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2020
https://hdl.handle.net/10539/31659
Edery, Kyle Jonathan (2020) Expecto Patronum:protecting the irreplaceable by creating a Bio-sanctuary to cultivate and sustain South Africa's endangered pollinator species, University of the Witwatersrand, Johannesburg, <http://hdl.handle.net/10539/31659>

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09

"It is time," he said, "for me to tell you what I
should have told you five years ago, Harry.
Please sit down. I am going to tell you everything."

- Dumbledore, The Order of the Phoenix

OUR END, THEIR BEGINNING

EXPLAINED

_This chapter provides a concluding story of the future civilisation of humanity, along with a bibliography, list of figures and accuracy of online sources, ending off this thesis.

Our End, Their Beginning . . .

Story by Author



Figure 9.1: The Earth and The Galaxy

If every beginning has an end and every end marks a new beginning, then this is the story of the future generations beginning and the story of our end...

149 years ago, a cascading collapse of nature, known as the event, killed everything on earth, leaving the planet barren and uninhabitable. Fortunately, humanity had foreseen this devastating event, unable to stop it, they prepared for it, and so not everyone was on the ground when the final wave hit. At that time 5 space stations forming ORION, were in orbit, on which the surviving members of humanity lived for the next 149 years. Everyone dreamed of one day returning to the ground, breathing in fresh, un-filtered air. Life on ORION had been manageable, it had been the only life I had ever know, this was my reality.

Today marked year 150, and the day I would leave ORION. I had been selected as part of an exploration team to return to the ground and see if it was finally safe for us to return home. Anxiety and adrenaline swirled inside of me like a swarm of bees. I looked behind me as I stepped onto the shuttle, looking back at the only home I had ever known. First came the pulse of the rockets as we launched off ORION, next there was a burst, as we passed through the earths atmosphere and then a thud, we had landed...

We all stood in silence as passenger 35 pulled the lever to open the shuttle door, unsure if the air was even breathable. As the shuttle door opened, what I saw could only have been described as a sanctuary - a haven. We all carefully stepped out of the shuttle onto the soil below us, afraid to even speak, as if breaking the silence would somehow kill us all. Around us were so many trees and plants. To a first-generation member, this may have seemed sparse but to us, forth generation members, who had never seen a proper tree, to us we were surrounded by forests. We all glanced at each other exchanging looks, slowly stepping out the shuttle, breathing in fresh air for the first time. Passenger 3 burst into an infectious cheer. We were home...

We made our way towards the nearest shelter, that had been marked as a safe zone in the first few years of the event. As we passed through a mixture of trees and desolate wasteland, the excitement only grew, our world was fighting back to survive. When we arrived at the supposed location, what could be seen were plants for miles, surrounding a dam, with water that was not too blue and not too green but the perfect combination. This was the first time I had ever seen so much water.

We began searching all over for something that resembled an entrance, hoping this shelter could become the starting point for our new lives. Passenger 45 pointed out a small buzzing sound, to which passenger 15 suggested that we were all still acclimating, and that noise disorientation was normal. We were all willing to accept that until passenger 23 started to push away some vines, revealing what appeared to be some sort of cavity, as the vines were parted to reveal the cavity out came a swarm of honeybees. The last colony of bees alive.

A few of us descended into this dark enclosure. With our torches on, we all started to move towards a door, the first room. In this dark room was an old bed and a few shelves of canned food, with the floor lined with a muddy rug. To our surprise we noticed fungi and weeds growing along the frame of one of the shelving units, assumingly feeding of the artificial sunlight produced by the old ones tech. Passenger 7, a botanist, pointed out that the weeds were milkweeds and noticed various species of daisies growing around a bed frame. As we moved further in, we noticed how the plants had wrapped themselves all around the structure, appearing as a spiderweb of green intertwined with yellows and reds. Further in, the buzzing became louder, we were nearing the hive. As we turned the corner into what may have been a work area, passenger 6 jumped, as a winged creature flew passed her, with the help of light from our torches, the winged creature was identified as a monarch butterfly. As the torches moved around frantically to find this beautiful creature, someone spotted a beehive up in the far end of the room. This shelter appeared to have once been inhabited by the old ones, however all that remained now was an ecosystem of a few insects and plants, the last of their kind.

This space became the starting ground of BIO-SANCTUARY, a space once developed to help these species thrive and would now be used to help our species thrive and allow our world to be reborn. We discovered a room filled with research that must have been accumulated over decades. Following the research by growing plants, breeding these insects and researching all we could, BIO-SANCTUARY became the cure to protect our irreplaceable world and revive the endangered species of humanity.

BIBLIOGRAPHY

*All images are the authors own,
unless otherwise stated.

Agrigem. (2018). *Pollinus Bee Attractant | Improve Pollination | Attract Bees.* [online] Available at: https://www.agrigem.co.uk/pollinus-1l [Accessed 13 Aug. 2019].

ArchDaily. (2012). Aviary, Bioparque Temaikén / Hampton+Rivoira+Arquitectos. [online] Available at: https://www.archdaily.com/301109/aviary-bioparque-temaiken-hamptonrivoiraarquitectos [Accessed 28 Jul. 2019].

ArchDaily. (2013). The Serpentine Sackler Gallery / Zaha Hadid Architects. [online] Available at: https://www.archdaily.com/433507/the-serpentine-sackler-gallery-zaha-hadid-architects?ad_medium=gallery [Accessed 28 Jul. 2019].

ArchDaily. (2008). *Spidernethewood / R&Sie(n)*. [online] Available at: https://www.archdaily.com/1878/spidernethewood-rsien [Accessed 25 May 2019].

ArchDaily. (2015). *Bioclimatic Prototype of a Host and Nectar Garden Building / HUSOS.* [online] Avail-able at: https://www.archdaily.com/772039/bioclimatic-prototype-of-a-host-and-nectar-garden-building-husos [Accessed 27 May 2019].

ArchDaily. (2016). *A Scaffolding System for a Temporary Facility / Peris+Toral.arquitectes.* [online] Available at: https://www.archdaily.com/796646/a-scaffolding-system-for-a-temporary-facility-peris-plus-torarquitectes [Accessed 18 Jun. 2019].

ArchDaily. (2017 A). Sir David Adjaye and Ron Arad Architects Selected to Design UK's New Holocaust Memorial in Central London. [online] Available at: https://www.archdaily.com/882240/sir-david-adjaye-and-ron-arad-architects-selected-to-design-uks-new-holocaust-memorial-in-central-london [Accessed 2 Jun. 2019].

ArchDaily. (2017 B). Louvre Abu Dhabi / Ateliers Jean Nouvel. [online] Available at: https://www.archdaily.com/883157/louvre-abu-dhabi-atelier-jean-nouvel [Accessed 18 Jun. 2019].

ArchDaily. (2018). *The Memorial Hall of Israel's Fallen at Mount Herzl / Kimmel Eshkolot Architects.* [online] Available at: https://www.archdaily.com/890304/the-memorial-hall-of-israels-fallen-at-mount-herzl-kimmel-eshkolot-architects [Accessed 2 Jun. 2019].

Architen Landrell. (2013). *Serpentine Pavilion 2015 - ETFE Foil*. [online] Available at: http://www.architen.com/projects/serpentine-arthouse-pavillion-etfe-foil/ [Accessed 27 Jul. 2019].

Atkinson, B. (2018). *Bees, Butterflies, and Flowers.* [online] Carolina.com. Available at: https://www.carolina.com/teacher-resources/Interactive/bees-butterflies-and-flowers/tr33001.tr [Ac-cessed 30 Jul. 2019].

Base Structures. (2003). *Living Coasts - Paignton Zoo | Base Structures.* [online] Available at: http://www.basestructures.com/portfolio/projects-case-studies/living-coasts-paignton-zoo/ [Accessed 27 Jul. 2019].

Base Structures. (2019). *Bespoke fabric, mesh & cable net structures.* [online] Available at: http://www.basestructures.com/knowledge/fabrics/ [Accessed 6 Aug. 2019].

Bee Saving Paper. (2018). *Bee Saving Paper.* [online] Available at: https://beesavingpaper.com/ [Accessed 17 May 2019].

Beecology Project. (2019). *Native Pollinator Decline and Conservation The Ecological Perspective.* [online] Available at: https://beecology.wpi.edu/website/learn#section1 [Accessed 23 Jun. 2019].

Biodiversity A-Z. (2014). *Habitat degradation definition.* [online] Available at: http://www.biodiversitya-z.org/content/habitat-degradation [Accessed 25 Apr. 2019].

Biokids. (2019). *Kids' Inquiry of Diverse Species, Apis mellifera, honey bee: Information.* [online] Available at: http://www.biokids.umich.edu/critters/Apis_mellifera/ [Accessed 28 Aug. 2019].

Bone Structure. (2016). *5 Reasons why Steel Buildings Are Eco-Friendly.* [online] Available at: https://bonestructure.ca/en/articles/5-reasons-why-steel-buildings-are-eco-friendly/ [Accessed 8 Aug. 2019].

Bortolotti, L. and Costa, C. (2014). *Chemical Communication in the Honey Bee Society.* [online] Ncbi.nlm.nih.gov. Available at: https://www.ncbi.nlm.nih.gov/books/NBK200983/ [Accessed 13 Aug. 2019].

Bryant, R. (2013). *Honey bees can be trained to detect cancer "in ten minutes" | design.* [online] Dezeen. Available at: https://www.dezeen.com/2013/11/20/honey-bees-can-be-trained-to-detect-cancer-in-ten-minutes-says-designer-Susana-soares/ [Accessed 16 May 2019].

Buczynski, B. (2013). *5 Technologies That Could Help Save Bees.* [online] Care2 Causes. Available at: https://www.care2.com/causes/5-technologies-that-could-help-save-bees.html [Accessed 20 May 2019].

Butterfly Conservation. (2019). *Why butterflies matter.* [online] Available at: https://butterfly-conservation.org/butterflies/why-butterflies-matter [Accessed 28 Apr. 2019].

Cape Contours. (2018). *Living Green Walls | Artificial Green Walls.* [online] Available at: https://www.capecontours.co.za/living-green-walls/ [Accessed 8 Aug. 2019].

Carrington, D. (2018 A). *Humanity has wiped out 60% of animal populations since 1970, report finds.* [online] The Guardian. Available at: https://www.theguardian.com/environment/2018/oct/30/humanity-wiped-out-animals-since-1970-major-report-finds [Accessed 24 Apr. 2019].

Carrington, D. (2018 B). *Humans just 0.01% of all life but have destroyed 83% of wild mammals – study.* [online] The Guardian. Available at: https://www.theguardian.com/environment/2018/may/21/human-race-just-001-of-all-life-but-has-destroyed-over-80-of-wild-mammals-study [Accessed 24 Apr. 2019].

Carrington, D. (2018 C). *What is biodiversity and why does it matter to us?.* [online] the Guardian. Available at: https://www.theguardian.com/news/2018/mar/12/what-is-biodiversity-and-why-does-it-matter-to-us [Accessed 26 Apr. 2019].

Carrington, D. (2019). *Plummeting insect numbers 'threaten collapse of nature'.* [online] The Guardian. Available at: https://www.theguardian.com/environment/2019/feb/10/plummeting-insect-numbers-threaten-collapse-of-nature [Accessed 26 Apr. 2019].

Carter, P. (2019). *Connected bees.* [online] Mi-idea.com. Available at: https://www.mi-idea.com/connected-bees [Accessed 20 May 2019].

Chang, J. (2013). *Saving Bees by Freezing Their Semen.* [online] ABC News. Available at: https://abcnews.go.com/Technology/bee-sperm-bank-prevent-colony-collapse-disorder/story?id=19403788 [Accessed 17 May 2019].

Clément, G. and Rahm, P. (2006). *Environ(ne)ment*. Milano: Skira.

Dempsey, L. (2010). *Montessori School - Laura Dempsey*. [online] *Cargocollective.com. Available at: https://cargocollective.com/lbd/MONTESSORI-SCHOOL [Accessed 12 Jun. 2019].*

Designboom. (2008). *Venice architecture biennale 08: japanese pavilion.* [online] Available at: https://www.designboom.com/architecture/venice-architecture-biennale-08-japanese-pavilion/ [Ac-cessed 18 Jun. 2019].

Designtex. (2019). *Casper™ Cloaking Technology by Designtex - See It To Believe It.* [online] Available at: https://www.casper-cloaking.eu/ [Accessed 8 Aug. 2019].

Eden Project. (2018). *What is pollination?.* [online] Available at: https://www.edenproject.com/learn/for-everyone/what-is-polli-

nation-a-diagram-for-kids [Accessed 27 Apr. 2019].

Eschooltoday. (2018). *What is an ecosystem?*. [online] Available at: http://eschooltoday.com/science/ecosystems/what-is-an-ecosystem.html [Accessed 24 Apr. 2019].

Etherington, R. (2007). *Aviary by Group8 with Guscetti & Tournier structural engineering.* [online] Dezeen. Available at: https://www.dezeen.com/2008/12/14/aviary-by-group-8-with-guscetti-tournier-structural-engineering/ [Accessed 28 Jul. 2019].

Frearson, A. (2011). *London Without Bees by Ben Kirk.* [online] Dezeen. Available at: https://www.dezeen.com/2011/06/28/london-without-bees-by-ben-kirk/ [Accessed 16 May 2019].

Frearson, A. (2011). *London 2012 Basketball Arena by Sinclair Knight Merz.* [online] Dezeen. Available at: https://www.dezeen.com/2011/06/14/london-2012-basketball-arena-by-sinclair-knight-merz/ [Accessed 28 Jul. 2019].

Frearson, A. (2012). *Olympic Shooting Venue by Magma Architecture.* [online] Dezeen. Available at: https://www.dezeen.com/2012/06/12/olympic-shooting-venue-by-magma-architecture/ [Accessed 28 Jul. 2019].

Frearson, A. (2016). *X Architects creates bird-watching facility at UAE nature reserve.* [online] Dezeen. Available at: https://www.dezeen.com/2016/05/21/x-architects-wasit-natural-reserve-sharjah-uae/ [Accessed 28 Jul. 2019].

Fullbloom Hydroponics. (2019). *Hydroponic Systems 101 | Learn The Basics of Hydroponics.* [online] Available at: https://www.fullbloomhydroponics.net/hydroponic-systems-101/ [Accessed 14 Aug. 2019].

Gillespie, C. (2018). *What Is the Life Span of a Honey Bee?.* [online] Sciencing. Available at: https://sciencing.com/life-span-honey-bee-6573678.html [Accessed 9 Aug. 2019].

Goudie, A. (2000). *Human impact on the natural environment.* 5th ed. Cambridge, Massachusetts: The MIT Press.

Hadley, D. (2019). H*ow Do Honey Bees Survive the Winter?*. [online] ThoughtCo. Available at: https://www.thoughtco.com/how-honey-bees-keep-warm-winter-1968101 [Accessed 1 Jul. 2019].

Harrison Atelier. (2016). *The Birds and the Bees Installation.* [online] Available at: http://www.harrisonatelier.com/the-birds-and-the-bees-installation [Accessed 25 May 2019].

Harry Potter Quotes:

Colyard, K. (2018). *21 Harry Potter Quotes To Use As Your Insta Caption On The 20th Anniversary.* [online] Bustle. Available at: https://www.bustle.com/p/21-harry-potter-quotes-to-share-on-the-20th-anniversary-of-sorcerers-stone-11471889 [Accessed 5 Jul. 2019].

McGrath, J. (2018). *The 40 Best Harry Potter Quotes We'll Never Forget.* [online] Teen Vogue. Available at: https://www.teen-vogue.com/gallery/best-harry-potter-quotes [Accessed 5 Jul. 2019].

Hecker Nursery. (2019). *Top 10 plants for attracting butterflies to your garden.* [online] Available at: http://heckers.co.za/top-10-plants-for-attracting-butterflies-to-your-garden/ [Accessed 13 Aug. 2019].

Hinde, N. (2017). *Life Without Bees: Gifs Show How Meals Could Be Affected By Declining Insect Population.* [online] Huffington Post. Available at: https://www.huffingtonpost.co.uk/entry/what-meals-would-look-like-without bees_uk_589d7e6de4b03df370d518f0?-guccounter=1&guce_referrer=aHR0cHM6Ly93d3cuZ29vZ2xlLmN-vbS8&guce_referrer_sig=AQAAAIzoMo9zGF3o14UDeMEtUu1XA-zBsS8oDoo6b_4OgVdmMk43ne0ta6UOgypSKawLkD0O3HTXfPu-wcnLyGZ6Ki8HifbFaNTMJQlH1Me_dKSr1AhhpvpOWbQNqG-pHgH-Vx5HVflapGrfVX3gapCYBbrbNWnDiB42kHswQrZP72DG_Vw [Accessed 20 Mar. 2019].

Hitti, N. (2018). *Matilde Boelhouwer designs artificial flowers to feed urban insects.* [online] Dezeen. Available at: https://www.dezeen.com/2018/11/12/matilde-boelhouwer-artificial-flowers-feed-urban-insects/ [Accessed 16 May 2019].

Hodgson, L. (2017). *Colors butterflies see.* [online] Laidback Gardener. Available at: https://laidbackgardener.blog/tag/colors-butterflies-see/ [Accessed 30 Jul. 2019].

Howarth, D. (2014). *Snøhetta entices bees to Oslo with honey-coloured Vulkan Beehives.* [online] Dezeen. Available at: https://www.dezeen.com/2014/08/27/snohetta-vulkan-beehives-wooden-hexagons-mathallen-oslo/ [Accessed 16 May 2019].

Home Insulations. (2018). *Rain Water Harvesting and Storage Tanks.* [online] Available at: https://www.homeinsulations.co.za/renewable/rainwater-harvesting-storage-tanks/ [Accessed 14 Aug. 2019].

Home Insulations. (2019). *Solar Panels.* [online] Available at: https://www.homeinsulations.co.za/renewable/solar-panels/ [Accessed 14 Aug. 2019].

Huh, E. (2019). *Honey Bees.* [online] Behance. Available at: https://www.behance.net/gallery/23179019/Bee-Infographic [Accessed 9 Aug. 2019].

Inked in black. (2011). *Thursday Feature: Junya Ishigami.* [online] Available at: https://inkedinblack.wordpress.com/tag/japanese-pavilion-venice-biennale-2008/ [Accessed 18 Jun. 2019].

Ipbes. (2019). *The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services on pollinators, pollination and food production.* [online] Available at: https://www.ipbes.net/system/tdf/downloads/pdf/ipbes_4_19_annex_ii_spm_pollination_

en.pdf?file=1&type=node&id=28363 [Accessed 27 Apr. 2019].

Iron Shell. (2019). *Ferrock.* [online] Available at: https://www.ironshellmaterials.com/ferrock [Accessed 8 Aug. 2019].

Joachim, M. (2019). *Monarch Butterfly Sanctuary.* [online] Terreform.org. Available at: http://www.terreform.org/projects_butterfly.html [Accessed 27 May 2019].

JoJo. (2019). *Water Storage Solutions: Rainwater Harvesting Above Ground.* [online] Available at: https://www.jojo.co.za/water-storage-solutions/water-storage-solutions-rainwater-harvesting-above-ground/ [Accessed 14 Aug. 2019].

Kearney, L. (2016). *How the Butterfly Can Shape an Ecosystem and Why We Need to Protect Them.* [online] One Green Planet. Available at: https://www.onegreenplanet.org/environment/how-the-butterfly-can-shape-an-ecosystem-and-why-we-need-to-protect-them/ [Accessed 22 Jun. 2019].

Kiedaisch, J. (2019). *The Staggering Worldwide Decline of Insects Is a Warning of Ecosystem Collapse.* [online] Popular Mechanics. Available at: https://www.popularmechanics.com/science/environment/a26323324/insect-population-ecosystem-collapse/ [Accessed 26 Apr. 2019].

Kleinman, Z. (2016). *Can tech keep the world's bees buzzing?*. [online] BBC News. Available at: https://www.bbc.com/news/business-37386490 [Accessed 20 May 2019].

Kloof Conservancy BioGuide. (2018). *Kloof Conservancy BioGuide - Broad Bordered Grass Yellow*. [online] Available at: https://bioguide.kloofconservancy.org.za/entry.php?commonname=Broad_Bordered_Grass_Yellow [Ac-cessed 28 Aug. 2019].

Magee, T. (2018). *Amazing ways technologists are trying to save the bees.* [online] Techworld. Available at: https://www.techworld.com/picture-gallery/tech-innovation/can-tech-save-bees-3683342/ [Accessed 20 May 2019].

Mason Bees. (2019). *Honey Bees versus Solitary Bees.* [online] Available at: https://masonbeesforsale.com/pages/honey-bees-versus-solitary-bees [Accessed 10 Aug. 2019].

Mairs, J. (2016). *Rasem Kamal proposes underground dwellings for Jordan's Wadi Rum.* [online] Dezeen. Available at: https://www.dezeen.com/2016/11/04/rasem-kamal-oppenheim-architecture-conceptual-subterranean-housing-wadi-rum-excavated-sanctuaries-jordan/ [Accessed 28 Jul. 2019].

Marvin, S. and Rutherford, J. (2017). *Artificial environments are turning the world outside in, but that's no way to save the planet.* [online] The Conversation. Available at: https://theconversation.com/artificial-environments-are-turning-the-world-outside-in-but-thats-no-way-to-save-the-planet-75511 [Accessed 25 Jun. 2019].

McCay, B. (2019). *Traditional approaches to conservation fail because they believe that nature is priceless, ecosystems services succeed because they believe they are not.* [online] Available at: https://www.academia.edu/17683204/Traditional_approaches_to_conservation_fail_because_they_believe_that_nature_is_priceless_ecosystems_services_succeed_because_they_believe_they_are_not._discuss_the_validity_of_this_statement [Accessed 4 Jul. 2019].

Mecenero, S. (2013). *Conservation assessment of butterflies of South Africa, Lesotho, and Swaziland.* Johannesburg: Saftronics (Pty) Ltd. and the Animal Demography Unit.

Mediated Matter. (2016). *Synthetic Apiary — Mediated Matter.* [online] Available at: https://mediatedmattergroup.com/synthetic-apiary [Accessed 16 May 2019].

Monarch-butterfly. (2018). *Migration of The Monarch Butterfly.* [online] Available at: https://www.monarch-butterfly.com/monarch-migration.html [Accessed 1 Jul. 2019].

Mr Stacky. (2018). *Hydroponics vs Soil – 10 Reasons.* [online] Available at: https://www.mrstacky.com.au/hydroponic-gardening-information/hydroponics-vs-soil/ [Accessed 14 Aug. 2019].

National Geographic Society. (2019). *Keystone Species.* [online] Available at: https://www.nationalgeographic.org/encyclopedia/keystone-species/ [Accessed 4 Jul. 2019].

No Soil Solutions. (2019). *What Is Nutrient Film Technique- NFT Hydroponics?*. [online] Available at: http://www.nosoilsolutions.com/nutrient-film-technique-nft-hydroponics/ [Accessed 14 Aug. 2019].

Organoid. (2016). *Surfaces - Organoid Technologies.* [online] Available at: https://www.organoids.com/en/products/surfaces/ [Accessed 8 Aug. 2019].

Ott, C. (2019). *The Buzz.ar Community Center / Eleena Jamil Architect.* [online] ArchDaily. Available at: https://www.archdaily.com/914221/the-buzr-community-center-eleena-jamil-architect?ad_medium=gallery [Accessed 16 Aug. 2019].

Pacheco, A. (2018). *Kuth Ranieri Architects transforms an abandoned roller coaster into an aviary in China.* [online] The Architects Newspaper. Available at: https://archpaper.com/2018/06/kuth-ranieri-architects-roller-coaster-aviary-china/ [Accessed 28 Jul. 2019].

Pearson, D. (2001). *New organic architecture.* Berkeley: University of California Press.

Plant Lust. (2018). *Plant lust - seriously simple search for plants.* [online] Available at: https://plantlust.com/ [Accessed 28 Aug. 2019].

Pullin, A. (1995). *Ecology and Conservation of Butterflies.* London, UK: Chapman & Hall.

Punwani, V. (2014). *Khan Academy - What is Coronary Artery Disease?*. [online] YouTube. Available at: https://www.youtube.com/watch?v=KmN0bIh7qyw [Accessed 27 Apr. 2019].

Queensland Government. (2016). *Impacts of erosion | Environment, land and water | Queensland Government.* [online] Available at: https://www.qld.gov.au/environment/land/management/soil/erosion/impacts [Accessed 27 Apr. 2019].

Rewilding Earth. (2018). *What is Rewilding?*. [online] Available at: https://rewilding.org/what-is-rewilding/ [Accessed 4 Jul. 2019].

Rewilding Europe. (2011). *What is rewilding?*. [online] Available at: https://rewildingeurope.com/what-is-rewilding/ [Accessed 4 Jul. 2019].

Reid, J. (2019). *Gardening for Butterflies.* [online] Pza.sanbi.org. Available at: http://pza.sanbi.org/sites/default/files/info_library/butterflies_1.pdf [Accessed 28 Aug. 2019].

Russell, G. (2018). *Can solar energy save the bees?*. [online] Phys.org. Available at: https://phys.org/news/2018-08-solar-energy-bees.html [Accessed 20 May 2019].

SANBI. (2018). *African honeybee.* [online] Available at: https://www.sanbi.org/animal-of-the-week/african-honeybee/ [Accessed 1 Jul. 2019].

Saatchi & Saatchi. (2018). *City Bees, 'Bee Saving Paper'*. [online] Available at: http://saatchi.com/en-us/work/bee-saving-paper/ [Accessed 17 May 2019].

Smart Solar Tech. (2019). *Rainwater Harvesting | South Africa | Rainwater Storage Tanks Guide.* [online] Available at: https://smartsolartech.co.za/rainwater-harvesting/ [Accessed 14 Aug. 2019].

Smart Solar Tech. (2019). *Solar Panels | South Africa | Types of Solar Panels.* [online] Available at: https://smartsolartech.co.za/solar-panels/ [Accessed 14 Aug. 2019].

Smith, A. (2018). *10 plants that repel bees and wasps.* [online] Ehrlich's deBugged Blog. Available at: https://www.jcehrlich.com/blog/10-plants-that-repel-bees-and-wasps/ [Accessed 13 Aug. 2019].

South Africa Environmental Observation Network. (2019). *Butterfly conservation gets wings with new atlas project — SAEON.* [online] Available at: http://www.saeon.ac.za/enewsletter/archives/2007/june-2007/butterfly-conservation-gets-wings-with-new-atlas-project [Accessed 26 Apr. 2019].

Spain, M. (2016). *How A Sperm Bank Is Saving Honey Bees.* [online] Knkx.org. Available at: https://www.knkx.org/post/how-sperm-bank-saving-honey-bees [Accessed 17 May 2019].

Templeton, G. (2014). *Ferrock: a carbon dioxide sponge that's harder than concrete.* [online] Geek.com. Available at: https://www.geek.com/news/ferrock-a-carbon-dioxide-sponge-thats-harder-than-concrete-1609410/ [Accessed 8 Aug. 2019].

Triviño, S. (2014). *Bio architecture*. Sant Adrià de Besós, Barcelona: Monsa.

True Nature Foundation. (2019). *What is rewilding?*. [online] Available at: https://truenaturefoundation.org/what-is-rewilding/ [Accessed 4 Jul. 2019].

University of Minnesota. (2019). *Carpenter Ants.* [online] Available at: https://extension.umn.edu/insects-infest-homes/carpenter-ants#where-they-live-104761 [Accessed 28 Aug. 2019].

Vidal, J. (2019). *The Rapid Decline Of The Natural World Is A Crisis Even Bigger Than Climate Change.* [online] Huffington Post. Available at: https://www.huffpost.com/entry/nature-destruction-climate-change-world-biodiversity_n_5c49e78ce4b06ba6d3bb2d44 [Accessed 26 Apr. 2019].

Waite, R. (2016). *Foster + Partners to overhaul London Zoo's Snowdon Aviary.* [online] Architects Journal. Available at: https://www.architectsjournal.co.uk/news/foster-partners-to-overhaul-london-zoos-snowdon-aviary/10014659.article [Accessed 28 Jul. 2019].

Watts, J. (2018). *Destruction of nature as dangerous as climate change, scientists warn.* [online] The Guardian. Available at: https://www.theguardian.com/environment/2018/mar/23/destruction-of-nature-as-dangerous-as-climate-change-scientists-warn [Accessed 24 Apr. 2019].

Willis, C. and Woodhall, S. (2010). B*utteflies of South Africa's National Botanical Gardens.* [online] SANBI. Available at: https://www.sanbi.org/sites/default/files/documents/documents/bioseries16butterfly.pdf [Accessed 28 Aug. 2019].

WSU Insider. (2018). R*esearchers create microparticles that could help save honey bees*. [online] Available at: https://news.wsu.edu/2018/04/09/microparticles-absorb-pesticide-save-honey-bees/ [Accessed 17 May 2019].

YouTube. (2013). *How coronary artery bypass graft (CABG) surgery is carried out.* [online] Available at: https://www.youtube.com/watch?v=vw6OKJu07NE [Accessed 27 Apr. 2019].

Yuan, L. (2016). *How MIT's Artificial Bee Lab Might Save the Honeybee.* [online] MOLD : Designing the Future of Food. Available at: https://thisismold.com/space/farm-systems/mit-synthetic-apiary-neri-oxman#.XTWi6_ZuJZU [Accessed 16 May 2019].

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Carrington, D. (2019). *Plummeting insect numbers 'threaten collapse of nature'.* [online] The Guardian. Available at: https://www.theguardian.com/environment/2019/feb/10/plummeting-insect-numbers-threaten-collapse-of-nature [Accessed 26 Apr. 2019].

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Aloe Maculate – edited by Author:
Aloe. (2018). [image] Available at: http://terpicg.pw/Hatiora-salicornioides-39Dancing-Bones39-Succulent-magic-t.html [Accessed 9 Apr. 2019].

Syringa Tree – edited by Author:
Syringa Tree. (2019). [image] Available at: https://www.cleanpng.com/png-flower-botany-botanical-illustration-clip-art-bota-713371/preview.html [Accessed 9 Apr. 2019].

Hilliardiella Oligocephala – edited by Author:
Hilliardiella Oligocephala. (2017). [image] Available at: https://darwinswitness.wordpress.com/2017/11/09/hilliardiella-oligocephala/ [Accessed 9 Apr. 2019].

Fern – edited by Author:
Prado, J. (2019). *Hypolepis.* [image] Available at: https://www.researchgate.net/figure/Holotype-of-Hypolepis-rugosula-subsp-pichi-sermolliana-FI-PS-part-II_fig2_257928993 [Accessed 9 Apr. 2019].

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Yellow Pansy – edited by Author:
Yellow Pansy Butterfly. (2019). [image] Available at: https://www.123rf.com/photo_44530044_exotic-yellow-pansy-butterfly-isolated-on-white-background-upper-wing-in-natural-color-profile.html [Accessed 9 Apr. 2019].

Broad-Bordered Grass Yellow Butterfly – edited by Author:
Martire, D. (2019). *Broad-Bordered Grass Yellow Butterfly.* [image] Available at: https://inpn.mnhn.fr/espece/cd_nom/458491?lg=en [Accessed 9 Apr. 2019].

Honey Bee – edited by Author:
Honey Bee. (2018). [image] Available at: https://www.nicepng.com/ourpic/u2a9o0i1o0t4u2i1_flying-bee-png-flying-honey-bee-png/ [Accessed 9 Apr. 2019].

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Host Plant – edited by Author:
Host Plant. (2019). [image] Available at: https://www.cleanpng.com/png-flower-botany-botanical-illustration-clip-art-bota-713371/preview.html [Accessed 6 Jul. 2019].

Water Splash:
Water Splash. (2019). [image] Available at: https://www.shutterstock.com/search/water+splash+sketches [Accessed 6 Jul. 2019].
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Nectar & Pollen Plant. (2019). [image] Available at: https://ijcnlp2008.org/explore/wildflower-clipart-wild-plant/ [Accessed 6 Jul. 2019].

Hive - edited by Author:
Bee Hive. (2019). [image] Available at: https://www.gettyimages.co.uk/photos/beehive?sort=mostpopular&mediatype=photography&phrase=beehive [Accessed 6 Jul. 2019].
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Vidal, J. (2019). *The Rapid Decline Of The Natural World Is A Crisis Even Bigger Than Climate Change.* [online] Huffington Post. Available at: https://www.huffpost.com/entry/nature-destruction-climate-change-world-biodiversity_n_5c49e78ce4b06ba6d3bb2d44 [Accessed 26 Apr. 2019].

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2 - Holzman, A. (2015). B*ee and pollinator research lab floor plan.* [image] Available at: https://www.parkbugle.org/bee-lab-breaks-ground-at-university-of-minnesota/ [Accessed 12 Jun. 2019].

3 - Archdaily (2017). *Bioprocess Innovation Center Floor Plans.* [image] Available at: https://www.archdaily.com/879329/bioprocess-innovation-center-clark-nexsen [Accessed 12 Jun. 2019].

4 - Archdaily (2011). *Sainsbury Laboratory Floor Plan.* [image] Available at: https://www.archdaily.com/154728/sainsbury-laboratory-stanton-williams [Accessed 12 Jun. 2019].

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Flower. (2019). [image] Available at: https://ijcnlp2008.org/explore/wildflower-clipart-wild-plant/ [Accessed 6 Jul. 2019].

Monarch Butterflies. (2019). [image] Available at: https://www.deviantart.com/madetobeunique/art/Monarch-Butterfly-Clipart-PNG-181725617 [Accessed 1 Jun. 2019].

Morris, J. (2016). *Bee Tube Homes.* [image] Available at: https://www.mercurynews.com/2015/09/30/bees-in-strange-places/ [Accessed 1 Jun. 2019].

Pintrest (2019). *Snowden Aviary.* [image] Available at: https://za.pinterest.com/pin/756534437376757461/?lp=true [Accessed 1 Jun. 2019].

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2 - Base Structures (2003). *Paignton Zoo Aviary.* [image] Available at: http://www.basestructures.com/portfolio/projects-case-studies/living-coasts-paignton-zoo/ [Accessed 27 Jul. 2019].

3 - Frearson, A. (2016). *X Architects Bird Watchers Facility.* [image] Available at: https://www.dezeen.com/2016/05/21/x-architects-wasit-natural-reserve-sharjah-uae/ [Accessed 28 Jul. 2019].

4 - Archdaily (2012). *Biopark Aviary.* [image] Available at: https://www.archdaily.com/301109/aviary-bioparque-temaiken-hamptonrivoiraarquitectos [Accessed 28 Jul. 2019].

5 - Pacheco, A. (2018). *Roller Coaster Aviary.* [image] Available at: https://archpaper.com/2018/06/kuth-ranieri-architects-roller-coaster-aviary-china/ [Accessed 28 Jul. 2019].

6 - Frearson, A. (2012). *London 2012 Olympic Games Shooting Venue.* [image] Available at: https://www.dezeen.com/2012/06/12/olympic-shooting-venue-by-magma-architecture/ [Accessed 28 Jul. 2019].

7 - Archdaily (2013). *The Serpentine Sackler Gallery.* [image] Available at: https://www.archdaily.com/433507/the-serpentine-sackler-gallery-zaha-hadid-architects?ad_medium=gallery [Accessed 28 Jul. 2019].

8 - Frearson, A. (2011). *London 2012 Basketball Arena.* [image] Available at: https://www.dezeen.com/2011/06/14/london-2012-basketball-arena-by-sinclair-knight-merz [Accessed 28 Jul. 2019].

9 - Architen Landrell (2013). *Serpentine Arthouse Pavilion*. [image] Available at: http://www.architen.com/projects/serpentine-

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Amazon (2019). *Bee House*. [image] Available at: https://www.amazon.com/KIBAGA-Mason-Bee-House-Productivity/dp/B078KLPS75 [Accessed 1 Jun. 2019].

Bee. (2018). [image] Available at: http://pngimg.com/imgs/insects/bee/ [Accessed 1 Jun. 2019].

Bee Brick. (2019). [image] Available at: https://www.notonthehighstreet.com/greenandblue/product/bee-brick-in-white-concrete [Accessed 1 Jun. 2019].

Beekeeping Hive. (2019). [image] Available at: https://www.almanac.com/news/beekeeping/beekeeping-101-types-of-beehives [Accessed 1 Jun. 2019].

Butterfly Home. (2019). [image] Available at: https://www.alibaba.com/product-detail/FSC-and-SEDEX-audited-bamboo-woven_60705848967.html [Accessed 1 Jun. 2019].

Chin, A. (2010). bioreboot. [image] Available at: https://www.designboom.com/architecture/bioreboot-the-architecture-of-rsien/ [Accessed 1 Jun. 2019].

Debczak, M. (2014). *Synthetic Flowers.* [image] Available at: http://mentalfloss.com/article/531026/these-fake-flowers-could-help-scientists-study-risk-bees [Accessed 1 Jun. 2019].

Handcrafted Bee Hotel. (2019). [image] Available at: https://www.notonthehighstreet.com/wuddl/product/handcrafted-honeycomb-solitary-bee-house [Accessed 1 Jun. 2019].

Hexagon Pattern. (2019). [image] Available at: https://videohive.net/item/white-hexagon-background/22643981 [Accessed 1 Jun. 2019].

Hitti, N. (2018). *Solitary Bee Homes*. [image] Available at: https://www.dezeen.com/2018/10/30/maliarts-refugio-shelters-bees-design/ [Accessed 1 Jun. 2019].

Hitti, N. (2018). *3D Printed Flower.* [image] Available at: https://www.dezeen.com/2018/11/12/matilde-boelhouwer-artificial-flowers-feed-urban-insects/ [Accessed 16 May 2019].

Joachim, M. (2019). *Monarch Butterfly Sanctuary Perspectives.* [image] Available at: http://onarch Butterfly Sanctuary. [online] Terreform.or [Accessed 1 Jun 2019].

Monarch Butterflies. (2019). [image] Available at: https://www.deviantart.com/madetobeunique/art/Monarch-Butterfly-Clipart-PNG-181725617 [Accessed 1 Jun. 2019].

New Atlas (2015). *Tube of bees*. [image] Available at: https://newatlas.com/beecosystem-beehive/39127/ [Accessed 1 Jun. 2019].

The Sun Hive. (2013). [image] Available at: https://www.losangelescountybeekeepers.com/blog/2013/4/4/the-sun-hive-experimental-natural-beekeeping.html [Accessed 1 Jun. 2019].

Toni, A. (2014). *Besswax*. [image] Available at: https://coolhunting.com/culture/ren-ris-bees-wax-sculptures/ [Accessed 1 Jun. 2019].

Sponge. (2019). [image] Available at: https://captainblankenship.com/products/sea-sponge [Accessed 1 Jun. 2019].

Figure 8.6: The cascading veil, amongst the blurred building forms - collage, and pollinator sketches by author. Additional images from:

Ferrero, L. (2019). *Silouettes of People*. [image] Available at: https://za.pinterest.com/pin/545709679825305922/?lp=true [Accessed 8 Aug. 2019].

Freepik (2019). *Flower Sketches.* [image] Available at: https://www.freepik.com/premium-vector/drawing-california-poppy-flowers_2124731.htm [Accessed 8 Aug. 2019].

Figure 8.9: Looking at nature through the beekeeper's veil - Collage by Author, with images from:

Bees. (2018). [image] Available at: http://pngimg.com/imgs/insects/bee/ [Accessed 1 Jun. 2019].

Flowing White Fabric. (2019). [image] Available at: https://www.videoblocks.com/browse/stock-video-footage [Accessed 8 Aug. 2019].

Monarch Butterflies. (2019). [image] Available at: https://www.deviantart.com/madetobeunique/art/Monarch-Butterfly-Clipart-PNG-181725617 [Accessed 1 Jun. 2019].

Shutterstock (2019). *Silhouettes of People.* [image] Available at: https://www.shutterstock.com/search/man+silhouette+standing [Accessed 8 Aug. 2019].

Water Colour Trees. (2019). [image] Available at: https://pngio.com/PNG/32743-watercolor-tree-png.html [Accessed 10 Aug. 2019].

Figure 8.14: Heydar Aliyev Centre

Archdaily (2013). *Heydar Aliyev Center Perspectives.* [image] Available at: https://www.archdaily.com/448774/heydar-aliyev-center-zaha-hadid-architects?ad_medium=gallery [Accessed 30 Aug. 2019].

Figure 8.15: Vilhelmsro Primary School

Designboom (2019). *Vilhelmsro Primary School Perspectives.* [image] Available at: https://www.designboom.com/architecture/big-architects-vilhelmsro-primary-school/ [Accessed 30 Aug. 2019].

Figure 8.16: Bosjes Chapel

Archdaily (2017). *Bojes Chapel Perspectives.* [image] Available at: https://www.archdaily.com/867369/bosjes-chapel-steyn-studio [Accessed 30 Aug. 2019].

Figure 8.17: Spidernethwood

Archdaily (2008). *Spidernethewood Perspectives.* [image] Available at: https://www.archdaily.com/1878/spidernethewood-rsien [Accessed 25 May 2019].

Figure 8.18: Buzz.ar Community Centre

Ott, C. (2019). *The Buzz.ar Community Center Perspectives.* [image] Available at: https://www.archdaily.com/914221/the-buzr-community-center-eleena-jamil-architect?ad_medium=gallery [Accessed 30 Aug. 2019].

CHAPTER 09

Figure 9.1: The Earth and The Galaxy

Shutterstock (2017). *The Earth and The Galaxy.* [image] Available at: https://www.hdwallpapers.in/galaxy_earth-wallpapers.html [Accessed 28 Aug. 2019].

ACCURACY & VALIDITY OF ONLINE SOURCES

*Excluding precedent sources, peer-reviewed sources, government websites and product websites.

Carolina was founded by Dr Thomas E. Powell, a geology and biology professor of Elon University. Having partnered with NASA, doctors and schools across America, Carolina has become a worldwide and trusted leading supplier of science teaching materials. Their staff include members who both formerly and currently work in the field of science. The selected article tilted *Bees, Butterflies, and Flowers* was written by Brent Atkinson, a biomedical product development consultant, who studied at Columbia University. The information provided by this company's website can thus be considered both trustworthy and valid as the information published is written by people educated in the field of science and biology, who have both the experience and knowledge.

Base Structures is a tensile architecture firm based in the United Kingdom. Having worked not only in the UK but also with projects in America, France, Denmark, Brazil and Iraq, Base Structures has established itself as leading contractors for complex tensile architecture. The information provided by this firm, with regards to tensile architecture and its required materials, can thus be considered both trustworthy and valid due to their years of experience and expert knowledge.

The Beecology Project was founded by Dr Robert Gegear as a means to increase ecological knowledge of pollinators, in order to develop effective conservation and restoration strategies for threatened species. Dr Robert Gegear is an assistant professor for the Department of Biology at the University of Massachusetts Dartmouth, who studies animal sensory and cognitive systems within the contexts of evolutionary ecology and conservation biology. The Beecology Project is backed by the National Science Foundation. With all this in mind, one can take the information provided by this source, with regards to pollinator decline, to not only be accurate but also reliable.

The definition of habitat degradation, provided by **Biodiversity A-Z** is accepted as being accurate and trustworthy as Biodiversty A-Z compiles the information depicted on its website from various sources including the official documents of international conventions, academic publications and reports from a number of relevant international organisations. The information depicted on this site is both written and reviewed by experts in the relevant

fields before being published. In addition, Biodiversity A-Z is also affiliated with The UN Environment Programme World Conservation Monitoring Centre. This centre is a world leader in biodiversity knowledge and similarly to Biodiversity A-Z, works with scientists and policy makers all over the world. This association adds an additional level of prestige and accreditation to the validity of the work published on Biodiversity A-Z.

BioKIDS is an educational research group aimed at improving biology and science learning throughout schools, particularly those located in high-poverty, urban areas. BioKIDS consists of various members with educational and science degrees, such as Phil Myers who is a Professor in the Department of Ecology and Evolution at the University of Michigan and Doctor Tricia Jones, who has a Ph.D. in Educational Technology from the University of Michigan. The author and editor of the selected article is George Hammond, who has a Master of Science degree in Biology from the University of Michigan and has done both filed research with insects and over 10 years of undergraduate teaching experience. BioKIDS is thus able to provide accurate and valid information with regards to the information published on their website, due to the expert knowledge provided by their educated and qualified members.

BONE Structure consists of over sixty architects, engineers, industrial designers and interior designers and focus on steel construction. BONE Structure create high-performance homes through a patented steel construction system, produced through an industrialized process inspired by the aerospace industry, producing minimal waste. In addition to the large number of educated members, BONE Structure is a member of the builder's association across Canada and has won numerous awards including the 2008 Contech Innovative technologies trophy and The Dunamis Award for innovation and sustainability. Together with the large number of educated members, years or experience and professional accreditation and acknowledgment, one can accept the information on steel construction, provided by BONE Structure, to be both accurate and trustworthy.

Butterfly Conservation, as an organisation, aims to improve the dire consequences facing butterflies and moths on a global scale. This organisation is the world's largest research institute for butterflies and moths and consists of over 31000 members, including 80 highly qualified scientist, with Sir David Attenborough existing as the president of this organisation. Sir David Attenborough has been at the forefront of global conservation for more than 60 years. This level of prestige and knowledge together with the expertise of their educated members allows one to accept the information published by Butterfly Conservations as being accurate and valid.

Contours Landscapes is a landscaping firm with over 14 years of experience and was awarded the SALI gold award of excellence in 2018. They have carried out over 700 projects and won 22 awards. Thus the information provided by Contour Landscapes, with regards to various planting methods and living green walls, can be considered to be both trustworthy and accurate, due to their expert knowledge and years of experience.

The Guardian is a British daily newspaper founded in 1821 and is world renowned and the same can be said for their Online edition. The articles selected from The Guardian Online edition are written both by Damian Carrington, the environment editor for the Guardian and John Watts, the global environment editor for the Guardian. Damian Carrington has a PhD and post-doc research in geology from Edinburgh University and has written over 2000 stories for the Guardian since his start in 2008. Damian's education together with his and John Watts's years of experience in the world of climate change and environmental issues allows for their work to be considered both accurate and trustworthy.

The Eden Project is a botanical garden consisting of two biomes of plants collected from many diverse climates and environments and aims to demonstrate the importance of plants in humanitY's survival. As a project with a botanical garden focus, the Eden Project conducted extensive research and sought out advise from multiple individuals educated in various fields of botany, entomology and biology in order to create biomes that would survive both naturally and through human intervention. This necessity, in addition to being a place of plant education, ensures that the definition of pollination provided by the Eden Project's website can be considered accurate.

Sciencing, started out as a trusted math textbook and then developed into an online platform providing the latest news in the world of math, science, biology and nature. The team at Sciencing consist of writers with degrees from molecular and cellular biology to degrees in chemistry. The selected article, titled *What is the Life Span of a Honey Bee*, was written by Claire Gillespire. Claire is a writer and editor with 18 years of experience, and together with writing articles for Sciencing, she has also written for Reader's Digest and Health Central. Claire's years of experience and gained knowledge, together with the educated editorial and writing staff of Sciencing, allows the information published on this company's website to be considered both trustworthy and valid as the information published is written by people educated in the field of science and biology, who have both the experience and knowledge.

With over 20 years of experience and numerous education awards, **ThoughtCo** is a website focused on creating education driven content. ThoughtCo produces content from science and math to religion and architecture, written by writers, experienced instructors and experts relevant to the chosen field. The selected article, titled *How Honey Bees Keep Warm in Winter*, was written by Debbie Hadley. Debbie has over 25 years of science education experience and has written entomology-based articles for over

a decade. In addition, to her experience, Debbie has a degree in political sciences, a background in marine science and has volunteered for 13 Earthwatch programmes. Earthwatch is a non-profit environmental organization uniting scientists and individuals for global betterment. Her level of experience, together with her expert knowledge ensures that the information published on ThoughtCo, is both accurate and trustworthy.

Laidback Gardener is a blog run by Larry Hodgson, who has over 30 years of experience in the world of horticulture. His career includes editor-in-chief of HousePlant Magazine, Fleurs, Plantes et Jardins and Houseplant Forum Magazine, all of which are renowned and respected gardening magazines. He has written over 50 books about various horticulture topics including The Garden Lover's Guide to Canada, Complete Guide to Houseplants and Houseplants for Dummies. His dedication to gardening and plants has allowed him to learn a lot about pollinators and their interaction with various plants and flowers. The information provided by Larry Hodgson with regards to pollinators and their interaction with flowering plants can thus be considered both trustworthy and valid due to his years of experience and expert knowledge.

Founded in 1990 **Home Insulations** has established itself as a leading and trustworthy insulation installer and supplier, with offices in Johannesburg, Pretoria and the Western Cape. Home Insulations currently has over 25 years of experience, 22 780 completed projects and 28 employed skilled professionals. Their experience and acquired knowledge ensures that the information published on their website is both accurate and trustworthy.

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) is an independent intergovernmental body, established by United Nation members in 2012. The aim of IPBES is to strengthen the science-policy interface for biodiversity and ecosystem services for the conservation and sustainable use of biodiversity, long-term human well-being and sustainable development. With over 100 government members and a continued growing membership of experts, IPBES has established itself as a body responsible for providing a high level of expert driven knowledge that is both accurate and credible.

Iron Shell Material Technologies was founded by Doctor David Stone. Doctor David Stone studied environmental iron chemistry at the University of Arizona and is the creator of Ferrock. He has spent 8 years doing various field tests, along with the assistance and advisement of Dr Narayanan Neithalath. Doctor Neithalath is a Professor in the School of Sustainable Engineering and the Built Environment at Arizona State University. He is also Senior Sustainability Scientist in the Julie Ann Wrigley Global Institute of Sustainability. Due to the level of expert knowledge and skill, together with Iron Shell Material Technologies' founder having developed Ferrock the information on this company's website about Ferrock, can be accepted as both accurate and trustworthy.

Popular Mechanics Magazine, together with its Online edition, provides their audience with latest news spanning a wide range of topics from the automotive industry and technology to science and outdoor spaces. Since 1902 Popular Mechanics publishes work with the aim of explaining how the world works and does so by ensuring the writers of such articles are well versed in the subject matter and have the necessary skills and credentials. The selected article titled *The Staggering Worldwide Decline of Insects Is a Warning of Ecosystem Collapse*, was written by Jill Kiedaisch. Jill is a regular contributor to Popular Mechanics and graduated with a BA in Environmental Science from Middlebury College and is thus well versed in issues facing the environment. Together with Jills credentials and the prestige of Popular Mechanics the information presented in the selected article can be accepted as valid, accurate and reliable.

The British Broadcasting Company (BBC) news division is world renowned and valued for its high factual reporting due to proper sourcing of information. The selected article titled *Can tech keep the world's bees buzzing,* was written by Zoe Kleinman. Zoe Kleinman is a BBC Presenter & Senior Reporter, specialising in technology and business, with years of experience reporting on technological innovations. Kleinmans's experience together with BBC's proper sourcing of information, allows the information presented in the selected article to be understood as both factually accurate and dependable.

The Kloof Conservancy BioGuide serves as an Online reference site and mapping project aimed at improving peoples experience of the Krantzkloof Nature Reserve. This project and the online information it provides' is done so to educate people on topics of biodiversity through easy-to-use technology. The Kloof Conservancy was founded in 1993 in order to promote environmental awareness and increase conservation efforts throughout South Africa. The years of experience has allowed the Kloof Conservancy members to garner important, first-hand knowledge on the lives of butterflies, allowing the information published on this website to be both accurate and reliable.

Techworld has been a leader in technology publishing for more than a decade and exists as a digital platform providing the latest news and opinions on technological innovations. Techworld analyses these innovations providing expert advice on various topics, ranging from mobile apps to cyber security. As a subsidiary of IDG (the world's leading technology media, marketing and data services company) Techworld's articles carry with them a high level of status and ensured accuracy with regards to the chosen content.

Mason Bees for Sale is an online shop that specialise in bee related products, from nesting materials and bee houses to live mason

bees for agricultural purposes, along with providing information on bees from becoming a beekeeper to the qualities of both solitary and honeybees. Years of professional experience and the required knowledge that is required to work with live bees, ensures that the information provided on this website, regarding the characteristics and lifestyles of bees, can be regarded as being both truthful and reliable.

The Conversation is a non-profit, organisation and exists as an independent source of news from various academic and research communities. The Conversation consists of a team of professional editors who work closely with university and research experts to compile their knowledge in an easy to read and accessible format. Some of their affiliations include The University of Sheffield (UK), Pretoria University and The University of Cape Town.

The selected article tilted *Artificial environments are turning the world outside in, but that's no way to save the planet*, was written by Simon Marvin and Jonathan Rutherford. Simon Marvin is the director of the Urban Institute at The University of Sheffield and has contributed considerably to major issues within the urban and planning realm, addressing important research around sustainability and ecological security, to name a few. Jonathan Rutherford is a visiting research fellow at The University of Sheffield, whose research focuses on infrastructure and urban technology. Together these writers, with their levels of expert knowledge and years of experience, along with the professional editors of The Conversation, ensure that the information presented not only in this article but on The Conversation's website is both reliable and valid.

Mr Stacky is a hydroponic planting company who is invested in approaching the ideas of food production in urban areas from a new perspective. This company's mission is to align food production with charitable causes to establish and develop communities and provide food security to vulnerable and underprivileged communities, all while educating people on the benefits of hydroponics. Mr Stacky's specific expertise in the filed of hydroponics, (which has allowed the company to flourish and succeed) allows for the information published on the companies website, about the pros and cons of hydroponics versus traditional growing methods, to be regarded as valid and reliable.

The National Geographic Society is a globally recognised organisation dedicated to exploring and defending the planet we, as humanity, call home. As an organisation they fund hundreds of research and conservation projects globally and have established themselves as a globally trusted and credible institution in the areas of science, education and exploration. It is because of this status and the years of experience and knowledge of their educated members that the information on key stone species, provided by their website, can be regarded as precise and truthful.

No Soil Solutions is a blog-like website set up by a garden enthusiast turned hydroponic expert, who uses his blog to exhibit his experience in hydroponics and provide valuable information on the aforementioned subject matter, based on his many years of practical experience. This invaluable knowledge gained though years of practical experience allows the information provided on this website, about hydroponic growing systems, to be regarded as both accurate and trustworthy.

Khan Academy is a non-profit, online educational organisation with the goal of providing quality education on an online platform through practice exercises and instructional videos. Khan Academy covers various subjects such as math, science and history, with the material produced for these courses being created by educated individuals, with degrees and practical experience in the required field. Since Khan Academy's videos are created by experienced and educated individuals one can trust the information produced by Khan Academy and accept it as being accurate and reliable.

The Rewilding Earth Institute was founded by Dave Forman, an American environmentalist and was established as an organisation to develop and promote ideas of conservation in North America. This organisation consists of a large number of influential scholars, activists and conservationists in the rewilding field with years of practical experience and professional expertise. This organisations website provides essential information about rewilding and conservation efforts currently being carried out across America. The years of experience coupled with the expertise of the organisations members, ensures that the information published on this website is both reliable and valid with regards to rewilding and nature conservation.

Rewilding Europe is a non-profit organisation, registered in the Netherlands and aims to create more places across Europe for nature to flourish and return to its natural process, currently overseeing eight large rewilding projects across Europe. Frans Schepers, the managing director and co-founder of Rewilding Europe, has over 30 years of professional experience in developing conservation strategies, species conservation, ecological networks and working in the field of rewilding. With a degree in forestry, land and water management, Schepers has had various conservation and nature based jobs, from working as a conservationist in the Dutch Government to working for the World Wildlife Fund for 14 years, with an interest in rewilding natural landscapes and providing the opportunity for nature and wildlife to bounce back in an environment that benefits all. Together with Schepers professional experience and knowledge, Rewilding Europe has established itself as trusted and formidable member in the fight against environmental collapse and rewilding projects, which is the reason why the information provided by Rewilding Europe on the topic of rewilding, can be considered both valid and accurate.

The South African National Biodiversity Institute (SANBI) is branch of the Department of Environmental Affairs and exists as an organisation who coordinates and leads research and monitors and reports on the state of biodiversity in South Africa. SANBI contributes to South Africa's sustainable development by enabling access to biodiversity data and generates information and knowledge based both on their research conducted and expertise of their expert members. Affiliated with The Botanical Society of South Africa, The National Research Foundation and The World Wildlife Fund, to name a few, SANBI has established itself as a leader in the exploration and exhibition of South Africa's unique Biodiversity. It is because of SANBI's prestige, expertise of their members and the wealth of knowledge that they both procure and produce that one can accept the information published under SANBI, with regards to the environment and pollinators, to be both reliable and correct.

Smart Solar Tech is a solar and renewable energy company located in South Africa, specialising in solar technology, insulation, roofing and rainwater harvesting. With expertise in solar technology and rainwater harvesting, together with over 5 years of practical experience in the South African climate, the information provided by Smart Solar Tech with regards to solar panels and rainwater harvesting in South Africa, can be regarded as both valid and accurate.

Phys Org is a branch of Science X, a leading online science, technology and research news service. Science X was founded in 2004 by two PhD students, with the aim of publishing science related news for educated and informed readers and covers a full range of topics from medicine and biology to nano-technology and engineering. Science X writers and editors include members with degrees from bio-chemistry too nano-engineering, ensuring that the articles published include accurate and trustworthy information, with relevance to what is happening in the world of science. One such member, the author of the selected article titled *Can Solar Energy Save The Bees*, is Argonne National Laboratory. Argonne is a renowned multidisciplinary engineering and science research centre, where leading researches and scientists work together to answer some of society's greatest questions. Working in tandem with universities, leading science industries and national laboratories. Argonne strives to improve the environment and society through its innovations. Considering both the level of knowledge and prestige surrounding both Science X and Argonne, the information provided by Phys Org, with regards to solar energy and bees, can be accepted as both valid and reliable.

Ehrlich is a pest control company founded in 1928, and after 85 years of professional experience, today includes over 750 pest control specialists. Ehrlich makes us of an in-house research and development team along will skilled and experienced entomologists. With their many years of experience and professional expertise one can trust the information provided by Ehrlich on plants favoured by bees, to be both trustworthy and accurate.

The True Nature Foundation leads and supports various conservation and ecological restoration efforts, efforts that benefit both people and their environment. With their headquarters in the Netherlands and branches in Germany, Spain, Portugal, Ukraine and Romania, together with their educated team who have backgrounds in life sciences, genetics, endangered species and protected area management, the True Nature Foundation can be understood as having expert knowledge and valid opinions when it comes to issues on the environment. This level of expert knowledge coupled with their years of experience allows the information published on their website, about the environment and related issues to be considered both accurate and trustworthy.

The Huffington Post is an American news and opinion blog which launched in 2005. The Huffington Post works on the ideology of putting people first, writing stories that they believe their readers are interested in, considering the curiosity and needs of their readers. The Huffington Post strives to be accurate and transparent in their reporting, ensuring a fair and independent analysis of the facts and being thorough with their sourcing. In addition, this publication aims to ensure accuracy in their reporting by collaborating information via multiple sources. This level of fact checking and sourcing of information allows one to understand the articles published by The Huffington Post to thus be accurate and reliable. Moreover, the selected article, tilted *The Rapid Decline of The Natural World Is A Crisis Even Bigger Than Climate Change,* was written by John Vidal, who has written for various publications, including serving as the environment editor for the Guardian newspaper for 27 years. The Huffington Post's prestige and rigorous fact checking, together with Vidal's experience in the realm of environmental issues ensures that the information published in the selected article can be accepted as both valid and trustworthy.

10

"Until the very end."

- James Potter, The Deathly Hallows

APPENDIX

EXPLAINED

_This chapter includes additional documentation ,
specifically ethical clearance and a plagiarism report.

ETHICAL CLEARANCE

[redacted]

SCHOOL OF ARCHITECTURE AND PLANNING
HUMAN RESERCH ETHICS COMMITTEE

SCHOOL OF ARCHITECTURE & PLANNING

CLEARANCE CERTIFICATE
PROTOCOL NUMBER: SOAP033/03/2019

PROJECT TITLE:	Expecto Patronum: Protecting the irreplaceable by creating a Bio-sanctuary to cultivate and sustain South Africa's endangered pollinator species
INVESTIGATOR/S:	Kyle Eldery (Student No: 731523)
SCHOOL:	Architecture and Planning
DEGREE PROGRAMME:	Masters of Architecture Professional (MArch Prof)
DATE CONSIDERED:	12 July 2019
EXPIRY DATE:	12 July 2020
DECISION OF THE COMMITTEE:	Approved

CHAIRPERSON B C Boshoff
(Dr Brian Boshoff

DATE: 16/7/19

cc: Supervisor/s: Kirsten Doermann

DECLARATION OF INVESTIGATORS
I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to endure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee.

Signature Kyle Eldery **Date** 18 July 2019

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The year is 2080. As I breathe in the morning air, I cringe as it feels stale, different. Breakfast has become a bland array of discontent, no coffee, no fruit, just a slice of bread. As the water passes through the filter, before it enters my glass, I look outside, this world looks so different now. An array of brown and grey seem to blur together, the sun almost engulfed by smog. This world looks so different now. We were warned. We didn't listen. One by one the creatures we saw as pests fell, and as they did, so did our natural world. But we still had a few trees, we thought that was enough. We thought nature could recover. We thought wrong. This world looks so different now...

INTRODUCTION

Will the butterfly become the unicorn of our children's generation? Will the bee fall into the category of the dinosaur, the once existed, the now extinct? Will there even be an earth for future generations? This thesis aims to explore the proposal of an artificial environment to sustain and cultivate South African endangered bee and butterfly species, who are vital to the survival of nature's ecosystems and by virtue all living things on earth. This thesis will explore this idea with the overarching question, can architecture work in tandem with nature, above and beyond sustainable design, in a way that allows the built form to cultivate and strengthen South Africa's ecosystems, by creating an artificial bio-sanctuary for South Africa's endangered pollinator species? In addition, this section will explore the reasons butterflies and bees are disappearing, their role as pollinators, illustrating their contribution to ecosystems and society and the consequences that would result if they were to become extinct. This section will also investigate what an artificial environment is and the possible programmatic structure of the proposed artificial environment, and how it can contribute to the aim of cultivating pollinator species and endangered plants, while spreading awareness and promoting research.

According to a study published by the World Wildlife Fund, humanity has wiped out 60% of all animal species since 1970 and at least half of all plants that once existed (Carrington, 2018 A). Equating this to 60% of human population loss would be equivalent to losing every person in North America, South America, Europe, China, Africa and Oceania (figure 2.2), a number that frankly seems unimaginable. Despite representing only 0.01% of all life on earth (figure 2.3), humans have contributed the most to the destruction of the natural world (Carrington, 2018 B). Nature consists of a complex network of systems interacting with one another, systems that have survived for billions of years, webs of connections between all living things. These webs and connections form our ecosystems, which are the foundation of the biosphere (all living things on earth) and ultimately determines and controls the health of our planet (Escheoltoday, 2018). Our destruction of nature, is causing species at the centre of these ecosystems (pollinators) to die, causing these ecosystems to collapse, hindering natures ability to provide food, water and security to billions of people (Watts, 2018). According to the most comprehensive biodiversity study in more than a decade, natures continued demise has and will continue to result in a catastrophic loss of biodiversity (Watts, 2018), which ultimately threatens humanity's future survival.

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