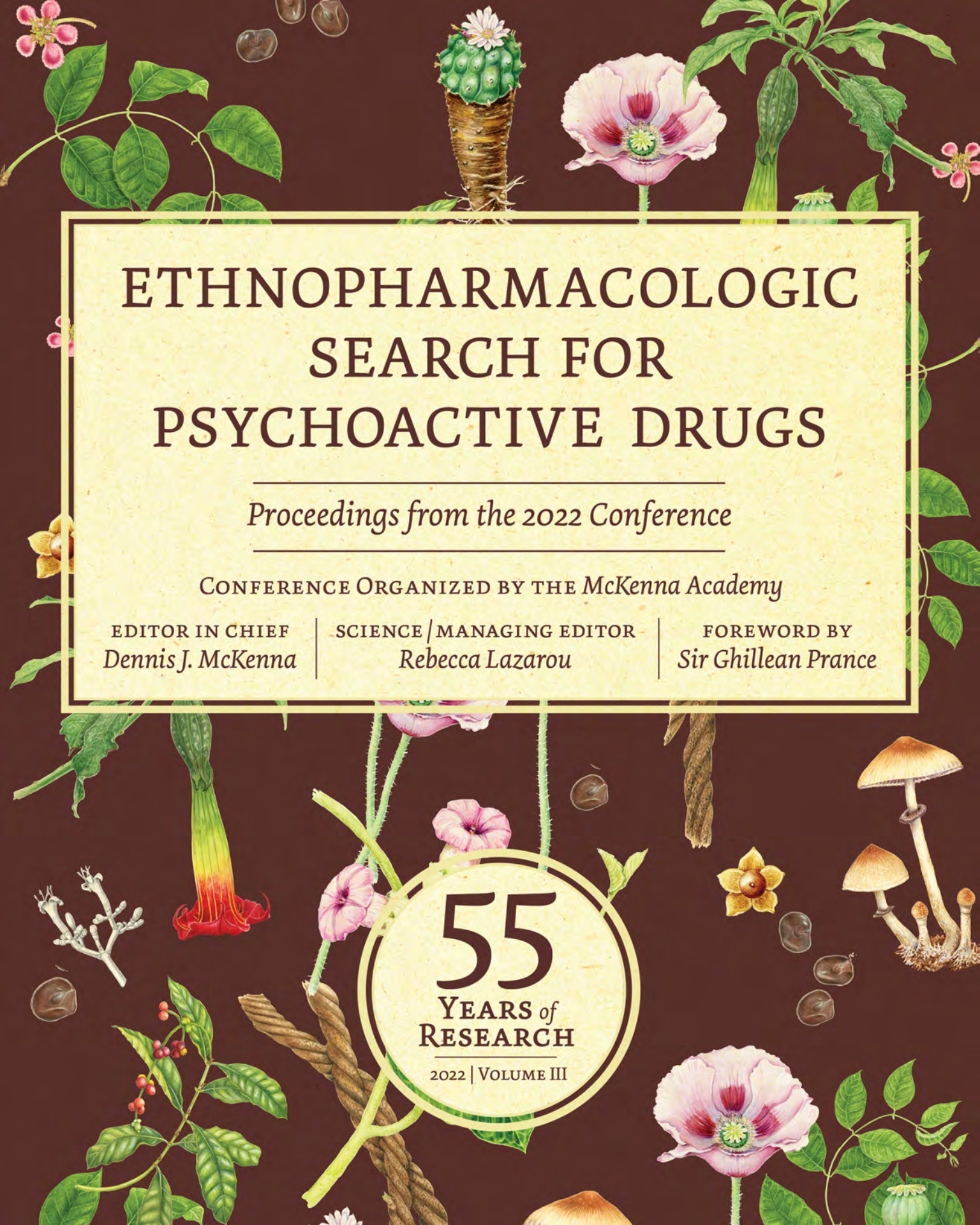

ETHNOPHARMACOLOGIC SEARCH FOR PSYCHOACTIVE DRUGS

Proceedings from the 2022 Conference

CONFERENCE ORGANIZED BY THE *McKenna Academy*

EDITOR IN CHIEF
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SCIENCE / MANAGING EDITOR
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FOREWORD BY
Sir Ghillean Prance

55 YEARS *of* RESEARCH

2022 | VOLUME III

ETHNOPHARMACOLOGIC SEARCH *for* PSYCHOACTIVE DRUGS • 2022

55th Anniversary Symposium › May 23–26, 2022

Vol. III


55

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ESPD55 2022 SYMPOSIUM SPEAKERS

ABOVE: Conference Speakers at St. Giles House, Dorset, UK.

FRONT ROW, L TO R: Zak Kulberg, Professor Constantino Manuel Torres, Paul Stamets, Dr. Dennis McKenna, Professor Wade Davis.

SECOND ROW, L TO R: Jonathan Lu, Professor Chris McCurdy, Dr. Bruce Damer, Professor Monica Gagliano, Dr. Glenn H. Shepard Jr., Dr. Luis Eduardo Luna, David F. Rodriguez-Mora.

THIRD ROW, L TO R: Colin Domnauer, Dr. Bryn Dentinger, Josip Orlovac Del Río, Dr. Michelle St. Pierre, Laurel Sugden.

BACK ROW, L TO R: Dr. Shauheen Etminan, Professor Mark Merlin, Dr. Mark Plotkin, Barrett McBride, Andrea Langlois.

NOT SHOWN: Alexandre Tannous, Professor Andrew Weil, Carey Turnbull, Christina Chaya, Cody Swift, Dale Millard, Professor David Nutt, Professor Elaine Elisabetsky, Greg Hemmings, Jerónimo Mazarrasa, Dr. Michael Coe.

ABOVE: Conference Speakers, Organizers and Participants at St. Giles House, Dorset, UK.

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Brian Hettler is a geographer and cartographer with the Amazon Conservation Team (ACT) and works with indigenous communities in South America on participatory mapping initiatives that support indigenous land rights and rainforest conservation. He also partakes in a range of projects including monitoring forest cover using remote sensing techniques, designing maps in both static and interactive digital formats, and supporting ACT's field staff and indigenous partners in the innovative use of spatial data collection and monitoring tools. Brian also creates interactive, map-based digital stories designed to raise awareness of Amazonian cultures and ecosystems and the many external threats they face.

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Dr. Bruce Damer is an astrobiologist who has spent his life pursuing two questions: how did life on Earth begin? And how can we give that life (and ourselves) a sustainable pathway into the future and a presence beyond the Earth? A decade of laboratory and field research with his collaborator Prof. David Deamer at UCSC and teams around the world resulted in the Hot Spring

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Colin Domnauer graduated from UC Berkeley, where he completed his thesis investigating the use of the psychoactive plant Vilca (*Anadenanthera spp*.) in pre-Columbian Andean cultures. He is now pursuing graduate research in Mycology at the University of Utah.

Dale Millard

Dale Millard is an ethnobotanist, naturalist and biodiversity explorer, with research interests ranging from herpetology to the study of plants used to treat tropical diseases and immune disorders. He has travelled and collected extensively in South Africa, Brazil and Indonesia.

David F. Rodriguez-Mora, Doctoral candidate

David F. Rodriguez-Mora is conducting his doctoral studies in environmental anthropology at the University of Texas at San Antonio. His doctoral research will expand the scope and geographic range of his master's research to better understand the Colombian Cofán territorial, cultural, and intellectual resources and help his Cofán colleagues protect them. David has also worked extensively on various interdisciplinary projects around biocultural preservation.

David Nutt, PhD
David Nutt is a psychiatrist and the Edmond J. Safra Professor of Neuropsychopharmacology in Imperial College London. He is currently Founding Chair of the charity DrugScience.org.uk and has been president of the European Brain Council, the BAP, BNA, and ECNP. David has published 35 books and over 1000 research papers that define his many landmark contributions to psychopharmacology.

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Elaine Elisabetsky, PhD is a Professor of Pharmacology at the Federal University of Rio Grande do Sul (Porto Alegre, Brazil), and a member of the WHO Traditional, Complementary and Integrative Medicine advisory panel. Her research focuses on the identification and characterization of psychopharmacological properties of medicinal plant extracts and isolated compounds, as well as conservation, fair benefit sharing and indigenous rights. A founding member for the International Society of Ethnobiology (1988) and the International Society of Ethnopharmacology (1990), served as president for the latter as well as for the Brazilian Society of Ethnobiology and Ethnoecology.

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Jerónimo Mazarrasa is an ayahuasca community activist. He works as Social Innovation Coordinator for ICEERS, and is a founding member of the Plantaforma (Platform for the Defense of Ayahuasca in Spain). Over the past 5 years he has devoted most of his energy to engaged research and innovation exploring how ceremonial plant practices can be integrated outside of their cultures of origin. Previously he wrote and produced four documentary films on various aspects of the encounters between the West and indigenous knowledge, from ayahuasca in the treatment of Drug addiction with Gabor Maté, to the Kogi Mamos, to the Brazilian ayahuasca religions.

Jonathan Lu, BS
Jonathan Lu is the co-founder of VCENNA, a CNS Drug discovery company focused on poly-pharmocology with naturally-extracted and purified alkaloid isolates. Jonathan is an expert generalist whose multidisciplinary career includes roles as a corporate manager, venture investor, and early stage operating executive. He is a graduate from Stanford University's Graduate School of Business, and received a BS in Chemical Engineering from Cornell University.

Josip Orlovac Del Río
Josip Orlovac Del Río is a maestro huachumero from coastal Peru with over 30 years of experience growing, cooking, drinking, and sharing the San Pedro cactus. He received his connection

to the plant through his Andean grandfather, and from a young age studied traditional healing in a lineage of curanderos from the Río Santa. He co-founded Huachuma Collective, a nonprofit association in Peru which works with indigenous communities towards the biological and cultural sustainability of San Pedro. He has been planting San Pedro for 25 years, and collectively his gardens are home to nearly 6,000 individual cacti.

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Laurel Anne Sugden is a PhD. candidate in Interdisciplinary Studies at the University of British Columbia. Her current work centers on the visionary San Pedro cactus (Huachuma), and its cultural and ecological roles in the Andes. Laurel co-founded Huachuma Collective, a nonprofit association in Peru which works with Indigenous communities towards the biological and cultural sustainability of San Pedro.

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Mark Merlin, PhD
Professor Merlin is recognized as an authority on archaeological record and cultural biogeography of mind-altering Drug plants, and is highly regarded for his research and publications focused on traditional environmental knowledge of the societies in Remote Oceania. His research has focused on the cultural histories of human-plant interactions with special emphasis on the pan-global, traditional use of psychoactive species, including ancient cannabis and opium use.

Mark Plotkin, PhD
Dr. Mark Plotkin is an ethnobotanist, educator, filmmaker co-founder and President of the Amazon Conservation Team (ACT.org). He is widely recognized for his advocacy for the protection of indigenous knowledge and Amazonian ecosystems. Plotkin was a protégé of Richard Evans Schultes, and gave a unique and insightful look at his mentor as part of ESPD55.

Michael Coe, PhD
Michael A. Coe earned a bachelor's of science degree in ethnobotany from the University of Hawai'i at Mānoa in 2015 and was a recipient of the Richard Evans Schultes Research Award from the Society of Economic Botany in 2016 for his research on ayahuasca. In 2019, he received a PhD in botany with a focus on evolution, ecology and conservation biology from the same university. Michael's current research interests include the ritualistic and therapeutic use of ayahuasca and other teacher plants in ethnomedicinal contexts aimed at improving physiological, psychological, emotional, and spiritual well-being. Michael A. Coe, PhD, is currently an assistant

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Dr. Michelle St. Pierre received her doctorate in Clinical Psychology from The University of British Columbia (UBC), and was UBC's 2021 Researcher of the Year. Michelle's research broadly explores the use of cannabis and psychedelics for therapeutic purposes. She has published and presented nationally and internationally on these topics and had her research featured in outlets such as *Forbes*, *Time Magazine*, and *The Globe and Mail*. Her research is supported by a CIHR Vanier Canada Graduate Scholarship and Killam Doctoral Fellowship.

Nigel Gericke, MD

Dr. Nigel Gericke is a South African medical doctor, botanist, ethnopharmacologist and entrepreneur has published many peer-reviewed scientific papers on ethnobotany and ethnopharmacology; he is co-author of books on South African ethnobotany including *Medicinal Plants of South Africa* and *People's Plants: A Guide to Useful Plants of Southern Africa*. He is the world's foremost authority on Kanna, an indigenous psychoactive plant used by the San and Khoi peoples.

Orou Gaoue, PhD

Professor Orou Gaoue holds a PhD in ecology, evolution and conservation biology. He is an associate Professor at the University of Tennessee, and the research in his lab integrates population ecology and ethnobiology to study plant-human interactions in a changing world and how this informs the conservation of biodiversity and sustainable use of ecosystem services.

Pascual Gonzalez, MPhil

Pascual Gonzalez provides cartographic support to all of the Amazon Conservation Teams's programs, working jointly with the Senior Mapping Coordinator to produce, assemble, and visualize ACT's cartographic and GIS data. Pascual holds a B.A. in Geography and an MPhil in Development Studies from the University of Cambridge.

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Paul Stamets is a speaker, author, mycologist, medical researcher and entrepreneur, is considered an intellectual and industry leader in fungi: habitat, medicinal use, and production. He lectures extensively to deepen the understanding and respect for the organisms that literally exist under every footstep taken on this path of life. Paul's philosophy is that "MycoDiversity is BioSecurity," and his passion is to preserve and protect as many ancestral strains of mushrooms as possible.

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Zak Kulberg
Zak completed a degree in Marine Toxicology, and then began work with Dutch sponge taxonomists in Indonesia. There he collected marine sponges, taking extracts, and tested them for bioactivity. He is now working on farming sponges on pearl farms across Indonesia to build biochemical libraries, and to transplant coral to grow for an ecological restoration program.

Contents

Foreword

Sir Ghillean Prance

Scientific Director of the Eden Project | Director (Ret.), Royal Botanic Gardens, Kew

On reading all of the papers in this book my greatest regret is that I did not attend the ESPD55 conference upon which it is based. This resulting book is a most important contribution to the study of psychedelic plants and fungi. It is full of good science and many interesting accounts of personal experiences of their use. The chapters here vary from descriptions of ritual and sacred ceremonies to DNA barcoding, the detailed molecular chemistry of sponges and neuroimaging. Many fascinating stories are told here, but this is not about the casual or tourist use of these compounds, rather it is a serious demonstration of the potential of these substances for medical uses based on good science. Something that immediately stood out to me is the great respect that the authors of each chapter have for the Indigenous Peoples with whom they associate or collaborate. This is a book in which the indigenous original discoverers of many of these chemical compounds are given due credit varying from the Matsigenka of southern Peru to the San people of Botswana. Richard Schultes who was one of the founding fathers of the ethnobotanical study of psychedelic plants is acknowledged in many chapters here. I am glad about this because, as Schultes was not present at the conference to write for himself, there is a chapter here about him and his huge contribution to research and teaching written by one of his former students Mark Plotkin. Two other people who are so frequently cited in the papers here for their contribution to the topic of this book are the McKenna brothers Terence and Dennis who really opened up this field of study. Dale Millard and Luis Eduardo Luna describe well the Wasiwaska Ethnobotanical Garden for medicinal plants that Terence helped them to set up in Florianopolis, Brazil. What a wonderful array of mind-altering plants are described here in some detail and that are cultivated in that garden. The existence of these species in this garden-preserve is increasingly important today as several of the psychedelic plant species are now seriously threatened by overharvesting.

In addition to accounts of contemporary research on psychedelics there is much interesting history of their uses given here which helps to put things into context and also helps us to understand the ancient uses of sacred plants. For example, we read about the uses of visionary plants by the ancient Tiwanaka and Wari people of Bolivia in 300-900 A.D. or the history of the sacred drink of the Zoroastrians of Iran. The use of the images depicted on ancient ceramics of the Pre-Columbian cultures Cupisnique, Paracas and Nazca clearly demonstrates the importance of the hallucinogenic *Anadenanthera* to them. Archeobotany has an important contribution to make about the ancient uses of psychedelic plants. Jonathan Lu in his chapter explains the long history of medicinal plants in China and shows that mind-altering substances from plants and fungi have played an important and often hidden role throughout the history of China. This chapter is an interesting comparison of the different attitudes to psychoactive substances between eastern and western cultures and it opens up a world that has been much neglected in the west. Another

contribution from Asia is the chapter by Chris McCurdy on the alkaloid rich leaves of Kratom (*Mitragyna speciosa*) a popular stimulant tea in southeast Asia, and a possible alternative to opioids in the west.

As a botanist it impresses me to see the wide range of the plant kingdom and even beyond which is used in some way to stimulate or calm the brain. This varies from *Ephedra*, a conifer in Eurasia, a lily bulb (*Boophone disticha*) in South Africa for leshoma, to many higher plants, such as the San Pedro cactus (*Echinopsis* species) and the forest liana that is the source of ayahuasca (*Banisteriopsis caapi*). But in addition, here we also read about the fungi that produce psilocybin and the marine sponges that contain tryptamines. I am also glad to see a chapter about the hunting medicines of the Matsigenka, as this is an aspect I have come across several times in my ethnobotanical research, particularly with the Guaraní.

There is much about the use of medicinal plants here. Elaine Elizabetzky seeks to use her ethnopharmacological research to improve the discovery of new drugs. Michelle St. Pierre and Zach Walsh demonstrate the potential use of psychedelics for the reduction of interpersonal violence and other psychotic disorders following up on some of the original ideas of Timothy Leary. Andrew Weil gives a very personal account of his use of coca in therapeutics. Coca also features in a good review of the history of its uses by Wade Davis. Both authors make an important plea for the legalisation of coca. It is distressing that this mild stimulant and calmant that so many of us have used is so vilified outside its use by Indigenous Peoples. This is one of the sacred plants of the peoples of South America that could easily be produced sustainably and used more widely if its use were to become legal. Can we convince the world of the difference between using a whole entire coca leaf from the isolation of the cocaine molecule? The pathways toward the legalisation of prohibited substances are well covered here in the chapter by Carey Turnbull which also discusses the rash of unwarranted patents on these substances. I am glad to see a chapter on intellectual property rights covered by David Rodríguez-Mora using ayahuasca and the Kofán people as a fine example of Community-Based Participatory Research.

There are three things that particularly stand out to me. Firstly, is that most of the medicines and substances used are mixtures rather than a pure compound. So much of the effect produced is from the chemical interactions between a mixture of plant parts that occurs in the brew. Ayahuasca is not the same without chacruna (*Psychotria viridis*) and in coca it is the whole leaf that is used and not just pure isolated cocaine. Secondly the plant species involved do not always produce a consistent amount or quality of the compound involved. There are many genetic varieties of most plants that may have different levels of production. In addition, the production of a particular compound may be strongly influenced by the environment, the soil, or the climate conditions. Thirdly the authors here understand the magical and sacred nature of the plants that they are studying, and this is often through their own personal experience of their use in authentic ceremonies with the native peoples. Those of us who have been through various ceremonial plant practices with our indigenous friends are often concerned about the use of these plants outside their place of origin. Jeronimo Mazarrasa provides here a very astute and useful analysis of this indicating both the positive and negative aspects.

In these times of environmental crisis I am glad to see concern expressed in several chapters about the threats of extinction by over harvesting of some of these sacred plants. This generally

happens when the use extends beyond that of the Indigenous Peoples who know how use them sustainably. There is a great need to promote sustainable production rather than the harvest of the last specimens from their natural habitats as is emphasised here both by Michael Coe and Barrett McBride for the case of ayahuasca. Laurel Sugden and Josip del Rio emphasise that the endangered San Pedro cactus (*Echinopsis*) of Peru is fast disappearing as a result of massive over-harvesting. These authors are even cautious not to mention exact location of the plants to protect them from harvest by tourist or commercial users rather than serious indigenous users. Andrea Langlois and Jeronimo Mazarrasa show how the commercialization of ayahuasca, iboga and magic mushrooms are all seriously overharvested due to their increasing popularity. They also address the important question of: What happens when the rituals become commercial products? In promoting the conservation of the species involved we also need to do as much as possible to preserve the cultural knowledge associated with them. Most of the writers here have experienced and understand the sacred nature of their use and this must not be lost amongst the creators of these rituals.

It is good to see that the study of psychedelic plants is continuing well as Sugden and some of the other authors, including Colin Domnauer, were doctoral candidates when they wrote their chapters for this book. The work of the pioneers such as Schultes, the McKenna brothers and Tim Plowman is continuing on in good hands for the benefit of future generations.

—Ghillean T. Prance FRS, FLS, VMH

Coca: The Divine Leaf of Immortality

Wade Davis, PhD

Professor of Anthropology | BC Leadership Chair in Cultures and Ecosystems at Risk at the University of British Columbia | Ethnobotanist | Author | Filmmaker

> *"A legal market in coca will generate for Colombia tax revenues that will allow a long-suffering nation to pay the price of peace, having drained its treasury for 50 years to cover the costs of a war only made possible by the sordid profits of prohibition."* —Wade Davis

This paper shares an interdisciplinary perspective on the potential and power of the coca plant, as well as the devastating impact tht its vilification has caused.

COCA: LEAF OF THE GODS

As darkness fell over the Colombian Amazon, the shaman lit a torch dripping in resin, and a red glow illuminated the circle of low stools where the Barasana had gathered, as they do every night. From the other end of the *maloca*, the community longhouse, came the rustle of women and children making ready to sleep. A young man played an instrument made from the head of a deer; another blew softly over a large shell, a sound intended to stir the spirits. To one side, a boy kindled a fire beneath a large clay griddle, upon which he placed the leaves we had harvested earlier in the day. He tossed the coca with a steady rhythm, chanting and singing. His brother swept clean the dirt floor before setting fire to a large pile of dried leaves from the *yarumo* tree; the flames flared well over his head, and quickly died back, leaving a mound of white ash. Tobacco was passed, a powerful snuff that caused the head to spin and beads of sweat to soak the fingertips.

When the coca was ready, the leaves lightly toasted and brittle, the brothers placed several handfuls into the mouth of a large wooden mortar, and began to pound them with a long pestle, taking turns. It was hard steady work, and sweat soon fell from their brows. Once the coca had been reduced to a bright green powder, they poured the contents of the mortar into a large calabash and mixed in some ash, roughly a handful for every two handfuls of coca. The color turned a rich gray-green. The next step involved wrapping the powder in palm fibre, securing the bundle to a stick, and shaking the contents vigorously inside a covered vessel. As small clouds of green dust filled the air, one of the men asked if I had ever tried *mambe*. At the time, I was only familiar with the coca of the highlands, where the leaves are taken whole, with alkali added to the quid. My new friend cringed at the thought. "*Qué bárbaro*," he said, "How barbaric."

He handed me the calabash. I followed his instructions and placed a large spoonful of the

powder gently on my tongue. Within seconds, I coughed and great puffs of green smoke blew out of my mouth and nostrils. The Barasana roared with laughter. Never talk, I was told, just wait and let the *mambe* come together. I tried again, and soon could feel the coca trickling down my throat. The flavour was smoky and delicious. Within a few minutes the inside of my cheek was numb and a sensation of well-being had spread throughout my body. It was a subtle feeling that lasted long into the night, even as the men spoke of the primordial journey of the *Ayawa*, the Thunders, the four culture heroes who brought order and harmony to the world, along with the gifts of the Anaconda, the sacred plants; tobacco, Yagé, and coca.

The next morning we left for the forest early. Fortified by a huge wad of *mambe*, I moved effortlessly over rough terrain and, for the first time, felt truly oblivious to the tropical heat. The renowned botanical explorer Richard Evans Schultes, my professor at Harvard, used coca every day during his 12 years in the Amazon, beginning in 1941. It was no wonder. I smiled to recall how, like a sommelier recommending a favourite vintage, he had urged me to seek out the *mambe* of the Tanimukas, a delicious recipe, he claimed, infused with aromatic resin of a rare forest tree. Schultes once pulled out a can of *mambe* at a society party in Bogotá. In measured tones, he explained to anyone who would listen that the preferred ash came from the large palmate leaves of *Cecropria sciadophila*, not the decidedly inferior foliage of *Cecropia peltata*. He naturally had the good stuff.

GREEN COCAINE

On October 31 2020, WPVI Action News, an ABC affiliate in Philadelphia, led its evening report with a sensational account of a rare drug bust at Philadelphia International Airport. US Customs and Border Protection (CBP) officers had seized more than 12 pounds of what was described as green cocaine, along with a mysterious "brown tar-like substance" which had tested positive for nicotine. The powder had tested positive for cocaine. According to authorities, the green hue was a way of camouflaging the drug, which through a chemical process using gasoline, ammonia and other chemicals, could be turned white, the implication being that, ounce for ounce, it was just your ordinary blow, tinged with another colour. "This seizure," reported Casey Durst, head of CBP's Baltimore Field Office, "perfectly illustrates how Customs and Border Protection officers use keen instinct and professional scientific analysis to intercept dangerous drugs being smuggled into our communities." In Cincinnati, Port Director Richard Gillespie heralded those singularly responsible for having "kept this dangerous green powder out of our neighbourhoods."

Beneath the righteous pose, however, was a farce worthy of Moliere. The source of nicotine reported in the bust I knew well. It was *ambil*, a native paste with very high concentrations of tobacco, an addictive and potentially lethal drug that, when smoked, is responsible for the death of 480,000 Americans each year. Tobacco being legal, this substance was of no concern to the customs agents. The green powder in question was *mambe*. As early as 1957, Schultes had reported its use as a mild stimulant and essential component of the nutritional regime of the peoples of the Northwest Amazon; daily consumption more than satisfied the Recommended Dietary Allowance for calcium, iron, phosphorous, vitamin A and riboflavin. Prepared from an

Amazonian variety of coca with notably low concentrations of the alkaloid, less than 0.5 percent dry weight, *mambe* is food as much as stimulant, as innocuous as a cup of black tea or coffee, and far better for the health.

The news reports from WPVI noted that the "green cocaine" had been sent to labs in Savannah and Newark for analysis. Not reported were the actual results of the assays, trivial amounts of cocaine equivalent to the concentrations of caffeine in a coffee bean. Had anyone tried to snort the powder, they would have simply plugged their nostrils most unpleasantly with a substance the consistency of talcum powder; *mambe* is always consumed orally. To suggest that smugglers might import *mambe* to extract cocaine, even assuming it could be done given the large quantities of ash in the preparation, makes about as much sense as suggesting that someone would import Dom Perignon to secure by chemical processing pure extracts of ethyl alcohol. Like champagne, *mambe* is a specialized item, made by trained individuals on a small scale, a labour-intensive process that yields a highly valued and unique natural product. Drug cartels that have successfully shipped cocaine by the ton into the United States for nearly fifty years are not about to waste their time with it.

What transpired at the airport in Philadelphia was a drug bust on par with Elliot Ness mistaking a truckload of potatoes for vodka and seizing the entire works as a violation of the Volstead Act. It's one thing to note with regret that after 50 years of a "war on drugs", there are more people in more places using worse drugs in worse ways than ever before. It's quite another to acknowledge that having spent billions of dollars a year on this misguided crusade, $1 trillion altogether, our front line defenders still do not know the difference between a pure alkaloid first isolated and extracted as a drug in 1859, and coca, a benign and highly nutritious plant, revered today by millions of indigenous people, and long celebrated by the ancient civilizations of South America as the divine leaf of immortality.

SOCIALLY DISRUPTIVE PLANTS

New drugs have a way of upsetting the social order. The French Revolution was caused, at least in part, by caffeine. For generations, it had been impossible to drink the water in any European city for fear of succumbing to disease, cholera and dysentery in particular. People slaked their thirst with alcohol—gin and rum, whiskey, wine, ale and mead. The entire continent was mildly besotted, which was fine as long as the main economic activities remained farming and handcrafted manufacturing.

Then, over the course of several decades, three botanical treasures appeared, all central nervous system stimulants: tea from India and China, chocolate from Guatemala, and coffee from Abyssinia by way of Brazil and the tropical lands of the New World. All had to be prepared with boiled water, which killed the pathogens, rendering them safe to drink. As each was a highly valued commodity, especially in the early years of the trade, their sale was concentrated in shops that, in time, became centers of intellectual and political intrigue, attracting the likes of Voltaire and Rousseau, Isaac Newton and Christopher Wren.

Rather than hanging out in the local tavern with their brows in their beer, those who patronized these new establishments became wired on caffeine and they couldn't shut up. The writings

of Alexander Pope, Samuel Pepys and Jonathan Swift are positively infused with the drug. The coffee houses of London and Oxford became known as penny universities, a reference to the cost of admission and the presence of the finest minds of the era engaged in open discourse and debate. Those of Paris served as fountains of revolution as equally talkative men took note that Louis XIV's chateau at Versailles was a bit bigger than their digs. The call to arms that led to the storming of the Bastille originated at the Café de Foy, Voltaire's favourite coffee house. From there the mob gathered and marched.

Not surprisingly, those in charge, royalty across Europe and beyond, tried their best to curtail the use of the drug. In 1633, having imposed the death penalty for coffee drinkers throughout the Ottoman Empire, Sultan Murad IV stalked the streets of Istanbul in disguise, ready to decapitate anyone caught with the brew. Charles II infiltrated the coffee houses of London with spies; in 1675, he ordered them all to close. As late as 1777, Frederick the Great of Germany attempted to outlaw coffee that his people might return to beer, which yielded a more docile and manageable citizenry.

A dull and passive work force was, in fact, the last thing the emerging industrial economy needed. One could harvest a field after a few tumblers of beer, but hardly operate an unforgiving machine tool. Along with steam and coal, coffee and tea fueled the Industrial Revolution, two stimulants that kept workers alert, while providing rare moments of relief and satisfaction. A cup of tea became the salve for any crisis, even as the coffee break was institutionalized in every corporate office, union hall, school, hospital, fire station and church priory, a brief but inviolable suspension of work allowing employees to imbibe with predictable regularity another dose of the drug.

Coffee, initially employed exclusively as a medicine, and only later serving as a spark of sedition, had by the 19th century been tamed and domesticated, in good measure because it allowed men and women to work, and industrial production to soar. Its pharmacology, the raw potential for good or ill, had not changed. Rats fed large doses of caffeine become aggressive and violent; a caffeine crazed rat may even attack itself, ripping apart its own flesh. The drug's undoubted potential for harm, however, did not ultimately result in its prohibition; caffeine was needed and thus its chemical essence was reconfigured and culturally redefined.

As a consequence, there is today no black market with extortionate prices that would bankrupt coffee drinkers and drive the most desperate among them to lives of crime, while delivering enormous profits to those in control of the dark trade. Instead, coffee is sold at prices that reflect a healthy and dynamic free market, generating both legitimate employment and significant tax revenues for countries and governments throughout the world. What's more, the ready availability of the natural product—coffee beans and tea leaves in scores of flavours and blends—has effectively precluded the emergence of a significant market for chemical extracts of caffeine, which is fortunate. It is an axiom of pharmacology that the purer the drug, the greater the potential for abuse.

THE HISTORY OF COCAINE IN THE WEST

The first drug distilled in pure form from a plant was morphine. Cocaine was the second, isolated in 1859 by Albert Nieman, a German chemist. The drug came into its own in 1884 when Carl

Koller, a close friend of Sigmund Freud, recognized its anesthetic properties, which led to the first application of local anesthesia in surgery. To this day, cocaine remains our most powerful topical anesthetic, notably for nose throat and ear surgery, a perfect illustration of the adage that there are no good and bad drugs, only good and bad ways of using them.

The Corsican chemist Angelo Mariani came down on the good side in 1863 when he patented *Vin Tonique Mariani*, a combination of red bordeaux wine, coca leaf extract, and a sprinkling of pure cocaine. Needless to say, it was a hit. Mariani was responsible for two U.S. presidents, four kings, two popes, three princes, one Russian tsar, a shah and the Grand Rabbi of France turning on to coca and cocaine. Pope Leo XIII carried a flask of the wine on his hip. In the United States, an ailing Ulysses S. Grant managed to complete his memoirs with the aid of a teaspoon a day for the last five months of his life. Louis Bleriot sipped Vin Mariani as he became the first to fly the English Channel in 1909. Among those who provided Mariani with testimonials were Thomas Edison, H.G. Wells, Jules Verne, Auguste Rodin, Henrik Ibsen, Sarah Bernhardt and the Prince of Wales.

As the most popular prescribed medicine in the world, Vin Mariani inspired a host of imitators. In 1885, John Pemberton, pharmacist in Atlanta, registered the trademark for a preparation called *French Wine of Coca: Ideal Nerve and Tonic Stimulant*. A year later, he removed the wine and added the kola nut of Africa, rich in caffeine, as well as citrus oils for flavouring. Two years after that, he replaced the water with soda water, because of its association with mineral springs and good health, and began to market the product as an "intellectual beverage and temperance drink." In 1891, Pemberton sold his patent to Asa Griggs Candler, another pharmacist from Atlanta, and a year after that the Coca-Cola Company was launched. Sold as a treatment for headache, a "sovereign remedy" for hangovers, Coca-Cola soon found its way into every drugstore in the land. The soda fountain, a kind of poor man's health spa, became an institution, and all over the country men and women were strolling into their pharmacies and ordering their favourite drink by asking for "a shot in the arm".

Although Coca-Cola removed cocaine from its formula in 1903, to this day it relies on the source plant as a flavouring agent. The Stepan Company in Maywood, New Jersey, imports tons of leaves every year, removing the cocaine to sell on the pharmaceutical market, before shipping the residue containing the essential oils and flavonoids to Atlanta. The company doesn't advertise its position as the only legal importer of coca in the country, but the leaves are the reason Coca-Cola can legitimately lay claim to be, as its advertising slogan has long professed, the real thing. That the company earns $3 billion a year selling cocaine, mostly to Mallinckrodt, the country's largest manufacturer of opioids, is just a bonus.

By the 1880s, cocaine was being marketed and sold in scores of products—sweets, cigarettes, ointments, sprays, throat gargles, over-the-counter injections and cocktails. Articles in leading medical journals recommended cocaine for the treatment of a host of afflictions ranging from seasickness to stomach pain, hay fever, depression, and even that scourge of the 19th century, female masturbation, for which one physician recommended a "topical dose to the clitoris for prevention." The wave of popularity peaked in 1884, the year Sigmund Freud published his misguided paper, *On Coca*, in which he celebrated cocaine as a panacea, recommending it in particular for alcoholism and opium addiction.

It soon became apparent, however, that the cure could be worse than the disease. By 1890, the medical literature contained more than 400 cases of acute toxicity brought on by the drug, psychotic episodes in which patients experienced horrific tactile hallucinations, haunting illusions of insects crawling beneath their skin. The reversal of fortunes was immediate and dramatic. Within a few years, cocaine went from being promoted as the most beneficial stimulant known to man, the tonic of choice of presidents and popes, to being perceived as a modern curse.

As laws increasingly circumscribed its use and availability, cocaine was condemned as a narcotic, which it is not, and culturally marginalized as a symbol of decadence, employed only by artists and assorted degenerates, most of them conveniently black. As both physicians and politicians came to consider cocaine and morphine as equally dangerous, coca became associated with opium, and the public was led to believe that the ruinous effects of habitual opium use would inevitably befall those who regularly chewed coca leaves. Thus, a mild stimulant that had been used for at least 5,000 years before Europeans discovered cocaine came to be viewed as an addictive drug.

But coca is not cocaine, and to equate the leaf with the raw alkaloid is as misguided as suggesting that the delicious flesh of a peach is equivalent to the hydrogen cyanide found in every peach pit. Yet, for nearly a century, this has been precisely the legal and political position of nations and international organizations throughout the world.

AN ETHNOBOTANICAL PERSPECTIVE

The US government, in particular, has long demonized the plant. In Peru, programs to eliminate the traditional fields, supported by the United States, began 50 years before a black-market trade in the drug existed. The real issue was not cocaine but, rather, the cultural identity and survival of those who traditionally revered coca. The call for eradication came from officials and physicians, Peruvian and American, whose concern for the well-being of the Andean peoples was matched in its intensity only by their ignorance of Andean life.

In the 1920s, as physicians from Lima looked up into the Andes, they saw only abject poverty, illiteracy, poor health and nutrition, and high rates of infant mortality. With the blindness of good intentions, they searched for a cause. Since political issues of land, economic disparity and raw exploitation struck too close to home, forcing them to examine the structure of their own world, they settled on coca. Every possible ill, every source of embarrassment to their bourgeois sensibilities, was blamed on the plant.

Carlos A. Rickets, who first presented a plan for coca eradication in 1929, described coca users as feeble, mentally deficient, lazy, submissive, and depressed. Referring in 1936 to Peru's "legions of drug addicts," Carlos Enrique Paz Soldán, a doctor and university professor, raised the battle cry: "If we await with folded arms a divine miracle to free our indigenous population from the deteriorating action of coca, we shall be renouncing our position as men who love civilization."

In the 1940s the push for eradication was led by Carlos Gutiérrez-Noriega, chief of pharmacology at the Institute of Hygiene in Lima. Considering coca "the greatest obstacle to the improvement of Indians' health and social condition," Gutiérrez-Noriega established his repu-

tation with a series of dubious scientific studies, conducted exclusively in prisons and asylums, which concluded that coca users tended to be alienated, antisocial, inferior in intelligence and initiative, prone to "acute and chronic mental alterations," as well as other reputed behavioral disorders such as "absence of ambition." The ideological thrust of his science was blatant. In a report published in 1947 by the Peruvian Ministry of Public Education, he wrote, "The use of coca, illiteracy and a negative attitude towards the superior culture are all closely related."

It was largely as a result of Gutiérrez-Noriega's lobbying that the United Nations dispatched a team of experts in the fall of 1949 to look into the coca problem. Not surprisingly, their findings, published as the 1950 Report on the Commission of Enquiry on the Coca Leaf, condemned the plant and recommended a 15-year phasing out of its cultivation. Such a conclusion was never in doubt. Eleven years later both Peru and Bolivia signed the Single Convention on Narcotic Drugs, an international treaty that called for the complete abolition of coca chewing and the end of coca cultivation within 25 years.

Incredibly, in the midst of this hysterical effort to purge the nation of coca, none of the Peruvian public health officials did the obvious: analyze the leaves to find out exactly what they contained. It was, after all, a plant consumed every day by millions of their countrymen and women. Had they done so, their rhetoric might have softened.

In 1973, the Botanical Museum at Harvard, under the direction of Professor Schultes, secured support from the US Department of Agriculture (USDA) to conduct the first comprehensive and modern scientific study of the botany, ethnobotany, and nutritional value of all cultivated species and varieties of coca. At the time, despite growing concerns about the illicit use of cocaine, surprisingly little was known about the source plant. The botanical origin of the domesticated species, the chemistry of the leaf, the pharmacology of coca chewing, the geographical range of the cultivated species and the relationship between the wild and cultivated species all remained mysteries. No concerted effort had been made to document the role of coca in the religion and culture of Andean and Amazonian peoples since W Golden Mortimer's classic book, *History of Coca,* published in 1901.

Leading the research effort was the botanical explorer Timothy Plowman, whose mandate from the US government, made deliberately vague by Schultes, was to travel the length of the Andean Cordillera and locate, among other things, the place of origin of the sacred plant. It was the dream academic assignment of the 1970s, and it was my good fortune to serve as Plowman's field assistant for two years. Also on the trail of coca at the time was another Schultes protégé, Andrew Weil, then in the midst of a multi-year odyssey studying altered states of consciousness around the world. A graduate of Harvard Medical School with a profound knowledge of medicinal botany, Weil was fascinated by the healing properties of coca and the plant's role in nutrition and well-being.*

With coca purchased in a public market in Bolivia, Plowman and Weil, in collaboration with Jim Duke of the USDA, examined 15 nutrients found in the leaves, comparing their concentrations with the levels of the same nutrients in 50 common Latin American foods; coca

* Professor Andrew Weil has written a paper for this ESPD55 publication called "The therapeutic potential of coca".

was higher than the average in calories, protein, carbohydrates and several minerals. The study also revealed that coca leaves contain a host of vitamins, more calcium than any other cultivated plant—especially useful for Andean communities that traditionally lacked dairy products—and enzymes that enhance the body's ability to digest carbohydrates at high altitude, an ideal complement for a potato-based diet. To the disappointment and horror of some of our backers in the US government, the results confirmed that coca, as consumed by Indigenous Peoples, serves as a mild and benign stimulant that is beneficial to the health and highly nutritious, with no evidence of toxicity or addiction.

As a physician, Weil went on to report that coca facilitates well-being, eases digestion, and demonstrably relieves the symptoms of altitude sickness, or *soroche*. His studies indicated that coca can be helpful in the treatment of rheumatism, dysentery, stomach ulcers and nausea, with the leaves having a positive influence on respiration and a capacity to cleanse the blood of toxic metabolites, notably uric acid. Daily use of the leaves clears the mind, elevates mood and tones and strengthens the digestive tract, enhancing the assimilation of foods, even while promoting longevity. Citing a popular Andean legend, Weil concluded that coca was indeed a gift from the heavens, a sacred leaf intended only to better the lives of all people dwelling in all places on the earth.

TRADITIONAL USE AND BOTANY

None of this will come as a surprise to students of South American history. For the Inca, coca figured prominently in every aspect of ritual and daily life. Before a journey, priests tossed leaves into the air to propitiate the gods. Unable to cultivate the plant at the heights of Cusco, they replicated it in gold and silver, in sacred gardens enclosed by temple walls. At the *Coricancha*, the Temple of the Sun, sacrifices were made to the plant, and supplicants could approach the altars only if they had coca in their mouths. Soothsayers read the future in the venation of the leaves and in the flow of green saliva on fingers, skills of divination acquired only by those who had survived a lightning strike. At initiation young Inca nobles competed in arduous foot races, while maidens offered coca and chicha, a fermented drink. At the end of the ordeal each runner was presented with a *chuspa,* a woven bag filled with the finest leaves as a symbol of his new manhood.

Long caravans carrying as many as 3,000 large baskets of leaves regularly moved between the lowland plantations and the valleys leading to Cusco. Without coca, armies could not be maintained or marched across the vast expanse of the empire. Coca allowed the imperial runners, or *chasquis*, to relay messages across 4,000 miles in a week. When the *yaravecs* (court orators) were called on to recite the history of the Inca at ceremonial functions, they were aided only by a system of knotted strings, called *quipus*, and coca to stimulate the memory. In the fields, priests and farmers scattered leaves to bless the harvest. A suitor presented leaves to the family of the bride. Official travelers lay spent quids of leaves on rock cairns dedicated to *Pachamama* and placed at intervals along the paths of the empire. The sick and dying kept leaves at hand, for if coca was the last taste in a person's mouth before death, the path to paradise was assured.

Just as the Inca venerated the plant, so, too, did the other peoples of the Andes. Archaeological evidence suggests that coca was used as early as 3000 BCE at Valdivia on the Santa Elena Peninsula in western Ecuador; on the coast of Peru, it was commonly grown by 2500 BCE. Lime

pots and ceramic figurines depicting humans chewing coca have been found at virtually every major site from every era of pre-Columbian civilization on the coast, Nazca, Paracas, Moche, Chimu. The very word coca is derived not from Quechua but from Aymara, the language spoken by the descendants of the Tiwanaku, the empire that predated the Inca on the altiplano and in the basin of Titicaca by 500 years. The root word is *khoka*, a simple term meaning bush or tree, implying that the source of the sacred leaves is the plant of all plants. An active trade was established in the Bolivian highlands as early as 400CE, a thousand years before the dramatic expansion of the Inca.

The plant itself is a beautiful if delicate shrub, with small white flowers and fruits the size and colour of rubies. The texture and shape of the leaves varies, for there are two cultivated species, each with two distinct varieties. *Erythroxylum coca* var. *coca* is the classic leaf of the southern Andes, grown in the upper reaches of the tropical valleys that fall away to the Amazon, the harvest making its way to the markets of Cusco and La Paz.

Colombian coca, *Erythroxylum novogranatense var. novogranatense*, is distinct. Adapted to hot, seasonally dry habitats and highly resistant to drought, it produces small narrow leaves of a bright yellowish green hue. Named in 1895 after the colonial name for the country, Nueva Granada, this was the coca of the 13th-century Muisca and Quimbaya goldsmiths, the stimulant of the unknown peoples who carved the monolithic statues of San Agustín, the plant that Amerigo Vespucci encountered on the Paria Peninsula in 1499, when he recorded the first European description of coca chewing. Once extensively grown along the Caribbean coast of South America, in adjacent parts of Central America, and in the interior of Colombia, it is now found in traditional context only in the rugged mountains of Cauca and Huila and in the Sierra Nevada de Santa Marta. Throughout Colombia it is known as *hayo*. Curiously, the coca of the north-west Amazon, *Erythroxylum coca var. ipadu,* the source of *mambe*, is derived not from *hayo*, but rather from cuttings or seeds carried downriver from southern Peru or Bolivia in pre-Columbian times. Finally, there is *Erythroxylum novogranatense* var. *truxillense,* now grown in the coastal desert valleys of northern Peru. With just a hint of wintergreen oil, this was the preferred coca of the Inca, not to mention the key ingredient in the secret formula of Coca-Cola.

Significantly, DNA analysis suggests that the progenitor of both domesticated species and all four varieties is *Erythroxylum gracilipes*, a wild species found the length of the Andes in the lowland forests of the western Amazon. Such botanical sleuthing may seem arcane, but to have two highly valued cultigens derived independently from a common ancestor, separate processes of artificial selection occurring thousands of miles apart, is an astonishing story of parallel invention, made all the more wondrous when the plants in question are revered throughout the entire range of the cultivated species as the very essence of the sacred.

COLONIALIZATION AND COCA

In the wake of the conquest, the Spaniards shattered every shrine, violated every temple, laid waste to an empire the scale and achievements of which they could not begin to fathom. All that was most precious to the Inca invoked the wrath of the conquerors, including coca, which was demonized as "the work of idolatry and sorcery", a plant serving only to strengthen "the wicked in their

delusions, and asserted by every competent judge to possess no true virtues; but on the contrary, to cause the death of innumerable Indians, while it ruins the health of the few who survive."

That none of this was true ultimately proved convenient for the Spanish crown, especially as it became clear that natives would not toil in the mines without access to the leaves. In 1573, with his eye on gold and silver, Francisco de Toledo, Viceroy of Peru, revoked earlier laws prohibiting coca, and, by decree, removed all obstacles to its cultivation. Even as he forcibly relocated much of the population to new settlements, condemning thousands to death—at Potosí alone an average of 75 would die each day for 300 years—Toledo made sure the workers had coca.

Secularized and commercialized on a scale unknown to the Inca, coca became the foundation of the colonial economy, with taxes on its cultivation and exchange providing the church with its largest source of revenue. Christ's mission in Peru for three centuries was made possible by a plant the clergy had initially condemned as the "weed of the devil".

Many of the early chroniclers, scholars who sincerely sought to understand these new found lands, wrote glowingly about the coca plant. In his *Royal Commentaries,* Garcilaso de la Vega stated that the magical leaf "satisfies the hungry, gives new strength to the weary and exhausted, and makes the unhappy forget their sorrows." Pedro Cieza de Léon, who traveled throughout the Americas between 1532 and 1550, noted: "When I asked some of these Indians why they carried these leaves in their mouths . . . they replied that it prevents them from feeling hungry, and gives them great vigor and strength. I believe that it has some such effect."

Throughout the colonial era and well into the 19th century, praise for coca was effusive, often taking a tone of reverence and devotion, even adulation. José Hipólito Unánue, the most famous Peruvian physician of the 18th century, heralded the leaves as a panacea, the most powerful herb in a healer's repertoire. The Swiss naturalist and explorer Johann Jakob von Tsudi, who spent five years in the Andes, was impressed by the longevity of those who, over the course of their lives, by his estimate, "have consumed no less than 2700 pounds of leaves, yet nevertheless enjoy perfect health." Writing in 1846, he concluded: "I am clearly of the opinion that moderate use of coca is not merely innocuous, but even very conducive to health."

In Scotland, Sir Robert Christison, President of the Royal Society of Edinburgh (1868-73) and President of the British Medical Association (1875), decided to put the leaves to the test as he and ten students set out to walk thirty miles over hilly countryside, including an ascent of Ben Vorlich, which rises 3232 feet above Lock Earn. "On arrival home before dinner," he reported, "I felt neither hunger nor thirst, after complete abstinence from food and drink of every kind for nine hours, but upon dinner appearing in half an hour, ample justices was done to it." At the time of his experiment, Christison was 78.

Such qualities, of course, had long been reported by scientifically minded travelers in South America. J.T. Lloyd, who published *A Treatise on Coca* in 1913, wrote of the native porters of Popayán in southern Colombia: "After eating a simple breakfast, they would start with their heavy packs, weighing 75 to more than a hundred pounds, strapped to their backs. All day long they traveled at a rapid gait over steep mountain spurs at an altitude that to us, without any load whatever, was most exhausting. On these trips the Indians neither rested anywhere nor ate at noon but sucked their wads of coca throughout the entire day. These Indians we found very pleasant, always cheerful, happy and good natured, in spite of the fact that their daily toil

subjected them to the severest of hardships and the most frugal fare." Lloyd concluded that coca was surely the key to their good health and good spirits. "Not only is it not harmful, it is said to provide nourishment for the body and to be useful in the treatment of many kinds of illnesses."

Perhaps the most fulsome praise came from the surgeon W. Golden Mortimer, author of *History of Coca* (1901). Among his more amusing testimonials is an account of the Toronto La Crosse Club which, in 1877, while hosting the world championships, decided to use coca in all their matches. As Mortimer reported: "The Toronto Club was composed of men accustomed to sedentary work, while some of the opposing players were sturdy men accustomed to out of door exercise. The games were all very severely contested, and some were played in the hottest weather of one summer; on one occasion the thermometer registered 110F in the sun. The more stalwart appearing men were so far used up before the match was completed that they could hardly be encouraged to finish the concluding game, while the coca chewers were as elastic and apparently free from fatigue as at the commencement of play."

Mortimer acknowledged coca as a panacea, noting its virtues as a medicine, tonic, and food. But what truly fascinated him was the subtlety of its mode of action. It was a stimulant to be sure and yet, at the same time, its subjective effect on the body was unlike that of any other stimulant known to science. As the physician W.S. Searle wrote in 1881, "It is not a little remarkable that while no other known substance can rival coca in its sustaining power, no other has so little apparent effect. To one pursuing the even tenor of his usual routine, the chewing of coca gives no especial sensation, in fact the only result seems to be a negative one, an absence of the customary desire for food and sleep. It is only when some unusual demand is made upon mind or body that its influence is felt... Those expecting some internal commotion or sensation are disappointed."

Andrew Weil captured this quality of the coca experience beautifully in his description of his first exposure to *mambe* whilst visiting the Cubeo in the Colombian Amazon in 1973. The effect of coca, he reported, was so subtle that it could not be compared to any other natural product similarly employed; it had to be learned to be appreciated, with set and setting playing a significant role. His first taste of *mambe* occurred at night, leaving him with a good feeling "that lasted for some time after I had nothing more in my mouth; in fact, it never really ended but simply trailed off imperceptibly." It was only in the morning, as he huddled with the men as they exchanged a calabash full of the delicate green powder, that he came to understand what all the fuss was about. "I found myself marching along in the column of Cubeos, swinging my machete, humming a tune, and feeling increasingly happy. The coca seemed stronger at this hour of the morning. Its warm glow spread from my stomach throughout my body. I felt a subtle vibrational energy in my muscles. My step became light, and there was nothing I wanted to do more than just what I was doing."

SOCIAL AND SPIRITUAL USES OF COCA

The difference between coca and cocaine, anthropologist Enrique Mayer once quipped, is the difference between traveling by donkey and jet plane. A clever line, but one that misses an essential point. The actions of coca and cocaine are not comparable. Each gives a sense of well- being, but while cocaine assaults the central nervous system, the effect of coca is modified by any number

of naturally occurring compounds found in the leaves and not present in cocaine. Indigenous people who have traditionally used and celebrated coca show no preference for leaves with high levels of the alkaloid. The preferred leaves are always those rich in aromatic compounds and essential oils and low in cocaine. *Mambe* is made from leaves that have the lowest concentrations of cocaine of any of the cultivated varieties.

What's more, the cultures of coca and cocaine consumption could not be more distinct. What draws people to cocaine is the exotic decadence, the mystique of a rich man's drug, the ritual of a handful of the select few slipping into the shadows of a party to snort a few grains of a mysterious crystal that these days could be just about anything. Inclusion in the clandestine circle in the corner of the room, the stall in the bathroom, a private office at work, declares that one has arrived. Everyone at the party knows what is happening, which again is intentional. One of the privileges of membership in a secret society, as anthropologists have long reported, is the right to periodically flaunt the secrecy in public. Otherwise, what's the point of belonging? A lingering legacy of the cocaine culture of the 1980s is a small epidemic of hepatitis C, contracted by those who in their youth found it glamourous to stick up their noses a $100 note, damp with the snot of a stranger.

Coca, by contrast, is less a high than a meditation. Consumed in the Colombian Amazon as *mambe*, the plant is more commonly taken as whole leaves, which are held in the mouth as a quid for about 40 minutes, and then removed and placed on the ground in a respectful and deliberate gesture. To chew coca, or at least to absorb efficiently the small amount of the alkaloid in the leaves, one must modify human saliva by the addition of alkali. Any basic compound— baking soda, ash, limestone— will do. The Barasana and Makuna fire yarumo leaves to secure the ash. The Kogi and Arhuaco of the Sierra Nevada de Santa Marta, mountains that soar to 20,000 feet above the Caribbean coastal plain of Colombia, prefer seashells, which they acquire by trade or gather as part of elaborate pilgrimages to the ocean.

For the *Mamos*, the sun priests of the Kogi and Arhuaco, the chewing of *hayo* represents the most profound expression of culture. Their spiritual ideal would be to refrain from sex, eating and sleeping while staying up all night, chewing the leaves and chanting the names of the ancestors. As the guardians of the world, they believe that their rituals and prayers maintain the cosmic and ecological harmony of nature. At night, before they rest, they taste the leaves, deep in contemplation of the day that has passed; and in the morning *hayo* welcomes a new dawn. Every adult man consumes roughly a pound of leaves each day, beginning at marriage and continuing until his final breath.

In the mountains of the southern Andes, distance is measured not in miles but in *cocadas*, the length of time that a traveler is sustained by a single chew of leaves. When men and women meet on a trail, they pause and exchange *k'intus* of coca, three perfect leaves arranged to form a cross. They then turn to face the nearest of the *Apus*, the protective mountain deities that hover over every community and direct the destinies of all those born in their shadows. With eyes lifted toward the summits, they bring the leaves to their mouths and blow softly, a ritual invocation that sends the essence of the plant back to the earth, the community, the sacred places, and the souls of the ancestors. The exchange of leaves is a social gesture, a way of acknowledging a human connection. But the blowing of the *phukuy*, as it is called, is an act of spiritual reciprocity, for in

giving selflessly to the earth, the individual ensures that in time the energy of the coca will return full circle, as surely as rain falling on a field will inevitably be reborn as a cloud. This subtlety of gesture is, in its own way, a prayer for the well-being of the entire world.

The etiquette of *hallpay*, the totality of the act of using coca—the exchange and salutations, the way one places the leaves in the mouth, the attitude of reverence and respect—in a very real sense defines what it means to be *Runakuna*, a child of Pachamama. Throughout the entire Andean world, as anthropologist Catherine Allen writes: "One cannot function as a social being unless you partake in the ritual, and you must do it properly." Nothing causes more offence than tourists and travelers who stuff their mouths with leaves, like horses eating hay.

Whether the leaves are taken in the presence of a friend or a stranger, alone or together with all the community, to chew coca, to *hallpay*, is to transcend self and become part of the social, moral and spiritual nexus that in the Andes gives meaning to life. Coca alone makes possible direct communication with the divine, with some saying today that the first to taste the leaves was Santísima María, mother of Christ, who according to legend lost her holy child, and chewed on the leaves to allay her grief. Thus, for the people of the Andes to be without coca is a form of social and spiritual death, an excommunication from existence itself. Efforts to deny the *Runakuna* access to the leaves, to eradicate the traditional fields, are not analogous to outlawing, for example, beer in Germany, coffee in the Middle East, or betel chewing in India. They are the policies of cultural genocide.

THE DESECRATION OF COCA

The war on drugs began in 1971 when Richard Nixon took hold of fear and turned it into a political movement. Caring little about drug use, as John Ehrlichman, his closest domestic advisor later acknowledged, Nixon concocted the crisis strictly as a political ploy to galvanize his base ahead of his re-election campaign in 1972. At the time, most Americans had never heard of cocaine. The illicit trade, such as it was, remained in the hands of the independent drifter; young travelers who rotated through Colombia from El Salvador and Peru, drawn to a good life, which they financed by smuggling into the US small packets of coke, hidden in their luggage or crammed uncomfortably into various body orifices.

Today, 50 years on, more cocaine is being produced and trafficked than ever before. Thanks to prohibition, the US is the only developed country to have more citizens with criminal records than university degrees. In Colombia, an actual war, funded almost exclusively by the profits of the drug trade, left 400,000 dead, and seven million internally displaced; in the past five decades, millions more have abandoned the country, some by choice, others desperate to escape.

Cocaine has been Colombia's curse, but the engine driving the trade has always been consumption. The cartels rose out of the barrios and country clubs of Medellín and Cali, but the ultimate responsibility for Colombia's agonies lies in good measure with every person who has ever bought street cocaine and every foreign nation that has made possible the illicit market by prohibiting the drug without curbing its use in any serious way.

Even were the complete removal of the plant to be desirable, it's highly unlikely that countries like Colombia and Peru could ever eliminate the cultivation of coca. The financial incentives

for small family farmers are too great, and the potential growing areas too vast and inaccessible, especially in the ecological and altitudinal zones where cultivated coca thrives.

Crop substitution programs are delusional. Coca produces three harvests a year, generating returns that dwarf those of any other crop. Aerial eradication is doomed to failure, even as it compromises pristine forests and taints the soil and waterways with toxins. Juan Manuel Santos, Nobel Laureate for Peace in 2016, served as minister of defense under Álvaro Uribe and subsequently two terms as Colombia's president. No one in the world, as he suggested in a recent podcast, has been responsible for eliminating more coca plants than him and his government, policies that proved, in his own words, to have been a total failure. Santos now advocates the only rational solution, the cleansing stroke of legalization, without which the corrosive influence of cocaine will never subside.

The war on drugs has not only been a grotesque failure, it has blackened the name and robbed us of the promise of one of the most beneficial plants known to botanical science. When, in the 1970s, Weil and Plowman attempted to develop coca-based products that had the potential to wean Americans from their addictions to coffee and tobacco, they were shut down by a government hellbent on the pursuit of egregious policies that have only made a bad situation worse with each passing year. In her classic book, *The March of Folly*, the historian Barbara Tuchman defined folly as the acts of political leaders who, though in full possession of the facts, nevertheless pursue policies contrary to the best interests of their people and nations. By any objective measure, the war on drugs has been the most misguided crusade in the history of public policy, save perhaps for the actual Crusades, and we all know how they ended. Yet, the drug war goes on, month after month, decade after decade, with no one held accountable for its failures, and no end in sight.

We remain stuck for a simple reason, something I came to understand many years ago, soon after I returned from South America, in 1975. There was a position advertised at the USDA that Tim Plowman wanted me to apply for, though he warned that if I took the job, he'd kill me. Intrigued, I went out to the USDA campus in Beltsville, Maryland, and found my way to the office of a corpulent bureaucrat who clearly was no agricultural agent. He was DEA (Drug Enforcement Administration), head to toe.

The first thing I noticed was that he was an addict; I could hardly see across the room for the cigarette smoke. The shelves of his bookcases were cluttered with drug paraphernalia. It was like going into the office of anti-pornographer and finding the walls papered with pornography. The man was wearing a bright orange jacket over a shirt with a wide butterfly collar that showed off a hairy chest. The hair was red. Around his neck were gold chains; his wristwatch had small nuggets of gold on the band. It was soon clear that all he had gleaned from our research was that Tim and I were good at finding coca fields. The job description called for me to return to Peru to collect any organism—insect, fungus, mold—that attacked and caused damage to coca plants. I was to bring them back to the lab so they could be genetically manipulated and then reintroduced, presumably with more lethal capabilities. When I suggested that this might be a somewhat hazardous assignment, he stuck his hand under his shirt and brought out a gold dog tag, inscribed with the names of field agents he had lost.

As the interview came to an end, I realized that, although we had never met before, I knew him well. In the early 1970s, I crossed paths in Medellín with many who later made their names

in the drug business, and if the future of the trade remained unclear at the time, the dark essence of these men and women was more than evident.

As I left the office at Beltsville, I understood in a heartbeat that the man asking me to manipulate nature in order to destroy coca was cut from exactly the same cloth as those making fortunes smuggling cocaine. Energetically, they were one and the same, two sides of the same coin, the DEA and the anti-drug crusaders, and the cartels and all of their *sicarios*. Neither had the slightest interest in ending the war on drugs. The drug traffickers would see their empires implode, with profits plummeting. Interest in cocaine, truth be told a shitty drug, might well fade to nothing once the scent of money was removed from the scene. As for those in the DEA, a victorious end to their obsessive war would find them all out on the streets, looking for work. As long as they can maintain the folly, with enemies to pursue, their appropriation is the safest in the US federal budget, garnering support from every branch of the bureaucracy because virtually every agency has a piece of that $50bn pie. For this reason alone, the war on drugs will never be won, for ending it is not in the interests of either side.

Needless to say, I didn't take that job, but apparently someone did. Twenty-five years after Tim Plowman, working for the USDA, revealed coca to be a mild and benign stimulant, essential to the diet, culture and spiritual life of Andean and Amazonian peoples, the US approved the use of a novel fungus, *Fusarium oxysporum*, developed by scientists at the USDA with the specific goal of wiping out coca wherever the plant was found. They also experimented with a moth, *Eloria noyesi*, known throughout the Amazon as the "gringo" because of its insatiable appetite for coca. In the end, much to the disappointment of the DEA, the scheme was cancelled by Bill Clinton, who was concerned that the unilateral use of biological agents would be perceived diplomatically, especially in Latin America, to be a form of biological warfare, which, of course, it was.

Frustrated on one front, those dead set on eradicating coca turned to defoliants. Beginning in 1990, and continuing for more than two decades, U.S. contractors in Colombia sprayed glyphosate, commonly known as Round Up, over 4.4 million acres. The herbicide kills plant life indiscriminately, leaving the forests, in the words of Colombian botanist Alberto Gómez, "burnt to ashes."

Gómez worked seven years on the eradication campaign, but came away disillusioned, convinced that little was accomplished by aerial fumigation save the destruction of the wild, and the violation of local people who, faced with hunger in the ruin of their gardens, readily turned against the state. If sprayed, he reported, coca fields were immediately harvested and the crop salvaged. In time, all such lands could be replanted, and most were. The impact on cocaine production was negligible. The acreage dedicated to coca in Colombia grew steadily each year through 2007, and then, even as eradication efforts began to be felt in some regions, overall production declines were offset by increases in productivity in the healthy fields.

In 2015, the then president, Juan Manuel Santos, suspended the program out of concern for the health of the nation's children; it was reported that in some indigenous communities, 80 percent of children exposed to aerial spraying had fallen sick with skin rashes, fever, diarrhoea, and eye infections. Every acre of coca destroyed, if not replanted, only forced growers deeper into the pristine forests of the Amazon, resulting in soaring rates of deforestation.

In 2019, cocaine production in Colombia reached an all-time high, only to increase again in 2020. Even as the country struggled with the biggest humanitarian crisis in the history of the

hemisphere, offering food, housing, medical care, schooling and the right to work to two million Venezuelan refugees, the US government threatened to revoke more than half a billion dollars in foreign aid if the Colombian government did not resume aerial spraying with glyphosphate, despite a 2014 WHO report suggesting that the defoliant may be carcinogenic. President Iván Duque agreed to do so, making Colombia the only Latin American nation willing to tolerate the presence of American contractors fully intent on saturating the air and soils of the nation with chemicals designed to kill everything green that grows. "The drug war has tried in vain to keep cocaine out of people's noses," remarked Sanho Tree, director of the Drug Policy Project at the Institute for Policy Studies, "but could result instead in scorching the lungs of the earth."

A GIFT FOR THE WORLD

Surely, it is time to find another way. Rather than yielding to American pressure to expand the aerial use of herbicides, it's not unreasonable to ask why any of Colombia's biodiversity, perhaps its greatest national asset, not to mention the health and well-being of its children, should be put at risk to satisfy the misguided policies of a foreign country. Having endured the consequences of the illicit trade for so many years, perhaps now is the time for Colombia to reclaim a stolen legacy by celebrating coca for what it really is, what the Inca saw it to be.

Marketed as a tea, perhaps as a chewing gum for those not keen on dried or powdered leaves, the sacred plant could be Colombia's greatest gift to the world- dwarfing the commercial success of coffee, in good measure because coca is simply a better product. Who would not want to experience a sense of enhanced energy and mental clarity, a mild suppression of hunger, a gentle feeling of creative confidence, a lightness to one's step lasting throughout the day, knowing that the source of your slight elevation of mood was a benign and highly nutritious leaf that has been revered by the peoples and ancient civilizations of South America for five thousand years?

In a digital economy in which work for so many implies long hours staring at screens, what could be more welcome or promising than a natural product that facilitates focus and concentration, even while inducing a subtle sense of contentment and well-being? Truth be told, coca is the ideal companion for any creative endeavour, be it the writing of poetry or code, composing music or simply basking in the silence of the stars.

Those who experience coca invariably come away astonished by its subtle yet pleasant effects, and its practical use. Coca works, and it works for everyone, in idiosyncratic ways. In my case, a writer happily cursed with a frenetic travel schedule, coca allows me take a seat on an aeroplane after a busy day, and return immediately to the task at hand, picking up right where I left off in a text, watching as the words flow from my fingers, oblivious to all distractions.

At the moment, coca is listed in Schedule II of the US federal Controlled Substance Act, a category reserved for drugs with acknowledged therapeutic use, but also a high potential for abuse. Technically, physicians can prescribe coca, as Andrew Weil has written, but in practice they can't, for there is no legal source and the therapeutic indications have not formally been specified. Marijuana, by contrast, along with ecstasy, mescaline, and LSD, have long been listed in Schedule I, classified as drugs with serious abuse potential but no recognized medical applications; drugs in this category are deemed to be the most dangerous, the greatest threats to society.

And yet today, even as Canada and 40 other nations have legalized the use of cannabis, and hallucinogens are being heralded as the therapeutic instruments of a psychedelic renaissance that will transform the treatment of mental health, coca, despite its long history as a healing plant, remains off limits, simply because of its association with the cocaine trade.

This has to change. Some weeks ago, I called Andy Weil. We hadn't been in touch for some time, and yet it felt as if we had never been apart. Our thoughts turned, as they often have over the years, to memories of our long-departed friend, Tim Plowman, who died in 1989. Tim devoted his professional life to the study of coca—the plant had no greater champion—only to have his research, the results of years of botanical exploration in the most difficult and remote reaches of a continent, denied and betrayed by the very government that had sponsored his work. Andy and I decided to once again take up the cause of this sacred plant, if only to expose the folly of those who have kept Tim's dreams from being realized, even while promoting policies that have only brought violence, corruption and pain to the world.

Our mission is to stimulate research that will document coca's medical and therapeutic benefits, with the goal of making available for all people a plant that promises to improve their well-being and ease the day-to-day challenges of their lives. A wide array of coca-based products will bring delight to consumers, even while supporting the 130,000 Colombian families who grow the plant for a living, allowing them to sever their ties to the cartels. The liberation of the leaves will undermine the black-market trade, and reduce deforestation by opening up for cultivation lands long ago cleared and abandoned. Through taxation, it will generate for Colombia the revenues that will allow a long-suffering nation to pay the price of peace, having drained its treasury for 50 years to cover the costs of a war only made possible by the sordid profits of prohibition.

We are not alone in this quest. Colombia is on side with the plant, as are the people of Peru, and those of Bolivia who are sick and tired of their patrimony being denied, their gift to the world insulted and refused. Throughout Andean South America there are scores of new enterprises, all focused on the beneficial potential of the leaves as food, medicine, stimulant and sacrament.

A new generation of political leadership in Latin America has found the courage to defy American pressure, setting their nations on new paths that will bring an end to policies that have only served the interests of criminals, profiteers and state institutions with a vested interest in prosecuting their war on drugs indefinitely, no matter the consequences.

Within weeks of his inauguration, Gustavo Petro, newly elected president of Colombia, made good on his campaign promise to end the forced eradication of coca. He is on record as supporting legislation that will decriminalize and regulate cocaine sales. The president has taken such a stand not because he endorses the use of the drug, but because he knows that only by destroying the illicit trade, and the profits that fuel it, will it be possible to secure peace, stability and prosperity for the Colombian people.

Should President Petro succeed, undercutting the black market with the cleansing stroke of legalization, even while bringing the gift of coca to the world, he will both inspire his supporters and give pause to his opponents, those who view his young presidency across a chasm of uncertainty and trepidation. What better way to signal a new beginning for all of Colombia, a nation divided, but a people long united in hope, resilience and faith. An end at last to the war on drugs.

A stolen legacy returned to its rightful status. A sacred plant, long defiled, heralded, as in the time of the Inca and all the ancient civilizations of the Andes, as a gift of the gods, coca, the divine leaf of immortality.

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—SIR GHILLEAN PRANCE, from the Foreword

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