

*Purpose
During Pandemic*

2020 Annual Report

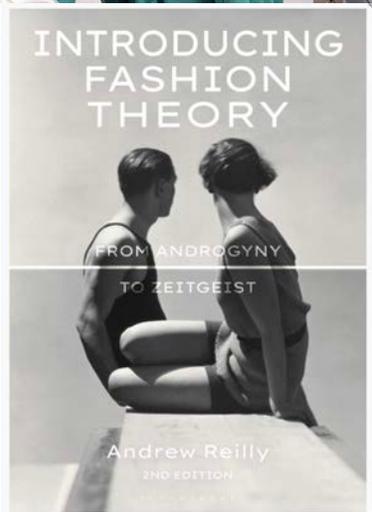
College of Tropical Agriculture
and Human Resources

University of Hawai'i
at Mānoa



CTAHR is

Cooperative Extension
Department of Family & Consumer Sciences
Department of Human Nutrition, Food & Animal Sciences
Department of Molecular Biosciences & Bioengineering
Department of Natural Resources & Environmental Management
Department of Plant & Environmental Protection Sciences
Department of Tropical Plant & Soil Sciences
Center for Tropical & Subtropical Aquaculture
Center on the Family
Hawai'i State 4-H
GoFarm Hawai'i



'20 CTAHR VIRTUAL WELCOME WEEK

Good News – 2020 is over.

What a year. We dealt with a pandemic, many worked from home, we taught a different way, and we figured out how to keep up with research and Extension obligations.

One may think that with all that going on, we could not get much more accomplished. But the truth is we had a productive year. Our student population was the largest in the history of the college, we continued our trend of increasing extramural grants, and –with fewer faculty – our refereed journal publications increased by 14% over last year.

All the credit goes to the faculty and staff. During the pandemic, our college's human capital was reduced by about 20% through retirements and folks leaving for different jobs. Yet, we increased our production in almost every area. Extension, which works directly with the community, often had more people coming to their virtual programs. We must ask ourselves why. I think it is because, during difficult times, CTAHR is incredibly relevant.

Food production becomes more important during difficult times. GoFarm Hawai'i is the premier new-farmer training program for the state. SNAP education by CTAHR, along with the 'double bucks' state program (that doubles state money for food assistance), helped get the necessary nutrition to their families. Extension was busy educating folks on how to garden, farm – grow their own food. Research was underway to combat COVID-19 and help families cope with the difficulties they faced. Many other examples can be found in this report.



CTAHR staff did an amazing job. With the loss of human capital, our staff chipped in and picked up the slack that resulted from retirements. Our County Administrators shepherded their programs to focus on the local needs. In addition, the collaboration between CTAHR and other agencies in the state continued, solidified, and made a difference.

I think we succeeded because we, in CTAHR, understand how blessed we are to be working within the University of Hawai'i at Mānoa, and in a college that is relevant to the state. It is in hard times that we see that our work makes a differences in people's lives.

We also did some soul searching. The campus-wide evaluation of programs made our departments take a hard look at themselves. Our undergraduate Ag program is now being revised to more be relevant to the future of the state. We looked at how our programs interact with the UH system across the state. We saw how important it is that we are state-wide, working in communities where we do the most good.

Of course, it is not over yet. We are looking at two pretty sparse budget years in our immediate future, and a number of years to hire back what we lost. This will require the same effort, but a different focus. When we report again next year, we will be talking about how our Strategic Positioning Plan is progressing and how we intend to serve the state as we move into the future.

Aloha,
Nick



Nicholas Comerford, PhD

Dean, College of Tropical Agriculture and Human Resources
Director, Hawai'i Agriculture Experiment Station and
Cooperative Extension Service

Frozen and Unfilled Positions

CTAHR is a Land Grant College, as identified in the Hatch Act of 1887 and Smith-Lever Act of 1914. As such, it is the home of the Agricultural Experiment Station and the Cooperative Extension Service. Therefore, our faculty include Extension Agents and Extension Specialists, which is different from most other colleges at the University of Hawai‘i at Mānoa (UHM). This is worth stating in order to understand the loss of faculty and staff we have experienced.

Due to the Covid-19 pandemic’s effect on the state budget, CTAHR is down 60 faculty and staff positions and counting (Table 1), representing 20% of our personnel. When we are able to rehire again, our initial focus will be on instruction. With our increasing enrollment, we have an obligation to our students to provide them with the best environment for success. Our staff situation is also challenging, with the loss of support in offices and on farms.

| Vacant Position | Department | | | | | | | | |
|----------------------|------------|------|------|-------|------|------|-------|---------|-------|
| | FCS | PEPS | TPSS | HNFAS | NREM | MBBE | Admin | Ag Tech | Total |
| Staff | | 1 | | | | 1 | 7 | 21 | 30 |
| Professor | 3 | | | | 1 | | | | 4 |
| Extension Agent | | 3 | 4 | 5 | 1 | | | | 13 |
| Extension Specialist | | 1 | 1 | 3 | 3 | | | | 8 |
| Researcher | 1 | 1 | 2 | | | 1 | | | 5 |
| Total | 4 | 6 | 7 | 8 | 5 | 2 | 7 | 21 | 60 |

The light at the end of the tunnel is UHM’s post-pandemic approach, as defined by the President. This situates CTAHR in a good position. Our college represents those areas that have been identified for investment: Agriculture (TPSS, PEPS, HNFAS, MBBE), Natural Resource Conservation (NREM), Engineering (MBBE), and Health and Social Welfare (MBBE, HNFAS, FCS).

One way to describe this past year is to look at the college’s effort with respect to the goals of the UHM campus. Are we meeting those goals? Below we can make the case that CTAHR is highly relevant to the university and to the state.

Goal 1. CTAHR as a Native Hawaiian place of learning

A focus on Native Hawaiian learning and culture has permeated the college since its founding more than 100 years ago. In fact, CTAHR was developed from the Bureau of Forestry and Agriculture that was initiated by Queen Lili’uokalani just 14 years earlier. Today, a Hawaiian influence is evident in our faculty, staff, and students, as well as in our programs in agriculture, natural resources, human nutrition, and family sciences (Table 2).

Table 2. Native Hawaiian and Pacific Islanders as an average percentage of the student, staff, and faculty populations in CTAHR (2019).

| | Students | Faculty | Staff | State |
|-------------------------------|----------|---------|-------|-------|
| Hawaiian and Pacific Islander | 17 | 7 | 15 | 10 |

Table 3. Undergraduate Student Enrollment by program over the past 3 years, based on Fall enrollment.

| Degree Program | 2018 | 2019 | 2020 | % Change from 2018-2020 |
|----------------|------|------|------|-------------------------|
| ANSC | 111 | 129 | 155 | 40 |
| BE | 36 | 35 | 37 | 3 |
| DPD | N/A | 29 | 29 | 0 |
| FDM | 77 | 77 | 89 | 16 |
| FSHN | 91 | 97 | 105 | 15 |
| HDFS | 140 | 165 | 169 | 21 |
| MBB | 38 | 48 | 53 | 39 |
| NREM | 115 | 107 | 130 | 13 |
| TAE | 33 | 37 | 43 | 30 |
| CTAHR | 707 | 727 | 811 | 15 |

Goal 2. Student Success

CTAHR in 2020-21 had its highest total enrollment in our recent history (Tables 3 and 4). During the past three years, with one exception, all CTAHR undergraduate programs grew between 3% and 40%.

Table 4. Graduate Student Enrollment over the past 3 years and percent change.

| Degree Program | Degree | 2018 | 2019 | 2020 | % Change (2018-20) |
|-------------------------|--------|------|------|------|--------------------|
| ANSC | MS | 8 | 10 | 10 | 25 |
| MBBE | MS | 26 | 25 | 28 | 8 |
| MBBE | PhD | 38 | 38 | 33 | -13 |
| Entomology | MS | 8 | 9 | 12 | 50 |
| Entomology | PhD | 7 | 7 | 8 | 14 |
| Food Science | MS | 9 | 8 | 7 | -22 |
| Nutritional Science | MS | 9 | 10 | 10 | 11 |
| Nutritional Science | PhD | 13 | 19 | 21 | 62 |
| Trop Plant/Soil Science | MS | 20 | 19 | 28 | 40 |
| Trop Plant/Soil Science | PhD | 6 | 5 | 6 | nc |
| Trop Plant Pathology | MS | 17 | 9 | 7 | -58 |
| Trop Plant Pathology | PhD | 4 | 6 | 9 | 125 |
| Natural Resource Mgmt | MS | 37 | 31 | 21 | -43 |
| Natural Resource Mgmt | MEM | 17 | 19 | 18 | 6 |
| Natural Resource Mgmt | PhD | 12 | 13 | 25 | 108 |
| Total | | 231 | 228 | 243 | 5% |

Table 5. Percent Undergraduate Student Annual Retention as indicated in the Fall of 2017-2019.

| | 2017 | 2018 | 2019 | % Change from 2017-2019 |
|-----------|------|------|------|-------------------------|
| ANSC | 68 | 75 | 77 | 13 |
| BE | 52 | 76 | 60 | 15 |
| Dietetics | 82 | 89 | 92 | 12 |
| FDM | 80 | 77 | 84 | 5 |
| FSHN | 51 | 66 | 61 | 20 |
| HDFS | 83 | 87 | 91 | 10 |
| MBBE | 97 | 84 | 80 | -17 |
| NREM | 85 | 79 | 88 | 4 |
| TAE | 58 | 66 | 75 | 29 |
| CTAHR | 73 | 78 | 80 | 10 |

Retention of our students was also high (Table 5), partly due to CTAHR's Academic and Student Affairs Office. Student-centered programs, student lounge, food pantry, and cooking shows provided opportunities for inclusion – a cornerstone of

Table 6. Number of prospective students and undergraduate students advised from 2018-2021

| Type of Appointment | Jan - Dec 2018 | Jan - Dec 2019 | Jan - Dec 2020 | Jan - May 2021 |
|-------------------------------|----------------|----------------|----------------|----------------|
| Prospective Student | 514 | 454 | 491 | 158 |
| Mandatory or General Advising | 1366 | 1222 | 1550 | 903 |
| Express | 274 | 184 | 421 | 288 |
| Academic Warning/Action | 291 | 93 | 123 | 21 |
| Kiosk Drop-ins | | | 138 | 64 |
| TOTAL | 2445 | 1953 | 2723 | 1434 |

Table 7. Student Evaluation of Academic Advising (Spring 2021)

| Academic Advising Evaluation [N=76] | To a great extent | To some extent | To a little extent | Not at all | Not applicable |
|--|-------------------|----------------|--------------------|------------|----------------|
| To what extent were you satisfied with CTAHR Academic Advising response time to emails/phone calls? | 93% | 7% | 0% | 0% | 0% |
| To what degree has CTAHR Academic Advising helped you identify your educational goals and develop a plan? | 75% | 20% | 4% | 0% | 1% |
| To what extent has CTAHR Academic Advising been able to answer your questions and concerns efficiently? | 86% | 14% | 0% | 0% | 0% |
| To what degree has CTAHR Academic Advising provided you with accurate assistance in selecting appropriate courses and offered helpful suggestions? | 82% | 16% | 3% | 0% | 0% |
| To what degree has CTAHR Academic Advising helped you identify resources on campus to use? | 63% | 28% | 5% | 4% | 0% |
| To what extent did CTAHR Academic Advising meet your advising needs as a student? | 88% | 11% | 1% | 0% | 0% |

student retention. Our multifaceted Advising program was well-received by students who gave it a 75% to 93% (Tables 6 and 7) “being satisfied to a great extent” rating. When we asked our students, “What are you going to do after Graduation?” (Table 8), 84% of CTAHR graduating students either had a job, were continuing

Table 8. Students survey about their Post-graduate plans.

| Term | # Responses | Post-Graduation Plans | | | | |
|--------------------|-------------|-----------------------|--------------------|----------------------|----------------------|------------|
| | | Unsure | Continue Education | Full-time Employment | Part-time Employment | Internship |
| Fall 2020 | 27 | 15% | 26% | 48% | 7% | 4% |
| Spring-Summer 2020 | 70 | 9% | 11% | 64% | 13% | 1% |
| Fall 2019 | 39 | 8% | 21% | 67% | 5% | 0% |
| Spring-Summer 2019 | 110 | 16% | 23% | 40% | 16% | 5% |
| Fall 2018 | 52 | 15% | 17% | 60% | 6% | 2% |

Table 9. Years to an undergraduate degree for freshmen only (not transfers) based on students graduating at the end of the spring semester from 2018-2020.

| Degree Program | 2018 | 2019 | 2020 |
|----------------|------|------|------|
| ANSC | 4.3 | 4.3 | 4.6 |
| BE | 5 | 4.5 | 5 |
| DPD | 4.5 | 4.7 | 4.3 |
| FDM | 4.3 | 4.2 | 4.1 |

Table 10. Overall student satisfaction with CTAHR undergraduate programs upon graduation, from 2018-2020.

| Quality of Programs | Highest | High | Medium | Low | Lowest |
|---|---------|------|--------|-----|--------|
| Please rate the overall quality of your academic program. | 40% | 41% | 13% | 4% | 1% |

their education, or acquired an internship. Even in the middle of the pandemic, where networking was limited, only 15% were unsure of their future plans following graduation (Fall 2020). A CTAHR degree means an employable graduate.

“Time to Graduation” across all degree programs was between 4 and 5 years (Table 9). One concern continues to be, because of the loss of faculty, whether programs continue to retain a clear 4-year path to graduation and still be taught by permanent, experienced faculty. This is particularly true for ANSC, HDFS and NREM;

which is why this has to be one of our foci when we begin to hire again. We want to keep student satisfaction with their degree programs high, as shown in Table 10.

Goal 3. Research

CTAHR faculty have been on a path of increasing success in acquiring grants for a range of research, education, and extension activities (Table 11). During the past three years, the value of extramural awards increased from \$13.9 million in 2019 to \$20.8 million in 2020, then to \$25.2 million in 2021. The average value of awards per individual faculty PI increased substantially (79%) from \$181K in 2019 to \$324K in 2021 (Table 12).

Faculty produced 205 peer-reviewed articles published in 2019, and 213 peer-reviewed articles published in 2020 (Appendix 5). CTAHR undergraduate students were also active in research: 100% of graduating students in MBBE applied for undergraduate research funding (e.g., from Undergraduate Research Opportunity Program [UROP]) and 85% of graduating students completed UROP projects. A number of patents were obtained recently (8) or are in the application phase (8).

Goal 4. Responsive to the Needs of Hawai‘i

CTAHR is organized around supporting the industries in the state. We have a diverse CTAHR Advisory Council. Extension programs have their own advisory groups. These groups keep us in touch with the industries and communities. We develop programs based on their input. Below are just a few ways CTAHR is meeting the needs of the state.

- There is an increasing need to train new farmers, as the average age of farmers is over 60. The GoFarm Hawai‘i program is successful in training farmers. Over 70% of its graduates are farming on their own

Table 11. Value (\$) of extramural awards garnered by CTAHR PIs by UHM fiscal year (ORS data).

| Unit | 2019 Awards | 2020 Awards | 2021 Awards | 3-YEAR TOTAL |
|----------------------|-------------------|-------------------|-------------------|-------------------|
| PEPS | 4,095,347 | 5,088,640 | 8,353,180 | 17,537,167 |
| HNFAS (ANSC, FSHN) | 2,599,529 | 2,806,362 | 2,508,098 | 7,913,989 |
| TPSS | 549,199 | 1,756,809 | 3,079,614 | 5,385,622 |
| NREM | 997,095 | 1,641,900 | 2,076,637 | 4,715,632 |
| MBBE (MBBE, BE) | 1,611,103 | 495,000 | 1,489,939 | 3,596,042 |
| FCS (HDFS, FDM) | 241,698 | 230,000 | -20,000 | 451,698 |
| FCS (COF) | 224,041 | 3,731,175 | 663,165 | 4,618,381 |
| Hawai'i County | 949,989 | 1,293,408 | 1,665,040 | 3,908,437 |
| Oahu County | 895,705 | 155,000 | 175,770 | 1,226,475 |
| Maui County | 144,709 | 368,415 | 446,126 | 959,250 |
| Kauai County | 19,300 | 7,800 | - | 27,100 |
| CTAHR (ASAO) | 495,840 | 2,348,390 | 2,785,995 | 5,630,225 |
| CTAHR (Extension) | 430,115 | 551,765 | 1,398,076 | 2,379,956 |
| CTAHR (Research) | 688,867 | 312,839 | 615,863 | 1,617,569 |
| TOTAL BY YEAR | 13,942,537 | 20,787,503 | 25,237,503 | 59,967,543 |

Table 12. Total extramural awards, number of faculty PIs, and average value of awards per faculty PI.

| Fiscal Year | Total Award \$ | Unique Faculty PIs | Award \$ per PI |
|-------------|----------------|--------------------|-----------------|
| 2019 | 13,942,537 | 77 | 181,072 |
| 2020 | 20,787,503 | 72 | 288,715 |
| 2021 | 25,237,503 | 78 | 323,558 |

or are working on farms. A graduate of GoFarm is automatically eligible to lease land from the Hawai'i Department of Agriculture. Expansion of the GoFarm program will be a significant addition to training farmers for the future.

- The Fashion Design and Merchandizing program feeds the burgeoning fashion industry with a workforce, but also inspires graduates to start their own businesses.
- Extension's purpose is to be responsive to the needs of communities and individuals through education in the areas of agriculture, natural resources, and human resources. For example, our edible crops

group has a longstanding reputation for working with agriculturalists and industries. The EF-NEP/SNAP group helps educate citizens on acquiring and using these programs (formerly Food Stamps). Our human resource agents educate groups on family resilience.

- Our BE program is developing new knowledge and methods to help agriculture become a circular economy. Three examples are the use of black flies to produce ethanol from waste, engineering a yeast biorefinery that can use agricultural wastes to produce high-value oleochemicals, and improving the cost-effectiveness of producing local aquatic feed from papaya fruit wastes via bioprocessing.
- CTAHR has a recognized research program on maintaining soil health, which is fundamental to maintaining the sustainability of Hawai'i agriculture and natural ecosystems.
- Hawai'i has a serious shortage of trained, certified human and family services workers. Human service occupations are among the fastest growing jobs in Hawai'i. A yearly growth rate of 3-4% creates a workforce demand for over 800 jobs. The HDFS undergraduate program is feeding this local need.

Goal 5. Outreach/Engagement

CTAHR's Cooperative Extension Service – our Extension Agents and Specialists – "...empowers farmers, ranchers, and communities of all sizes to meet the challenges they face, adapt to changing technology, improve nutrition and food safety, prepare for and respond to emergencies, and protect our environment (USDA)."

Extension took the greatest hit during the pandemic: 43% of faculty positions lost or frozen were Agents and 27% were Specialists. Yet, in the face of that, Extension continued its activity. Providing programs in a virtual environment attracted more participants. This is a trend seen by many Extension programs around the county.

Extension education is the promotion of life-long learning through community events, workshops, field-days, and presentations. Hawai'i Cooperative Extension delivered highly impactful programming in 2020, in spite of difficult conditions:

- 82,572 direct contacts with the public through a two-way exchange of information.

- 1,948,054 indirect contacts with the public through one-way exchange of information.
- 2,030,626 total contacts with educational content.
- 700+ workshops, field days, and demonstrations presented to 26,000 participants.
- 281 Extension publications, including fact sheets, bulletins, newsletters, new articles, videos.
- 8,882 participants adopted practices or changed behavior because of Extension educational programming.
- Extension faculty were part of 77 extramural grants totaling \$10,000,000 to address issues at the state and county levels.
- 1,200 Extension volunteers gave 130,000 hours of service, valued at \$3,600,000.

In summary, Instruction/Research/Extension, the three components that make up a land grant college, found ways to continue activities and impact, even during a budget and public health crisis. CTAHR exhibited its value to the university and to the state of Hawai‘i. The current year (2021) still presents us with challenges, but faculty and staff have shown that challenges are simply obstacles to be overcome.

Appendix 1: Acronyms

| | |
|-------|---|
| ANSC | Animal Sciences |
| BE | Biological Engineering |
| COF | Center on the Family |
| CSS | College of Social Sciences |
| DPD | Dietetics |
| FCS | Family and Consumer Sciences |
| FDM | Fashion Design and Merchandising |
| FSHN | Food Science and Human Nutrition |
| HDFS | Human Development and Family Sciences |
| HNFAS | Human Nutrition, Food and Animal Sciences |
| MBBE | Molecular Biosciences and Biotechnology (Department and Undergraduate Program) |
| NREM | Natural Resources and Environmental Management |
| PEPS | Plant and Environmental Protection Sciences |
| TAE | Tropical Agriculture and the Environment |
| TPSS | Tropical Plant and Soil Sciences |
| WICHE | Western Interstate Commission for Higher Education |



Appendix 2: Books Written or Edited by CTAHR Faculty in 2020

- Kataki, Rupam, Ashok Pandey, Samir Kumar Khanal, and Deepak Pant. 2020. *Current Developments in Biotechnology and Bioengineering: Sustainable Bioresources for the Emerging Bioeconomy*. Elsevier. 536 pages.
- Lincoln, Noa Kekuewa. 2020. *Kō: An Ethnobotanical Guide to Hawaiian Sugarcane Cultivars*. University of Hawaii Press. 192 pages.
- Reilly, Andrew. 2020. *Introducing Fashion Theory: From Androgyny to Zeitgeist*. Bloomsbury Publishing.
- Reilly, Andrew, and Ben Barry (Editors). 2020. *Crossing Gender Boundaries: Fashion to Create, Disrupt and Transcend*. Intellect Books. 225 pages.
- University of Hawai‘i at Mānoa Food Science & Human Nutrition Program. 2020. *Human Nutrition: 2020 Edition*. University of Hawai‘i at Mānoa.
- Varjani, Sunita, Ashok Pandey, Edgard Gnansounou, Samir Kumar Khanal, and Sindhu Raveendran (Editors). 2020. *Current Developments in Biotechnology and Bioengineering: Resource Recovery from Wastes*. Elsevier. 516 pages.
- Will, Kip, Joyce Gross, Daniel Rubinoff, and Jerry A. Powell. 2020. *Field Guide to California Insects: Second Edition. Vol. III*. Univ of California Press. 536 pages.

Appendix 3: Book Chapters by CTAHR Faculty in 2020

- Barry B & Reilly. 2020. "Gender More: An Intersectional Perspective on Men's Transgression of the Gender Dress Binary." In *Crossing Boundaries: Fashion to Deconstruct and Reimagine Gender*, edited by A Reilly, pages 122–36. Intellect Books.
- Bock, Dan G., Michael B. Kantar, and Loren H. Rieseberg. 2020. "Population Genomics of Speciation and Adaptation in Sunflowers." In *Population Genomics*, pages 1–29. Springer International Publishing.
- Friday, J. B. 2020. Managing Tree-Crop Competition. Chapter 2 in Elevitch, C.R. (ed) *Agroforestry Design for Regenerative Production - With Emphasis on Pacific Islands*. Permanent Agriculture Resources (PAR), Holualoa, Hawai'i. design.agroforestry.org.
- Hess, S.C., Wehr, N.H., Litton, C.M. 2020. "Invasive Wild Pigs in North America: Ecology, Impacts, and Management." In *Wild Pigs in the Pacific Islands*, VerCauteren, K.C., Beasley, J.C., Ditchkoff, S.S., Mayer, J.J., Roloff, G.J., Strickland, B.K. (Eds). CRC Press.
- Hue, Nguyen. 2020. "Biochar for Maintaining Soil Health." In *Soil Health*, Bhoopander Giri and Ajit Varma (Eds), pages 21–46. Springer International Publishing.
- Le, Thao N., and Don Trieu. 2020. "Personal Wisdom as Reflected in the Vietnamese Classic Literature The Tale of Kiêu." In *Practical Wisdom, Leadership and Culture: Asian, Indigenous, and Middle-Eastern Perspectives*, Ali Intezari, Chellie Spiller, and Shih-ying Yand (Eds). Taylor & Francis Group, pages 114–35.
- Lincoln, Noa Kekuewa. 2020. "State of Our Starches." In *The Value of Hawai'i 3: Hulihia, the Turning*, Good-year-Ka'ōpua, N., Howes, C., Osorio, J. K. K. O., & Yamashiro, A. (Eds). pages 107–10. University of Hawai'i Press.
- Muda, Pauziah, Nancy Jung Chen, and Robert E. Paull. 2020. "Postharvest Handling, Storage and Quality." In *The Papaya: Botany, Production and Uses*, S. Mitra (Ed), pages 237–51. CAB International.
- Paull, Robert E. and Nancy Jung Chen. 2020. "Chapter 17.4 - Tropical Fruits: Pineapples." In *Controlled and Modified Atmospheres for Fresh and Fresh-Cut Produce*, Maria Isabel Gil and Randolph Beaudry (Eds), pages 381–88. Academic Press.
- Paull, Robert E., and Jurandi G. Oliveira. 2020. "Chapter 17.3 - Tropical Fruits: Papayas." In *Controlled and Modified Atmospheres for Fresh and Fresh-Cut Produce*, Maria Isabel Gil and Randolph Beaudry (Eds), pages 373–79. Academic Press.
- Quito-Avila, Diego F., Juliana Freitas-Astúa, and Michael J. Melzer. 2021. "Bluner-, Cile-, and Higre-viruses (Kitaviridae)." In *Encyclopedia of Virology (Fourth Edition)*, Dennis H. Bamford and Mark Zuckerman (Eds), pages 247–51. Oxford: Academic Press.
- Reilly, Andrew, and José Blanco F. 2020. "Masculinities in Fashion and Dress." In *Routledge International Handbook of Masculinity Studies*, pages Routledge, 394–403.
- Tian, Miaoying, Natasha Navet, and Dongliang Wu. 2020. "CRISPR-Cas9-Mediated Gene Editing of the Plant Pathogenic Oomycete *Phytophthora Palmivora*." In *CRISPR-Cas Methods*, M. Tofazzal Islam, Pankaj K. Bhowmik, and Kutubuddin A. Molla (Eds), Pages 87–98. New York, NY: Springer US.
- Wongkiew, Sumeth, Zhen Hu, Hua Thai Nhan, and Samir Kumar Khanal. 2020. "Aquaponics for Resource Recovery and Organic Food Productions." In *Current Developments in Biotechnology and Bioengineering*, Rupam Kataki, Ashok Pandey, Samir Kumar Khanal, and Deepak Pant (Eds), pages 475–94. Elsevier.
- Zhu, Shousong, Gregory Bonito, Yinhua Chen, and Zhi-Yan Du. 2020. "Oleaginous Fungi in Biorefineries." In *Reference Module in Life Sciences*. Elsevier.



Appendix 4: Journals in which CTAHR Faculty have Refereed Publications in 2020

(156 total number of journals)

ACS Omega
 Acta Horticulturae
 Agricultural Systems
 Agriculture & Food Security
 Agroecology and Sustainable Food Systems
 Agroforestry Systems
 Analytical Chemistry
 Animal Microbiome
 Animal Science Journal
 Animals
 Applied Microbiology and Biotechnology
 Applied Soil Ecology
 Aquaculture
 Aquaculture Nutrition
 Archives of Virology
 Arthropod-Plant Interactions
 Biodiversity and Conservation
 Biological Control
 Biological Invasions
 BIO-PROTOCOL
 Bioresource Technology
 bioRxiv
 BMC Genetics
 Botanical Journal of the Linnean Society
 Brown University Digest of Addiction Theory
 and Application
 Bulletin of the American Meteorological Society
 Cell
 Chemosphere
 Child & Family Social Work
 Communications Biology
 Critical Reviews in Food Science and Nutrition
 Crop Protection
 Current Opinion in Biotechnology
 Development Policy Review
 Diversity and Distributions
 Earth System Science Data
 Ecological Monographs
 Ecology and Evolution
 Ecology and Society
 Ecopsychology
 Educational Perspectives
 Educational Research for Policy and Practice
 Environmental Entomology
 Environmental Research
 Environmental Science and Pollution Research
 Environmental Science and Pollution Research
 International
 Environmental Science and Technology
 European Journal of Plant Pathology
 European Journal of Social Science Education And
 Research
 Food Chemistry
 Food Engineering Reviews
 Food Science and Biotechnology
 Foods
 Forest Ecology and Management
 Frontiers in Chemistry
 Frontiers in Microbiology
 Frontiers in Plant Science
 Frontiers in Veterinary Science
 G3: Genes|Genomes|Genetics
 General and Comparative Endocrinology
 Genetic Resources and Crop Evolution
 Genome Biology
 Genomics
 Global Change Biology Bioenergy
 Hawaii Journal of Health & Social Welfare
 Horticulturae
 HortScience
 HortTechnology
 Industrial Crops and Products
 Insect Conservation and Diversity
 Insect Pests
 Insect Science
 International Journal of Biometeorology
 International Journal of Community Well-Being
 International Journal of Environmental Research
 and Public Health
 International Journal of Quantitative Research
 in Education
 International Journal of Smart Grid and Clean Energy
 International Journal of Tropical Insect Science
 Journal of Agricultural and Food Chemistry
 Journal of Animal Science and Biotechnology
 Journal of Applied Horticulture
 Journal of Applied Microbiology
 Journal of Biogeography



Journal of Dairy Science
 Journal of Economic Entomology
 Journal of Environmental Chemical Engineering
 Journal of Environmental Management
 Journal of Extension
 Journal of Family and Economic Issues
 Journal of Family Issues
 Journal of Food Engineering
 Journal of Food Process Engineering
 Journal of General Virology
 Journal of Hazardous Materials
 Journal of Heredity
 Journal of Immigrant and Minority Health
 Journal of Insect Biodiversity
 Journal of Insect Conservation
 Journal of Integrated Pest Management
 Journal of Natural Products
 Journal of Neuroendocrinology
 Journal of Nutrition Education and Behavior
 Journal of Nutritional Science
 Journal of Pest Science
 Journal of the American Oil Chemists' Society
 Journal of the Lepidopterists' Society
 Journal of Youth Development
 Limnology and Oceanography
 Limnology and Oceanography Bulletin
 LWT – Food Science Technology
 Marine Policy
 Metabolic Engineering Communication
 Microorganisms
 Mitochondrial DNA B Resources
 NACTA Journal
 Nature Biotechnology
 Nature Ecology & Evolution
 Nematropica
 Nota Lepidopterologica

Nutrients
 Nutrition Reviews
 Pacific Science
 Pathogens
 Peer J Life and Environment
 Pest Management Science
 Pesticide Biochemistry and Physiology
 Physiological and Molecular Plant Pathology
 Plant Cell
 Plant Direct
 Plant Disease
 Plant Molecular Biology
 Plant Physiology
 Plant Science
 Plants
 PLoS One
 Poultry Sci
 Proceedings of the Estonian Academy of Sciences
 Proceedings of the Hawaiian Entomological Society
 Proceedings of the USABE 2020 Conference
 Radiocarbon
 Remote Sensing
 Rice
 Science of the Total Environment
 Scientific Reports
 Small Methods
 Sustainability
 The Journal of Applied Poultry Research
 Toxins
 Transactions of the American Entomological Society
 Transactions of the ASABE
 Transgenic Research
 Tropical Plant Pathology
 Waste Management
 Water
 Water Research
 Wildlife Society Bulletin
 Zookeys

Appendix 5: Refereed Journal Articles Published by CTAHR Faculty in 2020

(212 total number of articles)

- Adhikari, P., A. Kiess, R. Adhikari, and R. Jha. 2020. "An Approach to Alternative Strategies to Control Avian Coccidiosis and Necrotic Enteritis." *The Journal of Applied Poultry Research* 29 (2): 515–34.
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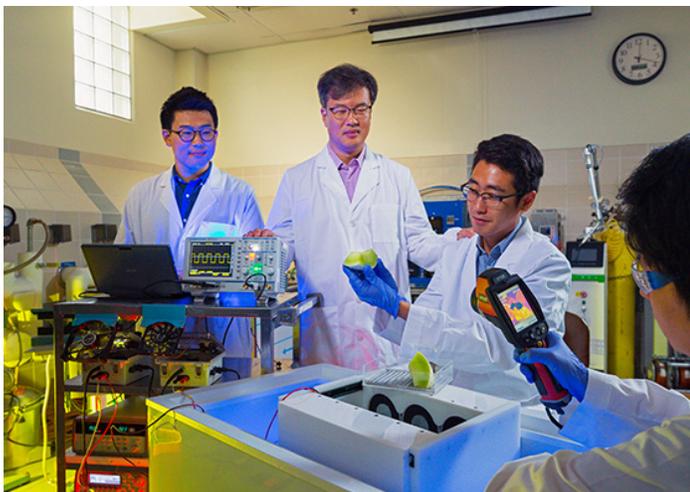
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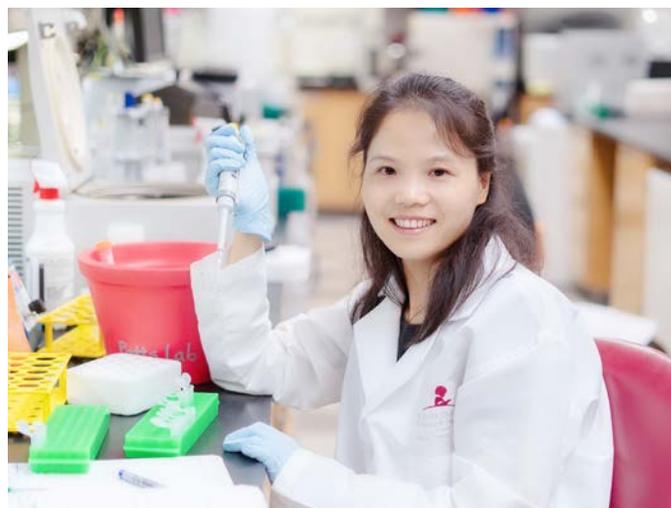
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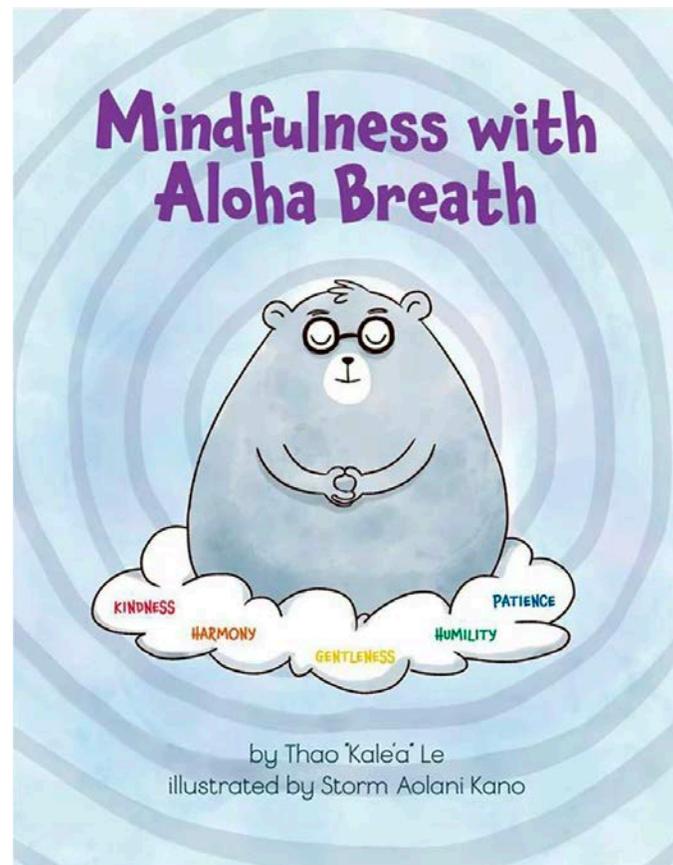


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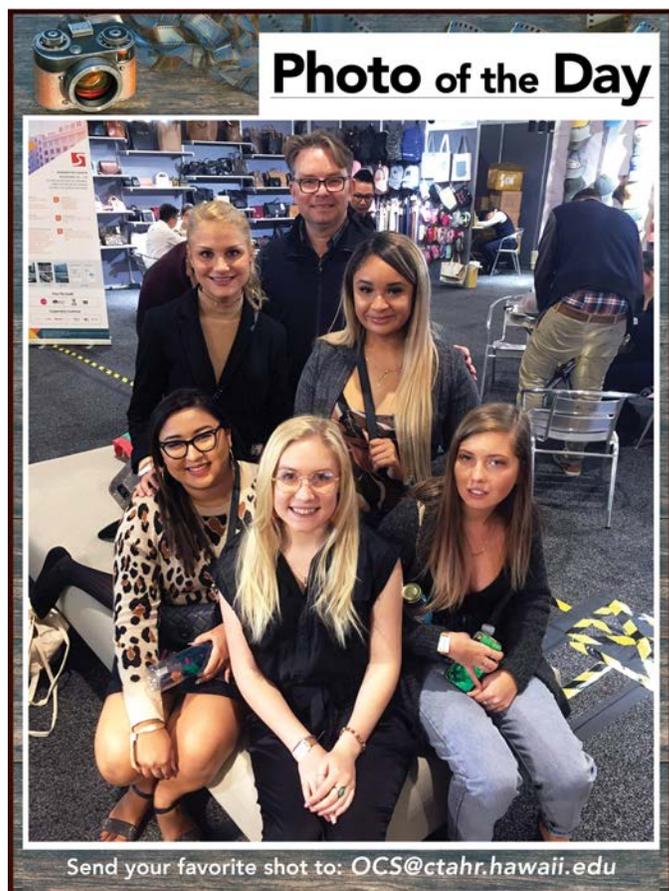
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