl/slaa201

Authors' abstract: *In the outskirts of nearby spiral galaxies, star formation is observed in extremely low gas surface densities. Star formation in these regions, where the interstellar medium is dominated by diffuse atomic hydrogen, is difficult to explain with classic star formation theories.*

In this letter, we introduce runaway stars as an explanation for this observation. Runaway stars, produced by collisional dynamics in young stellar clusters, can travel kiloparsecs during their main-sequence lifetime.

Using galactic-scale hydrodynamic simulations including a treatment of individual stars, we demonstrate that this mechanism enables the ejection of young massive stars into environments where the gas is not dense enough to trigger star formation.

This results in the appearance of star formation in regions where it ought to be impossible. We conclude that runaway stars are a contributing, if not dominant, factor to the observations of star formation in the outskirts of spiral galaxies.

Hjorth, M., et al (2021) **A backward-spinning star with two coplanar planets.** PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES USA 118:doi.org/10.1073/pnas.2017418118

Authors' abstract: *The Sun's equator lines up with the orbits of the planets. This fact supports the theory that stars and their planets inherit their angular momentum from the same source, the gravitational collapse of a molecular cloud.*

Most astronomers expected spin-orbit alignment to be a universal feature of planetary systems. This proved false: many drastic misalignments are known, and many possible reasons have been offered. In one theory, a distant companion star upsets the alignment at an early stage, while the star is still surrounded by a protoplanetary disk.

Here, the K2-290 system is shown to be the best-known candidate for such a primordial misalignment. The star rotates backward, and a companion star with suitable properties has been identified.

It is widely assumed that a star and its protoplanetary disk are initially aligned, with the stellar equator parallel to the disk plane. When observations reveal a misalignment between stellar rotation and the orbital motion of a planet, the usual interpretation is that the initial alignment was upset by gravitational perturbations that took place after planet formation.

Most of the previously known misalignments involve isolated hot Jupiters, for which planet-planet scattering or secular effects from a wider-orbiting planet are the leading explanations. In theory, star/disk misalignments can result from turbulence during star formation or the gravitational torque of a wide-orbiting companion star, but no definite examples of this scenario are known.

An ideal example would combine a coplanar system of multiple planets, ruling out planet-planet scattering or other disruptive post-formation events, with a backward-rotating star, a condition that is easier to obtain from a primordial misalignment than from post-formation perturbations. There are two previously known examples of a misaligned star in a coplanar multi-planet system, but in neither case has a suitable companion star been identified, nor is the stellar rotation known to be retrograde.

Here, we show that the star K2-290 A is tilted by 124 degrees ±6 compared with the orbits of both of its known planets and has a wide orbiting stellar companion that is capable of having tilted the protoplanetary disk. The system provides the clearest demonstration that stars and protoplanetary disks can become grossly misaligned due to the gravitational torque from a neighboring star.

Bagheri, A., et al (2021) **Dynamical evidence for Phobos and Deimos as remnants of a disrupted common progenitor.** NATURE ASTRONOMY 5:doi.org/10.1038/s41550-021-01306-2

Authors' abstract: *The origin of the Martian moons, Phobos and Deimos, remains elusive. While the morphology and their cratered surfaces suggest an asteroidal origin, capture has been questioned because of potential dynamical difficulties in achieving the current near-circular, near-equatorial orbits.*

To circumvent this, in situ formation models have been proposed as alternatives. Yet, explaining the present location of the moons on opposite sides of the synchronous radius, their small sizes and apparent compositional differences with Mars has proved challenging.

Here, we combine geophysical and tidal-evolution modelling of a Mars-satellite system to propose that Phobos and Deimos originated from disintegration of a common progenitor that was possibly formed in situ. We show that tidal dissipation within a Mars-satellite system, enhanced by the physical libration of the satellite, circularizes the post-disrupted eccentric orbits in <2.7 gigayears and makes Phobos descend to its present orbit from its point of origin close to or above the synchronous orbit.

Our estimate for Phobos's maximal tidal lifetime is considerably less than the age of Mars, indicating that it is unlikely to have originated alongside Mars. Deimos initially moved inwards, but never transcended the co-rotation radius because of insufficient eccentricity and therefore insufficient tidal dissipation.

Whereas Deimos is very slowly receding from Mars, Phobos will continue to spiral towards and either impact with Mars or become tidally disrupted on reaching the Roche limit in about 39 megayears.

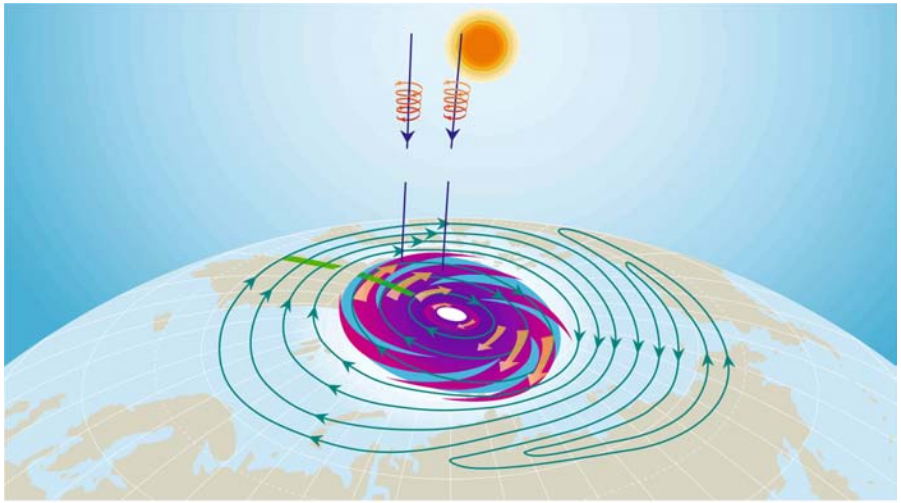
Zhang, Q.H., et al (2021) **A space hurricane over the Earth's polar ionosphere.** NATURE COMMUNICATIONS 10:doi.org/10.1038/s41467-021-21459-y (available as a free pdf)

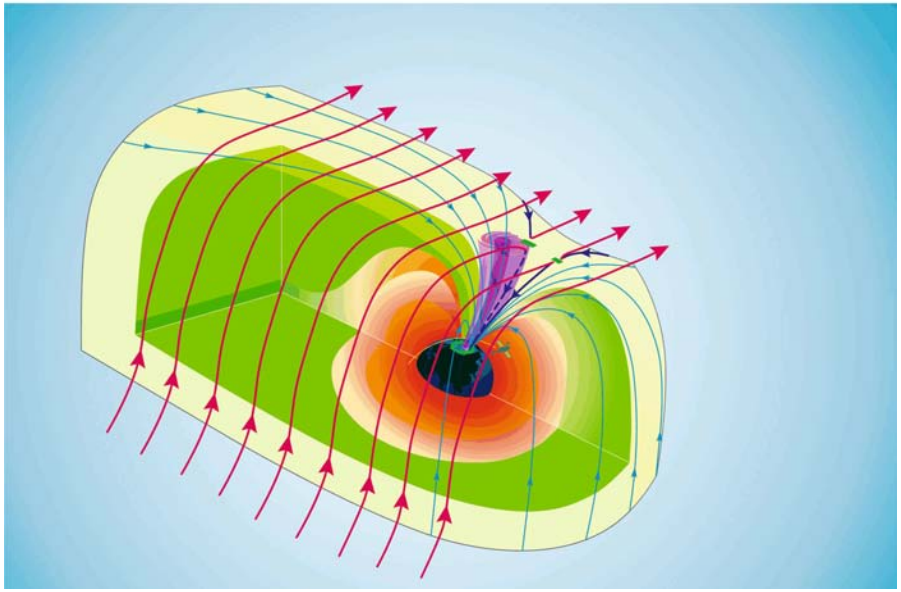
Authors' abstract: *In Earth's low atmosphere, hurricanes are destructive due to their great size, strong spiral winds with shears, and intense rain/precipitation. However, disturbances resembling hurricanes have not been detected in Earth's upper atmosphere.*

Here, we report a long-lasting space hurricane in the polar ionosphere and magnetosphere during low solar and otherwise low geomagnetic activity. This hurricane shows strong circular horizontal plasma flow with shears, a nearly zero-flow center, and a coincident cyclone-shaped aurora caused by strong electron precipitation associated with intense upward magnetic field-aligned currents. Near the center, precipitating electrons were substantially accelerated to ~10 keV.

The hurricane imparted large energy and momentum deposition into the ionosphere despite otherwise extremely quiet conditions. The observations and simulations reveal that the space hurricane is generated by steady high-latitude lobe magnetic reconnection and current continuity during a several hour period of northward interplanetary magnetic field and very low solar wind density and speed.

[Images are from this paper.]





Dill, K.A., and L. Agozzino (2021) **Driving forces in the origins of life.** OPEN BIOLOGY 11:doi.org/10.1098/rsob.200324 (available as a free pdf)

Authors' abstract and extracts: *We discuss four major prebiotic 'discoveries': persistent sampling of chemical reaction space; sequence-encodable foldable catalysts; assembly of functional pathways; and encapsulation and heritability. We describe how a 'proteins first' world gives plausible mechanisms. We note the importance of hydrophobic and polar compositions of matter in these advances.*

We assume that origins happened on Earth. While amino acids and simple organics are found on meteorites from space, we are interested in more life-like complexity, which is unlikely to have come from panspermia (i.e. originating in space before coming to Earth.

Life arose by natural laws, including chemical transformations of simpler molecules into more complex ones as well as physical processes such as diffusion, binding, catalysis, chemical reactions and changes in molecular concentrations and conformations.

Like today, it was far away from equilibrium. Life is a non-equilibrium (NEQ) state. It requires continual input of energy and matter. Earth's energy input from the sun is huge. At some point during life's origin, some chemical reactions became linked with energy to drive them. Chemistry 'learned' to harness energy, through gradients of ions or protons, or daily cycles of light and dark, or heating and drying, or changes in salts, temperature, or redox or pH states, for example.

It started with simple chemicals, maybe in a special environment, like a prebiotic soup, a shared space, maybe 'Darwin's warm little pond' or a hot hydrothermal vent in a sea floor. That medium contained prebiotically plausible simple molecules, such as methane, ammonia, water, some amino acids and nucleic acids, catalysed by surfaces, minerals and metals.

By what stochastic physical chemistry did dead matter 'invent' live matter? We cannot look to equilibrium principles because life has remained far from equilibrium (FFE) for 3 billion years. Unlike equilibria, which are pulled by goal-like end states, FFE dynamics are driven by the pushing flows of available matter and energy. Fitness is a tendency towards matching to environments, a driver for effective utilization of resources.

What mechanisms might have led to the autocatalysis and SOF? We describe three bootstraps. In the foldcat bootstrap, proteins became controllable catalysts, programmable through their sequences.

In the catpath bootstrap, different enzymes come together in space to form pathways. In the encapsulation/heritability bootstrap, biochemistry becomes encapsulated and compartmentalized into cells, and outfitted with genetic memory to link past to future.

Proteins and biochemistry, through the first two bootstraps, could have been stably self-sustaining, prior to encapsulation and heritability. Of course, this is presently just a speculation. But, there is no evident alternative mechanism by which nucleic acids could achieve persistent sustainability prior to proteins.

A thread through these mechanisms is the antipathy between hydrophobic and polar interactions, in protein chains, in folding, in encapsulation, and in protein-nucleic acid interactions.

Speirs: A fascinating article, well worth downloading.

Ros-Rocher, N., et al (2021) **The origin of animals: an ancestral reconstruction of the unicellular-to-multicellular transition.** OPEN BIOLOGY 11:doi.org/10.1098/rsob.200359 (available as a free pdf)

Authors' abstract and extracts: *How animals evolved from a single-celled ancestor, transitioning from a unicellular lifestyle to a coordinated multicellular entity, remains a fascinating question.*

Key events in this transition involved the emergence of processes related to cell adhesion, cell to cell communication and gene regulation.

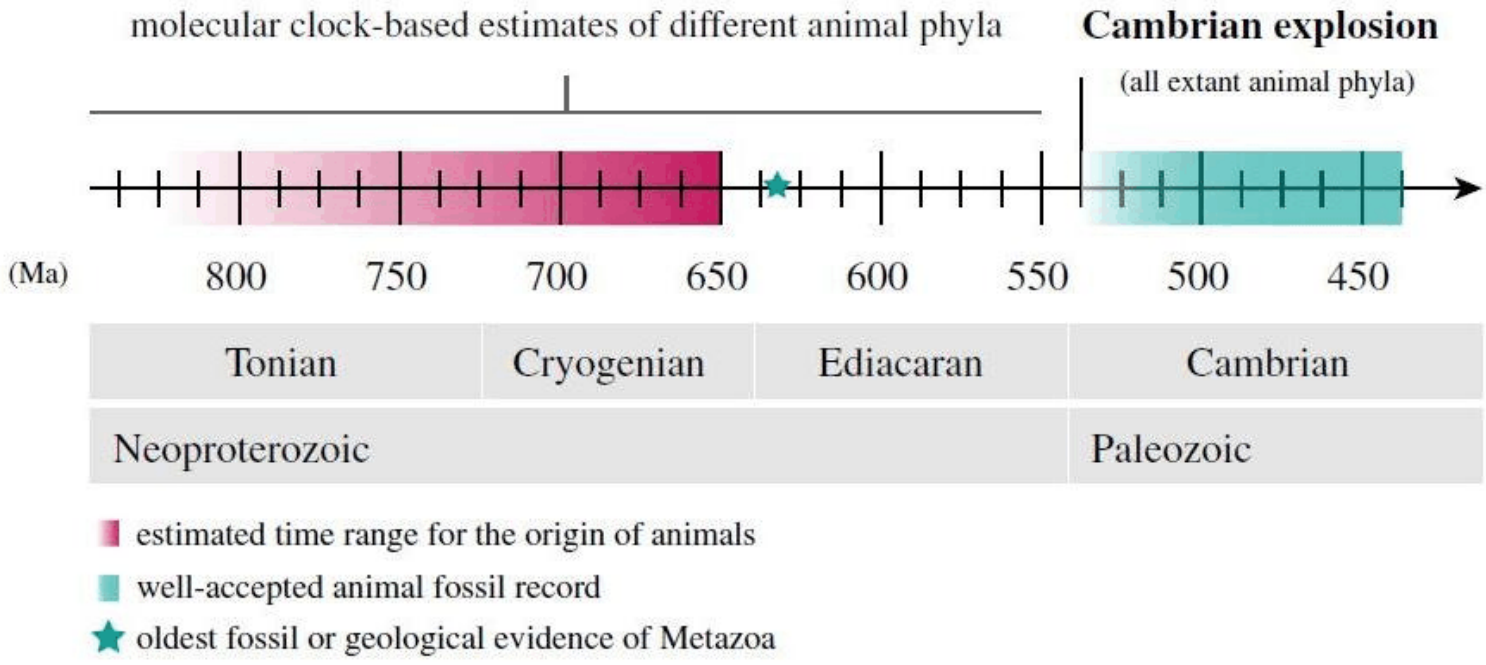
To understand how these capacities evolved, we need to reconstruct the features of both the last common multicellular ancestor of animals and the last unicellular ancestor of animals.

In this review, we summarize recent advances in the characterization of these ancestors, inferred by comparative genomic analyses between the earliest branching animals and those radiating later, and between animals and their closest unicellular relatives.

We also provide an updated hypothesis regarding the transition to animal multicellularity, which was likely gradual and involved the use of gene regulatory mechanisms in the emergence of early developmental and morphogenetic plans.

All extant animals living today diversified from a common multicellular ancestor, also known as the last common ancestor (LCA) of animals or the animal LCA. The animal LCA evolved from a single-celled ancestor more than 600 million years ago (Ma), transitioning from a unicellular ancestral state to complex multicellularity.

[Timeline is from this paper.]



Evans, S.D., et al (2021) **Developmental processes in Ediacara macrofossils.** PROCEEDINGS OF THE ROYAL SOCIETY OF LONDON 288B:doi.org/10.1098/rspb.2020.3055 (available as a free pdf)

[The Ediacaran era was 570 to 539 megayears ago at the dawn of animal life.]

Authors' abstract: *The Ediacara Biota preserves the oldest fossil evidence of abundant, complex metazoans. Despite their significance, assigning individual taxa to specific phylogenetic groups has proved problematic. To better understand these forms, we identify developmentally controlled characters in representative taxa from the Ediacaran White Sea assemblage and compare them with the regulatory tools underlying similar traits in modern organisms.*

This analysis demonstrates that the genetic pathways for multicellularity, axial polarity, musculature, and a nervous system were likely present in some of these early animals. Equally meaningful is the absence of evidence for major differentiation of macroscopic body units, including distinct organs, localized sensory machinery or appendages.

Together these traits help to better constrain the phylogenetic position of several key Ediacara taxa and inform our views of early metazoan evolution. An apparent lack of heads with concentrated sensory machinery or ventral nerve cords in such taxa supports the hypothesis that these evolved independently in disparate bilaterian clades.

Boyer, D.L., et al (2021) **Living on the edge: The impact of protracted oxygen stress on life in the Late Devonian.** PALAEOGEOGRAPHY, PALAEOCLIMATOLOGY, PALAEOECOLOGY 566:doi.org/10.1016/j.palaeo.2021.110226

[The Devonian era was 416.0 to 358.9 megayears ago. It began with the emergence of land plants and ended with the first of five natural mass extinctions.]

Authors' abstract: *We examined Late Devonian biocrises using paleontological and geochemical data. The Late Devonian Appalachian Basin is characterized by fluctuating redox conditions. Each biocrisis has a unique local signal, decoupled from extinction magnitude.*

The Late Devonian records one of the most dramatic series of taxonomic and ecological turnovers in the history of life. The precise controls over the elevated extinctions and depressed origination rates at this time are not fully resolved, but reduced oxygen conditions undoubtedly played a role.

A combined geochemical and paleontological dataset from 17 localities across New York and Ohio provide a cohesive record of prolonged and repeated oxygen stress in the Appalachian Basin associated with numerous biotic turnovers through the Late Devonian.

The trace fossil signal, captured as ichnofabric index data, and trace metal proxies (Mo, U, V) in this study provide insight into bottom water conditions. The biomarker data, including hopane/sterane, sterane carbon number ratios and Chlorobi-derived carotenoid abundances, in combination with organic-walled microfossil (OWM) abundances inform the nature of biological communities and redox conditions in the water column.

These collective proxies allow us to compare the Lower and Upper Kellwasser Events, and the Hangenberg Biocrisis, with background conditions through the Late Devonian across a range of depositional environments. The results reveal that each of these three extinctions has a unique signal.

Interestingly, the Hangenberg exhibits the greatest departure from background environmental conditions without comparable extinction rates, suggesting that prolonged oxygen stress throughout the Late Devonian removed vulnerable populations and limited the impact of this event.

Further, variable signals and responses between bioevents likely indicate different drivers for each. This work adds to the narrative that the Late Devonian extinction event was unique among the "Big 5" and sets the stage for a more global-scale dissection of triggers, kill mechanisms, and responses.

Kent, D.V., et al (2021) **Northward dispersal of dinosaurs from Gondwana to Greenland at the mid-Norian (215 to 212 Ma, Late Triassic) dip in atmospheric pCO_2.** PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES USA 118:doi.org/10.1073/pnas.2020778118

Authors' abstract: *Sharply contrasting climate zonations under high atmospheric pCO_2 conditions can exert significant obstacles to the dispersal of*

land vertebrates across a supercontinent. This is argued to be the case in the Triassic for herbivorous sauropodomorph dinosaurs, which were confined to their initial venue in the Southern Hemisphere temperate belt of Pangea for about their first 15 million years.

Sauropodomorphs only appear in the fossil record of the Northern Hemisphere temperate belt about 214 million years ago based on a composite magnetostratigraphy of the Fleming Fjord Group in East Greenland. The coincidence in timing within a major dip in atmospheric pCO_2 from published paleosol records suggests the dispersal was related to a concomitant attenuation of climate barriers in a greenhouse world.

The earliest dinosaurs (theropods and sauropodomorphs) are found in fossiliferous early Late Triassic strata dated to about 230 million years ago (Ma), mainly in northwestern Argentina and southern Brazil in the Southern Hemisphere temperate belt of what was Gondwana in Pangea. Sauropodomorphs, which are not known for the entire Triassic in then tropical North America, eventually appear 15 million years later in the Northern Hemisphere temperate belt of Laurasia.

The Pangea supercontinent was traversable in principle by terrestrial vertebrates, so the main barrier to be surmounted for dispersal between hemispheres was likely to be climatic; in particular, the intense aridity of tropical desert belts and unstable climate in the equatorial humid belt accompanying high atmospheric pCO_2 that characterized the Late Triassic.

We revisited the chronostratigraphy of the dinosaur-bearing Fleming Fjord Group of central East Greenland and, with additional data, produced a correlation of a detailed magnetostratigraphy from more than 325 metres of composite section from two field areas to the age-calibrated astrochronostratigraphic polarity time scale. This age model places the earliest occurrence of sauropodomorphs (Plateosaurus) in their northernmost range to ~214 Ma.

The timing is within the 215 to 212 Ma (mid-Norian) window of a major, robust dip in atmospheric pCO_2 of uncertain origin but which may have resulted in sufficiently lowered climate barriers that facilitated the initial major dispersal of the herbivorous sauropodomorphs to the temperate belt of the Northern Hemisphere. Indications are that carnivorous theropods may have had dispersals that were less subject to the same climate constraints.

Hogan, J.D., and D.J. Varricchio (2021) **Do paleontologists dream of electric dinosaurs? Investigating the presumed inefficiency of dinosaurs contact incubating partially buried eggs.** PALEOBIOLOGY 47:101-114 (available as a free pdf)

Authors' abstract: *Troodon formosus, a theropod from the Late Cretaceous, is one of the few species of dinosaurs with multiple nest sites uncovered. It has been consistently demonstrated that eggs within these nests would have been partially buried in life, an exceedingly rare state in modern vertebrates.*

There has been debate over Troodon's capacity to engage in thermoregulatory contact incubation, especially regarding an adult's ability to efficiently supply partially buried eggs with energy.

An actualistic investigation was undertaken to determine the thermodynamic efficiency of contact incubating partially buried eggs. An efficient system would keep eggs at temperatures closer to the surrogate parent than the ambient, without prohibitively high energy input.

For the experiment, a surrogate dinosaur was created and used in both indoor controlled ambient temperature trials and in an outdoor variant. Even with ambient temperatures that were likely cooler than Cretaceous averages, the results showed that contact incubating partially buried eggs did seem to confer an energetic advantage; egg temperatures remained closer to the surrogate than ambient in both indoor and outdoor tests.

Still, critics of contact incubating partially buried eggs are correct in that there is a depth at which adult energy would fail to make much of an impact, perhaps more relevant to buried eggs, as partially buried eggs would be in contact with an adult and likely above the thermal input threshold.

Additionally, results from this experiment provide evidence for a possible evolutionary path from guarding behavior to thermoregulatory contact incubation.

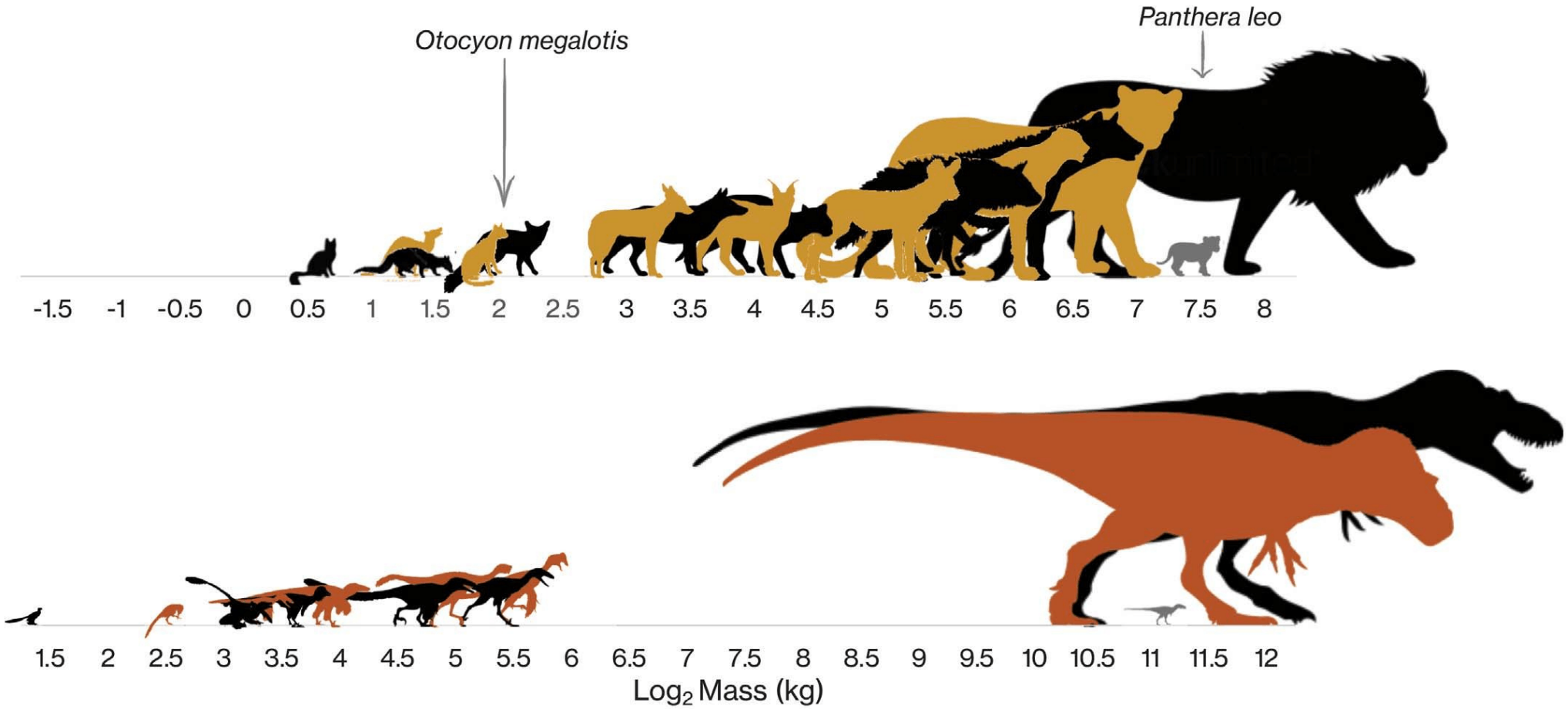
Schroeder, K., et al (2021) **The influence of juvenile dinosaurs on community structure and diversity.** SCIENCE 371:941-944 (available as a free pdf)

Authors' abstract: *Despite dominating biodiversity in the Mesozoic, dinosaurs were not speciose. Oviparity constrained even gigantic dinosaurs to less than 15 kg at birth. Growth through multiple morphologies led to the consumption of different resources at each stage. Such disparity between neonates and adults could have influenced the structure and diversity of dinosaur communities.*

Here, we quantified this effect for 43 communities across 136 million years and seven continents. We found that megatheropods (more than 1,000 kg) such as tyrannosaurs had specific effects on dinosaur community structure. Although herbivores spanned the body size range, communities with megatheropods lacked carnivores weighing 100 to 1,000 kg.

We demonstrate that juvenile megatheropods likely filled the mesocarnivore niche, resulting in reduced overall taxonomic diversity. The consistency of this pattern suggests that ontogenetic niche shift was an important factor in generating dinosaur community structure and diversity. Dinosaurs were the dominant terrestrial vertebrates for >150 million years, yet their species diversity, particularly at sizes <60 kg, remained well below that of other fossil groups. Moreover, their overall body size distribution differed from other vertebrates.

Because small-bodied vertebrates can finely partition resources and have high turnover between environments, they typically have the highest diversity across regions. Yet curiously, large-bodied dinosaurs were the most diverse. This was particularly true for herbivorous sauropods and ornithischians, whereas the predominantly carnivorous theropods exhibited a more uniform range of sizes globally.



Brown, C.M., et al (2021) **High-resolution (centimetre-scale) GPS/GIS-based 3D mapping and spatial analysis of in situ fossils in two horned-dinosaur bonebeds in the Dinosaur Park Formation (Upper Cretaceous) at Dinosaur Provincial Park, Alberta, Canada.** CANADIAN JOURNAL OF EARTH SCIENCES 58:doi.org/10.1139/cjes-2019-0183

Authors' abstract: *Mapping of fossil sites represents an important aspect of palaeontology, because the data collected are required for interpreting the taphonomic and depositional history of the site, as well as the palaeoecology and behavior of the organisms.*

Methods for mapping and documenting certain vertebrate fossil sites, such as trackways, have drastically changed in recent years, with the integrated technologies of photogrammetry, laser scanning, and geographic information systems becoming standard practice, and providing digital, three-dimensional, and georeferenced data for analyses.

Contrasting this technological revolution, the methods for mapping vertebrate bone accumulations, such as bonebeds, have changed little in recent decades, and are largely limited to two dimensions, are non-georeferenced, and produce static maps.

Here, we present a novel test case in the mapping of two ceratopsid (Dinosauria: Ornithischia) monodominant bonebeds (mass death assemblages) that are documented digitally, fully georeferenced, and in three dimensions, using a combination of high resolution (at centimetre-scale) global positioning system, photogrammetry, and geographic information systems.

Importantly, accompanying spatial data (i.e., size and orientation) are collected in the field in the traditional manner and directly compared with values calculated from the digital map.

Parameters describing bone length and orientation exported from the digital map are largely reflective of measured field data, with both size and orientation distributions being statistically indistinguishable, but with disproportionate error for elements smaller than 10 cm.

Prebble, J.G., and E.M. Crouch (2021) **A 100 million year composite pollen record from New Zealand shows maximum angiosperm abundance delayed until Eocene.** PALAEOGEOGRAPHY, PALAEOCLIMATOLOGY, PALAEOECOLOGY 566:doi.org/10.1016/j.palaeo.2020.110207

[Angiosperms are the flowering plants. They began evolving in the early Cretaceous, just as dinosaurs began to spread to their maximum glory before the asteroid ended the Cretaceous. Gymnosperms are coniferous trees and cycads. Bryophytes are mosses and liverworts.]

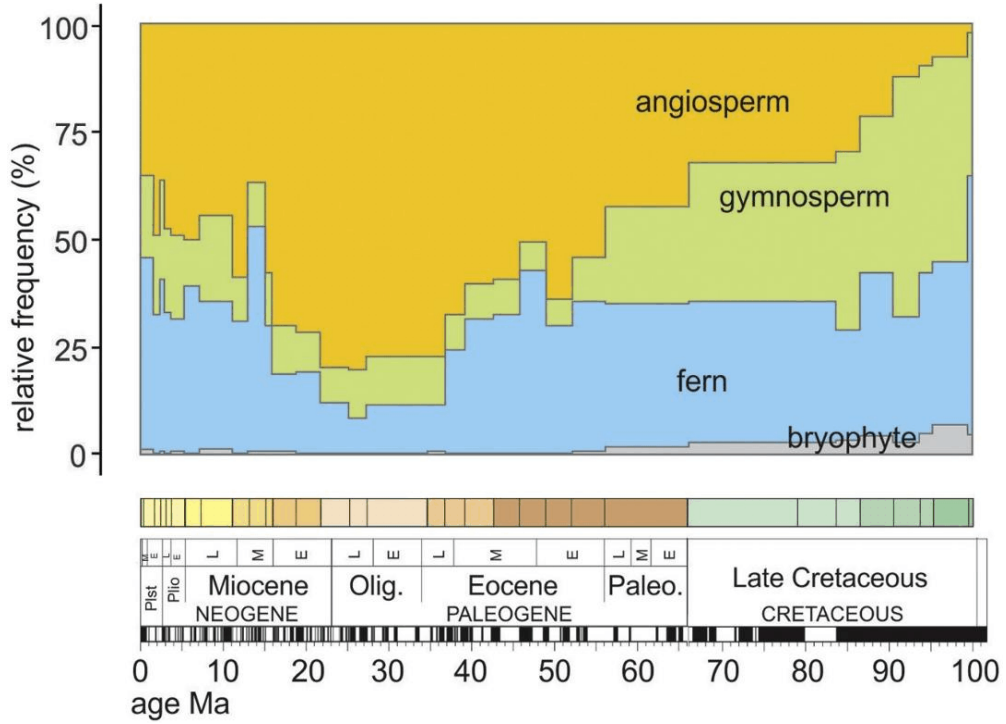
Authors' abstract: *Although significant angiosperm diversification occurred during the Cretaceous, the timing of subsequent expansion of flowering plants across austral landscapes is poorly understood due to a lack of continuous records.*

Our new 100 million year composite pollen record from New Zealand shows a striking temporal separation between diversification and ecological dominance in this group.

While Cretaceous diversification was closely followed by an increase in angiosperm frequency, maximum frequency did not occur for another 40 million years, during the Eocene. The two most consistent intervals of floral change over the 100 Myr record occur within the middle Eocene and the middle Miocene.

Notable floral changes also occur around the Cretaceous-Paleogene, Paleocene-Eocene, and Pliocene-Pleistocene transitions. These major changes occur in the context of the northward drift of Zealandia across the Antarctic circle, global warming in the early Paleogene, and middle Miocene, and onset of Southern Ocean circumpolar circulation and cooling in the late Paleogene.

[Chart on the next page is from this paper. Strangely, the times series runs backwards from our time to the Cretaceous. This makes the expansion of angiosperms less obvious on the graph. I'm surprised the editor let this one through.]



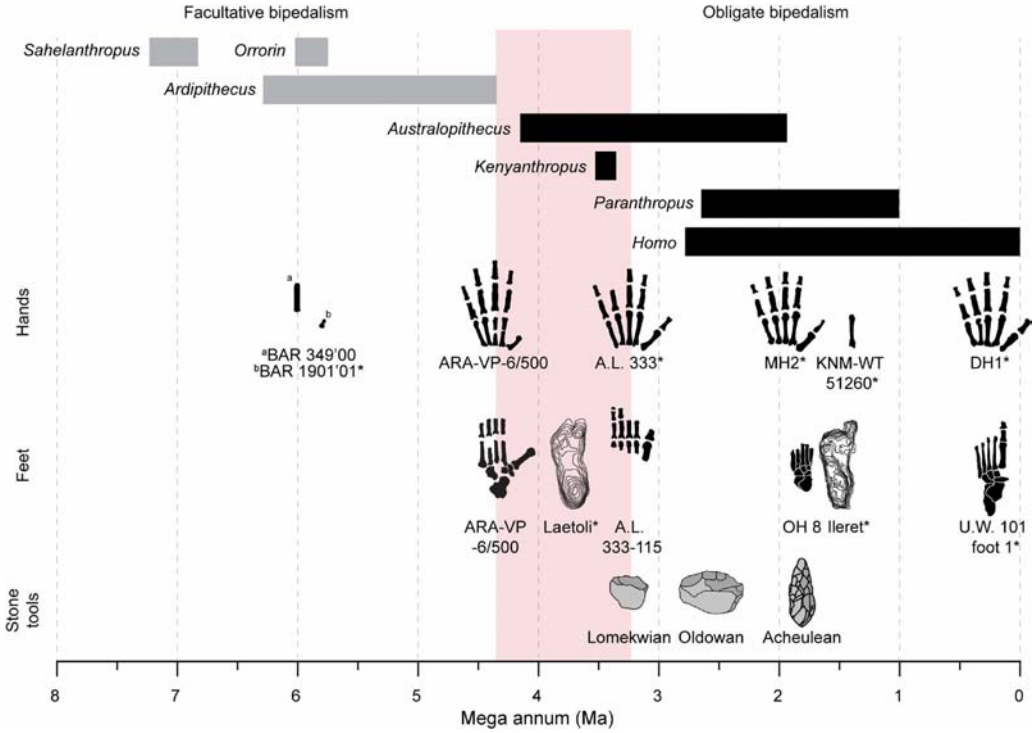
Prang, T.C., et al (2021) ***Ardipithecus* hand provides evidence that humans and chimpanzees evolved from an ancestor with suspensory adaptations.** SCIENCE ADVANCES 7:doi.org/10.1126/sciadv.abf2474 (available as a free pdf)

Authors' abstract: *Early 20th century anatomical research supported the view that humans evolved from a suspensory ancestor bearing some resemblance to apes. However, the hand of the 4.4-million-year-old hominin Ardipithecus ramidus purportedly provides evidence that the hominin hand was derived from a more generalized form.*

Here, we use morphometric and phylogenetic comparative methods to show that Ardipithecus retains suspensory adapted hand morphologies shared with chimpanzees and bonobos. We identify an evolutionary shift in hand morphology between Ardipithecus and Australopithecus that renews questions about the co-evolution of hominin manipulative capabilities and obligate bipedalism initially proposed by Darwin.

Overall, our results suggest that early hominins evolved from an ancestor with a varied positional repertoire including suspension and vertical climbing, directly affecting the viable range of hypotheses for the origin of our lineage.

[Image is from this paper.]



da Silva Coelho, F.A., et al (2021) **An early dog from southeast Alaska supports a coastal route for the first dog migration into the Americas.** PROCEEDINGS OF THE ROYAL SOCIETY OF LONDON 288B:doi.org/10.1098/rspb.2020.3103 (available as a free pdf)

Authors' abstract: *The oldest confirmed remains of domestic dogs in North America are from mid-continent archaeological sites dated approximately 9,900 calibrated years before present (cal BP). Although this date suggests that dogs may not have arrived alongside the first Native Americans, the timing and routes for the entrance of New World dogs remain uncertain.*

Here, we present a complete mitochondrial genome of a dog from southeast Alaska, dated to 10,150 ± 260 cal BP. We compared this high-coverage genome with data from modern dog breeds, historical Arctic dogs and American precontact dogs (PCDs) from before European arrival.

Our analyses demonstrate that the ancient dog belongs to the PCD lineage, which diverged from Siberian dogs around 16,700 years ago. This timing roughly coincides with the minimum suggested date for the opening of the North Pacific coastal (NPC) route along the Cordilleran Ice Sheet and genetic evidence for the initial peopling of the Americas.

This ancient southeast Alaskan dog occupies an early branching position within the PCD clade, indicating it represents a close relative of the earliest PCDs that were brought alongside people migrating from eastern Beringia southward along the NPC to the rest of the Americas.

The stable isotope d13C value of this early dog indicates a marine diet, different from the younger mid-continent PCDs' terrestrial diet.

Although PCDs were largely replaced by modern European dog breeds, our results indicate that their population decline started approximately 2,000 years BP, coinciding with the expansion of Inuit peoples, who are associated with traditional sled-dog culture.

Our findings suggest that dogs formed part of the initial human habitation of the New World, and provide insights into their replacement by both Arctic and European lineages.

While genetic evidence suggests that the first Native Americans split from East Asian ancestors as early as 23,000 years ago, and evidence from archaeological artefacts indicates a presence of human populations south of the continental ice sheets at possibly more than 16,000 years ago, the earliest human remains in North America date to only around 12,600 years ago.

Genetic data for dogs indicate that their Old World domestication process occurred between 32,100 and 18,800 years ago, early enough to accompany the first North American immigrants.

Okamiya, H., et al (2021) **Increasing body size and fecundity in a salamander over four decades, possibly due to global warming.** BIOLOGICAL JOURNAL OF THE LINNEAN SOCIETY 132:634-642

Authors' abstract: *Recent climate change has been shown to affect phenotypic traits, such as body size and fecundity, in some animals. It is important to assess the response of a species to climate change for predicting a population's future.*

We compared historic and contemporary body size and clutch size measurements in the lentic breeding salamander, Hynobius tokyoensis, collected from a wide range of latitudes in its geographical range and concluded that the species has gone through significant increases in body size and clutch size over the last four decades.

Although a decrease in body size due to climate change is well documented for other species, reports of an increase in body size are rare. In addition, we found that increases in temperature and precipitation were constant regardless of latitude, but that the ratios of increase in body size and clutch size were greater in high-latitude populations.

Our results suggest that, even within a species, the magnitude of the response to climate change depends on the geography of the population.

Sato, M., and A. Sasaki (2021) **Evolution and maintenance of mutualism between tubeworms and sulfur-oxidizing bacteria.** AMERICAN NATURALIST 197:351-365 (available as a free pdf)

Authors' abstract: *Tubeworms and sulfur-oxidizing bacteria mutualism, an essential part of the chemosynthetic ecosystem in the deep sea, has several puzzling features. After acquiring sulfur-oxidizing bacteria from the environment, tubeworms become fully dependent on their symbiont bacteria for nutrient intake.*

Once ingested by the tubeworm larva, no additional symbionts join from the environment, and no symbionts are released until the host tubeworm dies. Despite this very narrow window to acquire symbionts, some tubeworm species can live for 1,200 years.

Such a restricted release of symbionts could lead to a shortage of symbiont bacteria in the environment without which tubeworms could not survive.

In our study, we examine the conditions under which this mutualism can persist and whether the host mortality rate evolves toward a low value using a mathematical model for the tubeworm-symbiont bacteria system.

Our model reveals that mutualism can persist only when the host mortality rate is within an intermediate range. With cohabitation of multiple symbionts strains in the same host, host mortality rate evolves toward a low value without driving either host or symbiont to extinction when competition among symbionts is weak and their growth within a host is slow.

We also find the parameter conditions that lead to unlimited evolutionary escalation of host mortality rate toward co-extinction of both tubeworms and symbionts populations (evolutionary double suicide). The generality of this evolutionary fragility in obligate mutualistic systems as well as the contrasting evolutionary robustness in host-parasite systems are discussed.

Spadaro, A.J., and M.J. Butler IV (2021) **Herbivorous crabs reverse the seaweed dilemma on coral reefs.** CURRENT BIOLOGY 31:853-859

Authors' abstract: *Coral reefs are on a steep trajectory of decline, with natural recovery in many areas unlikely. Eutrophication, overfishing, climate change, and disease have fueled the supremacy of seaweeds on reefs, particularly in the Caribbean, where many reefs have undergone an ecological phase shift so that seaweeds now dominate previously coral-rich reefs.*

Discovery of the powerful grazing capability of the Caribbean's largest herbivorous crab (Maguimithrax spinosissimus) led us to test the effectiveness of their grazing on seaweed removal and coral reef recovery in two experiments conducted sequentially at separate locations 15 km apart in the Florida Keys (USA).

In those experiments, we transplanted crabs onto several patch reefs, leaving others as controls (n = 24 reefs total; each 10 to 20 m 2 in area) and then monitored benthic cover, coral recruitment, and fish community structure on each patch reef for a year.

We also compared the effectiveness of crab herbivory to scrubbing reefs by hand to remove algae. Crabs reduced the cover of seaweeds by 50% to 80%, resulting in a commensurate 3 to 5-fold increase in coral recruitment and reef fish community abundance and diversity. Although laborious hand scrubbing of reefs also reduced algal cover, that effect was transitory unless maintained by the addition of herbivorous crabs.

With the persistence of Caribbean coral reefs in the balance, our findings demonstrate that large-scale restoration that includes enhancement of invertebrate herbivores can reverse the ecological phase shift on coral reefs away from seaweed dominance.

Li, G., et al (2021) **Self-powered soft robot in the Mariana Trench.** NATURE 591:66-71

Authors' abstract: *The deep sea remains the largest unknown territory on Earth because it is so difficult to explore. Owing to the extremely high pressure in the deep sea, rigid vessels and pressure-compensation systems are typically required to protect mechatronic systems. However, deep-sea creatures that lack bulky or heavy pressure-tolerant systems can thrive at extreme depths.*

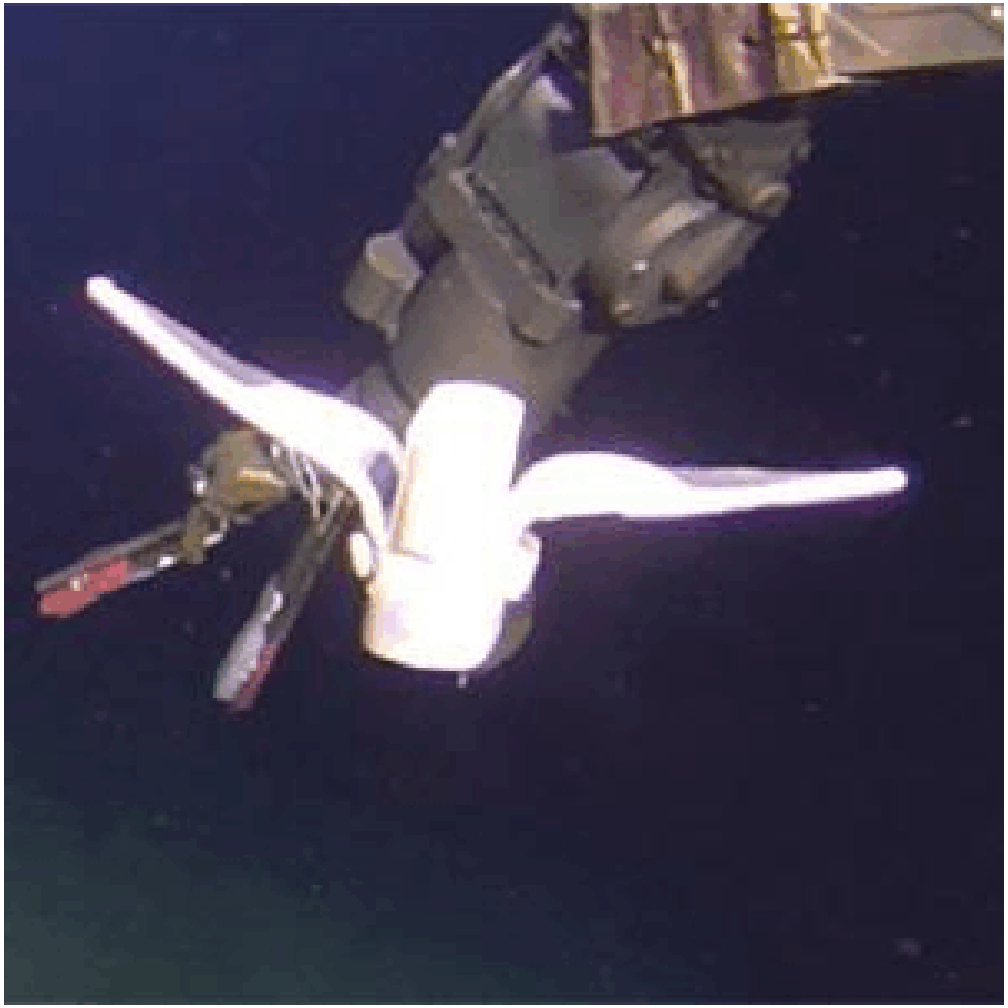
Here, inspired by the structure of a deep-sea snailfish, we develop an untethered soft robot for deep-sea exploration, with onboard power, control and actuation protected from pressure by integrating electronics in a silicone matrix. This self-powered robot eliminates the requirement for any rigid vessel.

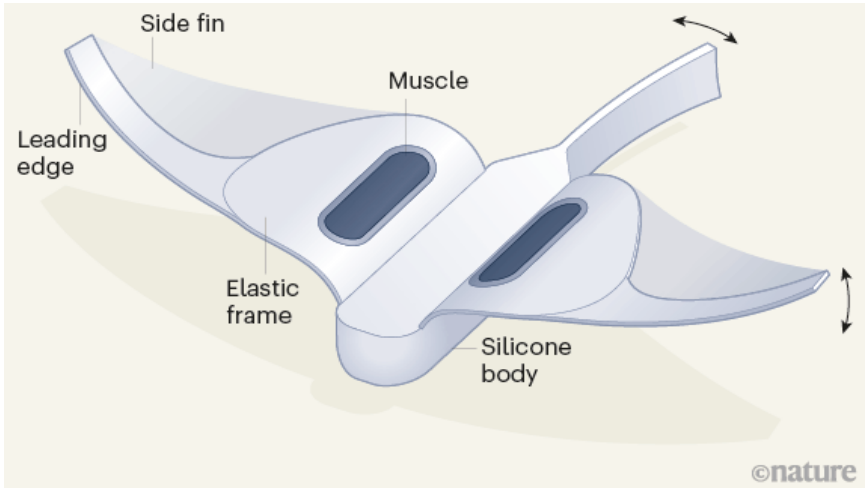
To reduce shear stress at the interfaces between electronic components, we decentralize the electronics by increasing the distance between components or separating them from the printed circuit board.

Careful design of the dielectric elastomer material used for the robot's flapping fins allowed the robot to be actuated successfully in a field test in the Mariana Trench down to a depth of 10,900 metres and to swim freely in the South China Sea at a depth of 3,224 metres.

We validate the pressure resilience of the electronic components and soft actuators through systematic experiments and theoretical analyses. Our work highlights the potential of designing soft, lightweight devices for use in extreme conditions.

[Images are from this paper.]





Katajamaa, R., et al (2021) **Cerebellum size is related to fear memory and domestication of chickens.** BIOLOGY LETTERS 17:doi.org/10.1098/rsbl.2020.0790 (available as a free pdf)

Authors' abstract: *Red Junglefowl (Gallus gallus) were selected for divergent levels of fear of humans during eight generations, causing the selection lines to differ in fear levels as well as in the proportional brain and cerebellum masses. Birds from the two lines were then crossed to obtain an F3 intercross in order to study the correlations between brain mass and fear learning.*

We exposed 105 F3-animals individually to a fear habituation and memory test at 8 days of age, where the reactions to repeated light flashes were assessed on 2 consecutive days. After culling, the absolute and relative sizes of each of four brain regions were measured. Stepwise regression was used to analyse the effects of the size of each brain region on habituation and memory.

There were no effects of any brain region on the habituation on day one. However, birds with a larger absolute size of cerebellum had significantly reduced reactions to the fearful stimuli on day two, indicating a better memory of the stimuli. No other regions had significant effects.

We conclude that increased cerebellum size may have been important in facilitating chicken domestication, allowing them to adapt to a life with humans.

Goldhawk, C., et al (2021) **Effect of animal's experience and rodeo procedures on behaviour of bucking horses at a large commercial rodeo in Canada.** APPLIED ANIMAL BEHAVIOUR SCIENCE 234:doi.org/10.1016/j.applanim.2020.105199 (available as a free pdf)

Authors' abstract: *Horses with increased experience with rodeo displayed fewer reactive behaviours during both loading and holding in the chute prior to performance, likely indicative of habituation based on spontaneous and anticipatory behaviours.*

Human activity not inherent to rodeo performance was associated with increased reactive behaviours prior to performance and not associated with performance scores, indicating changes to reduce reactivity would not alter the competition.

The use of animals in rodeo performances exemplifies the debate of trained performance vs. coerced abuse in human-animal interactions, particularly for roughstock or bucking events. The debate suffers from a lack of scientific evaluation to represent the animals' experience and to inform discourse. The current study evaluated 116 horses over 3 yrs at the same rodeo in the Bareback, Novice Bareback, Saddle Bronc, and Novice Saddle Bronc events.

Behaviour of humans and horses were continuously recorded during active loading and while horses were held in chutes prior to performance. Behaviours displayed were combined into composite scores for horses and handlers with increasing scores reflecting increasing behavioural vigor, suggested to be related to escape/fear in horses.

Overall, 71.5 % of horses balked during loading, of which 36.8 % balked more than once. During loading 83 % of balking events had a human located in front of the line of movement and the odds of a horse balking increased with increasing number of handlers (P =0.04).

For every exposure to the rodeo below the median of 3 performances, the odds of balking during loading increased by 1.1 (95 %CI: 1.1–1.3; P =0.04), odds of higher animal loading behaviour scores increased by 1.1 (95 %CI: 1.1–1.3; P =0.06), and odds of higher animal behaviour scores while being held in the chute increased by 1.2 (95 %CI: 1.1–1.3; P <0.001) indicating that increased exposure to the rodeo decreased the odds of balking or vigorous behaviours prior to the rodeo performance.

The scoring of the vigour of horses' behaviour prior to the rodeo was not related to the judges' scoring of bucking performance nor to the event. When reactive behaviours were observed in the bucking chute in association with an activity most were associated with preparing the horse for performance.

Horses also showed spontaneous behaviours with no association with activity. The results of the role of experience and potential performance-related anticipatory behaviours is likely indicative of horses' habituation to rodeo versus learned helplessness.

The association of increased experience with the rodeo and decreased behavioural vigor, in combination with no association with animal performance score, supports further research on the role of training methods and exposure to rodeo environments in promoting positive animal welfare at rodeos.

Vrbanec, L., et al (2021) **Enhanced problem-solving ability as an adaptation to urban environments in house mice.** PROCEEDINGS OF THE ROYAL SOCIETY OF LONDON 288B:doi.org/10.1098/rspb.2020.2504

Authors' abstract: *Enhanced cognitive abilities and the ability to innovate have been suggested as crucial traits for thriving in human-altered habitats. We tested if house mice (Mus musculus) subspecies have evolved enhanced innovative problem-solving abilities throughout their commensal lives with humans.*

The time that subspecies lived commensally with humans ranges between approximately 3,000 years to more than 11,000 years, thus providing an excellent example of human-animal coexistence. In addition, we tested whether differences in problem-solving were mediated by differences in object and place exploration, motivation, persistence or inhibitory control.

We found that populations of subspecies living commensally the longest excelled in problem-solving across seven food-extraction tasks over subspecies living commensally short or intermediate times. These differences were not mediated by exploration, motivation, persistence or inhibitory control suggesting that subspecies have evolved better cognitive abilities when living commensally in urban environments.

This suggests that the ability to problem-solve may be an important trait promoting prosperity in human-altered environments.

Adaken, C., et al (2021) **Ebola virus antibody decay-stimulation in a high proportion of survivors.** NATURE 590:doi.org/10.1038/s41586-020-03146-y (available as a free pdf)

Authors' abstract: *Neutralizing antibody function provides a foundation for the efficacy of vaccines and therapies. Here, using a robust in vitro Ebola virus (EBOV) pseudo-particle infection assay and a well-defined set of solid-phase assays, we describe a wide spectrum of antibody responses in a cohort of healthy survivors of the Sierra Leone EBOV outbreak of 2013 to 2016.*

Pseudo-particle virus-neutralizing antibodies correlated with total anti-EBOV reactivity and neutralizing antibodies against live EBOV. Variant EBOV glycoproteins (1995 and 2014 strains) were similarly neutralized. During

longitudinal follow-up, antibody responses fluctuated in a 'decay-stimulation-decay' pattern that suggests de novo restimulation by EBOV antigens after recovery.

A pharmacodynamic model of antibody reactivity identified a decay half-life of 77 to 100 days and a doubling time of 46 to 86 days in a high proportion of survivors. The highest antibody reactivity was observed around 200 days after an individual had recovered. The model suggests that EBOV antibody reactivity declines over 0.5 to 2 years after recovery.

In a high proportion of healthy survivors, antibody responses undergo rapid restimulation. Vigilant follow-up of survivors and possible elective de novo antigenic stimulation by vaccine immunization should be considered in order to prevent EBOV viral recrudescence in recovering individuals and thereby to mitigate the potential risk of re-seeding an outbreak.

Stockmaier, S., et al (2021) **Infectious diseases and social distancing in nature.** SCIENCE 371:doi.org/10.1126/science.abc8881 (available as a free pdf)

Authors' abstract: *Spread of contagious pathogens critically depends on the number and types of contacts between infectious and susceptible hosts. Changes in social behavior by susceptible, exposed, or sick individuals thus have far-reaching downstream consequences for infectious disease spread.*

Although "social distancing" is now an all too familiar strategy for managing COVID-19, nonhuman animals also exhibit pathogen-induced changes in social interactions. Here, we synthesize the effects of infectious pathogens on social interactions in animals (including humans), review what is known about underlying mechanisms, and consider implications for evolution and epidemiology.

Speirs: Worth reading for a comparison of how social animals from ants to apes use social distancing to reduce the spread of disease.

Srinivasan, B., et al (2021) **A preliminary investigation on airborne fungi of pedestrian underpasses.** AEROBIOLOGIA 37:71-78

Authors' abstract: *Pedestrian underpasses are the unique environment where air transaction with outdoor is complicated, inducing interest to study the air quality for the presence of microbes. Thus, the study on the presence of airborne fungi from 11 different underpasses in Chennai city was conducted. The airborne fungi was monitored by exposing potato dextrose agar strips in reuter centrifugal sampler.*

A total of 1,735 colonies were isolated from underpasses and the control site recorded only 1,255 colonies. Total average colony forming unit of underpasses and control site was 157.7 CFU/m3 of air and 114.09 CFU/m3 of air, respectively. Altogether 22 species classified in 16 genera were isolated from both the environments.

Of which 21 species belonging to 16 genera were isolated from underpasses whereas the control site yielded 15 species belonging to 12 genera. The isolated species were categorized into three species belonging to Zygomycota, 2 species to Ascomycota and the remaining to Mitosporic fungi.

The air sample in the underpass is dominated by the presence of the fungi, Aspergillus flavus, Curvularia lunata and A.niger, whereas the control is dominated by Cladosporium cladosporioides, Aspergillus niger and A. flavus. The study proves the underpasses are a favorite niche for the proliferation of fungal propagules and proper maintenance of underpass is recommended.

Vaupel, J.W., et al (2021) **Demographic perspectives on the rise of longevity.** PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES USA 118:doi.org/10.1073/pnas.2019536118

Authors' abstract: *This article reviews some key strands of demographic research on past trends in human longevity and explores possible future trends in life expectancy at birth. Demographic data on age-specific mortality are used to estimate life expectancy, and validated data on exceptional life spans are used to study the maximum length of life.*

In the countries doing best each year, life expectancy started to increase around 1840 at a pace of almost 2.5 y per decade. This trend has continued until the

present. Contrary to classical evolutionary theories of senescence and contrary to the predictions of many experts, the frontier of survival is advancing to higher ages.

Furthermore, individual life spans are becoming more equal, reducing inequalities, with octogenarians and nonagenarians accounting for most deaths in countries with the highest life expectancy. If the current pace of progress in life expectancy continues, most children born this millennium will celebrate their 100th birthday.

Arceneaux, K., et al (2021) **Some people just want to watch the world burn: the prevalence, psychology and politics of the 'Need for Chaos'.** PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY OF LONDON 376B:doi.org/10.1098/rstb.2020.0147 (available as a free pdf)

Authors' abstract: *People form political attitudes to serve psychological needs. Recent research shows that some individuals have a strong desire to incite chaos when they perceive themselves to be marginalized by society. These individuals tend to see chaos as a way to invert the power structure and gain social status in the process.*

Analysing data drawn from large-scale representative surveys conducted in Australia, Canada, the United Kingdom and the United States, we identify the prevalence of Need for Chaos across Anglo-Saxon societies.

Using Latent Profile Analysis, we explore whether different subtypes underlie the uni-dimensional construct and find evidence that some people may be motivated to seek out chaos because they want to rebuild society, while others enjoy destruction for its own sake.

We demonstrate that chaos-seekers are not a unified political group but a divergent set of malcontents. Multiple pathways can lead individuals to 'want to watch the world burn'.

Speirs: Now you know where trollers come from, and why cancel culture exists. This should be mandatory reading for science fiction convention committees, who have a bad habit of knuckling under to anonymous tweeters.

Romano, A., et al (2021) **Political ideology, cooperation and national parochialism across 42 nations.** PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY OF LONDON 376B:doi.org/10.1098/rstb.2020.0146

Authors' abstract: *Political ideology has been hypothesized to be associated with cooperation and national parochialism (i.e. greater cooperation with members of one's nation), with liberals thought to have more cooperation with strangers and less national parochialism, compared to conservatives.*

However, previous findings are limited to few, and predominantly western, nations. Here, we present a large-scale cross-societal experiment that can test hypotheses on the relation between political ideology, cooperation and national parochialism around the globe.

To do so, we recruited 18,411 participants from 42 nations. Participants made decisions in a prisoner's dilemma game, and we manipulated the nationality of their interaction partner (national ingroup member, national outgroup member or unidentified stranger).

We found that liberals, compared to conservatives, displayed slightly greater cooperation, trust in others and greater identification with the world as a whole. Conservatives, however, identified more strongly with their own nation and displayed slightly greater national parochialism in cooperation.

Importantly, the association between political ideology and behaviour was significant in nations characterized by higher wealth, stronger rule of law, and better government effectiveness. We discuss the implications of these findings for understanding the association between political ideology and cooperation.