Exploring Nature's Curiosity Cabinet

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When I was a professor and dean at BYU, I received in my office in the Maeser Building a small red envelope. The return address was marked The Royal Palace, Stockholm. Inside was a note signed by King Carl XVI Gustaf of Sweden announcing that for his fiftieth birthday, the Royal Swedish Academy of Sciences had given him the opportunity to appoint a visiting professor to a chair named in his honor. I was stunned to open this letter and read that I was his choice. I did not even know that I was under consideration for anything.

I showed the letter to Merrill J. Bateman, the president of BYU at the time.

He said, "Well, you had better go."

My family and I packed our suitcases and moved to Uppsala, Sweden. After we had arrived, a palace official told me that I should prepare a special inaugural lecture for King Carl XVI Gustaf and Queen Silvia in a lecture hall in Uppsala. He opined that I probably didn't know many people in Sweden. Was there anyone special I would like to invite? I told him that in addition to my colleagues at the Swedish Biodiversity Center, I had approximately seventy friends in Uppsala. At my inaugural lecture, many members of the Uppsala Branch of the Church met, for the first time, their own monarchs.

In addition to the Royal Palace in Stockholm, I was able to visit other historic castles and gardens throughout Sweden. At Skokloster Castle, on a beautiful lake south of Uppsala—which I visited with my former BYU postdoctoral fellow Dr. Thomas Elmqvist and his wife, orthopedic surgeon Dr. Eva Pontén—I asked permission to go up in the castle's attic. There I spied a large and ornate but dusty wardrobe. It was a curiosity cabinet, housing special collections of natural history. Assembling such curiosity cabinets was the rage among seventeenth-century monarchs and aristocrats.

Curiosity cabinets emerged as compact versions of small rooms containing natural history specimens, books, paintings, and other curious

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things. One of the earliest illustrations of such a room is found in Ferrante Imperato's 1599 book *Dell'Historia Naturale.* A drawing shows drawers containing pressed flowers and seashells and depicts—of all things—a stuffed crocodile affixed to the ceiling.

The frontispiece to the 1655 Danish book *Ole Worm's Cabinet of Wonder: Natural Specimens and Wondrous Monsters* (and we wonder where J. K. Rowling got her ideas from) depicts mineral, plant, and animal specimens. The engraving is complete with what may be the first illustration of a robot—a machine that is dressed as a man—that had a wheel that could be turned to make it wander around the room. It appears to me to be dressed in what could be a Sami costume from Lapland. In England, a curiosity cabinet purchased in 1702 from William Courten by the popularizer of milk chocolate, Sir Hans Sloane, provided the genesis of the collections currently housed at the Natural History Museum in London.

When I approached this dusty wardrobe at Skokloster Castle, much to the curator's amazement, I opened the swinging doors at the top and the drawers in the side and bottom and found dried plants, seashells, and a multitude of other natural curiosities. There was also a double coconut, the seed of the palm species *Lodoicea maldivica,* which grows only in the islands of the Seychelles in the Indian Ocean.

Anciently, double coconuts—which are the largest seeds in the world—would wash up on beaches. Their origin was shrouded in mystery. Some said that these double coconuts must be relics from the Garden of Eden. Since God had pronounced the garden good, they believed that no beverage or food served from double coconut shells could possibly poison the recipient. Hence, double coconuts were highly sought by European monarchs.

To my mind, our planet resembles a gigantic curiosity cabinet, with wonders to be found in every nook and cranny. Today I would like to explore with you a few items from nature's curiosity cabinet. Some of these may also provide solutions to our modern problems.

Drawer One: *Pediocactus despainii*

In the San Rafael Swell desert in Utah is found a remarkable plant, *Pediocactus despainii.* This small cactus spends almost its entire life hidden underground. In what poet e. e. cummings termed "just-spring,"[1] *Pediocactus* pushes itself up above the soil surface, producing exquisite cantaloupe-colored petals. After pollination and seed production, the cactus then retreats again underground, where it spends the remainder of the year hidden beneath the soil. Over centuries, these cacti have continued their annual excursions up to the surface and then back down again. I don't know if they were ever observed by the early Native Americans or pioneers, but my hat is off to the Bureau of Land Management, which is endeavoring to protect this highly endangered species by restricting off-road vehicles at the time the cacti are flowering in the spring. The *New York Times* published my photo of *Pediocactus despainii* for an article on the importance of saving endangered plant species.[2]

Drawer Two: Stromatolites

In another drawer of nature's curiosity cabinet, we find fossils of stromatolites. Stromatolites are concentric accretions made over thousands of years by cyanobacteria. They occur in the fossil record as early as three billion years ago. Through the miracle of photosynthesis, these microscopic organisms captured electrons from seawater and, in the process, released molecular oxygen. For billions of years, day after day, cyanobacteria bubbled up oxygen every time the sun shone. Six hundred million years ago, this iterative process yielded oxygen concentrations equivalent to 1 percent of our current atmospheric levels. This oxygen was sufficient to screen out enough DNA-scrambling ultraviolet radiation that life, for the first time, could survive at the surface of the ocean. The resultant explosion of plant life in the oceans over the next two hundred million years increased oxygen to 10 percent of current levels. At that point, life could survive on the surface of the land. As the moderator of the earth's atmosphere and the current largest carbon sink in the world, cyanobacteria seldom receive any thanks for their service. Yet their production of oxygen gas on this planet has been crucial. As Nephi told us, "And thus we see that by small means the Lord can bring about great things."[3]

When I was a University of Melbourne research fellow, my wife, Barbara, and I traveled with our small children to remote Shark Bay in Western Australia to see living stromatolites. These are relics of the divine machinery that produced our oxygen-rich atmosphere. When we visited Shark Bay, at that time the only other known site for marine stromatolites was near the Exuma Cays in the Bahamas. On our arrival at Shark Bay after a long and dusty twelve-hour drive from Perth, I saw only large, rounded rocks. I was embarrassed to realize that in my haste to make the trip, I had neglected to find out what stromatolites actually look like. Fortunately our young children forgave this lapse, particularly when they swam with the wild dolphins off the wilderness beach at nearby Monkey Mia. The children were concerned when the dolphins suddenly left, but then they returned with a small baby dolphin. It was as if the adult dolphins said, "Quick, find Junior! There are baby humans up on the beach!"

Upon returning to Melbourne, I found out, to my embarrassment, that the large, rounded rocks I had stood on in Shark Bay were actually the stromatolites I had sought. Stromatolites are formed over vast amounts of time through layer upon layer of microscopic cyanobacteria interacting with minerals and other species of bacteria. I quickly arranged another trip to go back to Shark Bay, and those stromatolites I studied are now part of a World Heritage Site established by the United Nations and the Australian Government.

Here in North America, there is great concern about the impact of a historically long drought. The resultant lowering of Lake Mead in Nevada has revealed sunken boats, cars, and unfortunately even a few dead bodies. In 1984, the water of the Great Salt Lake occupied 3,300 square miles. Today, forty years later, the waters occupy 950 square miles—a reduction in area of 71 percent. As the surface of the Great Salt Lake has receded, it has revealed its own stunning secret, but one far more beautiful than those of Lake Mead. It turns out that the turbid waters of the Great Salt Lake have long concealed living stromatolites.

I photographed these stromatolites by helicopter with my colleague from Brain Chemistry Labs, Dr. James S. Metcalf. I was stunned to find that these modern representatives of earth's most ancient life forms are living there. Now, to be clear, this is not an original discovery. We thought it was at the time, but after searching the literature, I saw that other scholars had previously observed cyanobacterial forms in the lake. These stromatolites are so extraordinary and the Great Salt Lake is so important to this ecosystem along the Wasatch Front that I believe the entire area should be protected.

Drawer Three: Cycad Seeds

Another drawer in nature's curiosity cabinet reveals seeds of the cycad tree from the island of Guam in the Pacific Ocean. This provides another fascinating link to cyanobacteria.

I was working with colleagues to find the cause of a puzzling paralytic disease that had killed many of the residents of two villages when we discovered that cyanobacteria harbored in specialized roots of the cycad tree produce a chronic neurotoxin called BMAA, or β-N-methylamino-L-alanine.[4] These unusual aerial roots of the cycad tree grow upward through the soil surface and look like little lumps of coral. There the cyanobacteria photosynthesize and produce the nitrogen-rich toxin. Traditional food items made from cycad seed flour, such as tortillas and dumplings, are contaminated with this neurotoxin.

Together with Dr. Sandra Anne Banack, Dr. Susan J. Murch, and Dr. Patricia Ann Stewart, we discovered that villagers feasting on bats called flying foxes, which forage on cycad seeds, receive a particularly high dose of BMAA. When consumed at village feasts, the cooked flesh of flying foxes dramatically increases the BMAA dose villagers receive. Professor Clark S. Monson, who gave the opening prayer today, wrote part of his doctoral dissertation and published an outstanding paper on this issue.[5] Villagers in Guam with this disease have symptoms of Parkinson's, Alzheimer's, or the paralytic disease ALS—some poor individuals have all three symptomologies—and at the peak of this illness, more than 25 percent of the adults in these two villages perished from the disease.

Outside of Guam, we are not immune to BMAA exposure. Agricultural runoff and improperly treated sewage flowing into rivers, lakes, and estuaries trigger explosions in cyanobacterial populations, causing what we call cyanobacterial blooms. We found a clear link between chronic exposure to BMAA and the risk of neurodegenerative illness. In a research facility on the Caribbean island of St. Kitts, we were able to replicate the neuropathology of Guam villagers in vervets that were fed each day for 140 days a piece of fruit dosed with BMAA.[6] Control animals did not have any neuropathology. Dartmouth neurologist Dr. Elijah W. Stommel found that individuals in New England who live near lakes or reservoirs with cyanobacterial blooms have a twenty-five-fold increased risk of developing ALS. Dredging lakes has been proposed as a way to reduce nutrient loads, including here for Utah Lake, but there are concerns that this would only mobilize the nutrients, causing even greater cyanobacterial blooms.

At Brain Chemistry Labs, we have been monitoring toxins and cyanobacterial blooms in Lake Okeechobee in Florida. When water from Lake Okeechobee is released down the St. Lucie River to the east coast of Florida and to the Caloosahatchee River to the west, tens of thousands of Florida residents are exposed to BMAA and other cyanobacterial toxins.[7] Together with a team at Aware Scientific in Provo, Utah, Brain Chemistry Labs is now designing a commercial immunoassay—similar to a COVID-19 test—so that lay people can simply and inexpensively test green, discolored water near their boat docks and homes for BMAA.

With our colleagues Dr. Rachael A. Dunlop and Dr. Kenneth J. Rodgers in Sydney, Australia, we discovered that protein misfolding induced by BMAA—and this is what kills motor neurons—can be blocked by the naturally occurring amino acid L-serine.[8] This amino acid is abundant in soybeans, sweet potatoes, and many species of marine algae. With neuropathologist Dr. David A. Davis at the University of Miami Brain Endowment Bank, we found that L-serine blocks microglial activation and deposits of the protein TDP-43 as well as other signs of early ALS in vervets that had chronic dietary exposure to BMAA.[9]

In Ōgimi village on the northern tip of the island of Okinawa, Japan, we found that the villagers' traditional diet of seaweed and tofu gives them almost five times the amount of L-serine that we receive daily in our American diet.[10] Ōgimi is known throughout Japan as "longevity village" because of its high percentage of ninety- and one-hundred-year-old residents. The absence of Alzheimer's disease and ALS there is striking. Aged Ōgimi villagers move like ballerinas and have absolute recall back to their earliest childhood. Talking to these people is like being in a time machine. Based on the data we collected, the FDA rapidly approved four different human clinical trials of L-serine as a possible treatment for neurogenerative illness, including ALS.[11] In August of this year, we started a clinical trial at Houston Methodist Hospital for mild cognitive impairment, which is seen as a precursor to Alzheimer's disease. This will allow us to determine if L-serine is neuroprotective in people the same way it is in vervets and in the way it appears to be in Ōgimi villagers.

Drawer Four: Dried Violets

Another drawer in nature's curiosity cabinet yields a dried sample of violets. These small flowers may actually hold the key to treating glioblastoma, a lethal form of brain cancer. Together with Dr. Samantha L. Gerlach, we have been studying small circular peptides called cyclotides. They are really cool—they sort of look like warped Frisbees. We find that these cyclotides have extraordinary potency *in vitro* against human glioblastoma cells.[12] During long days and nights in our laboratory in Jackson Hole, Wyoming, we have been able to extract only minuscule quantities of cyclotides from violets. But this summer our research has been accelerated by chemical synthesis of these fascinating molecules.

Searching nature's curiosity cabinet for new medicines is far from an unusual endeavor. More than 60 percent of prescriptions written in the United States either contain or are modeled after a molecule found in biodiversity, and more than half of those come from plants. Many of them have been used for centuries by healers and shamans in indigenous societies.[13]

Drawer Five: Samoan Healing Bark

Opening another drawer in nature's curiosity cabinet, we find the bark of a small Samoan rain forest tree, *Homalanthus nutans,* which Samoan healers use to treat hepatitis. With the permission of village chiefs and the prime minister of Samoa, my colleagues Dr. Gordon M. Cragg, Dr. Michael R. Boyd, Dr. John H. Cardelina II, Dr. John A. Beutler, other colleagues at the U.S. National Cancer Institute, and I analyzed the bark of *Homalanthus nutans,* discovering prostratin, a promising drug candidate for the treatment of HIV/AIDS.[14] My friend Dr. Paul A. Wender, a Stanford chemistry professor, has now synthesized even more active forms of the prostratin molecule.

In a benefit-sharing agreement prior to the establishment of the international Convention on Biological Diversity (CBD), we agreed to share any commercial proceeds of prostratin with the government of Samoa, the village, and the families of the healers.[15] But subsequent to our discovery of prostratin at the National Cancer Institute, we faced a serious challenge. A logging company showed up and started clear-cutting the rain forest where we had collected this small tree. I requested a meeting with the village chiefs to ask them why they had allowed the loggers to cut their rain forest.

The chiefs responded that the government required them to build an elementary school; otherwise, the government would pull all the teachers out of the village.

The chiefs said, "We're poor people. We're just subsistence farmers and fishermen."

The only way they had to get $85,000 to build the school was to accept that exact amount offered by the logging company to completely clear-cut their rain forest.

So I asked the village, "Could you save the rain forest if somehow we could raise the money to build the school?"

The village dispatched two chiefs with machetes to send the loggers and their bulldozers away.

I returned to Barbara with good news and bad news. Good news: we had an opportunity to save the largest lowland rain forest remaining in Samoa. Bad news: we would have to sell our house and our car to do so.

You can tell if your marriage is working at a moment like that.

Barbara took my hand and looked into my eyes. She said, "Paul, how often in our lives will we have a chance to do something like this? Let's go for it!"

Soon our family, friends, and students—some here at BYU—heard that we were cashing out. They all started pitching in. Ken Murdock and Rex Maughan, former missionaries to Samoa, made significant donations. Soon we had assembled the necessary funds, and we didn't even have to sell our house. In just a few weeks, I returned to Samoa with all the needed funds for the school in my backpack. Together with the villagers, we went to the logging company headquarters and told the loggers never to return. Falealupo village signed a covenant to protect their rain forest for fifty years.[16]

Blake M. Roney and Steven J. Lund at Nu Skin offered $75,000 to build an aerial walkway through the top of the rain forest. The village now earns more ecotourism revenue from visitors to the walkway than was ever offered to them by the logging company—without destroying a single tree.[17]

Soon we started receiving requests from other villages that had heard the story—villages that were being forced to choose between protecting their rain forests and building schools for their children. BYU alumnus Bill Marré joined with Barbara and me and Ken Murdock to create a new not-for-profit organization: Seacology. The word comes from the interface of the forest and the ocean. Using generous contributions from people throughout the world, Seacology builds schools, medical clinics, solar electrification schemes, and water supply projects in small island villages in return for the villagers' covenanting to protect their rain forests, coral reefs, and other precious resources.

In 2019, Barbara and I attended the dedication of the 350th project built by Seacology, which included an elementary school, water tanks, and teacher housing in the remote village of Nabubu on Vanua Levu island in Fiji.[18] In this effort, Seacology partnered with BYU education professor R. Wayne Shute. A little girl asked that we take her photograph with Barbara. We later found that this little barefoot girl walks eight kilometers every day to get to the school. That is how precious education is to her and her family. Seacology has now completed 386 different schools, electrification schemes, and projects in sixty-nine countries, conserving 1.5 million acres of rain forest and coral reef.

Drawer Six: Mangrove Seeds

Another drawer in nature's treasure chest reveals a mangrove seed. Mangroves are trees with stilt roots that grow in saltwater along the coastlines of many islands. In a remarkable convergence with mammals, mangroves give live birth: their long seeds germinate right on the trees. The growing seedling then drops into the ocean and floats to another site.[19]

Mangroves sequester more carbon per gram dry weight than any other type of terrestrial vegetation. Conserving mangroves can therefore play an important role in reducing atmospheric carbon levels.

In the nation of Tuvalu in the Pacific, Seacology partnered with a local women's collective to plant mangroves. In Sri Lanka, we made an agreement with the president and parliament to protect all of Sri Lanka's mangroves in return for Seacology sponsoring microloans and short business training courses for twelve thousand impoverished coastal women.[20] We found that villages that protect mangroves receive far less damage from tsunamis and hurricane-driven waves. In such cases, mangrove conservation can prove to be a matter of life and death for the villagers. In addition, mangroves serve as nurseries for fish and other marine organisms.

As part of the Sri Lanka project, we built three large mangrove nurseries throughout the country, each growing half a million mangrove seeds. We also built a mangrove museum just a short drive from the capital city of Colombo. Outside the museum you can get on a boat and tour the mangroves. We are now replicating the successful effort in Sri Lanka at the national level in the Dominican Republic in the Caribbean.

Drawer Seven: Seagrass Leaves

A final drawer in nature's curiosity cabinet reveals the leaves of seagrasses. Seagrasses, which are flowering marine plants that grow underwater, sequester more carbon per gram dry weight than any other plants on this planet. Their pollination mechanisms are extraordinary. In *Enhalus acoroides,* which I studied in the Banda Islands in the remote Maluku province of Indonesia, male flowers release their flowers underwater at the lowest tide of the year. These male flowers float to the surface of the sea, where they collide in the depression made by the female flowers. As the tide rises, the floating petals of the female flowers rise up to envelop the tiny male flowers, bringing them close to the stigmas, and pollination occurs. In Australia, I discovered that on the lowest tide of the year, the noodle-like pollen of the seagrass species *Amphibolis antarctica* form floating rafts that collide with female flowers.[21] In the Caribbean island of St. Croix, Dr. Thomas Elmqvist, my former Harvard professor P. B. Tomlinson, and I discovered that the seagrasses *Syringodium filiforme* and *Thalassia testudinum* are both pollinated underwater.[22]

Despite their fascinating pollination systems, seagrasses are seriously endangered along coastlines and islands throughout the world. More than half of their populations worldwide have disappeared. This decline in seagrass populations has resulted in serious declines in the populations of manatees, dugongs, turtles, and other marine mammals, including whales, that depend on small fish and crustaceans nurtured and protected by seagrass meadows. Seacology has now funded seagrass conservation projects in the Dominican Republic, Greece, India, Indonesia, Jamaica, Mexico, Papua New Guinea, the Philippines, Spain, Thailand, the United States, Vanuatu, and Wales. We are learning from these projects how to protect seagrasses—particularly how to protect them from anchors dropped by boats, how to map their distributions and provide information online so boat captains can avoid them, and, most importantly, how to reestablish seagrass populations from seed.

Seagrass leaves break off underwater at the base and then float to the surface, where they are washed up along the beach. This happens day after day, week after week, month after month. If the leaves are allowed to decay, the carbon that the leaves have sequestered is released back to the atmosphere. But if they are dried for thatch, such as that used on traditional cottages on the Danish island of Læsø, the carbon these seagrass leaves have stored can be preserved for centuries without atmospheric release.

My former BYU PhD student, Dr. Sandy Wyllie-Echeverria, studied seagrass insulation quilts manufactured prior to World War II. He documented the historical seagrass leaf industry in Nova Scotia, Canada, and found that farmers there sold $1.6 million of dried seagrass leaves each year. These leaves were shipped down to Boston and manufactured into seagrass quilts made by the Cabot Corporation. By 1930, seagrass quilts had insulated more than 350 buildings, including the first Bauhaus design in America—the Walter Gropius House in Lincoln, Massachusetts—as well as Carnegie Hall in New York City. We are now attempting to reboot the seagrass insulation industry because of its potential contributions in reducing carbon footprints. Seagrass leaves are resistant to mold and decay, they can't catch fire, and they offer outstanding natural insulation. Imagine insulating your home with seagrass quilts that make an unmatched contribution to stopping global warming.[23]

Creating Your Own Curiosity Cabinet

What are some concrete steps that you as a student can personally take to show reverence for the earth? Here are three suggestions:

First, you can draw closer to the earth by taking time to view spectacular sunsets or even getting up early to see the sunrise. You could begin by making your own curiosity cabinet, perhaps even just within a shoebox, where you might place a colorful fall leaf, some beautiful seashells, or maybe a sketch or a poem you have made or a photo that you have taken of the earth. As Presiding Bishop Gérald Caussé said in the October 2022 general conference, "Our interactions with the beauties of nature around us can produce some of the most inspiring and delightful experiences in life."[24]

Second, you can take a bold stand against climate change by planting and caring for a tree or even just for a house plant. Every single gram of carbon dioxide sequestered by plants reduces by one gram the burden of greenhouse gas in the atmosphere.

Third, you can support national parks, national forests, and local preserves. The beautiful park at the base of Rock Canyon just above this campus resulted from a plan crafted by BYU students in a beginning botany class that I taught here some years ago.

Perhaps together we could create a national park to protect the stromatolites and precious habitats of the Great Salt Lake. Together with the migratory bird habitat, the Golden Spike National Historical Park, and Robert Smithson's 1,500-foot-long geological sculpture *Spiral Jetty*—which has been called the most important piece of art that virtually no one has seen—there are more than enough natural, archaeological, and historical treasures present in and near the Great Salt Lake to qualify that area for national park status. Based on our personal experience in creating the fiftieth United States national park—the National Park of American Samoa,[25] in which villagers are allowed and encouraged to sustainably harvest medicinal plants and other resources from the rain forest—we know it is possible to craft the legislation so that the Great Salt Lake can be protected and restored without endangering the livelihoods of brine shrimp fleet workers or those who work for companies that extract salt and rare minerals from the Great Salt Lake waters by evaporation. I personally think the National Park Service would be a good arbiter for the many different stakeholders who share a desire to have the Great Salt Lake restored to its previous vibrant condition.

In reverencing the earth, we can also cooperate with others of good intent. In the October 2022 general conference, President Dallin H. Oaks, speaking of humanitarian service, said, "As members of the restored Church, we need to be more aware and more appreciative of the service of others."[26] Nephi foresaw that members of the Church would be "few" but "also upon all the face of the earth."[27] I believe that we—as citizens of more than 160 countries and as members speaking more than 178 different languages—have an unparalleled geographical reach and an opportunity to provide leadership in reverencing the Creation.

Conclusion

Today I have focused my remarks about nature's curiosity cabinet on plants. As a botanist in Sweden, I was deeply moved by the beauty of Kungsängsliljan (*Fritillaria meleagris* L.), a lily that grows in a large field near Uppsala. As Jesus told His disciples, "Consider the lilies how they grow: they toil not, they spin not; and yet I say unto you, that Solomon in all his glory was not arrayed like one of these."[28]

Yet if we gaze upward at nighttime, we see the vastness of the Creation. As Ralph Waldo Emerson wrote, "If the stars should appear one night in a thousand years, how would men believe and adore; and preserve for many generations the remembrance of the city of God which had been shown!"[29] As Moses stated, "Were it possible that man could number the particles of the earth, yea, millions of earths like this, it would not be a beginning to the number of thy creations."[30] Recent observations from NASA using the James Webb Space Telescope confirm that the number of stars in the universe is so great that it exceeds the number of grains of sand on every beach and in every desert of this planet. The next time you sift sand with your hand, realize that you could assign to each single grain of sand a different star and never run out. The vastness of this universe and the beauty of the creation that surrounds us is evidence to my mind of the handiwork of a loving Creator. I believe that as a result, we have a great responsibility to care for all creation and to protect it.

By exploring nature's curiosity cabinet, we not only increase our own sense of wonder but also discover truths that can help us solve some of the world's most serious problems. As Brigham Young said, "Be willing to receive the truth, let it come from whom it may."[31] In our recent general conference, President Russell M. Nelson explained, "The Church of Jesus Christ of Latter-day Saints embraces *all* truth that God conveys to His children, whether learned in a scientific laboratory or received by direct revelation from Him."[32]

It is my hope—my sincere hope—as we explore together nature's curiosity cabinet that we can demonstrate reverence for the earth and for the Creator. If you love the Artist, please do not slash His painting. If we pursue conservation of the earth, I am confident that in the process we will discover new medicines, we will prevent serious disease, we will reduce the impacts of climate change, and we will prove ourselves worthy stewards of our "earthly blessings, which [the Lord has] made and prepared for [what He calls His] creatures,"[33] as well as for millions of our brothers and sisters throughout the world.

Notes

1. e. e. cummings, "in Just-," first published in "Five Poems," IV, *The Dial* 68, no. 5 (May 1920): 580.
2. See Stephen L. Buchmann, "Our Vanishing Flowers," Opinion, *New York Times,* 16 October 2015.
3. 1 Nephi 16:29.
4. See Paul Alan Cox, Sandra Anne Banack, and Susan J. Murch, "Biomagnification of Cyanobacterial Neurotoxins and Neurodegenerative Disease Among the Chamorro People of Guam," *Proceedings of the National Academy of Sciences* 100, no. 23 (11 November 2003): 13380–83.
5. See Clark S. Monson, Sandra Anne Banack, and Paul Alan Cox, "Conservation Implications of Chamorro Consumption of Flying Foxes as a Possible Cause of Amyotrophic Lateral Sclerosis/Parkinsonism Dementia Complex in Guam," *Conservation Biology* 17, no. 3 (June 2003): 678–86.
6. See Paul Alan Cox, David A. Davis, Deborah C. Mash, James S. Metcalf, and Sandra Anne Banack, "Dietary Exposure to an Environmental Toxin Triggers Neurofibrillary Tangles and Amyloid Deposits in the Brain," *Proceedings of the Royal Society B: Biological Sciences* 283, no. 1823 (27 January 2016): 20152397.
7. See James S. Metcalf, Sandra Anne Banack, James T. Powell, Fiona J. M. Tymm, Susan J. Murch, Larry E. Brand, and Paul Alan Cox, "Public Health Responses to Toxic Cyanobacterial Blooms: Perspectives from the 2016 Florida Event," *Water Policy* 20, no. 5 (October 2018): 919–32.

8. See Rachael Anne Dunlop, Paul Alan Cox, Sandra Anne Banack, and Kenneth John Rodgers, "The Non-Protein Amino Acid BMAA Is Misincorporated into Human Proteins in Place of L-Serine Causing Protein Misfolding and Aggregation," *PLOS ONE* 8, no. 9 (September 2013): e75376.

9. See David A. Davis, Paul Alan Cox, Sandra Anne Banack, et al., "L-Serine Reduces Spinal Cord Pathology in a Vervet Model of Preclinical ALS/MND," *Journal of Neuropathology and Experimental Neurology* 79, no. 4 (April 2020): 393–406.

10. See Paul Alan Cox and James S. Metcalf, "Traditional Food Items in Ogimi, Okinawa: L-Serine Content and the Potential for Neuroprotection," *Current Nutrition Reports* 6, no. 1 (March 2017): 24–31.

11. See Todd D. Levine, Robert G. Miller, Walter G. Bradley, et al., "Phase I Clinical Trial of Safety of L-Serine for ALS Patients," *Amyotrophic Lateral Sclerosis and Frontotemporal Degeneration* 18, no. 1–2 (February 2017): 107–11.

12. See Samantha L. Gerlach, Rachael A. Dunlop, James S. Metcalf, Sandra A. Banack, and Paul Alan Cox, "Cyclotides Chemosensitize Glioblastoma Cells to Temozolomide," *Journal of Natural Products* 85, no. 1 (January 2022): 34–46.

13. See Michael J. Balick and Paul Alan Cox, *Plants, People, and Culture: The Science of Ethnobotany*, 2nd ed. (New York: Garland Science, 2020), 25–36.

14. See Balick and Cox, *Plants, People, and Culture,* 40–42.

15. See Paul Alan Cox, "Ensuring Equitable Benefits: The Falealupo Covenant and the Isolation of Anti-Viral Drug Prostratin from a Samoan Medicinal Plant," *Pharmaceutical Biology* 39, supplement 1 (December 2001): 33–40.

16. See Paul Alan Cox, *Nafanua: Saving the Samoan Rain Forest* (New York: W. H. Freeman, 1999).

17. See Balick and Cox, *Plants, People, and Culture,* 186.

18. See Balick and Cox, *Plants, People, and Culture,* 187.

19. See P. Barry Tomlinson and Paul Alan Cox, "Systematic and Functional Anatomy of Seedlings in Mangrove Rhizophoraceae: Vivipary Explained?" *Botanical Journal of the Linnean Society* 134, no. 1–2 (September 2000): 215–31.

20. See Balick and Cox, *Plants, People, and Culture,* 186–87.

21. See Paul Alan Cox, "Hydrophilous Pollination," *Annual Review of Ecology and Systematics* 19 (1988): 261–79.

22. See Paul Alan Cox and P. B. Tomlinson, "Pollination Ecology of a Seagrass, *Thalassia testudinum* (Hydrocharitaceae), in St. Croix," *American Journal of Botany* 75, no. 7 (July 1988): 958–65.

23. See Balick and Cox, *Plants, People, and Culture,* 202–4.

24. Gérald Caussé, "Our Earthly Stewardship," *Liahona,* November 2022.

25. See Paul Alan Cox and Thomas Elmqvist, "Indigenous Control of Tropical Rain-Forest Reserves: An Alternative Strategy for Conservation," *Ambio* 20, no. 7 (November 1991): 317–21.

26. Dallin H. Oaks, "Helping the Poor and Distressed," *Liahona,* November 2022.

27. 1 Nephi 14:12.

28. Luke 12:27.

29. Ralph Waldo Emerson, *Nature* (1836), section 1.

30. Moses 7:30.

31. Brigham Young, "Remarks," *Deseret News,* 31 May 1871, 198; punctuation modernized; also *JD* 14:136 (21 May 1871).

32. Russell M. Nelson, "What Is True?" *Liahona,* November 2022; emphasis in original.

33. Doctrine and Covenants 104:13.