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A Horticultural Journey and Leadership Opportunities with IPPS

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Summary

Traveling the world for a year after college was an epiphany for Fred Davies choosing a career in horticulture. He later started his research and teaching program studying the biology of plant propagation. Early involvement in the International Plant Production Society – Southern Region of North America (IPPS-SRNA) provided invaluable opportunities for professional networking, leadership development, and personal growth, all grounded in the Society's guiding principle of "seeking and sharing." This year marks the 50th anniversary of the IPPS-SRNA. The inaugural 1st meeting took place in 1976 in Mobile, Alabama – organized and led by President, Charles Parkerson. The SRNA has evolved as the elite region of the IPPS - with its scholarships, educational programs, early career professional exchanges and professional opportunities. The SRNA is supported by 21 committees, with dedicated people working behind the scenes to keep the organization running smoothly. The strength

of the SRNA has been recruiting new talent - bringing fresh ideas and energy. Leadership opportunities are plentiful—and new volunteers continue to rise through the ranks.

Dedicated to Jaime E. Lazarte (26 July 1943 – 22 January 2025): my best friend for 55 years—mentor, colleague, fellow world traveler—the consummate optimist - always helping and giving back.

INTRODUCTION

THE 50TH ANNIVERSARY OF THE IPPS-SOUTHERN REGION OF NORTH AMERICA

What a great day for the IPPS-Southern Region of North America (SRNA). It is our 50th anniversary and 49th meeting! We missed a year due to Covid canceling the 2020 meeting – but Brie Arthur and Cheryl Boyer skillfully picked up the slack – and organized the on-line 2020 North American Summit - with some 947 zoom participants from around the world.

IN THE BEGINNING: A HORTICULTURAL JOURNEY THAT CONTINUES

Some 50-plus years ago, when I graduated from college, I decided to travel the world before settling down to a job, career, wife, family – responsibility! I grew up working summer jobs on potato farms in central New Jersey as a teenager – but never considered horticulture/agriculture as a career choice. I had a very good friend, Jaime Lazarte, who had just finished his Master's degree in pomology under the supervision of Drs. Fred Hough and Catherine Bailey – two world-renowned temperate-fruit breeders at Rutgers University. So, I convinced Jaime: *We GOTTA DO this trip!* And for the next year we traveled the world backpacking and hitchhiking – when you could still do those adventures - at a cost of $2700/each (equivalent to $20,000 today). See some of the challenges of traveling in 1971-72 (**Table 1**).

We spent a couple of months hitchhiking through Canada and the US- and then headed south to Mexico and Central America. Our original plan was to board a ship via the Panama Canal and head to Australia to work. No luck with that. So, we shifted gears and traveled to Colombia in South America.

We later journeyed 2400 miles down the Amazon on little river boats, made it to the Carnivals in Rio de Janeiro (an awesome, citywide block party), got thrown in jail in Argentina (a police chief in a small town was trying to shake us down for a bribe), caught a Chinese cargo-passenger ship from Buenos Aires to Cape Town, hitchhiked around South Africa during the time of apartheid, traveled around East Africa, took an old cargo-passenger ship on its final voyage from Mombasa, Kenya to Bombay (Mumbai), India - wandered around Nepal, Southeast Asia, and Japan.

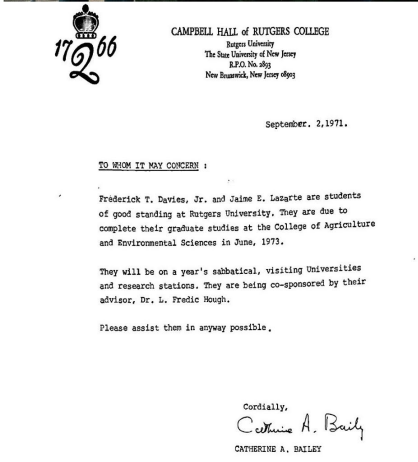
Table 1. Travel challenges and some historical events in 1971-1972.

TRAVEL CHALLENGES
There was no internet, world wide web or Apps; no microwave.
International phone calls were astronomically expensive – there was no Skype, Facetime, WhatsApp. You did NOT call home! You had to WING-IT on your own!
The I-phone would not be developed until 36 years later – so no Starbucks with free Wi-Fi to text, email and make phone calls.
There were no desk-tops, lap-tops, tablet computers; a "computer" was an "industrial-strength," IBM mainframe (occupied an entire room).
There were no GPS, Google Maps, Waze - just hard-copy maps (if you could afford one) - that many people can no longer read.
You traveled with American Express Travelers checks – credit cards and debit cards were not available; there were no ATM machines.
You had to plan ahead (weeks!) if you wanted to receive a letter – typically at one of the American Express offices around the world.
WORLD EVENTS
The Apollo program ended with the last person to walk on the Moon – 53-years ago!
President Nixon started the NASA Space Shuttle program.
President Nixon opened up relations with China –27 years after WW II had ended.
The Vietnam War was still raging with Henry Kissinger negotiating in Paris.
The Watergate Scandal occurred – and President Nixon would resign in 2 years.
HBO began operating as a pay television service.
The Dallas Cowboys finally won their first Super Bowl with quarterback Roger Staubach
John Lennon's "Imagine" topped charts amid the chaos of Vietnam and Watergate.
Atari released Pong, launching the video game industry.
The "Godfather" premiered redefining Hollywood's storytelling style and moral ambiguity.
The Andean plane crash (Uruguayan Flight 571) —survivors resorted to cannibalism to stay alive for 72 days in the frozen Andes.
1972 was the longest year in modern times, thanks to two leap seconds being added (June 30 and Dec 31) to adjust atomic clocks to Earth's rotation!
South Africa's apartheid system of racial segregation severely restricted opportunities for non-white citizens. Some 21-years later, the last white Afrikaner President, F. W. de Klerk, and their first black president, Nelson Mandela, would win the Nobel Peace Prize for their efforts to peacefully end South Africa's apartheid system - and lay the groundwork for a democratic, multiracial government.

A year after setting out, we arrived in Long Beach, California, by ship – and hitchhiked cross-country to our final destination of New Jersey -with $25 and pocket change ($175 today) between the two of us. But the trip was more than just adventuring from one place to another. It was an epiphany discovering the international opportunities in horticulture as high-value, niche crops: nutrient-dense fruits and vegetables, ornamentals/landscape plants (green industry), medicinal crops and herbs (Davies, 2012). [Horticulture accounts for over 35% of farmgate value of all crops in the U.S. –50% in California, and 80% in urban New Jersey]. Along the way, we visited banana plantations, temperate and tropical fruit and vegetable production centers, tea plantations, and ornamental production/green industry businesses.

We had a letter of introduction from Professor Bailey that we were students of good standing at Rutgers (*a white lie!*) on a year's sabbatical– and to please assist us anyway possible. That letter became our passport to businesses and institutions — and it was dog-eared by the end of the trip (**Fig. 1**). I also discovered that a career in Horticulture was what I wanted to pursue in life. And my horticultural tutor – Jaime - turned out to be a great mentor – and life-long, best friend.


Fred & Jaime on Oregon Coast.



CAMPBELL HALL of RUTGERS COLLEGE
Rutgers University
The State University of New Jersey
R.F.D. No. 1879
New Brunswick, New Jersey 08903

September. 2,1971.

TO WHOM IT MAY CONCERN :

Frederick T. Davies, Jr. and Jaime E. Lazarte are students of good standing at Rutgers University. They are due to complete their graduate studies at the College of Agriculture and Environmental Sciences in June, 1973.

They will be on a year's sabbatical, visiting Universities and research stations. They are being co-sponsored by their advisor, Dr. L. Fredic Hough.

Please assist them in anyway possible.

Cordially,
Catherine A. Baily
CATHERINE A. BAILEY

- ❑ Back-packed/ hitchhiked around the world for a year.
- ❑ Jaime Lazarte: Best friend, mentor, colleague
- ❑ U.S., Canada, Mexico, Central America, South America [Amazon River], Africa, India, Nepal, Southeast Asia, Japan.
- ❑ Visited banana plantations, temperate and tropical fruit and vegetable production & research centers, tea plantations, ornamental production
- ❑ *Epiphany*: International Opportunities in Horticulture for High-value, Niche Crops.


Camping in Wyoming snow

Figure 1. Traveling the globe with horticulturist Jaime Lazarte – discovering international opportunities in horticulture as high-value, niche crops. Professor Baily's letter of introduction (bottom left) was our passport to horticultural businesses and institutions. Fred and Jaime on the Oregon Coast (top left) and camping in Wyoming snow (bottom right).

In Guacimo, Costa Rica we spent a week on a German-owned banana plantation (**Fig. 2**). Bananas are clonally produced as herbaceous perennial monocots. At the time, propagation was by rhizome division (locally called corms) – now bananas are

commercially propagated by tissue culture to minimize pathogens, such as Fusarium wilt. It was a 9-month production cycle. They used a trellis and pulley system to haul the harvested banana bunch (a cluster of bananas weighs up to 150 lbs.) to the processing shed (**Fig. 2)**. This was before GPS systems, but the company used coordinates on the plantation to trace/mark the crop.

The bunch was cut up into tiers (hands) composed of attached banana fingers (individual bananas) which were graded in a float tank. The bananas were then boxed, trucked to the Guacimo railroad head – and transported on a narrow-gage railway system (because of dense rainforest terrain) to Puerto Limon. The bananas were then loaded on a reefer ship headed for Hamberg, Germany (**Fig. 2)**.

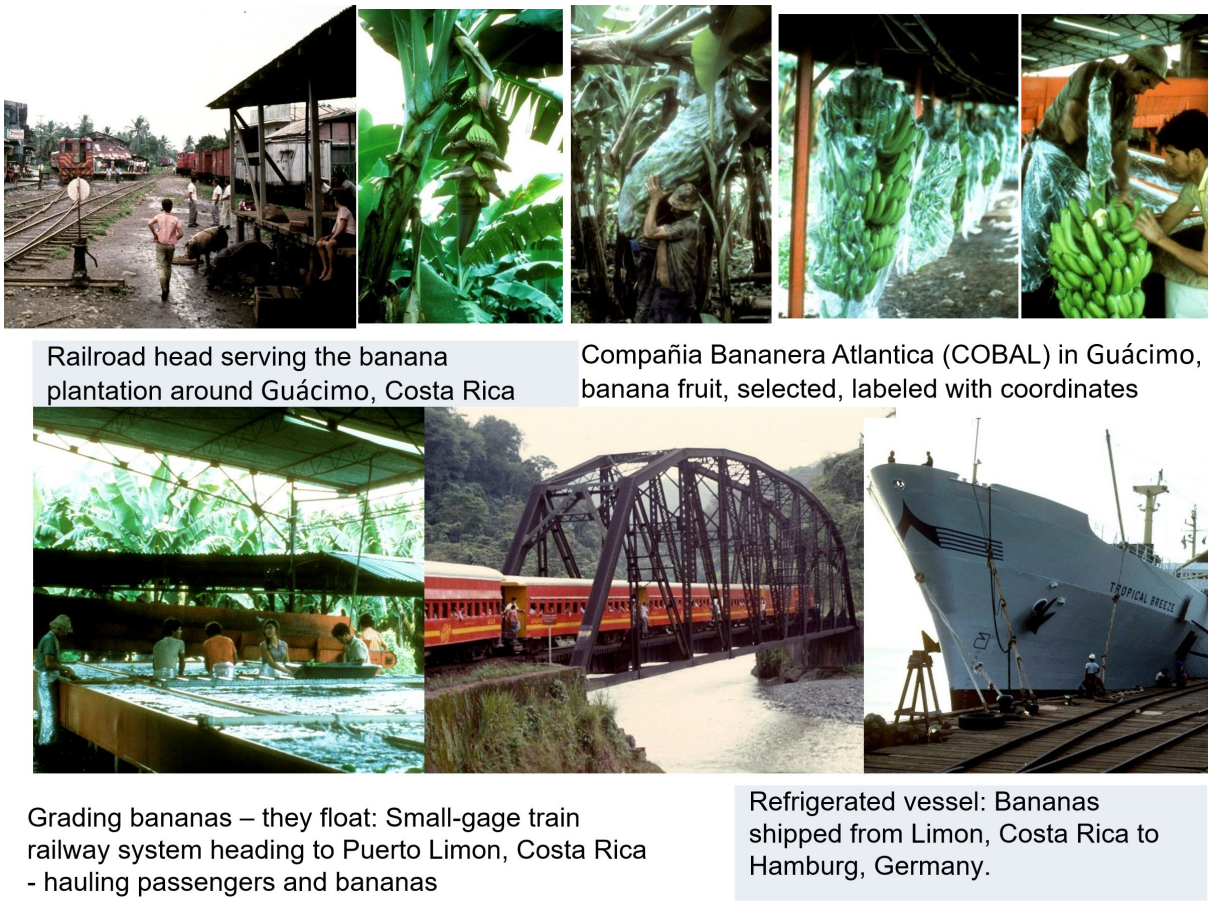


Figure 2. Commercial banana production in Guácimo, Costa Rica servicing European markets.

We later traveled from Panama to Colombia – and spent over 3-weeks navigating the Amazon on small river boats from Leticia, Colombia to Belem, Brazil where the Amazon meets the Atlantic Ocean (**Fig. 3**). The Amazon watershed covers some 40% of South America. It is the world's largest river system, carrying more than 20% of the freshwater that rivers discharge into the oceans. The Amazon Basin is the world's largest rainforest—spanning nine countries and containing about one-third of the planet's remaining tropical forests. It is a vital global climate regulator, but Brazil's expansion as the largest exporter of beef and soybean - has driven major defor-

estation, accelerating human-caused climate change. In 1972, the Amazon Basin had no connected road system, so people and cargo moved almost entirely by riverboats along the Amazon and its tributaries.

And it was hammock city: standard sleeping arrangement on the small river boats was to hang your hammock on an open-aired deck – and fight the mosquitoes! (**Fig. 3**).

World climate regulator. Amazon Watershed/ Aquatic Ecosystem- tributaries from Peru, Bolivia, Colombia.

Wood/tin-roof diesel powered river boats –down-river from Leticia, Colombia.

Hammock City –open-air, sheltered deck.

Local transportation along the Amazon.

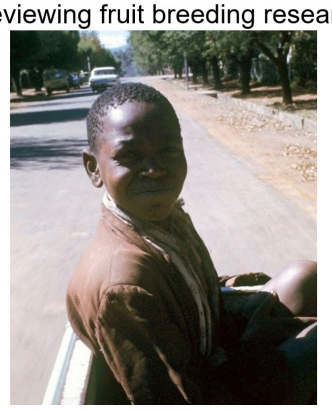
Figure 3. Navigating 2400 miles down the Amazon from Leticia, Colombia to Belem, Brazil.

After spending over a month with friends in Argentina (great Malbec wine, asado/barbecue, steaks, empanadas, choripán, chimichurri, pasta, dulce de leche, alfajores, herba mate, music/tangos, coquet girls!) – we caught a Chinese cargo/passenger ship to South Africa. Through Drs. Hough and Bailey – we had contacts with Professors Steyn and Hurter - temperate fruit breeders at the Fruit and Food Technical Research Institute, Stellenbosch University, South Africa (**Fig. 4**.) At the time, South Africa had the largest temperate fruit refrigeration facilities in the world – and were doing innovative research with controlled atmospheric storage of fruits. Their export market was Europe which was in winter when South Africa was in austral summer. The repertoire of their horticulture exports included: apples, pears, citrus, wine & table grapes, wine, avocados, mangoes, and protea cut-flowers. Producers did a remarkable job growing crops with challenging soils, tough environments, water scarcity – and like the Israelis' they were utilizing advanced irrigation technology.

Jaime, Professor Steyn, temperate fruit breeder at the Fruit and Food Technical Research Institute, Stellenbosch University, South Africa

Professor Hurter at University of Stellenbosch reviewing fruit breeding research plots.

Flower market. South Africa has a diversity of native & exotic ornamental plants.



A young South African passenger sharing the truck bed of vehicle with us - on a ride we hitched.

Figure 4. Horticulture in South Africa during the time of apartheid. Their main horticultural export market was Europe which was in winter when South Africa was in austral summer.

The South Africans were incredibly hospitable – and during the month we hitch-hiked around - people would invite us into their homes/farms for a braai /barbecue, to sip some homebrew, go horseback riding, swimming. But South Africa was controlled by an apartheid government with strict racial segregation of non-whites. A black or colored (people of mixed ancestry) could never hold a managerial position over a white. Privately, people opposed the system. Some 20-years later, F.W. de Klerk, the last white Afrikaner President, and Nelson Mandella, their first elected black president would be awarded the Nobel Peace Prize for their leadership in the peaceful transition from apartheid to a democratic, multiracial government. As a civil rights lawyer and anti-apartheid activist, Nelson Mandela spent 25 years in prison under harsh conditions. He had every right to be vengeful/vindictive when he became President. But his legacy was peacefully uniting a bitterly divided South Africa into a democracy. And when his 5-year term as President was up – he walked from power – and let the next generation lead his country. The U.S. has much to learn from Mr. Mandella!

We spent a month roaming across Kenya and Tanzania, where most roads outside the cities were unpaved laterite tracks. Riding overloaded buses as the only *wazungu* — white dudes — we shared the same excitement as the locals whenever a giraffe or elephant wandered across the road. The driver would brake, everyone would pile to the windows - and we'd all

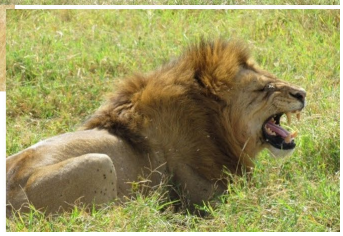
gawk. We were hitchhiking in Arusha, Tanzania on our way to Ngorongoro Crater when we lucked into a ride with the owners of the Ngorongoro Crater Lodge: Skip Levitt and his British wife - Anne. During the bumpy 4-hour ride in the Land Rover, Jaime kept jawing about what a great cook he was - and the diverse array of his native Peruvian dishes. By the time we finally reached the lodge, Anne had had enough. "Alright, buster—let's see what you can do in the kitchen!" Jaime ended up crafting a delicious spaghetti dish "Spaghetti alle Ostriche" with garlic, wine and canned oysters from the People's Republic of Red China. They were impressed with his culinary talents! And it was a good barter: they hosted us at the lodge for the night, and at daybreak we began the 2,000-foot descent to the floor of the crater in a Land Rover to check out the wildlife.

Ngorongora Crater is the world's largest intact volcanic caldera (**Fig. 5**). Once a massive volcano in northern Tanzania that violently erupted - the entire volcanic cone collapsed inward, forming a huge, bowl-shaped depression. It had a diameter of over 11- miles, walls 2000-ft high – and was part of the larger 3,100-square-mile Ngorongoro Conservation Area along the eastern arm of the Rift Valley. Some of humankind's earliest ancestors were discovered in the area. Most memorable for us was the extraordinary density of wildlife, some of the greatest concentrations of big game anywhere in the world (**Fig. 5**)!

Traveling by bus from Nairobi, Kenya to Arusha, Tanzania; Wazungu.

Ngorongora Crater, Tanzania – UNESCO World Heritage Site; World's largest intact caldera, 12- mile diameter, 102 sq.miles; Land Rover (arrow); Eastern flank of the Rift Valley.

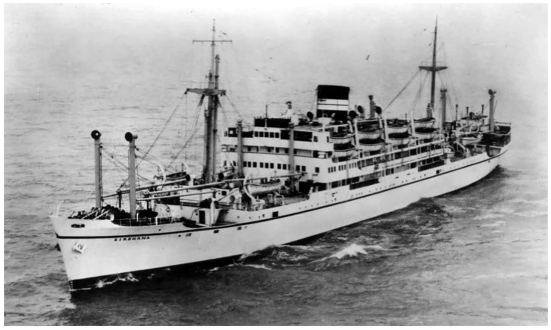
Traveling down the 2000-ft crater rim in a Land Rover with two spare tires.



Some of the big game at Ngorongora Crater.

Figure 5. Traveling in East Africa on local buses, and Ngoronogora Crater, Tanzania – with some of the highest concentration of big game in the world.

We later took an old cargo-passenger ship between Mombasa, Kenya to Bombay (Mumbai), India; ship passage then was cheaper than air travel. It was the M.S. Sirdhana's last voyage before she was broken-up and salvaged (**Fig. 6**). Strapped for cash, we booked third-class, deck passage. Before boarding, we had to sign a document declaring we would not seek comfort with Europeans in upper classes – and were relegated to traveling with people "alien to our customs and European lifestyles!" As we crossed the Equator on the sweltering Indian Ocean, we bunked in a cavernous hold (no AC!) with 200 others, sweating on wooden bunks and eating hot curry meals three times a day.



Sirdhana. Mombasa, Kenya to Bombay (Mumbai). P&O Line; Her last voyage!

3rd class/deck passage – no A/C - trying to cool off at equator!

Kalpana, Jay and Jaime in Indore, India.

Taj Mahal, Agra, India. No monument is more beautiful in moonlight

Figure 6. Traveling from Kenya to India via ship (above). Attending friend, Jay Patel's wedding in India (bottom left) and the spectacular Taj Mahal (bottom right).

In Bombay (Mumbai), we met up with a close college friend, Jay Patel, who was traveling to India to marry his bride, Kalpana, in a family-arranged marriage. It lasted 50 years! Jay came from a well-to-do-family, so the elaborate wedding ceremony started in the western state of Gujarat (his father's home) to Indore in central India (bride's home) to Calcutta (Kolkata) in the east where Jay's family lived (**Fig. 6**). We later traveled around India and Nepal. Few monuments rival the Taj Mahal under moonlight (**Fig. 6**). With its perfect symmetry, lush formal gardens, and luminous white marble inlaid with semi-precious stones, it embodies an Islamic vision of paradise. More than 20,000 laborers, artisans, and craftsmen created it.

Jay's family was in the tea business. So, we caught a ride on a weathered DC-3/Dakota cargo plane from Calcutta to Dooars

(Duar) in North Bengal, near Bhutan - and spent a week on a tea estate immersed in tea production. They grew Assam tea, which is a high-quality, bold, malty black tea - grown at humid-lower elevations. For premium, high-grade tea, women harvesters would nimbly select the terminal bud and the two youngest, smallest leaves (**Fig. 7**). Propagation of *Camellia sinensis* var. assamica is done with single-node cuttings using 500 ppm IBA (auxin). The harvested tea was spread on withering troughs, and later mechanically rolled to rupture cells to start oxidation and shape the long, twisted leaf style. Leaves were then fermented/oxidized, later placed in oven dryers to lock in the flavor and make the tea shelf-stable – then sorted and graded. Full disclosure: most of the tea drunk in the U.S. is of the lowest quality: fannings & dust!

❑Tea production in Dooars, North Bengal, India — near the Bhutan border;
❑Assam tea is a bold, malty black tea grown in the northeastern state of Assam, India; larger leaf, humid-lower elevation.

❑First Flush (March–May): lighter, more delicate.
❑Second Flush (June–August): prized for richness and "muscatel" flavor.;
❑*Camellia sinensis* var. assamica ; single-node cuttings - 500 ppm IBA.

Figure 7. Assam tea [*Camellia sinensis* var. *assamica*] production in North Bengal, India. The first flush with the terminal bud and two youngest leaves would be hand plucked (top left). Ladies harvesting and carrying fresh tea (top center, bottom left). A rotorvane processing machine that crushed, tore and curled the withered tea leaves to start the oxidation process (bottom center). The tea estate was in Dooars, North Bengal, India (right, yellow arrow).

Thailand is the horticultural breadbasket of Southeast Asia with its climate, soils, water – and access to export markets: China, Japan, Singapore, Malaysia, and Indonesia. It was a wonderful country filled with warm, gentle people—and, at the same time, the fierce, no-holds-barred world of Thai boxing! Thailand is a global leader in horticulture export with its advanced infrastructure – producing a diverse niche of high-value

tropical fruits, vegetables, and flowering plants, i.e. orchids (**Fig. 8**).

Thailand is also the number one exporter of durian (*Durio zibethinus*) - king of tropical fruits in Southeast Asia - weighing up to 7lbs (3kg) - the size of a football. However, the fruit is polarizing - either loved or detested. It has an acquired taste – custard-like creamy and smooth, sweet, savory – salty, spicy, umami-rich. It is eaten fresh, or in ice cream, pastries, candy, select Asian dishes. It has been described as crème brûlée with garlic! But it comes with a pungent odor of rotten onions/cheese, raw sewage. Hence, it is frequently banned in hotels and public places (**Fig. 8**). Propagation is by grafting clones onto seedling rootstock – which bears fruit within 4-6 years.

Figure 8. Thailand is the horticultural breadbasket of Southeast Asia. The floating market (upper left) with the large repertoire of tropical fruits and vegetables. Shallow-draft, rapid, long-tail boats (Ruea Hang Yao) with a rebuilt auto engine mounted on a swivel – and a modified propeller shaft (long-tail) (upper right). Exotic Buddhist temples (bottom left & center). Thailand is the world's largest exporter of Durian fruit (*Durio zibethinus*) (lower right).

Throughout our travels, we found people very hospitable and friendly (**Fig. 9**). In Japan, hitchhiking was something no "honorable Japanese" would do. But our clean-cut, European/American appearance sparked curiosity — making it easier to hitch rides than in the U.S. People would go out of their way to leave us at a good spot to hitchhike, take public transportation, or at an inexpensive youth hostel. One Sunday morning in a small Japanese town, we went to a restaurant to eat. We were motioned

over by six Japanese who invited us to join them eating sushi and drinking beer. This went on for over an hour – with none of us feeling any pain. The wife of one of the guys came out, saw the party, became livid – and started shouting at the poor man. We didn't speak a lick of Japanese – nor they any English – but we knew *exactly* what she was telling him. We may not share the same culture or language - but we share so much as people!

Friendliness of People around the World.
Jaime with a young Japanese couple who had given us a lift stopped to share some watermelon.

Jaime and Fred hitchhiking a ride. In Japan, hitchhiking was not done - but since we looked European/ American - people were curious, friendly, and gave us lifts. Daigo (大子) was a small rural town in northern Ibaraki. .

Figure 9. Hitchhiking in Japan – the friendliness of people around the world.

THE BIOLOGY OF PLANT PROPAGATION – AND ITS APPLICATION

One of Horticulture's strengths is that it's a translational science – what we learn can be applied. Horticulturists utilize the basic sciences (biology, molecular biology, biochemistry, genetics, breeding) – and integrate them to develop/produce new goods and services (Davies, 2012; Davies and Garrett, 2018). As a graduate student, I was fascinated with the biology of plant propagation and its applications. Working on my Master's degree at Rutgers, I was able to do some of the early research with Pyranylbenzyladenine (PBA) - stimulating adventitious bud and shoot formation on begonia leaf cuttings (**Fig. 10**). As a cytokinin, PBA, was more potent and had a longer biological activity than either 6-benzylaminopurine (BA) or kinetin. Begonia leaf cuttings could readily form adventitious roots, but formation of adventitious buds (embryonic shoots) was difficult. From a horticultural perspective - we were able to show that an intermediate level of PBA was optimal for both adventitious bud and shoot development – without impeding root development

- for commercial propagation of begonia leaf cuttings (Davies and Moser, 1975). Interestingly, a high cytokinin to low auxin ratio stimulated adventitious bud formation, while a low cytokinin to high auxin ratio promoted adventitious root formation.

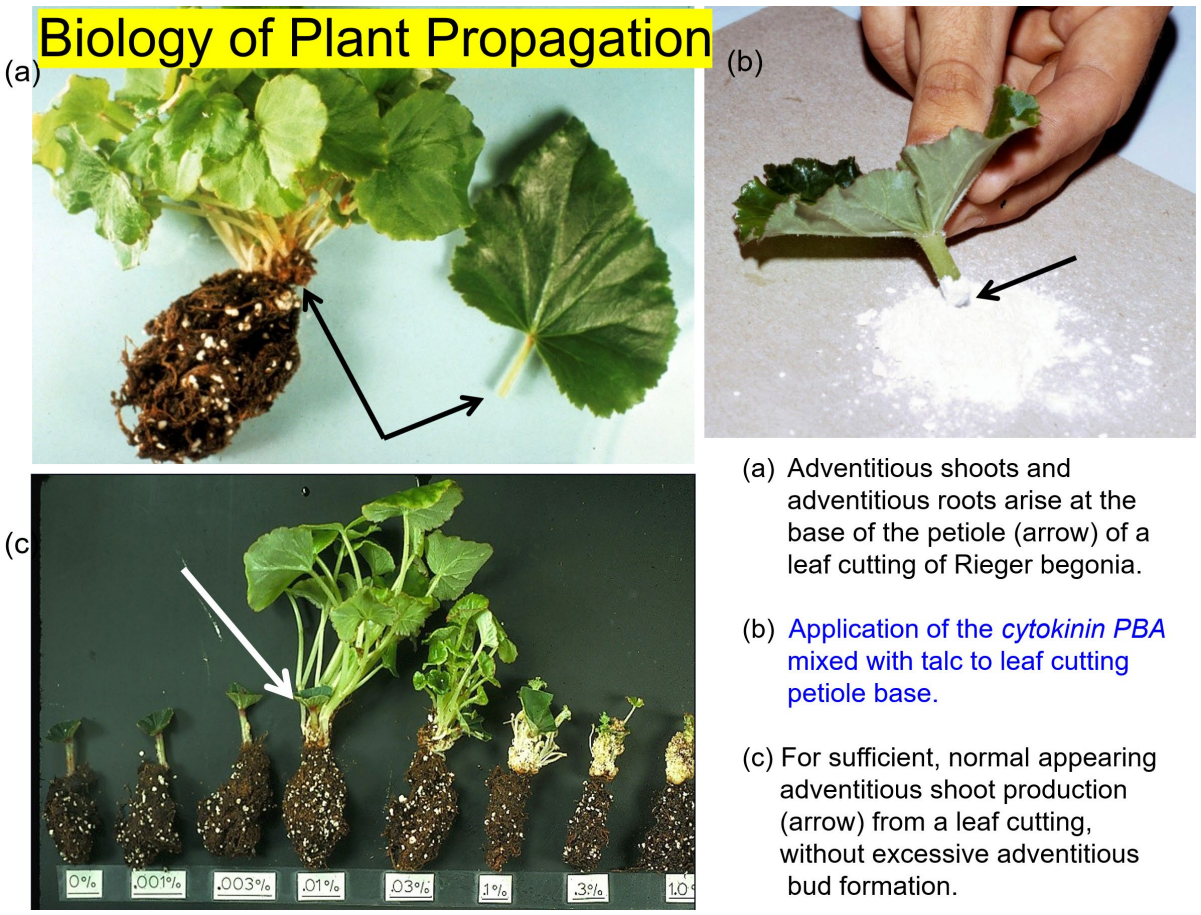


Figure 10. Discovering the biology of plant propagation—using cytokinins to stimulate adventitious bud and shoot formation in leaf cuttings of Rieger begonias.

The 1970's was the golden era of plant growth regulators (PGRs) - when growers, not just researchers, began using them extensively for flowering, height control/dwarfing, rooting, breaking dormancy, fruit set, ripening control, tissue culture, etc. I was fortunate to present our cytokinin-begonia leaf cutting research at the 1975 IPPS meeting in Tallahassee, Florida when plans were underway for developing the new IPPS-Southern Region of North America (Davies and Moser, 1975; Parkerson, 2000).

I ended up going to the University of Florida as their first PhD student in Environmental Horticulture. I wanted to study the biology of juvenility and maturity effects on adventitious rooting. We did studies looking at the developmental events of rooting and comparing them between easy-to-root juvenile *Ficus pumila* and its difficult-to-root mature phase (Davies et al. 1982). The early events of rooting occur more quickly in easy-to-root juvenile cuttings. Better rooting occurred with spray applications with easier to absorb potassium salt formulations of indole-3-butyric acid (K-IBA). With difficult-to-root, mature cuttings - optimum periods of IBA/auxin application were at sticking up to 3-days, while there was a loss of cell receptivity to respond to auxin when applied

15-days or later (**Fig. 11**). Spray applications of potassium formulation of auxin after cuttings were stuck and placed on propagation beds were later adapted by industry (Drahn, 2007; Kroin, 2010).

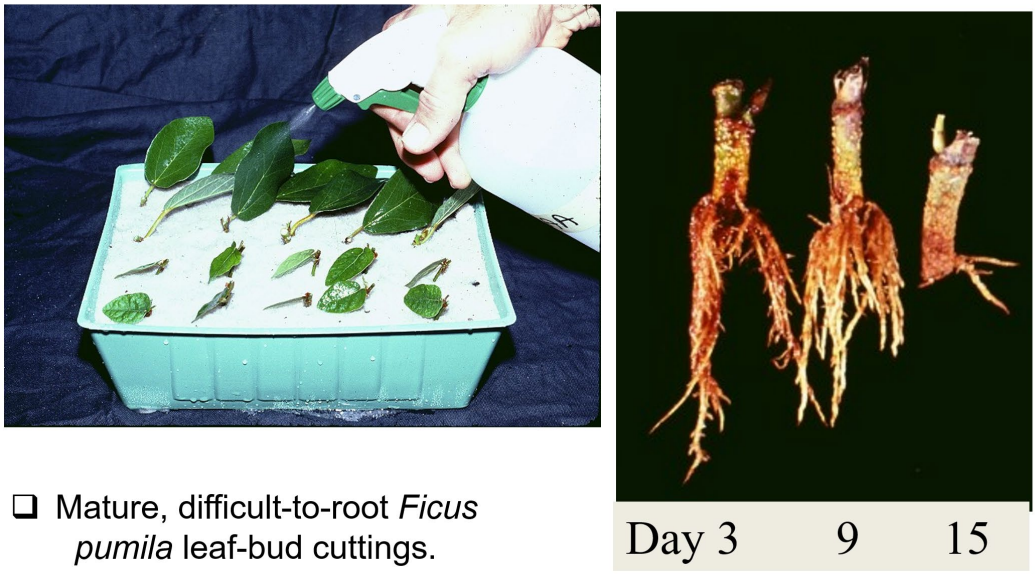


Figure 11. The effect of a water-soluble potassium formulations of auxin (K-IBA) as a foliar spray application to juvenile (easy-to-root) and mature (difficult-to-root) *Ficus pumila* leaf-bud cuttings (top left). Delaying auxin application to 15 days after sticking mature cuttings dramatically reduced rooting (Davies et al. 1982, 2018) (top right).

Applying the biology of adventitious rooting can be beneficial for successful commercial propagation. In poinsettia cutting propagation, until root meristems are formed – photosynthetic levels and stomatal conductance are very low (**Fig. 12**). But as soon as root meristems develop and root elongation begins - there is a dramatic increase in photosynthetic rates (likely a cytokinin effect) and gas exchange (Svenson, et. al, 1995).

So, the take home message was maintain low light levels to minimize stress during the first 10-days of propagation – then raise the light levels when cuttings can photosynthesize - to maximize root growth and rooted liner development for transplanting. Likewise, with difficult-to-root species there are seasonal windows of optimal rooting to propagate cuttings to maximize IBA (auxin) effectivity – based on cues, such as monitoring shoot RNA and cambial activity (Davies, 1984)

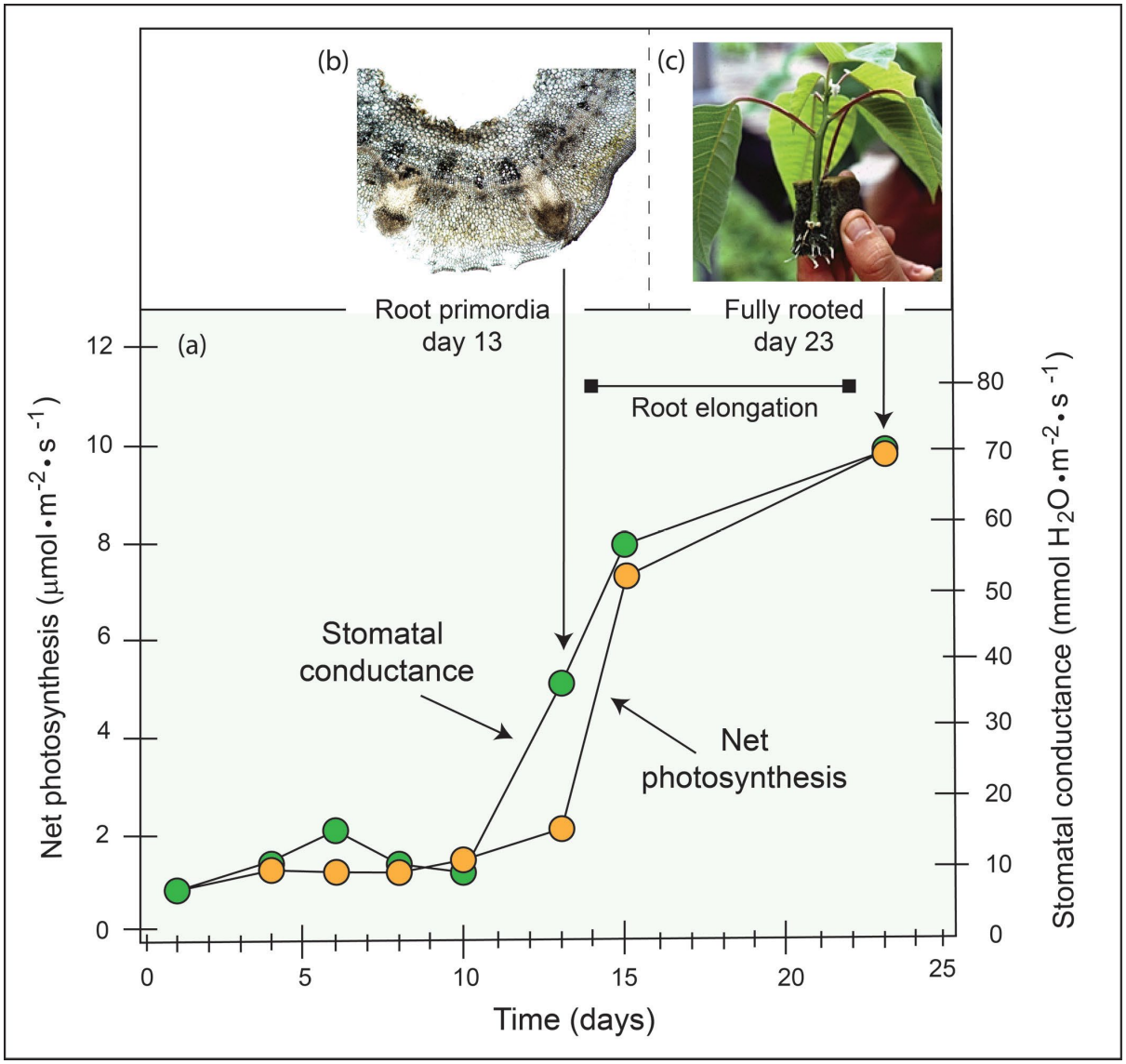


Figure 12. (a) Influence of adventitious root formation on gas exchange of poinsettia (*Euphorbia pulcherrima* cv. Lilo) cuttings. (b) Root primordia were microscopically observed at day 13, when photosynthesis began to increase. (c) Maximum photosynthesis was at 100% rooting (Svenson et al., 1995).

THE MAJORITY OF PLANTS DON'T FORM ROOTS – THEY FORM MYCORRHIZA

Mycorrhiza means "fungus roots" which is a symbiotic association between specific fungi and the fine, young roots of higher plants. There are opportunities for the utilization of mycorrhiza with the challenges facing the green/nursery industry and refining best management practices (BMP). At Texas A&M we spent 35-years utilizing mycorrhiza to enhance efficiency of plant roots to absorb water; and increase macro- and micro-nutrient efficiency - from mineral soils to high-organic container media (**Fig 13**). We observed that mycorrhiza enhance drought resistance by causing changes in the host plant biochemistry [greater osmotic adjustment, lower production of abscisic acid (ABA)], changes in root morphology (more fine roots initiated for greater soil-water-mineral contact) – and greater extraradical hyphae development - which allow the root system to have

better contact with soil water (Davies, 2008). Projects took us from using mycorrhiza to enhance plant revegetation of severe lignite coal sites in Texas (Davies and Call, 1990) to stimulating native Andean mycorrhiza for enhanced potato production in the highlands of Peru at 3900 meters (13,000 ft) – about the highest altitude in the world that potatoes are grown (Davies et al. 2005)!

Figure 13. The majority of higher plants do not have roots – rather they form mycorrhiza. There is a soil internet of extraradical hyphae with chlamydospores (yellow arrows) connecting the root system (top left & middle). Soil aggregation into micro- and macro-aggregates (white arrows) is enhanced by glomalin—a hydrophobic glycoprotein that coats and protects hyphae, helping bind soil particles together and improving tilth and water percolation (top right). Mycorrhizal projects ranged from revegetation of lignite coal sites in Texas (bottom left & center) to enhancing potato production in the highlands of Peru at 3900 m/ 12,800 ft (bottom right).

Interestingly, at the 1st meeting of the IPPS-SRNA, then President Charles "Charlie" Parkerson made the observation that: "*Good compost mixes contain different fungi – and we will be adding mycorrhizal fungi to our soil mixes to help plants get established and grow better* (Parkerson, 1976). Something that Monrovia and other nurseries adapted years later. It all takes time!

GROWING PLANTS UNDER LOW-PRESSURE (HYPOBARIA) CONDITIONS: NASA SALAD BOWL PROGRAM

As part of NASA's salad bowl program - we were able to demonstrate that lettuce

plants can be grown under low pressure (hypobaria) and tolerate low oxygen conditions (hypoxia). This was collaborative research with Chunjiu He (plant biologist/ horticulturist) and Ron Lacey (mechanical engineer) - who designed the 6-chamber system as a testbed to grow lettuce plants at variable atmospheric pressures, carbon dioxide and oxygen levels (**Fig. 14**). There are engineering and safety advantages in growing plants under low pressure (25 kPa), i.e. low atmospheric pressure occurs at summit of Mount Everest (1/3 normal atmospheric pressure; 33 kPa), Mars (0.6 kPa), and the moon which is a vacuum (0 kPa) - compared to higher, earth-ambient pressure (101 kPa) at sea-level. For extra-terrestrial habitation to maintain a higher, earth ambient pressure - more structure/mass would need to be shipped into space (costly, increased payload) to construct the controlled environment agriculture facility (CEA) – plus there are leakage and safety issues between high internal and extreme low external pressures.

Figure 14. Growing lettuce under low-pressure conditions (hypobaria) – and the future of horticultural crops for long-term extraterrestrial habitation. When an astronaut does a space-walk (EVA) – their suit pressure is 30 kPa at 100% oxygen (top left). Ron Lacey, Chuanjiu He and Fred Davies (top middle: left, middle, right). The 6-chambered testbed (bottom left). A lettuce plant at 26-days from seed to crop at low pressure (25kPa) – maintaining normal growth, photosynthesis and respiration - compared to an earth-ambient grown plant (101 kPa) (bottom right).

Lettuce grows well at reduced atmospheric pressure of 25 kPa, even under reduced oxygen conditions (He et al. 2007)) – and reducing oxygen (hypoxia) during the final week of production – enhanced antioxidants and other beneficial phytonutrients (He et al. 2013). Bottom line: there will be long-term extraterrestrial habitation (exploration/colonization is in our human DNA) – and horticulture and growing crops under low pressure conditions will play an important role.

PROFESSIONAL OPPORTUNITIES WITH THE IPPS

Members can attest to the tremendous professional networking and personal growth opportunities of belonging to the IPPS. Hudson Hartman, long-time International Editor from the IPPS Western Region and Dale Kester, former President of the IPPS Western Region - asked me as a young faculty member - to join them in writing the 5th edition of their classic textbook: *Hartmann and Kester's Plant Propagation — Principles and Practices*. In 2018, I teamed up with colleagues - Robert Geneve, former President of the IPPS Eastern Region and Sandy Wilson, Distinguished Teaching Scholar from the IPPS-SRNA- to co-edit the 9th edition (**Fig. 15**) (Davies et al., 2018).

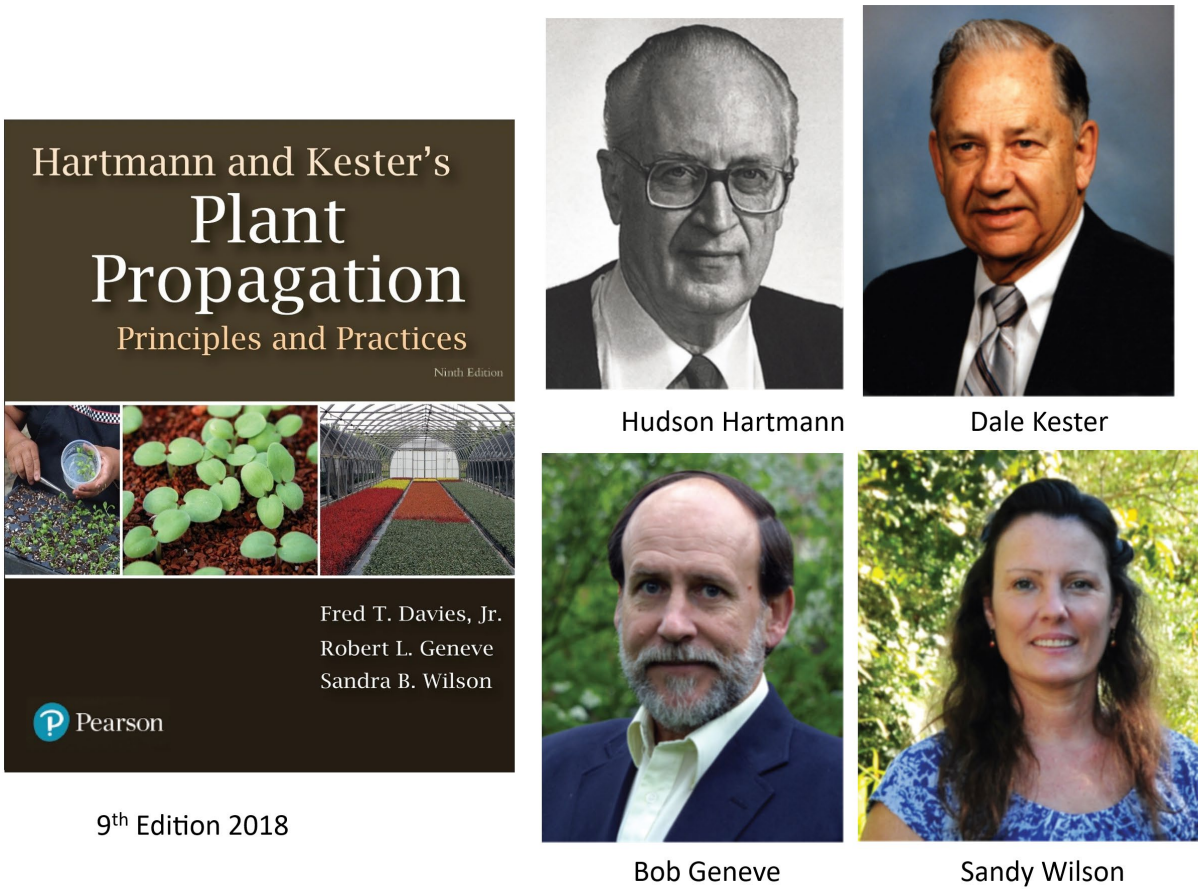


Figure 15. Collaborative opportunities through our IPPS affiliation and colleagues: networking, connection, "seeking and sharing". Hudson Hartmann and Dale Kester from the IPPS-Western Region (top center & right), Bob Geneve from the IPPS-Eastern Region and Sandy Wilson from the IPPS-SRNA (bottom center and right).

THE EVOLUTION OF THE IPPS-SOUTHERN REGION OF NORTH AMERICA (SRNA)

With the 50th Anniversary celebration of the SRNA – we owe a tremendous gratitude to Charles H. "Charlie" Parkerson who was the "George Washington" of the SRNA (**Fig 16**). Charlie Parkerson led the organization of the inaugural Southern Region meeting in Mobile, Alabama, in December 1976. He served as the first program chair and President. He later became the first International President from the SRNA – and the first Meadows awardee, and International Award of Merit recipient. At the founding meeting, Charlie was joined by 51 nursery professionals including: Hunter Boulo, Jim Fountain, Bryson James, Charles Johnson, Earle Marvin, Fount May, Sidney Meadows, John Machen, Dick Marshall, David Morgan, Lanny Neel, Ralph Pinkus, John Roller, Ray Self, Don Shadow, Paul Smeal, Gerald Smith, Lin Taber, Jake Tinga, Grady Wadsworth, Jim Wells, Zack Westbrook, Johnny Wight, and Curtis Wilkins (Parkerson, 2000).

Figure 16. The SRNA was founded and led by Charles "Charlie" Parkerson, first President and Program Chair. Charlie and Maggie Parkerson at SRNA's annual dinner banquet.

LEADERSHIP OPPORTUNITIES WITH THE IPPS-SRNA

The SRNA has focused on nurturing students to become leaders in the green industry. Randy Davis, current President and CEO of Greenleaf Nursery, a Carl Whitcomb protégée – presented student research at the exploratory 1975 Tallahassee Meeting to establish the SRNA. The Charles Student Research Competition, in honor of Charles Parkerson and the late Professor

Charles Gilliam of Auburn University - has supported students who became prominent in industry and academia **(Fig 17).**

The SRNA has become the elite IPPS region with its industry and academic scholarships, early career professional exchanges, educational programs, professional opportunities – and leadership development. There are five SRNA scholarships (Vivian Munday Work Scholarships, Margie Jenkins Industry Scholarships, Early Career International Exchange program, Coach Vince Dooley Scholarship, and Charles Student Research Competition). These scholarships are tied to the SRNA-HRI Education Endowment Fund – that was started 8-years ago with an initial $20,000 donation – and has grown to $172,000.

IPPS Southern Region of North America
Sharing Plant Production Knowledge Globally

Students @ IPPS - Leadership Positions in the Green Industry

- ❑ Randy Davis
- ❑ Tom Saunders
- ❑ Donna Fare
- ❑ Patricia Knight
- ❑ James Altland
- ❑ Mack Thetford
- ❑ Cheryl Boyer
- ❑ Brian Jackson
- ❑ Gene Blythe
- ❑ Richard Olsen
- ❑ Chris Marble
- ❑ Anthony Witcher
- ❑ Judson LeCompte
- ❑ Elizabeth Riley
- ❑ Paul Bartley
- ❑ Anthony Bowden
- ❑ Ping Yu
- ❑ Kristopher Criscione
- ❑ Bin Wu

Charles Student Research Competition

Figure 17. The SRNA nurturing students to become leaders in the Green Industry. Randy Davis, President and CEO of Greenleaf Nursery, a Carl Whitcomb protégée – presented student research at the exploratory 1975 Tallahassee Meeting to establish the SRNA (left). A list of Charles Student Research Competitors who have gone onto leadership positions in the green industry (right).

It takes a village. The SRNA is supported by 21 committees, with dedicated people working behind the scenes to keep the organization running smoothly—and each year they deliver an exceptional educational conference and industry tours. It is a committed, well-coordinated team. The strength of the SRNA has been recruiting new talent - bringing fresh ideas and energy. There are plenty of leadership positions being offered. So, let Sec-Tres Donna Foster,

President Michael Roe or anyone on the executive committee - know you are interested (**Fig 18**).

When Jim Wells organized the IPPS in 1951, propagators and nursery professionals never shared technical information with competitors. As an *immigrant* from England with a nursery in Redbank, N.J. – Jim realized the only way he would become more successful and for the green industry to flourish - was through "seeking and sharing". A core requirement for joining the IPPS was to freely share knowledge. The IPPS changed the culture of the green industry. We are an organization of mentors and collaborators. Through educational programs, nursery visits, the Question Box, net-working – we all return with new ideas to use for our businesses, organizations, and universities. As Dennis Niemeyer remarked: "None of us knows as much as all of us!" We all learn from each other.

Figure 18. Leadership opportunities with the SRNA. It takes a village: some 21 committees help guide the organization.

THE FUTURE OF THE IPPS AND SRNA LOOKS GOOD

The successful brand refresh to *IPPS: International Plant Production Society* – led by the SRNA - will help with membership recruitment, marketing, and sponsorships. The 2024 SRNA Strategic Plan is being implemented and led by Cheryl Boyer and the executive committee. The SRNA recently hired a rock star in Brie Arthur - as the new Digital Communications Director - which should help tremendously with membership recruitment, social media and communications. Brie and IPPS International Executive Director, Katy McDavid, have been in-

strumental in launching the new IPPS international website. Another superstar is Secretary-Treasurer Donna Foster who has been superb in her 16-years with the SRNA (**Fig. 19**).

With the establishment of the SRNA-HRI Endowment – the SRNA will be developing a Sustainability Fund – to help with the long-term financial health of the organization. The International Board has become more cohesive through the leadership of four SRNA members serving on the Intl. Board: 1) Intl. Chair -Tom Saunders, 2) Intl. Treasurer - Donna Fare, 3) Intl. Delegate - Brie Arthur, and 4) Intl. Alternate Delegate - Dennis Neimeyer. Richard May and his Sponsorship Committee raised $69,000 for the Orlando meeting – a record! And we have new volunteers coming up through the ranks. The future looks bright for the IPPS!

Figure 19. SRNA Board of Directors (top left) and key players – Secretary-Treasurer Donna Foster (top right) and Digital Communications Director Brie Arthur (bottom left). The ad-hoc beer committee was tasked to make the Houston 2026 a memorable experience (bottom right)!

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