CONTENTS

spiritual nourishment, which made it easier to subjugate them [to Spanish rule]".

In the more recent past, certain amaranth species cultivated in rural areas of Guatemala by Indigenous groups were nearly brought to extinction by the scorched-earth policies favoured by those US military advisors working with right-wing military governments in Central America in the 1980s in their wars against insurgent guerrilla movements.

According to Beilin and Suryanarayanan, South American eco-activists currently have adopted the radical strategy of using mud "bombs" containing glyphosate-resistant *Amaranthus palmeri* seeds to sabotage the fields of monoculture crops such as soybeans.

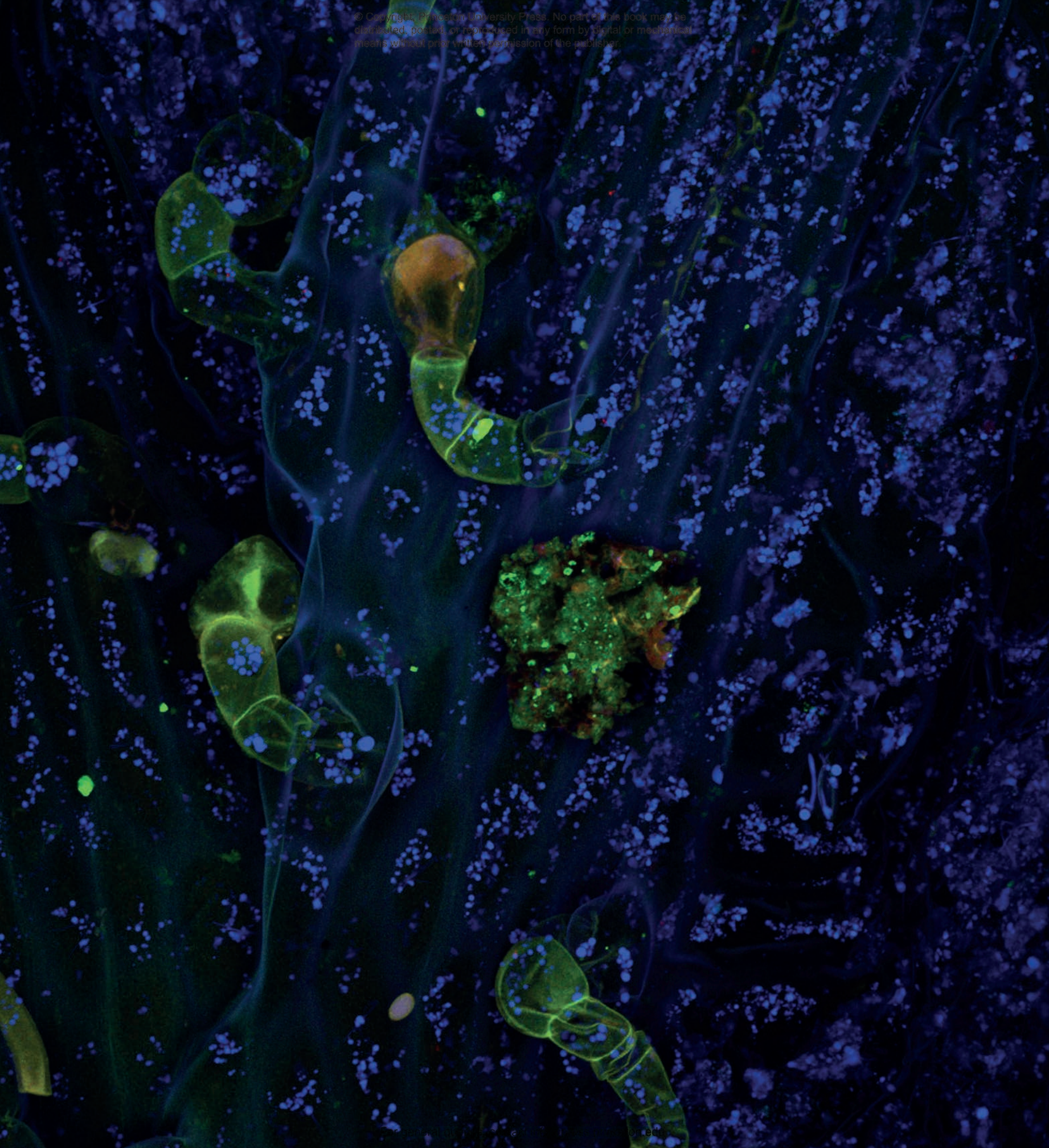
The amaranth "weeds" – whose cereal is, in fact, edible, – choke the ecologically-destructive plants grown primarily for export, whilst the amaranth plants themselves prove virtually impossible to eradicate.

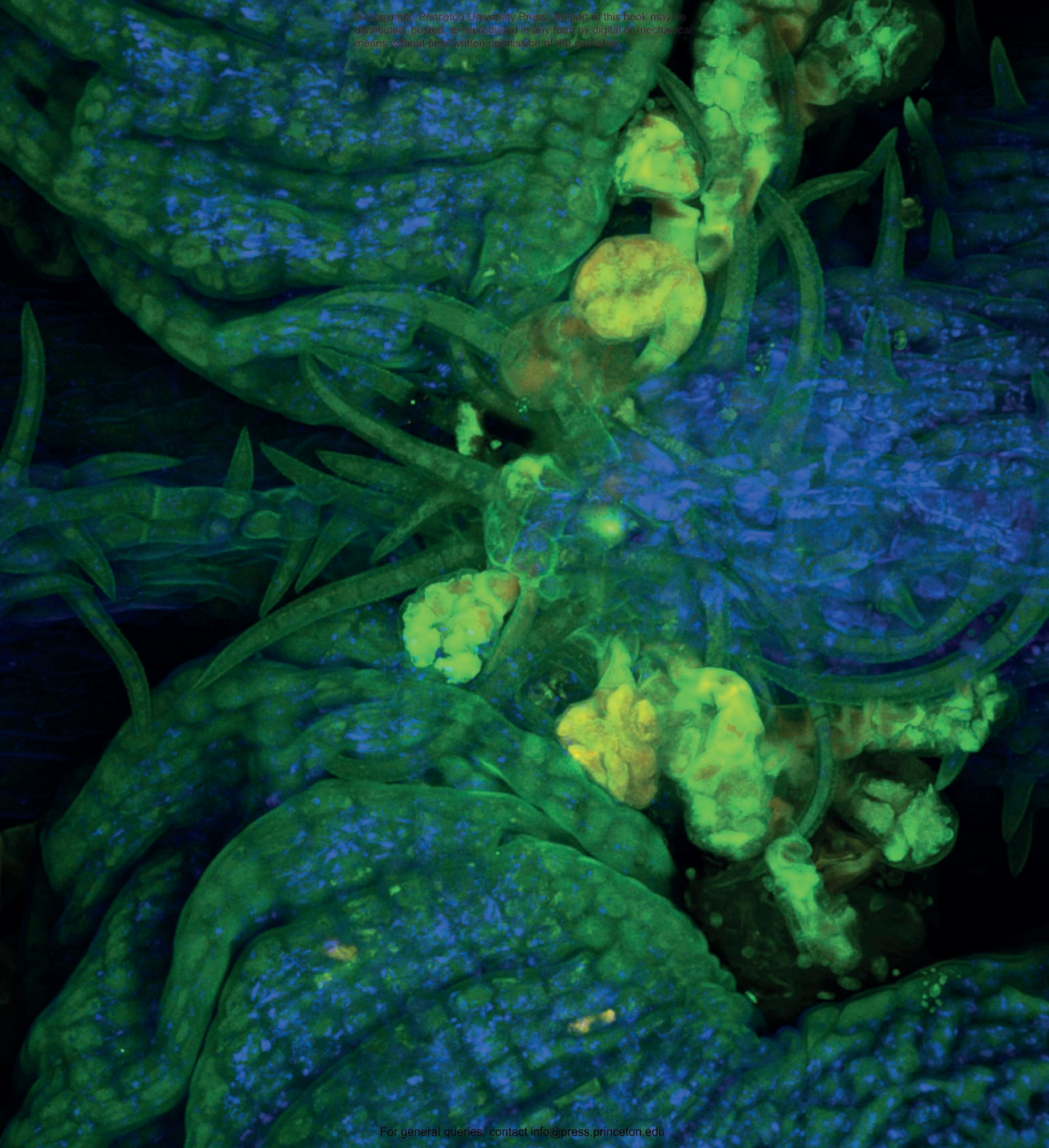
Soriano-García and Aguirre-Díaz, in their overview "Nutritional Functional Value and Therapeutic Utilisation of Amaranth", recognise *Amaranthus* as an ancient and highly-nutritious New World crop consumed by the Aztec, Maya, and Inca civilisations. The researchers also document how, in contemporary usage, amaranth aids with "antihypertensive, antioxidant, antithrombotic, and antiproliferative biological activities".

A team of South African scientists led by Olusanya N. Ruth, in addition to pointing out the value of amaranth as a drought-tolerant plant with a "massive potential of curbing food-related problems", also indicate that, despite being considered a superfood, amaranth has been neglected and stigmatised as a "food plant for the poor". The article documents the numerous neutraceutical and healing properties of amaranth in its use throughout Africa, Asia, and the Americas. The researchers believe that more educational measures must be taken in order to fully communicate the enormous benefits of this plant.

Ukrainian researchers headed by O. L. Chulak focus their study on how amaranth oil can be used "to significantly slow down the processes of vascular hardening, and therefore reduce the possibility of developing a heart attack and stroke". The scientists make the following recommendation for the use of amaranth oil: for "prevention and treatment of cardiovascular diseases: coronary heart disease, myocarditis – take 30 minutes before meals, 1 teaspoon 2 times a day during complex treatment or 400-500ml per year for preventive purposes".

top and above: *Amaranthus cruentus* (amaranth); plant
opposite: *Amaranthus cruentus* (amaranth); confocal image





Fabaceae

Anadenanthera colubrina

Angico, cebil, vilca

The coin-like black seeds of this tropical and subtropical tree contain the powerful psychoactive alkaloid bufotenine, and have been used ceremonially by different Amerindian groups for thousands of years. It is closely related as a species to Anadenanthera peregrina, whose utilisation in shamanic snuff powders by the Taínos was documented in the 15th century in the Greater Antilles by Columbus.

Constantino Manuel Torres and David B. Repke, authors of the most comprehensive study of this plant, *Anadenanthera: Visionary Plant of Ancient South America*, maintain that "the genus *Anadenanthera* was, together with tobacco, one of the most widely used shamanic inebriants. It is primarily South American in distribution and includes two species with two varieties each. The earliest evidence for the use of psychoactive plants in South America is provided by remains of seeds and pods recovered from archaeological sites four millennia old. Seeds are roasted, pulverised, and inhaled through the nose, or smoked in pipes or as cigars".

They also point out that "the earliest descriptions of the use of visionary plants in the Americas refer to smoking of tobacco and inhalation of powdered seeds of *Anadenanthera peregrina* by the Taínos of the Greater Antilles […]".

The first description of snuffing practices in the Americas was written by Christopher Columbus from observations made during his second voyage (1493-1496). During his brief period of residence on the island of Hispaniola, Columbus observed that the natives

right: *Anadenanthera colubrina* (cebil); seeds
opposite: *Anadenanthera colubrina* (cebil); confocal image

50 µm

engaged in a religious ceremony in which the snuffing of a psychoactive powder was an integral part.

Hundreds of thousands of examples of rock art possibly produced by the Carijona people have been identified at the archaeological site of Chiribiquete (located in the departments of Caquetá and Guaviare in Colombia). The oldest drawings could be up to 20,000 years old. The paintings in the rock shelters include depictions of sacred plants, among them the psychoactive acacia *Anadenanthera peregrina,* known as cohoba and yopo. Colombian archaeologist and anthropologist Carlo Castaño-Uribe, author of the indispensable study *Chiribiquete: la maloka cósmica de los hombres jaguar*, writes that: "in the sacred iconography, the yopo seed is represented with a spiky stem and a bifurcation for the beginning of germination. As the seedling grows, it forms a central branch (tridigit). In many representations the image is synthesised with a fully horizontal germination and ascending leafy ramifications, which are associated with dances with the Center of the World Pole, a key aspect of the dance rituals observed in Chiribiquete".

The images from the confocal microscope that we have included in this book are of *Anadenanthera colubrina*, which is from South America. The incontrovertible archaeological evidence in the form of actual seeds that Torres and Repke mention comes from sites in northern Chile and Argentina, as well as Bolivia, near Lake Titicaca. There are also extraordinarily artistic snuffing trays and other paraphernalia associated with the ingestion of the toasted and crushed seeds that contain high amounts of bufotenine.

I met Manolo Torres in 1983 when we both had Fulbright grants to work on projects in Chile. I had the rare privilege of seeing Manolo as he worked through his hypotheses and fascinating questions, still unresolved at that time, when he invited me to visit him in San Pedro de Atacama, one of the driest and most beautiful places on earth. Ancient mummies, snuff trays and, at night, more stars than I had ever seen. The Milky Way is a white river there!

The very closely-related species *Anadenanthera peregrina*, called cohoba by the Taínos in the Caribbean, was documented by a friar, Ramón Pané, who was commissioned by Columbus to study the ceremonies and antiquities of the Indigenous people who inhabited the islands. Pané, beginning in 1494, worked a full four years on his ethnographic research, which included specific references to this all-important psychoactive powder made from the seeds of *Anandenanthera peregrina*. The Inquisition incited the violent banning of this sacred plant along with the rituals associated with it that were considered a threatening source of Indigenous social coherence and unwanted competition with Christianity. This tragedy also marks the beginning of Europe's ecological devastation of the Americas. And, of course, the regional human toll with regard to the subsequent extermination of the Amerindian population of the Greater Antilles could not be greater.

Palaeoethnobotanic evidence discovered by a team of researchers led by Matthew E. Biwer during excavations at a site in Quilcapampa strongly suggests that the Wari culture during the Middle Horizon (AD 600-1000) produced a psychoactive fermented drink by combining *Schinus molle* drupes and *Anadenanthera colubrina* (vilca) seeds. According to this article published in the journal *Antiquity*: "vilca-infused molle chicha enabled a more inclusive psychotropic experience in Wari society. For perhaps the first time in the Andes, the consumption of vilca therefore moved beyond those spiritual leaders who communed with the supernatural realm". The public, ritualised partaking of this brew is an example of the ancient use of hallucinogens in Peru to coordinate collective action and create social cohesion.

In the extraordinarily insightful and comprehensive study "Contemporary Uses of Vilca (*Anadenanthera colubrina* var *cebil*): A Major Ritual Plant in the Andes", Verónica S. Lema, an anthropologist from the National University of Córdoba in Argentina, highlights "the enduring ritual value" of *Anadenanthera colubrina* from a

"The wide spatial and temporal distribution of the evidence for Anadenanthera ritual and visionary use attest to its importance in the construction and subsequent maintenance and modification of pre-Columbian and postcontact Indigenous ideologies."

~ Constantino Manuel Torres

"New chemical and microbotanical analyses conducted by a team of researchers led by anthropologists John W. Rick and Verónica S. Lema confirm for the first time the ritual use of Anadenanthera colubrina (cebil) and Nicotiana at the ceremonial centre of Chavín de Huantar in Peru as early as 1000 BCE. The scientists affirm that "use of psychoactive plants was intimately associated with institutionalised ritual, and not limited to the individualised contexts of ecstatic shamanism."

Anadenanthera peregrina (yopo); plant

above: *Anadenanthera colubrina* (cebil); Argentina
opposite: *Anadenanthera colubrina* (cebil); confocal image

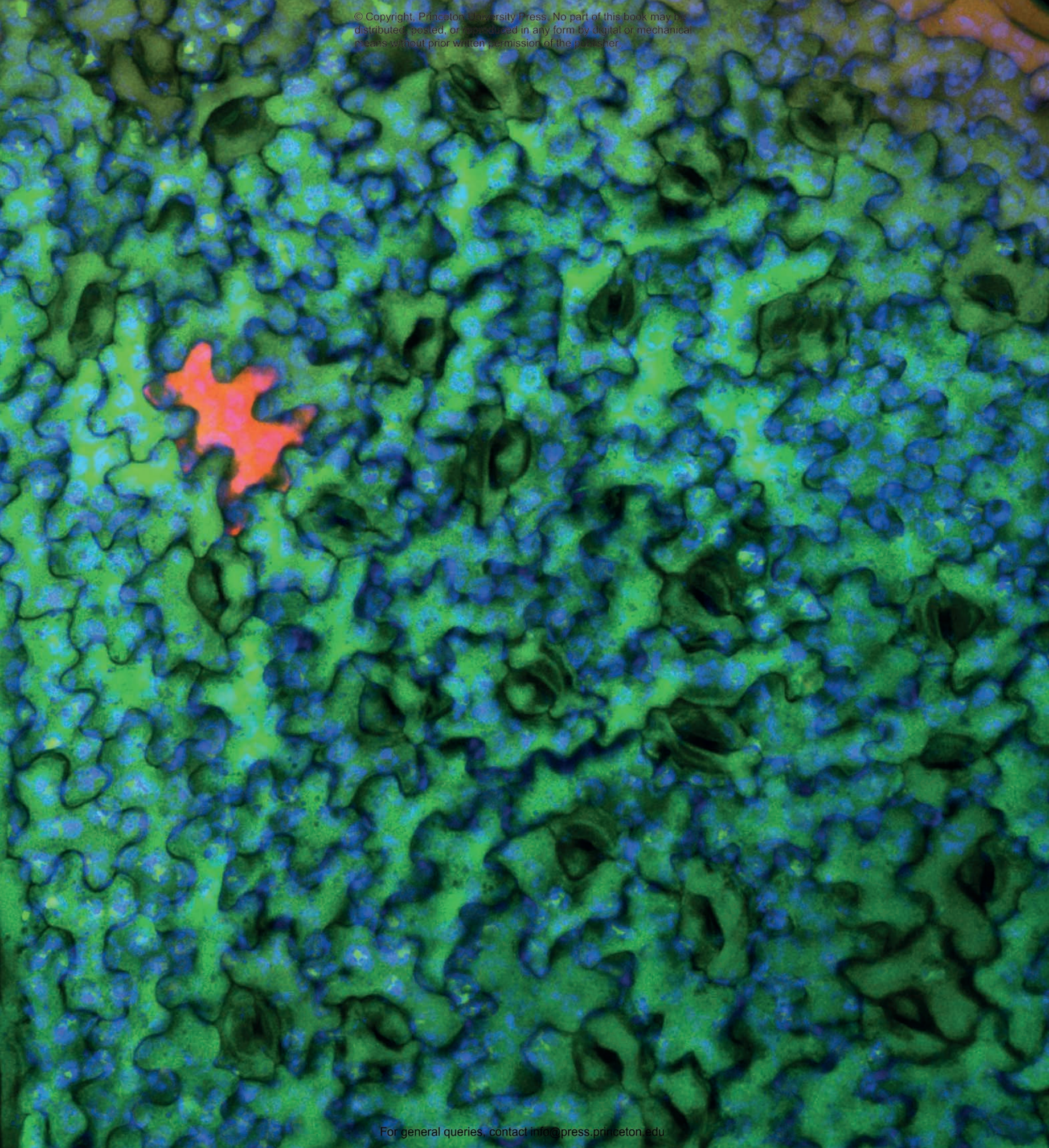
50 µm

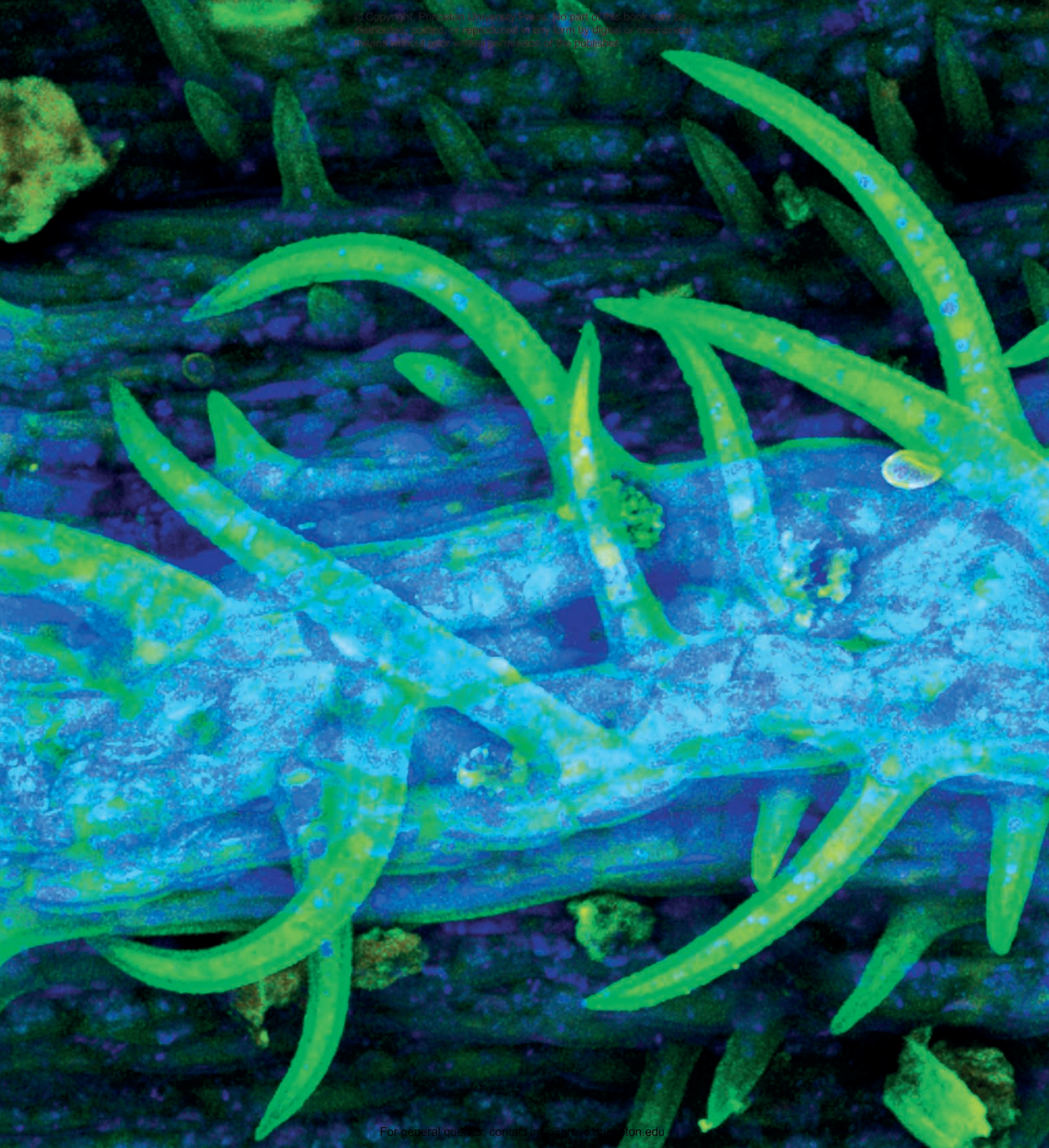
overleaf: *Anadenanthera colubrina* (cebil); confocal image

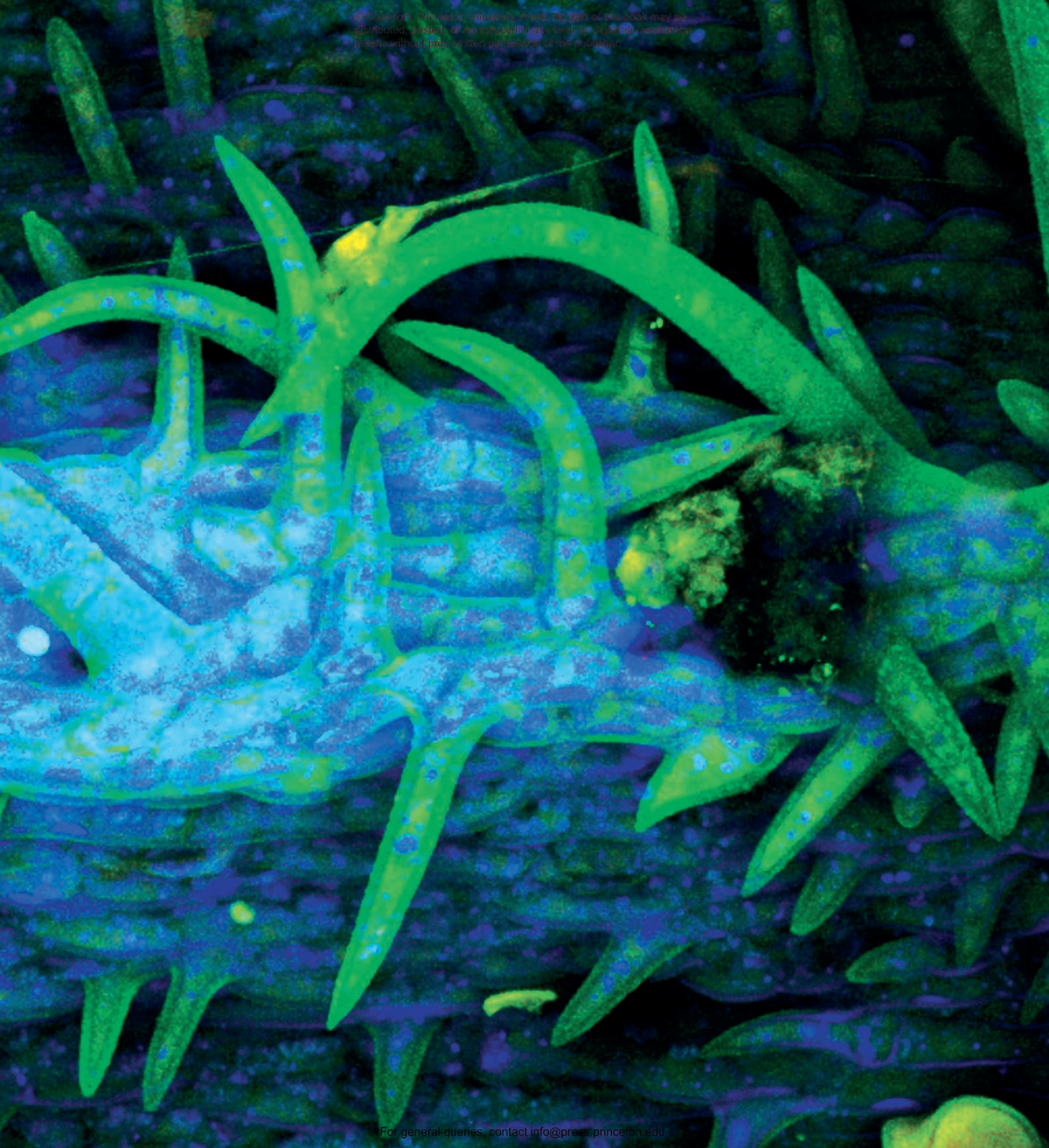
25 µm

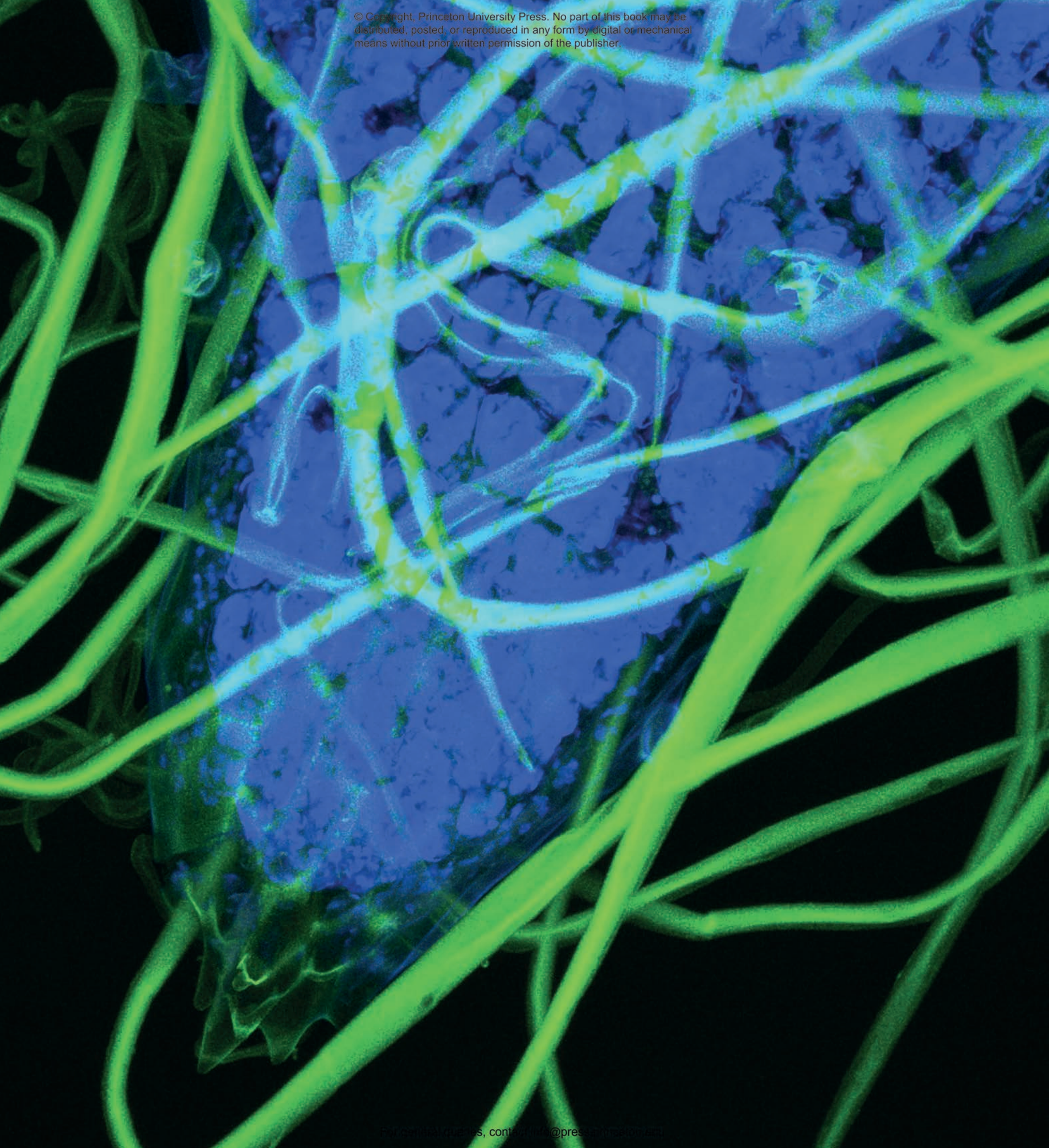
pre-Hispanic past to the contemporary south Andean world. Vilca or cebil, says Lema, is used for magical-religious, medical, and veterinary purposes, as well as for construction, fuel, fodder, dyeing, and artefact-making. In keeping with Andean conceptions of illness, Lema describes how Vilca seeds are believed to "act as protective amulets, playing a dual role: shielding the body to prevent the displacement of its spirit and embodying a continuous, rotation movement, [which] compels incoming negativity to reverse its trajectory and to return to its point of origin". Lema provides detailed information about the multiple ways that *Anadenanthera colubrina* is used not only for protection and to bring good luck, but also as a purge, cleanser, medicine, and ritual drink, as well as an ingredient in ritual bundles for ceremonial altars (*mesas*). Lema undertook this fieldwork between 2017-2019 by conducting interviews with people selling medicinal products at numerous traditional markets in Peru, Bolivia, and northwest Argentina.

A group of scientists, primarily from Brazil's Universidade Federal de Mato Grosso, and led by Merline Delices, published an overview of *Anadenanthera colubrina* that demonstrates how recent pharmacological studies corroborate popular therapeutic uses of extracts of this plant to heal wounds and as an anti-inflammatory, antioxidant, antidiarrheal, antifungal, and antitumoral. The scientists warn that unregulated use of bark and seeds from this plant for medicines and for recreational psychedelic experiences may result in its extinction.









Asteraceae

Artemisia ludoviciana subsp. *mexicana*

Estafiate, Mexican white sagebrush, western mugwort

This perennial plant with small, whitish-grey silky leaves grows in dry, rocky subsoil. It was used as a ritual incense by the Plains Indians. Contemporary scientific research is demonstrating that its essential oils have a wide range of important medicinal properties.

Artemisia ludoviciana ssp. *mexicana* (known commonly as western mugwort) is found throughout the Southwestern US in addition to both the dry and warm zones of Mexico.

In the monumental *Encyclopedia of Psychoactive Plants: Ethnopharmacology and Its Applications*, Christian Rätsch describes the North American prairie sagebrush *Artemisia mexicana* as the "most important ritual incense of the Plains Indians", for whom the rising fragrant smoke "links together Maká, the Mother Earth, with Wakan Tanka, the Great Spirit, who is active in all creatures". The plant was also used for this ceremonial purpose by the Aztecs in the pre-Columbian era, and is mentioned in the Florentine Codex as being associated with Uixtociuatl, the Aztec goddess of salt and salt makers. In ritual dances, the staff of Uixtociuatl is adorned with wormwood leaves, whilst the participants, who are connected by a flower rope, also wear wormwood flowers in their hair. This plant is also held sacred to Tláloc, the god of rain.

In *Pharmacotheon*, Jonathan Ott summarises research demonstrating how different species of *Artemisia* were used as traditional analgesics and stimulants by the Zuni, the Cheyenne, and the Potowatomi. Ott also says that "the ancient Aztecs used *Artemisia mexicana* as an inebriant, under the name *itzauhyatl*", and cites sources linking this plant to

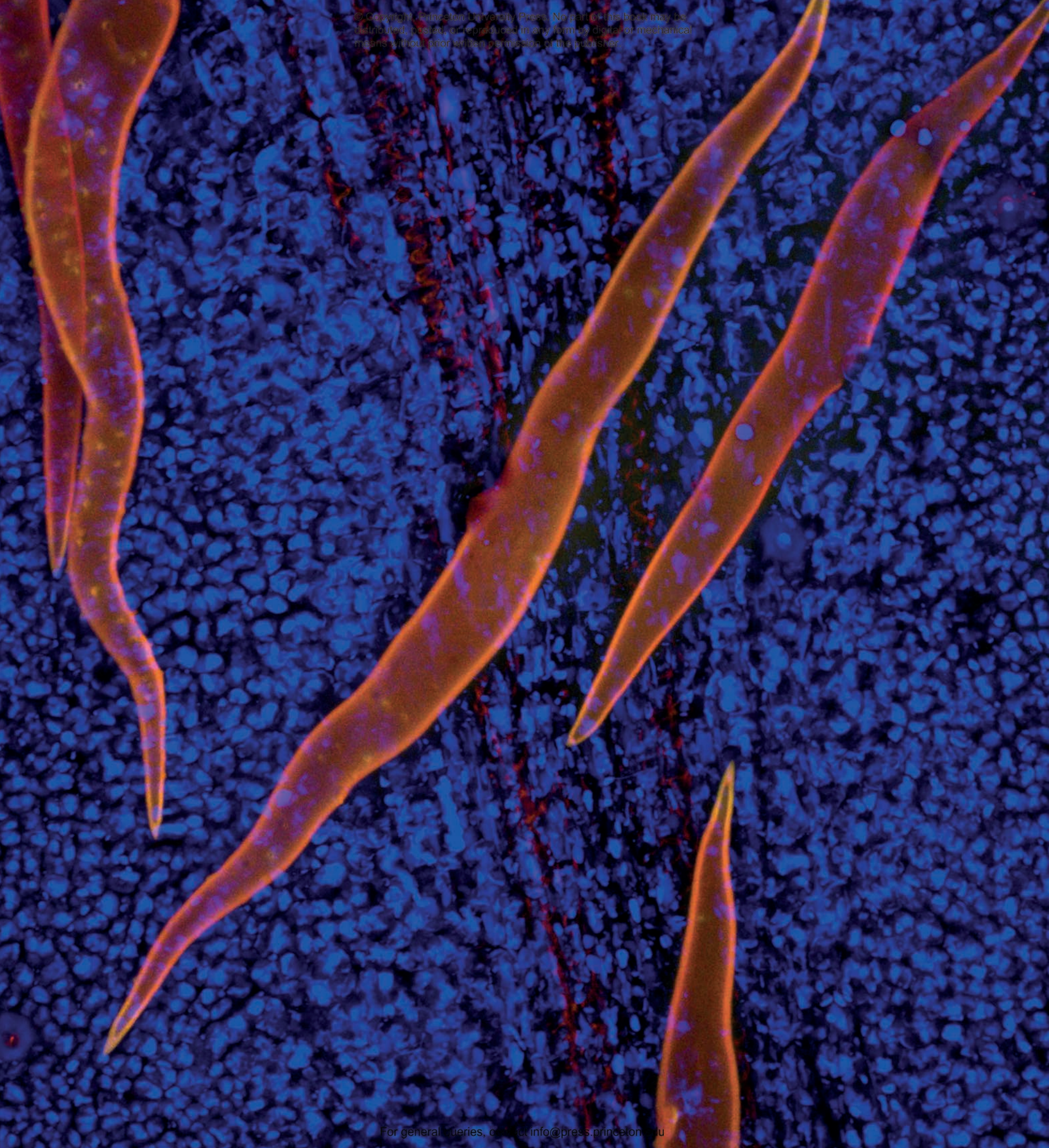
Artemisia ludoviciana ssp. *Mexicana* (western mugwort); confocal image

50 µm

the sacraments *peyótl* and *ololiuhqui*. Estafiate, the Spanish name for *Artemisia ludoviciana* subsp. *mexicana*, is an ethnomedicine in current use by urban Mexicans as well as the Tarahumara. For their part, the authors of *Plants of the Gods* document the presence of a bundle of sagebrush (*Artemisia*) for smudging purposes among the roadman's essential ritual implements for conducting peyote ceremonies in the Native American Church.

Scientific studies directed by Gerardo D. Anaya-Eugenio indicate that "*Artemisia ludoviciana* preparations showed hypoglycemic and antihyperglycemic effects, which could explain its effectiveness for treating diabetes in contemporary Mexico". Subsequent research led by Anaya-Eugenio with regard to this plant's widespread use as a popular remedy in Mexico confirm that "essential oils from a wide range of *Artemisia* species have been largely employed for their antiinfective, analgesic, antipaludic, anticancer and anti-inflammatory alleged properties". Based on the experiments conducted, the article concludes: "the neurogenic and peripheral antinociceptive effects of the essential oil of the plant were demonstrated; since these effects were partially blocked by naloxone, an opioid mechanism action was proposed". A team of researchers from Mexico led by Juan Francisco Palacios-Espinosa conducted a 2021 study of *Artemisia ludoviciana* subsp. *mexicana* that "validates traditional consumption methods" of the plant due to its "gastroprotective and anti-inflammatory activities". The scientists call their work on *Artemisia ludoviciana* as a source for antibiotics against *Helicobacter pylori* a "remarkable contribution to the ethnopharmacological knowledge of this species". José Luis Gálvez Romero led a group of scientists that published a study in 2022 confirming the antimycobacterial activity of *Artemisia ludoviciana* and suggesting that ethanol extracts of the plant "could potentially be used to supplement the treatment of tuberculosis".

Artemisia ludoviciana ssp. *Mexicana* (western mugwort); Montana



Ayahuasca / yagé

the combination of:

Malpighiaceae

Banisteriopsis spp.

Ayahuasca, hoasca, jagube, yagé, miiyabu, red ayahuasca

This giant tropical liana that seeks the support of surrounding trees to climb is the basis of a sacred beverage called ayahuasca, or yagé, that is used by highly-prepared Amazonian visionary doctors to engage with spirits from suprasensible worlds, to converse with ancestors, and to diagnose illness in their Indigenous communities. There is a great deal of current scientific research seeking ways to distinguish between the numerous ethno-varieties of Banisteriopsis caapi.

Malpighiaceae

Diplopterys spp.

Chagropanga, chaliponga, huambisa

Two species of the scandent vine Diplopterys, a source of the psychoactive substance DMT, are a common admixture to a sacred drink that always includes Banisteriopsis caapi. Diplopterys cabrerana (chaliponga and oco-yagé) is used for the brew in Colombia. Diplopterys longialata (huambisa) is often utilised for this purpose in southern Ecuador and, increasingly, in Peru as a more ecologically adaptable substitute for Psychotria viridis.

Rubiaceae

Psychotria spp.

Amyruca, chacruna, kawa

Psychotria viridis (known as chacruna) is a member of the coffee family with similar ovate shiny leaves. It is the preferred DMT-source admixture plant in the ayahuasca sacramental drink in parts of Peru and throughout Brazil, where the Santo Daime church cultivates different varieties. Psychotria carthagenensis (amyruca) is sometimes added by traditional Lamista healers in Peru to their preparations of ayahuasca.

For the sake of clarity, we have decided to create a special grouping of sacred plants for *Microcosms*. *Banisteriopsis* spp., *Diplopterys* spp., and *Psychotria* spp. are the plants most widely used to create the sacred drink known either as ayahuasca or yagé, depending on the brew's geographical origin. Our organising principle here for this book comprised of many different species of sacred plants, however, is "B" for *Banisteriopsis*. To be clear, the two words "ayahuasca" and "yagé" are used to name a drink that is composed of more than one plant. But both words also designate the single vine *Banisteriopsis caapi* on its own. Neil Logan, writing in "The Yagé Complex", explains the importance of highlighting *Banisteriopsis caapi* as the common underlying element that joins all the multiple variations possible in the preparation of the sacred beverage: "ultimately, the use of *Banisteriopsis caapi* combined with more than one hundred potential admixture plants, became common across the eastern Andes from Bolivia, north to Colombia, and Venezuela, following the Amazon and its tributaries eastward across much of north and central Brazil. "Caapi" or "cabi" are two of the more common names for referring to related vines across most of northern South America. *Banisteriopsis caapi* is considered by many groups of these regions to be a kind of driver of ecological ingenuity. It is the fundamental master medicinal plant teacher around which all other plants revolve".

Constantino Manuel Torres summarises the synergy between these plants in his brilliant study "From Beer to Tobacco: A Probable Prehistory of Ayahuasca and Yagé": "the *Banisteriopsis* vine contains several -carboline alkaloids – harmine, harmaline, and tetrahydroharmine – which are potent inhibitors of the enzyme monoamine oxidase (MAO). Frequently, ayahuasca and yagé are combined with the leaves of *Psychotria viridis* (Chacruna) or *Diplopterys cabrerana* (Chaliponga, Chagropanga, Oco-Yagé). The leaves of these two species contain N,N-dimethyltryptamine (DMT), which is not orally active. However, its combination with the MAO-inhibiting harmala alkaloids allow for its activity". Therefore, although these species could very well be considered separately, they are more conveniently regarded together as a sacred synergetic mixture.

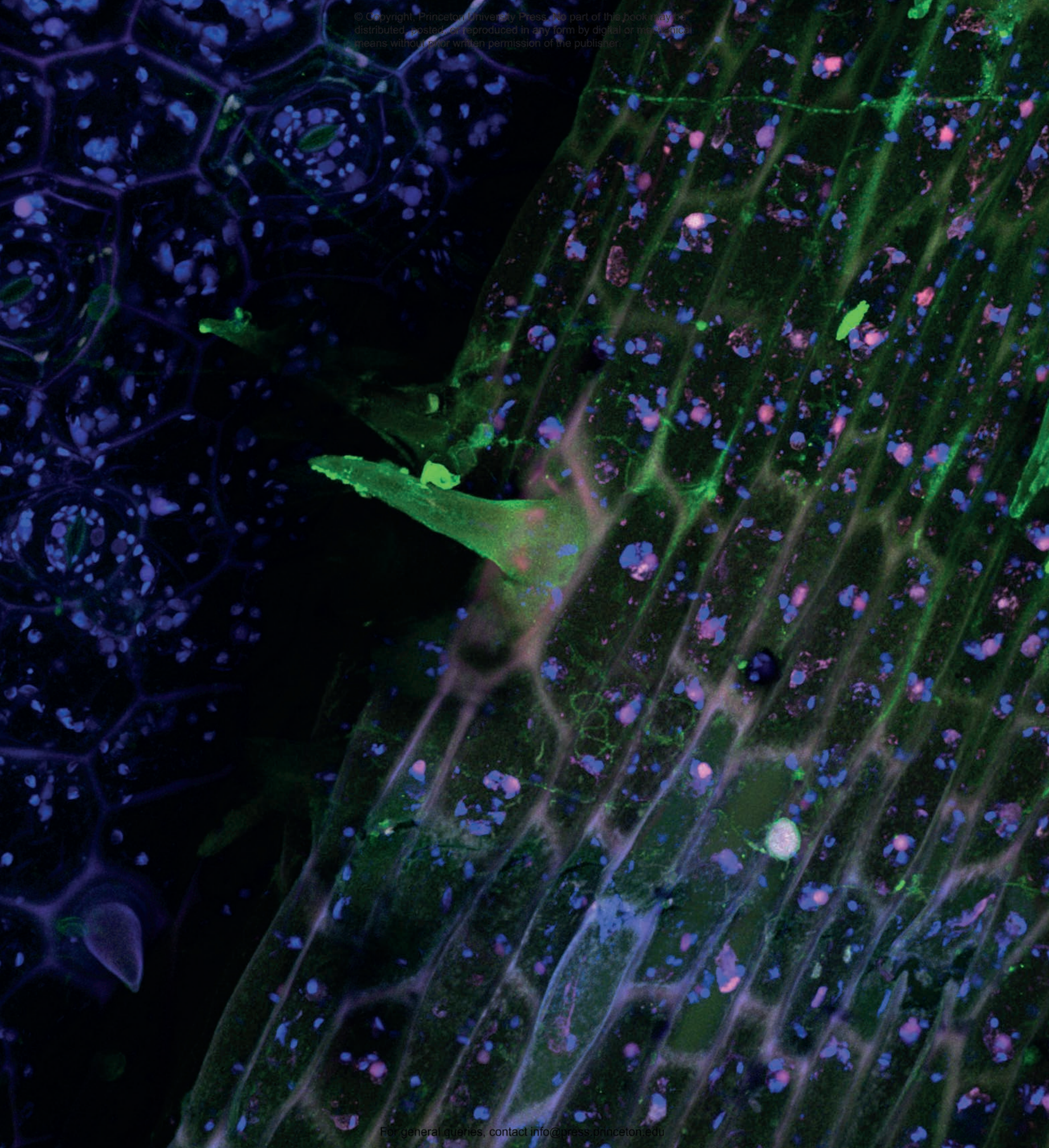
"Sometimes they mix tara yagé, wa´i yagé and pehí so that the result is very concentrated. When you drink it, the drunkenness hits you before you finish the gourd. You feel burns all over your body like you're being hit with burning logs. Then the body catches on fire and is reduced to ashes. When the flesh is destroyed, only then does the soul emerge and begin to see. At that moment the most fantastic visions begin."

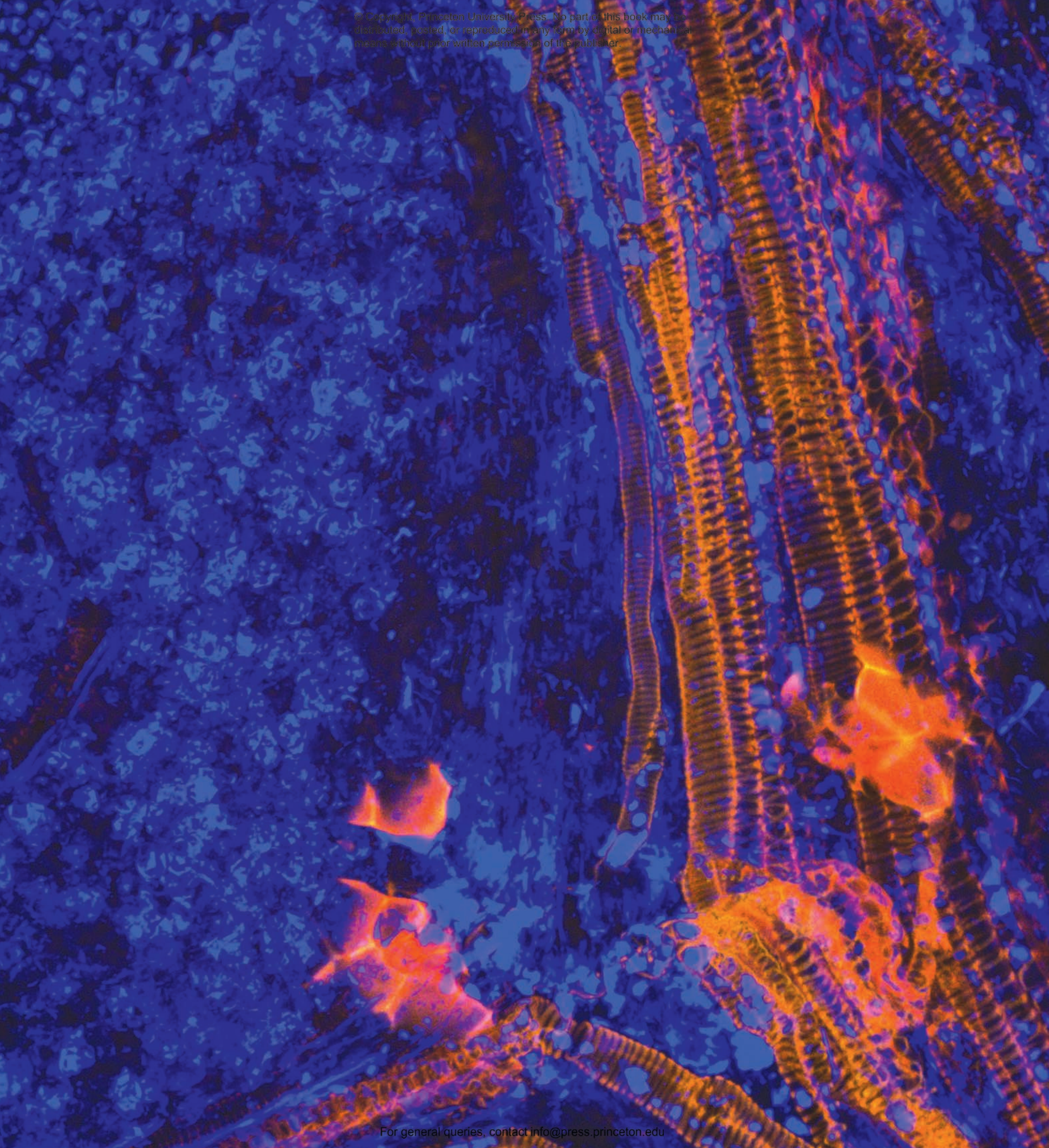
~ Fernando Payaguaje, The Yagé Drinker

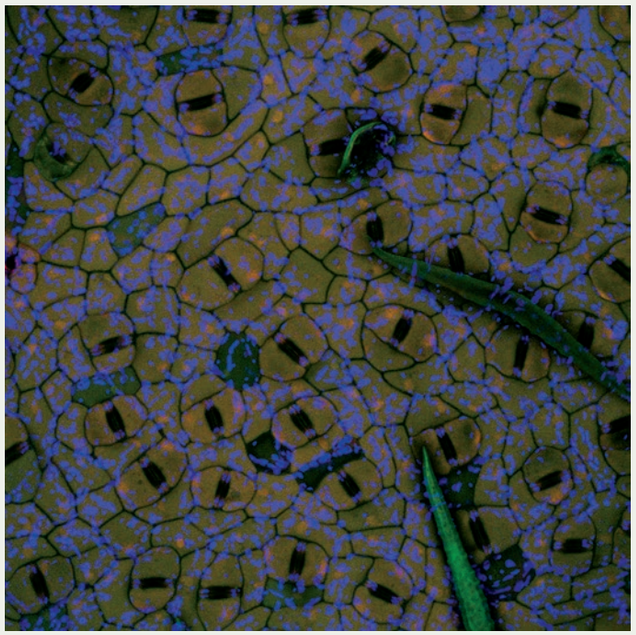
We are pleased to offer some additional botanical information that is rarely given the attention it deserves. In some brief comments on his photos of *Diplopterys longialata* (huambisa), Alan Rockefeller maintains how important it is to keep in mind the overlooked or even occluded presence of this particular species as perhaps the most common plant additive in the ayahuasca brew always prepared with *Banisteriopsis caapi*. Often, he affirms, *Diplopterys longialata* is misidentified as *Diplopterys cabrerana*. Indeed, botanically, the two species of *Diplopterys* can easily be confused if they are not flowering.

page 54: *Banisteriopsis caapi* (ayahuasca / yagé); confocal image
opposite: *Psychotria viridis* (chacruna); confocal image

50 µm







top: *Diplopterys cabrerana* (chaliponga); confocal image

50 µm

above: *Diplopterys cabrerana* (chaliponga); plant, Costa Rica

opposite: *Banisteriopsis caapi* (ayahuasca / yagé); confocal image

50 µm

However, generally speaking, *Diplopterys cabrerana* is almost always used to prepare yagé in Colombia. In northern Ecuador along the Colombian border, *Diplopterys cabrerana* and *Diplopterys longialata* are used with *Banisteriopsis caapi* interchangeably, and sometimes together. *Diplopterys longialata*, known by its common name huambisa, is used in ayahuasca preparations in southern Ecuador. Additionally, over the last fifty years, it has been introduced into Peru, becoming increasingly popular as a substitute for *Psychotria viridis* due to its similar entheogenic strength/quality, and also because it is more resilient in terms of climate fluctuations such as cold, drought, and flooding.

In Brazil, ayahuasca is also known as daime, a sacrament used by members of the Santo Daime church, which has legal status and exists throughout the country. As always, the preparation includes the obligatory *Banisteriopsis caapi* (known also as jagube) and, in Brazil, the plant admixture *Psychotria viridis* (called "a Rainha" – "the Queen" by the *daimistas*). Life, of course, is complicated on account of biodiversity. So, a curious reader with some Brazilian Portuguese can read the doctoral dissertation by Ricardo Monteles about the different varieties of sacred plants used in the Santo Daime ceremonies. Also in Brazil, Regina Célia de Oliveira is undertaking serious scientific studies with other academic researchers on the numerous *Banisteriopsis caapi* ethno-varieties. Unfortunately, the names of these ethno-varieties in Brazil do not coincide with the plethora of Indigenous names for varieties of *Banisteriopsis caapi* (including wai yagé, tara yagé and tzinca) in combination with *Diplopterys cabrerana* (oco yagé) in the Northwest Amazon, which is the probable geographic origin of the synergistic plant knowledge that, over time, evolved in the following way: from *Banisteriopsis caapi* used on its own, to chewed *Banisteriopsis caapi* raw stems combined with the ground seeds of *Anadenanthera peregrina* (a source of bufotenine, 5-OH-DMT), to *Banisteriopsis caapi* stems boiled with the leaves of *Diplopterys cabrerana* (which may have begun as recently as less than 200 years ago, according to Torres). We are pleased to offer in *Microcosms* confocal images of some of these Amazonian legacy vines. Not all *Banisteriopsis caapi* is the same. Hardly! The great Richard Evans Schultes may have had difficulty distinguishing between these varieties of the sacred Amazonian vine, but this is not true for the Siekopai, Siona, and Cofán with their sophisticated ethno-taxonomy. Jonathon Miller Weisberger has studied this phenomenon

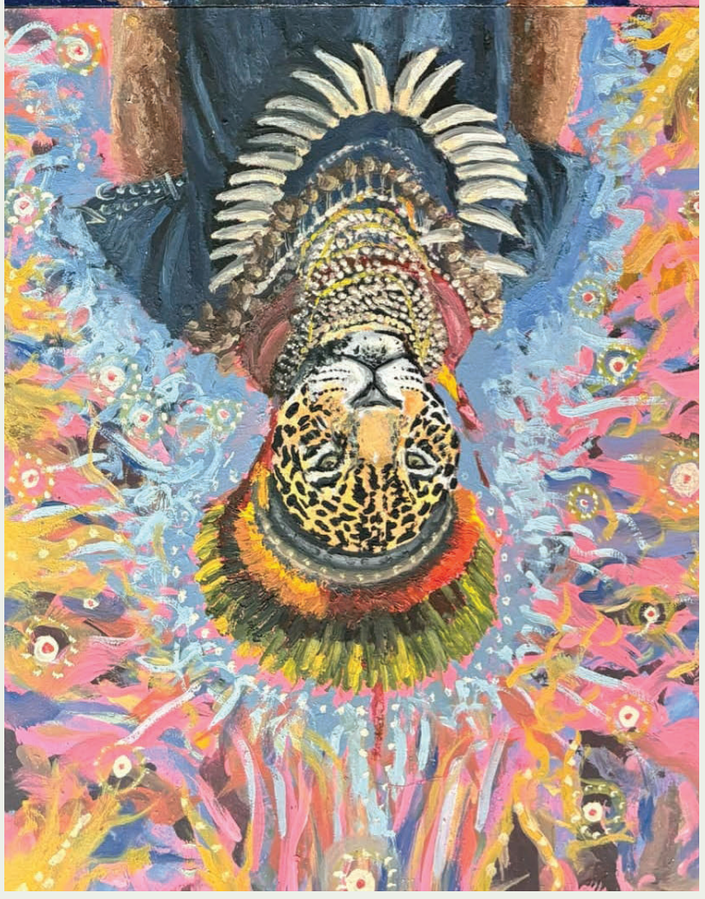
in *Rainforest Medicine: Preserving Indigenous Science and Biodiversity in the Upper Amazon*.

Luis Eduardo Luna and I met at Palenque in 1996 for a gathering sponsored by the Botanical Preservation Corps and began the structural planning for what would become the nearly 500-page volume *Ayahuasca Reader: Encounters with the Amazon's Sacred Vine*. From the onset, it was the highest priority for us as co-editors to emphasise what might be called an Indigenous research paradigm. *Ayahuasca Reader*, like *Microcosms*, is a tribute to the Amerindian receivers, keepers, and perpetuators of particular vegetal lives that are gifts from the gods. For this reason, the first of five different sections in the anthology is called "Ayahuasca Myths and Testimonies", and collects plant narratives related to *Banisteriopsis caapi*, *Diplopterys* spp., and *Psychotria* spp. Sometimes, as in the case of Gerardo Reichel-Dolmatoff, the stories reach us through old-school, now questionable, anthropological methodologies using anonymous informants to create paraphrased recreations. In other instances, the ethnographers provide more information, and, rightly so, furnish the names of Indigenous guardians of shamanic tales such as Ricardo Yaiguaje (Siona), Milton Maia and Maria Domingo (Cashinahua/Huni Kuin), Mengatue Baihua and Huepe Orengo Coba (Huaorani), Alberto Prohaño (Yagua), Hilario Peña (Inga), and, finally, Fernando Payaguaje (Secoya/Siekopai), the extraordinary *bebedor de yagé* (yagé drinker), whose extensive and invaluable first-person testimony was preserved in Payaguaje's first language Pai-Coca by the very elderly healer's grandchildren, then translated into Spanish. One hopes that these voices (recorded as interviews, transcribed, edited, translated, and even translated yet again into a third language) are ethically and equitably collected. One deeply appreciates these words, even as one recognises that there is always a complex process of mediation occurring that involves close family members fighting oblivion in the inexorable flow of time or a foreign anthropologist, perhaps a graduate student hoping to finish a dissertation or someone such as Bruce Albert, who collaborated with healer and activist Davi Kopenawa over decades to create the remarkable book *The Falling Sky: Words of a Yanomami Shaman*.

Despite these filters, nonetheless, the plants are able to make themselves known. An awareness of inevitable mediating processes also makes one personally cherish less mediated contact, in my case a long direct conversation with the highly-respected Onanya (Shipibo visionary doctor) Don Benito Arévalo in Pucallpa, Peru in June, 2000. It was a true privilege to talk with him about these healing plants and then watch or, rather, hear him labour through the entire night as he treated local patients (none of whom drank ayahuasca) for a wide variety of maladies. In this Shipibo context, it was the doctor, not the patient, who drank ayahuasca in order to diagnose and cure difficult and persistent illnesses.

Pedro Favaron's enormously insightful books *Las visiones y los mundos: sendas visionarias de la Amazonía Occidental* and *La senda del corazón: sabiduría de los pueblos indígenas de Norteamérica* are journeys into traditional Indigenous knowledge. Favaron (a Peruvian-Argentine of Italian descent from Lima and the Shipibo-Konibo Native Community of Santa Clara) is married to the accomplished Shipiba artist Chonon Bensho from Santa Clara de Yarinacocha, Peru, and, through her family, now also his, he is able to describe lineages of legendary healers (such as his wife's grandfather Ranin Bima) and their relationship to plant medicine, ancestral narratives, and songs by engaging in dialogue with other members of his family (especially his father-in-law Menin Bari and his uncle Kene Jisman) over the long periods of time that constitute lifetimes of shared responsibilities and accumulated knowledge. The visionary doctors of the Shipibo nation, according to Favaron, undergo arduous initiations that enable them to establish relations with the Ibo, or Dueños (in the double sense in English of both Owners and Masters) of the medicinal plants called *rao* in the Shipibo language. It is thanks to these plant-alliances created through ritual dieting that the traditional physician is able to use songs to cure in keeping with the healing powers of particular species. In "Netabaon Joi: the Shipibo-Konibo

opposite top left: *Banisteriopsis caapi* (ayahuasca / yagé); Ecuador
opposite bottom left: *Banisteriopsis caapi* (ayahuasca / yagé); Ecuador
opposite right: "Transformation of Taita Rufino", oil on wood painting by Colombian artist Jeisson Castillo



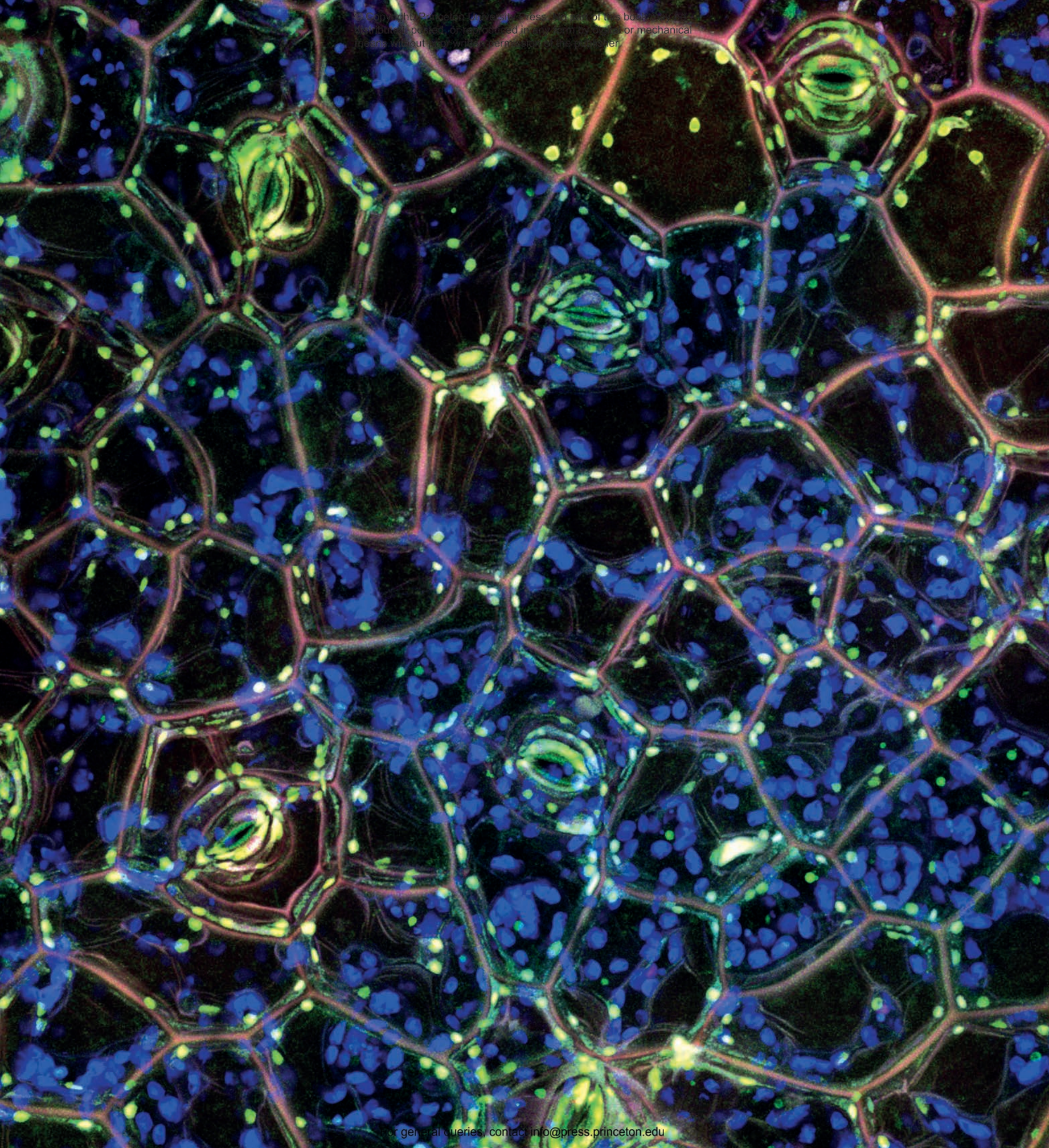
Cosmic Semiotics", Favaron concludes that "the diverse beings of the cosmos are all interwoven in a single communicating loom".

In general, Favaron has a very negative view of the explosive increase in the non-Indigenous globalised use of ayahuasca in recent decades. As he puts it, "the visionary medicine of the Western Amazon has become the new spiritual territory that the modern way of thinking wants to profane and commercialise". He laments the confusion and the lack of respect that he perceives in relation to ayahuasca, and recognises that "some Indigenous persons, with little preparation, call themselves maestros just to do business". "The Shipibo doctors in the olden days", continues Favaron, "did not have the custom of giving ayahuasca to their patients, but, rather, drank to connect themselves to spiritual worlds and cure the sick by singing songs and using other medicinal plants".

Alex K. Gearin, author of *Global Ayahuasca: Wondrous Visions and Modern Worlds*, analyses the burgeoning use of ayahuasca in several contexts, including non-Indigenous foreigners arriving en masse to the Peruvian Amazon for spiritual retreats with Shipibo healers, who are contracted to provide these services in businesses that are owned by foreign nationals. The guests, called pasajeros, or passengers, by their hosts, writes Guerin, "came to heal themselves, learn about their own spiritual interior, and transcend 'modern' problems with shamans seen to be relatively uncorrupted by the ills of civilisation". These centres, however, are based on what Gearin calls "a double dislocation": "Indigenous healers are dislocated from the place, context, and moral order of their existing local shamanic practices, and ayahuasca tourists are dislocated from their homelands and ordinary cultural realities when embarking on pilgrimages to the Amazon rainforest". Even so, ultimately, affirms Gearin, "ayahuasca has attracted people from distant corners of the planet precisely because of its adaptive ontological capacities". His study also documents ayahuasca use in Australia (where Australian facilitators guide ayahuasca drinkers who "aim to heal distress and sickness by imbibing a natural antidote sometimes said to heal the trauma of society itself") and, yes, believe it or not, in China (where users tend to be young, wealthy Chinese entrepreneurs and corporate managers "searching for holistic wellness, self-cultivation, and a competitive edge in capitalist environments"). During his research and interviews in China, what struck Gearin, who teaches

top: *Psychotria viridis* (chacruna); Nicaragua
centre: *Psychotria carthagenensis* (amyruca); Nicaragua
bottom: *Psychotria viridis* (chacruna); seeds
opposite: *Psychotria viridis* (chacruna); confocal image

50 µm



"On the other hand, there were other customs that got lost: for example, the yagé ceremony. When she learned of it, the missionary went around repeating: "It's bad to drink yagé, it's harmful." At that point, some people became evangelicals. I couldn't build another yagé hut on my own; so we let it go, despite the fact that I can still heal people."

~ Fernando Payaguaje, The Yagé Drinker

in the Medical Ethics and Humanities Unit at the University of Hong Kong, was the "utilitarian ethos of ayahuasca", and "the sanitisation of ayahuasca into a secular framework". In China, writes Gearin, psychoactive plants have "become a visionary technology employed to advance business life". Some insider will no doubt soon publish a book on the prevalence of ayahuasca use in the Hollywood film industry, the creation of Artificial Intelligence, and venture capitalism in Silicon Valley. Welcome to the contemporary world of global ayahuasca!

The astonishing growth in worldwide interest in ayahuasca has become a recurring theme in the mainstream media and in prominent publications such as David Wallace-Wells' bestselling *The Uninhabitable Earth: Life After Warming* (2019), in which the author describes a burgeoning Wellness Movement, saying, "what has been called the "new New Age" arises from a similar intuition – that meditation, ayahuasca trips, crystals and Burning Man and microdosed LSD are all pathways to a world beckoning as purer, cleaner, more sustaining, and perhaps above all else, more whole. This purity arena is likely to expand, perhaps dramatically, as the climate continues to careen toward visible degradation…".

Researchers such as Luis Eduardo Luna and Dennis J. McKenna, who have been writing for decades on this phenomenon that has been called an Archaic Revival, emphasise the transformative ecological perspectives that many people experience – and it's not always pretty! Luna describes how ayahuasca can "increase fully-sensed body-and-mind awareness of the current perils of environmental destruction, nuclear disaster, and social turmoil". McKenna proposes ayahuasca as a teacher, an "ambassador from the community of species", and, most importantly, "a catalytic influence in changing global environmental consciousness". In this regard, ayahuasca might propitiate a visceral, indelible, impassioned understanding of the term "biophilia", a love of life worth defending against its powerful enemies.

Additionally, as Dale Millard points out, the healing properties of harmine in ayahuasca are of utmost consideration. Millard's research overview demonstrates its "wide variety of therapeutic activity inducing antimicrobial, anti-diabetic, anticancer, antidepressant, antiparasitic, DNA-

below: *Diplopterys cabrerana* (chaliponga); plant, Costa Rica

above and centre: Miguel Payaguaje making cuttings of wai yagé to plant in a garden with pineapples, Sucumbíos Province, Ecuador, 2017

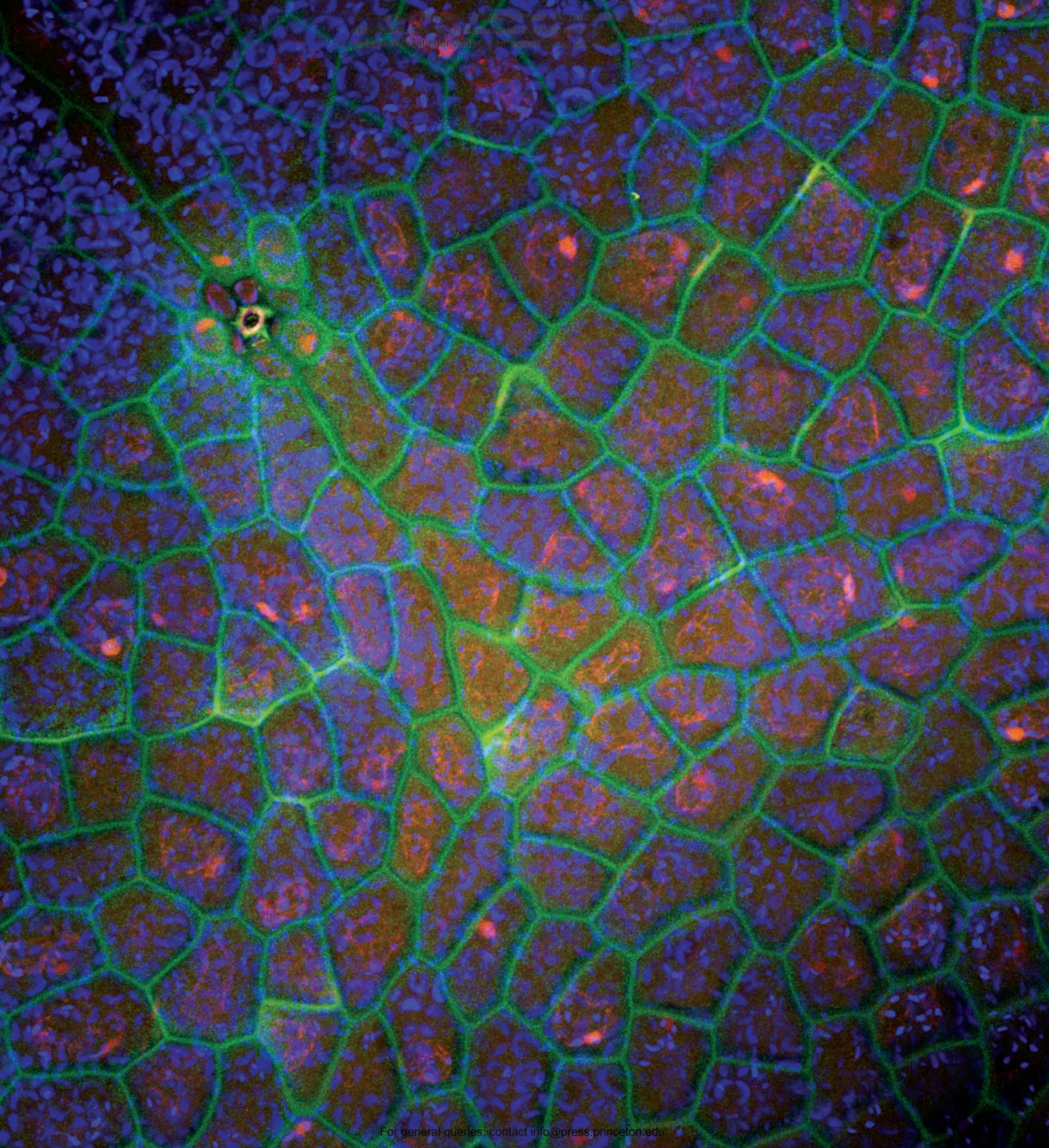
above: Fernando Payaguaje, Siekopai author of *El bebedor de yagé* (*The Yagé Drinker*)

binding, osteogenic, chondrogenic, neuroprotective and other effects. Harmine is by far the most abundant constituent of the medicine ayahuasca. Its presence in pharmacologically active amounts may therefore provide a rationale for its contribution in ayahuasca's wide application in traditional medicine and its general reputation for treating a broad range of diseases and ailments".

Psychotria viridis is the species of *Psychotria* that is the preferred ayahuasca admixture plant, though there is evidence that the closely-related species *Psychotria carthagenensis* also is used, especially by the formidable Lamista shamans in Peru, according to University of Cambridge medical anthropologist Françoise Barbira Freedman in her study "Shamanic Plants and Gender in the Healing Forest". Barbira Freedman affirms that "shamanic plant knowledge acquisition involves the understanding of the dynamic relations between the gendered species and the engineering of balance among them". She goes on to explain that there are androgynous trees as well as some plants that are not gendered: "for instance, the various plants that are labelled Ayahuasca (several varieties of *Banisteriopsis* and *Brugmansia*) are paired with plants that activate the visionary quality of the brews. These plants are generically called chacruna; the most commonly used species are two shrubs (*Psychotria viridis* and *Psychotria carthagenensis*) and a scandent vine (*Diplopterys cabrerana*)". It is interesting to note that, etymologically, the word chacruna is from the Quechua verb *chakruy*, which means to mix. In this important region of shamanic traditions, chacruna is not solely associated with *Psychotria viridis* (as it is elsewhere) but has, instead, a generic use and refers to a range of ayahuasca admixture plants. Despite certain controversies regarding the actual alkaloidal content of *Psychotria carthagenensis* in the context of phytochemical lab testing, the ritual Amerindian use of this species of *Psychotria* is well documented. For this reason, we include *Psychotria carthagenensis* (amyruca) among the sacred plants of *Microcosms*.

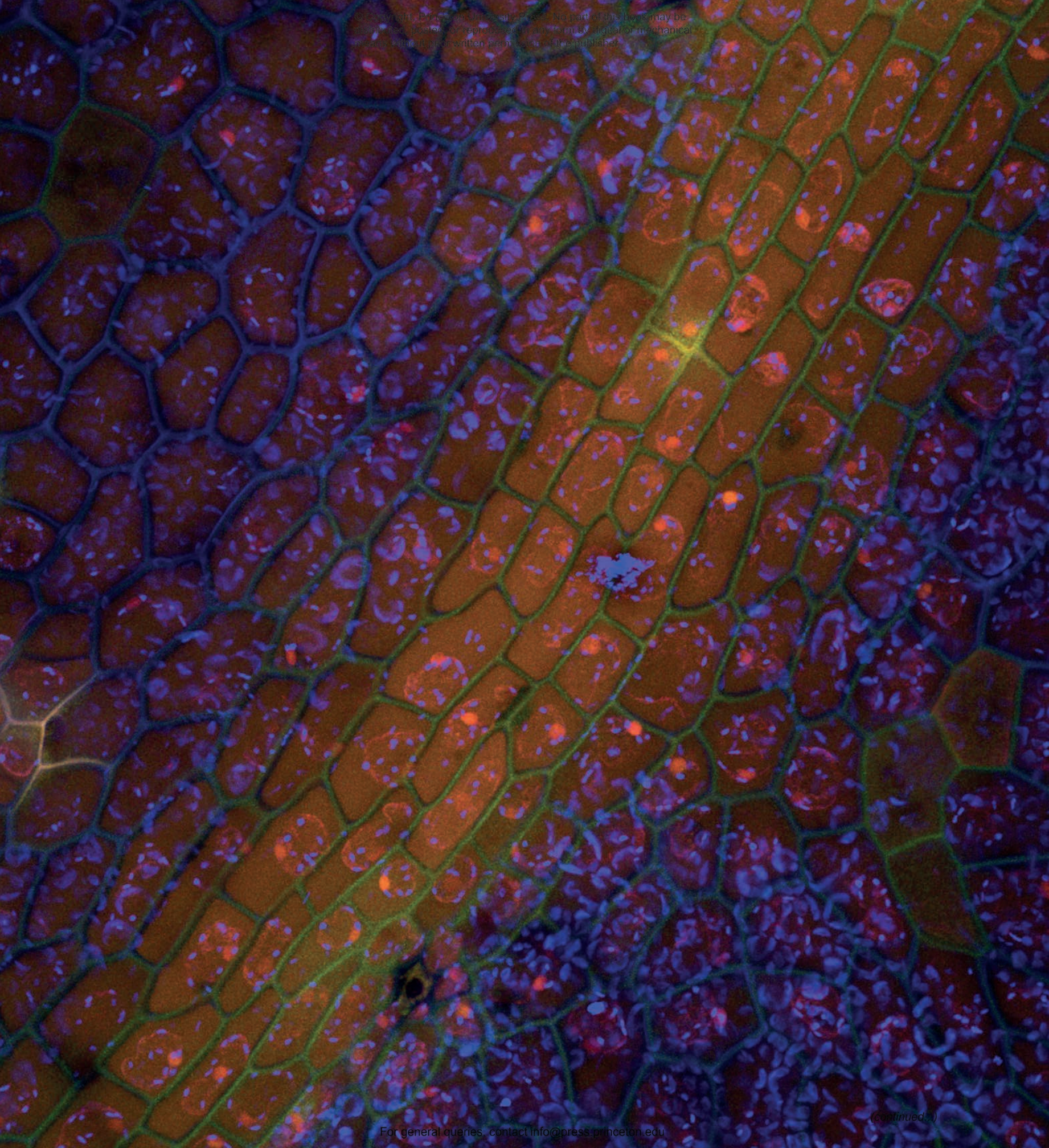
overleaf left: *Banisteriopsis muricata* (red ayahuasca); confocal image
overleaf right: *Diplopterys longialata* (huambisa); plant

50 µm



above: "Song of Ayahuasca", embroidered cloth, anonymous Shipiba artist, Peru
opposite: *Diplopterys cabrerana* (chaliponga); confocal image

50 µm



(continued)

INDEX OF PLANTS & FUNGI ILLUSTRATED

Page	Latin name	Authority for name	Plant family
34, 36, 37	*Alicia anisopetala*	(A.Juss.) W.R.Anderson	Malpighiaceae
38, 40, 41	*Amaranthus cruentus*	L.	Amaranthaceae
42, 43, 46, 47, 48-49, 254	*Anadenanthera colubrina*	(Vell.) Brenan	Fabaceae
54	*Anadenanthera peregrina*	(L.) Speg.	Fabaceae
50, 52, 53	*Artemisia ludoviciana* subsp. *mexicana*	(Willd. ex Spreng.) D.D.Keck	Asteraceae
20, 24, 26, 33, 54, 58, 61, 74, 76, 77	*Banisteriopsis caapi*	(Spruce ex Griseb.) C.V.Morton	Malpighiaceae
frontis, 66, 75	*Banisteriopsis muricata*	(Cav.) Cuatrec.	Malpighiaceae
78, 81	*Bourreria huanita*	(Lex.) Hemsl.	Boraginaceae
back cover	*Brugmansia aurea*	Lagerh.	Solanaceae
23, 89, 91	*Brugmansia insignis*	(Barb.Rodr.) Lockwood ex R.E.Schult.	Solanaceae
82 88	*Brugmansia* × *candida* var. *'Culebra'*	Pers.	Solanaceae
86, 87, 88, 90 92, 93	*Brugmansia sanguinea*	(Ruiz & Pav.) D.Don	Solanaceae
94, 97, 98, 99	*Brunfelsia grandiflora*	D.Don	Solanaceae
100, 102	*Bursera fagaroides*	(Kunth) Engl.	Burseraceae
104, 106, 107	*Calea ternifolia*	Kunth	Asteraceae
110, 111, 112, 113	*Cannabis sativa*	L.	Cannabaceae
front cover, 114, 116, 117, 118, 119	*Ceiba pentandra*	(L.) Gaertn.	Malvaceae
120, 122	*Cestrum parqui*	(Lam.) L'Hér.	Solanaceae
25, 27, 124, 126, 127	*Datura innoxia*	Mill.	Solanaceae
128, 131, 132, 133	*Desfontainia spinosa*	Ruiz & Pav.	Collumelliaceae
134, 136, 137	*Dianthera pectoralis*	(Jacq.) J.F.Gmel.	Acanthaceae
59, 64, 68, 70	*Diplopterys cabrerana*	(Cuatrec.) B.Gates	Malpighiaceae
67, 71	*Diplopterys longialata*	(Nied.) W.R.Anderson & C.Davis	Malpighiaceae
138, 141	*Drimys andina*	(Reiche) R.A.Rodr. & Quezada	Winteraceae
141	*Drimys winteri*	J.R.Forst. & G.Forst.	Winteraceae
142, 144, 145	*Erythroxylum novogranatense*	(D.Morris) Hieron.	Erythroxylaceae
146, 148, 149	*Heimia salicifolia*	Link	Lythraceae
150, 153	*Hierochloe odorata*	(L.) P.Beauv.	Poaceae
154, 158	*Ipomoea corymbosa*	(L.) Roth	Convolvulaceae
157, 158	*Ipomoea tricolor*	Cav.	Convolvulaceae
160, 161	*Latua pubiflora*	(Griseb.) Baill.	Solanaceae
162, 164, 165	*Leonotis nepetifolia*	(L.) R.Br.	Lamiaceae
29, 166, 168, 169, 170	*Lophophora williamsii*	(Lem. ex J.F.Cels) J.M.Coult.	Cactaceae
172, 174, 175	*Mimosa pudica*	L.	Fabaceae
176, 178, 179	*Mimosa tenuiflora*	(Willd.) Poir.	Fabaceae
180, 182, 186, 187	*Neltuma limensis*	(Benth.) C.E.Hughes & G.P.Lewis	Fabaceae
182	*Neltuma pallida*	(Humb. & Bonpl. ex Willd.) C.E.Hughes & G.P.Lewis	Fabaceae
188, 191	*Nicotiana rustica*	L.	Solanaceae
192, 194, 195	*Paullinia cupana*	Kunth	Sapindaceae
200	*Polylepis australis*	Bitter	Rosaceae
196, 199, 201	*Polylepis incarum*	(Bitter) M.Kessler & Schmidt-Leb.	Rosaceae
201	*Polylepis lanata*	(Kuntze) M.Kessler & Schmidt-Leb.	Rosaceae
201	*Polylepis reticulata*	Hieron	Rosaceae
200	*Polylepis tarapacana*	Phil.	Rosaceae
202, 205	*Psilocybe cubensis*	(Earl) Singer	Hymenogastraceae
62, 72	*Psychotria carthagenensis*	Jacq.	Rubiaceae
57, 62, 63, 73	*Psychotria viridis*	Ruiz & Pav.	Rubiaceae
206	*Salvia apiana*	Jeps.	Lamiaceae
208, 210, 211, 212	*Salvia divinorum*	Epling & Játiva	Lamiaceae
214, 218, 219	*Solandra maxima*	(Moc. & Sessé ex Dunal) P.S.Green	Solanaceae
222	*Tabernaemontana sananho*	Ruiz & Pav.	Apocynaceae
220, 223	*Tabernaemontana undulata*	Vahl	Apocynaceae
224, 225	*Tagetes lucida*	Cav.	Asteraceae
228, 231, 232, 233	*Theobroma cacao*	L.	Malvaceae
30, 234, 236-237	*Trichocereus macrogonus* var. *pachanoi*	(Britton & Rose) Albesiano & R.Kiesling	Cactaceae
238, 241, 242, 243	*Ullucus tuberosus* (*aborigineus*)	(Brücher) Sperling	Basellaceae
246, 247	*Virola calophylla*	(Spruce) Warb.	Myristicaceae
244, 248	*Virola theiodora*	(Spruce ex Benth.) Warb.	Myristicaceae
250, 253	*Zea luxurians*	(Durieu & Asch.) R.M.Bird	Poaceae