

# **Dr. Lonnie O'Neal Ingram**

**(1947-2020)**



**“The development of technology for the cost-effective conversion of modern renewable biomass into clean-burning automotive fuel has the potential to free the United States and other nations from oil-dependence and to allow a redistribution of wealth based on the productivity and ingenuity rather than natural resources.”**

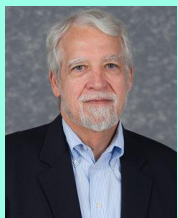
**-Lonnie O. Ingram**



**SUGAR CANE**



## **In Memoriam: Ingram, Lonnie O'Neal**



**Dr. Lonnie O'Neal Ingram, a 50-year member of the American Society for Microbiology (ASM), passed away on June 25, 2020 at the age of 72 in Charleston, South Carolina.**

**Lonnie O'Neal Ingram was born in Greenwood, SC, and raised in Cheraw, SC. He received his undergraduate degree from the University of South Carolina in 1969, and his PhD two years later (1971) from the University of Texas. After a short post-doctoral study at the Oak Ridge National Laboratory, Ingram joined the Department of Microbiology at the University of Florida (1972), where he remained until his retirement as Distinguished Professor from the Department of Microbiology and Cell Science in 2017. He served as the Founding Director of the Florida Center for Renewable Chemicals and Fuels at the University of Florida from 1998 until his retirement.**

**Dr. Ingram, a microbial physiologist, metabolic engineer and synthetic biologist, started his career studying peptidoglycan and membrane synthesis in cyanobacteria. His interest in this process led to studies of membrane organization and the effect of alcohol on membrane architecture, funded through a NIH Career Development Award. These studies**

**in turn led to research on ethanol production, biocatalyst development and metabolic engineering. Results of these studies were published in over 250 referred publications and 25 book chapters and reviews, and his work was presented in numerous national and international venues.**

**In 1991, the U.S. Department of Commerce awarded its landmark patent, number 5-million, to Ingram, along with University of Florida researchers Tyrrell Conway and Flavio Alterthum, for creating a means to use *Escherichia coli* bacteria to produce ethanol. The pioneering development of ethanologenic *E. coli* by introducing pyruvate decarboxylase and alcohol dehydrogenase genes from *Zymomonas mobilis* into *E. coli* was a significant philosophical step in metabolic engineering, and was essentially an early version of synthetic biology (construction of an organism with new metabolic potential that does not exist in nature). These initial studies opened the area of metabolic engineering for production of chemicals from biomass. In addition to developing microbial biocatalysts, Ingram designed and oversaw construction of a pilot/demonstration plant with an integrated process for converting biomass to fuel ethanol at the University of Florida.**

**This patent was followed by numerous other patents (a total of 35) for Ingram's work.**

**Ingram was well known among his colleagues as one who employed novel ideas to solve problems. One such idea was the construction of what he called "Zoolibraries" as a source of genes from environmental samples without the need for isolation of individual organisms with required metabolic function. In simple terms, "Zoolibraries" can be constructed with DNA isolated from any specific environment and the desired gene can be selected from**

**such libraries. This concept was developed by Ingram long before other scientists and biotech companies adopted similar practices. Many of the engineered microorganisms developed by his team were licensed to the industry.**

**Ingram's research, covering the entire spectrum of microbial physiology, from basic to applied, was well-funded by both government and private sources (over \$50 million). His work has been recognized at the Federal and State government level as evidenced by the awards he has received: Commendations by the State of Florida Senate and House (1991), Distinguished Service Award from the US Department of Agriculture (the highest presented for research) in 1993, election to the US National Academy of Inventors (2013), among others. He presented his research to groups around the world and advised the State of Florida and President George W. Bush (2007) on renewable energy issues. Ingram's contributions to science led to his election to the US National Academy of Sciences in 2001.**

**Ingram was an active ASM member, and served in various capacities for the national organization, including as Chair of the Fermentation and Biotechnology Division (Division O), in 2000-2001. He also served in various leadership capacities for the Florida Branch of ASM, including as Branch President in 1987-1989. In 1998, Ingram was elected as a Fellow of the American Academy of Microbiology. He was also an active member of the Society for Industrial Microbiology and Biotechnology and was elected Fellow of that society in 2001.**

**Dr. Ingram collaborated with colleagues at the University of Florida as well as from several other universities across the country. In addition to being viewed by colleagues as "a very pleasant person to work with," he was always willing to help others excel in their work, and**

**he worked to create an academic department in which everyone in the department was able to be productive and successful. He trained numerous graduate students and postdoctoral researchers over the course of his career, and the scientists he trained can now be found all over the world carrying on the tradition established at his lab. “At work, Dr. Ingram was an inspiration and guiding light to his peers,” his colleague, K. T. Shanmugam, reports.**

**Dr. Ingram is survived by his loving wife, Nancy, their children and their spouses, grandchildren, and his brother.**

**Submitted by  
K.T. Shanmugam, University of Florida  
July 22, 2020**

Published In the American Society for Microbiology







**He touched so many lives.**



**National Academy member and Emeritus Professor of our department, Lonnie Ingram, passed away last Thursday.**

**Lonnie was, in many ways, our guiding light. I always looked up to him as a shining example of collegiality and productivity. I learned so much from his example. I will miss him very much.**

**In his honor, Neal's wife Nancy has established a scholarship fund in his honor for our department. Gifts can be made online at <https://bit.ly/nealingram>.**

**This is a great way to recognize and honor Neal's contributions to science, our department and our many students over the decades of his service. Neal was one of the very few members of the National Academy of Sciences whose entire faculty career was spent at the University of Florida.**

**Neal was our rock and is sorely missed.**

**Eric Triplett**

**(Professor and Chairman, Microbiology & Cell Science, UF)**

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**In my view, Lonnie Ingram taught UF that it could be a much greater University that it was when he joined it in 1972. He showed that UF's home-grown researchers can be world-class and reach the highest levels of their profession. I don't think UF would be where it is today without him.**

**Neal is sorely missed.**

**Best regards and stay well,**

**Eric 6/29/20**

**A wonderful man, scientist, and colleague. He did much for our understanding of biofuels and was a great representative for the University.**

**Jack M. Payne**

**(Senior Vice President of Agriculture and Natural Resources, UF)**



**Dear Nancy and Ingram family,**

**I have been looking back at the time I first met Neal. I went back to school in 1988 to complete my BS in microbiology; I needed a summer job and was given a list of professors who might be hiring a dishwasher. I called Neal and he said he was sorry, but he had hired his son Kenny to wash dishes. He suggested I come in to meet him anyway. We met in his office and discussed his labs and research. Then he took me on a tour of the labs and introduced me around. He surprised me by offering a 20 hour a week research position instead of washing dishes! That summer he trained me on the techniques used in his lab to work with DNA, leading to the first of many publications I was to be a part of. After I received my BS, he kept me on in the lab while I worked on my MS and upon completion hired me full time to do research for and with him.**

**We both went through ups and downs through the years, but he was always there for me, and for everyone else that came through his lab.**

**His research was groundbreaking. He was at the top of his field, doing important work. I know he wanted to make a difference and he has. I feel honored to have worked for him. There will be a hole in research and in my life without him.**

**I am sincerely sad for your loss.**

**Always,**

**Lorraine**



**I started working with Dr. Ingram more than 25 years ago while in college as I worked for a local biotech company that was licensed to use his engineered strains. Shortly later, Dr. Ingram hired me to work at UF in his lab as a Senior Biological Scientist and we continued to advance the research and technology. Along with Lorraine Yomano, we co-managed 4+ labs and lots of students, graduates, and post docs over the years. The list is long of people who have come through Dr. Ingram's lab and have all gone on to successful careers in science due to Dr. Ingram's guidance and mentoring. A lot of us would not be where we are today without his assistance. Dr. Ingram was a well of knowledge and his creativity in the lab with the research resulted in multiple patents and hundreds of publications. We all worked hard to push the technology forward and our effort was shown in what we accomplished. Years later, his peers thought the same and was inducted into the National Academy of Sciences and named a Distinguished Professor at UF all a while remaining his jovial, down to earth self. His passion for the research was evident and we all shared that, yet he still found time for his family and the occasional vacation. I wish his family well and hope they carry on in their own lives with some of that passion. Even now, former students are carrying on with the research that Dr. Ingram started, and we hope that it will continue, a testament to his love of the work and his dedication to the future. Thanks for mentoring all of us for so many years, for being there when we needed it, you will be missed.**

**Sean**

**I cannot stop tearing up. He is like a parent to me and teaches me a lot.**

**I miss Dr. Ingram and cannot believe this is truth. Do you know what happened to him? Last September I still got emails from him. I wrote to him last December and March but did not get any response. I worried about the COVID-19 influence on him, but never thought he would pass away. He told me that he wanted to take care of his kids until the youngest one to be 50 years old. At that time, I thought how lucky his kids were.**

**During my postdoc training in his lab, he cared about me like a father. And he taught me a lot, not just science, but also how to treat people. He also encouraged me when I had troubles in research. I really miss him.**

**Aiqin Shi**

**(Postdoctoral Scholar, Penn State University – College of Medicine)**

**I am saddened by Dr. Ingram's passing, and thank you for reaching out.**

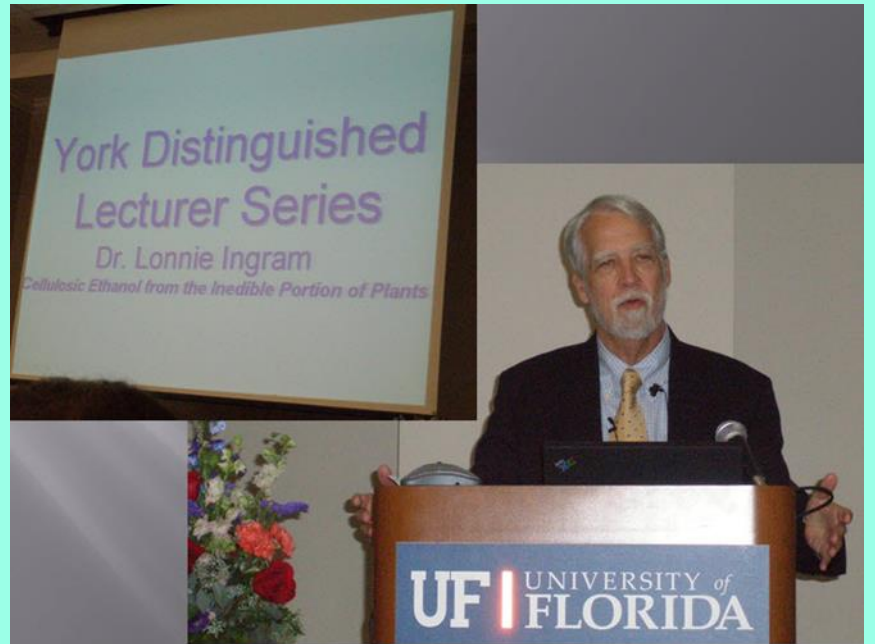
**I recognized some of the names in your e-mail list, and I feel an enormous gratitude to Dr. Ingram and to all of you that I met while at his lab in Gainesville. I am currently living in Arizona, which has become an epicenter of the Covid-19 pandemic. I wish this was a different time that would allow me to better pay my respects to Dr. Ingram.**

**Best,**

**Maria Barbosa**

**(Chief Executive Officer, Conquerab Inc.)**





**I'm so sorry to hear that through your email this morning. It must be really tough for his wife at this time. Please forward my sincere condolences to Dr. Ingram family and I hope everything is being well organized and processed.**

**As one of his postdocs, I keep remembering his outstanding achievements and contributions in biofuels and biochemicals research field by metabolic engineering. Especially, typical fermentation products including Alanine, lactates are being well commercialized.**

**Regards**

**Huabao Zheng**

**(School of Environmental and Resources Sciences, Zhejiang Agricultural and Forestry University)**

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**I'm really sad. So many good memories from Dr. Ingram.**

**This is so sudden that I can't think what to say.**

**Fernando Martinez M.**

**(Professor Biotechnology Research Center (CEIB) *Universidad Autónoma del Estado de México.*)**



**I am so sad to hear this news. Thank you for sharing. I just can't believe it. He was such a force of nature. I'll speak to Ryan and see how we can give our condolences. So sad.**

**Best regards,**

**Claudia Geddes**

**(Senior Scientist II Senior Scientist, Technical Service, *Novozymes*)**

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**Thank you for reaching out to me. I had not heard this sad news. I am very sorry to hear he passed away so soon after retiring. I hadn't seen him since the retirement party. He seemed to be doing well then. How old was he? Not old enough, anyway.**

**Joy**

**Joy Peterson**

**(Professor, Biomedical and Health Sciences Institute, *University of Georgia*)**







**So sad to hear Dr. Ingram's passing. Dr. Ingram was an extraordinary mentor and an important part of our professional life. I last saw him at the 2017 ASM meeting for his Dupont Industrial Biosciences Award and he seemed to be doing well. I feel it is an end to an era, but I am grateful for the wonderful memories of the time with this big UF family brought together by Dr. Ingram.**

**Hugs to everyone and take care of yourselves!**

**Yilei Qian**

**(Associate Professor of Microbiology, Indiana University South Bend)**

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**This is very shocking and sad. He seemed pretty healthy when I visited UF during his retirement ceremony in 2017. Too many things happened this year. My mentor during my master student time in China also passed away last month. These unexpected events always shake me to reflect about the value of life. Thank Dr. Shan for a touching obituary and Dr. Ingram rarely exposed his personal life to me while I was in Gainesville. No doubt that I will not have my current career without his support and wonderful mentoring. He has been such an inspiring model for my career pursuits. Due to COVID, I cannot travel to FL.**

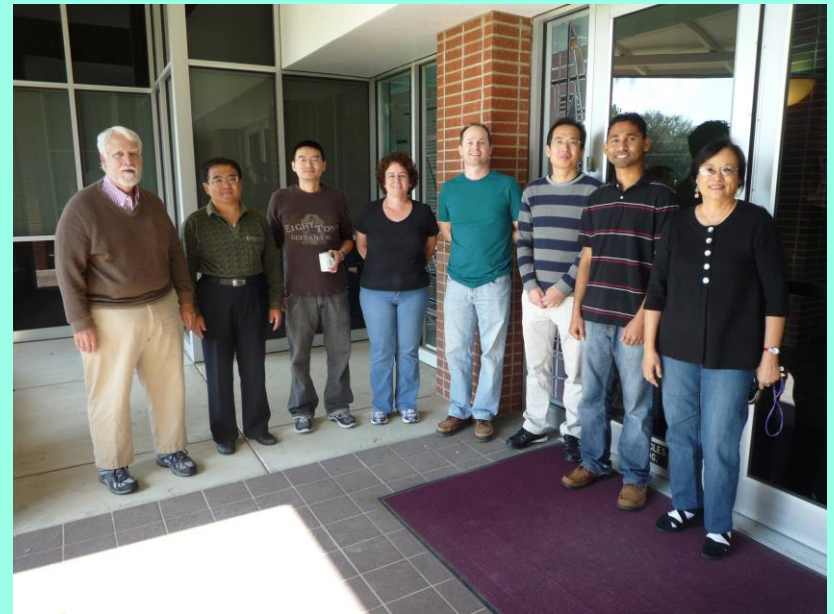
**Best,**

**Xuan Wang**

**(Assistant Professor, Arizona State University)**

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**Very Sad indeed. I owe him a lot for being a part of my education here at the department. To honor his contribution to biotechnology, renewable energy, and biofuels, perhaps we should name something in the department after him. For example, seminar series, seminar room. Or a scholarship.**

**Karim Asghari**

**(Sr. Lecturer, Microbiology & Cell Science, UF)**

**I am very sad to hear that Dr. Ingram's passed away. Please let me know if there is anything I can do. I miss him very much.**

**Shengde Zhou**

**(Associate Professor, Northern Illinois University, Department of Biological Sciences)**

**I am deeply saddened to hear that Dr. Ingram is not among us anymore. I want to convey my sincere condolences to his family and to you. I hope he passed away in peace and not in a struggle with health issues due to current pandemic.**

**Sincerely,**

**Deepika**



**Thank you for letting me know about this sad news.**

**It is a pity that Dr. Ingram was able to enjoy his retirement only for a short period of time.**

**Best regards**

**Eulogio Castro**

**(Professor, Universidad de Jaén | UJAEN • Department of Chemical, Environmental and Material Engineering)**

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**Claudia, Vanessa, and Sean alerted me of the tragic news last week. I literally cried. Dr. Ingram meant so much to so many people, and it's going to take months of grieving for us to accept his passing. He congratulated me on my new faculty position at NC State a week before his passing, which makes this even more difficult to handle. He opened so many doors for me and I will forever be grateful. He wanted his ethanol strain to scale more than anything, and we all worked so hard at the plant in Perry to make it happen. We had the deepest respect for him.**

**With kind regards,**

**Joe Sagues**

**(Assistant Professor, Biological & Agricultural Engineering North Carolina State University)**



**Updating my resume<sup>1</sup> a few days ago, I came across a site that listed publications and showed pictures of the authors. Doctor Ingram, you, Sean, Fernando (a funny picture, of a child behind a cone of green ice cream), Alfredo (very formal) were there.**

**Google Scholar gave me an idea of where things stood, after many years. Our paper on “Aldehydes” (483 citations) ranked fourth among all Doctor Ingram’s publications.**

**Then the next day, Ana called me with the news. (I was walking around, hadn’t seen your email). It surprised us.**

**Doctor Ingram was an important person in our lives. I told him that years after I left Gainesville. Working in his Lab set the basis for publication in important journals and for my next career move to Europe. In Ingram’s Lab I met Mohammed, who a decade later, would hire me to work in Boston, an important step my life.**

**And of course, Doctor Ingram also welcomed Ana, who later joined me in Denmark, where a daughter was born. And in this chain of events, and coincidences, two former post-docs of Doctor Ingram (Ana and I) got married on June 25, the date that he would pass on 19 years later.**

**I had met Doctor Ingram in NYC in the late 1980’s, I believe it was an ACS meeting. After his presentation, (remember his Birkenstock sandal), I spoke with him. He had mentioned Flavio who I knew from Sao Paulo. Incidentally, about decade later he visited my RAFT-poster in San Diego and invited me to visit his Lab. I ended up in Gatorland.**

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<sup>1</sup> <https://www.linkedin.com/in/ingramlab>

**(For Flavio patent 5,000,000 and his time in Gainesville were memorable. In his Sao Paulo office, under the glass cover of his desk he placed a giant map of UF with a big logo of the green gator with orange and blue background).**

**I remember Doctor Ingram's (and gentle Vicky) Christmas parties for the Department, and the science-related events he attended bringing us together, recognizing our hard work: the Microbiology meeting in Atlanta<sup>1</sup> and the inauguration of the ethanol plant in Jennings. Moreover, he never forgot to put everybody's name on the reviews he wrote.**

**Doctor Ingram was a focused, hard-working, prolific inventor and ethical scientist. I can't say that my stay in the lab was spectacular, but Labs are not supposed to be spectacular in the first place, and, we're humans after all. His caring recommendation letter afterwards was no less than moving.**

**Over the years, I haven't forgotten three things I heard Doctor Ingram say:**

**First, "after you get something done, you look back and see that you could've taken a shorter path, but now it's done anyway" which emphasized his "go for it" approach.**

**The second, since he wasn't a Molecular Biology expert in the early days, the first thing he did, was to purchase materials and reagents and go to the Lab to do it himself. That he would make mistakes it didn't matter, learning how to do it was the purpose. Again, nothing is better than "go for it" to master something.**

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**The third, that one of his first publication (“adaptation of cell membranes,” I believe) still fresh at UF, the solo approach took so much of his time and energy, with small and slow “return on investment.” Teamwork is faster, more effective and allows higher throughput was the lesson.**

**Yes, “well done and fast,” his motto was. A Ph.D. degree in two years is the proof. Unfortunately, death came to him fast also. And that nobody wants for a good man.**

**Rest in peace Doctor Ingram.**

**Jesus Zaldivar**

**(JZ Consulting)**

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**Thank you for letting me know about Dr. Ingram. I'm sorry to hear the news. Dr. Ingram's hard work, generosity, and wisdom made a huge impact on so many people's lives. I think of him often and about how fortunate I was to have known him. You, his other friends, and family are also in my thoughts and I'm sending you my best wishes.**

**Take care,**

**Jonathan Moore**

**So sad to hear this news. Prof Ingram was one of the greatest Scientist I come across during my career. By his great mentorship, he made lots of positive impact on our lives. He will be remembered for long time. May god give peace to the departed great soul and courage to his family to bear such a big loss.**

**Thanks,  
Vilas Shukla**

**I am so sad to hear Prof. & Dr. Ingram's passing. He achieved many great accomplishments in genetic engineering of bacteria for production of fuels and chemicals from inedible plant materials. As a pioneer in this field, Professor Ingram also trained many excellent scientists all over the world. He invited me to his laboratory in 2012 and was always very kind to me. The experience of one year in his laboratory expanded my research scope. At this sad moment, please extend my sincere greetings and thanks to his family**

**Sincerely,**

**Dan Li**

**(visiting Professor)**

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**I am so sad to hear this information. It's a huge loss to all of us.  
Dr. Ingram will live in our heart forever.**

**Rest in Peace.**

**Xueli Zhang  
(Professor, Tianjin Institute of Industrial Biotechnology)**





**Very sad to hear about Dr. Ingram. Wishing comfort to his family!**

**Regards,**

**-Ana Borges**

**(former Post-Doc)**

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**I am sorry to hear of Dr. Ingram's passing. May the soul of Dr. Ingram rest in peace!**

**Please forward my deep condolences to his family.**

**Thank you very much.**

**Lai, Xiaokuang**

**(former PhD student)**

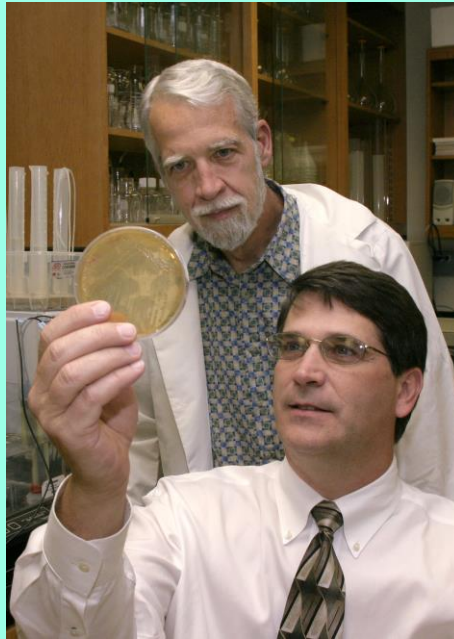
**I'm sorry.**

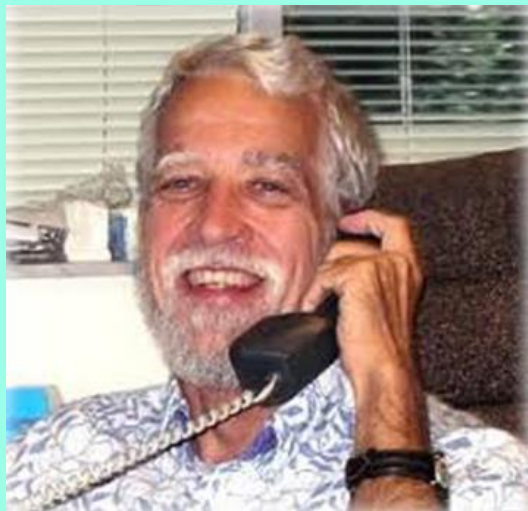
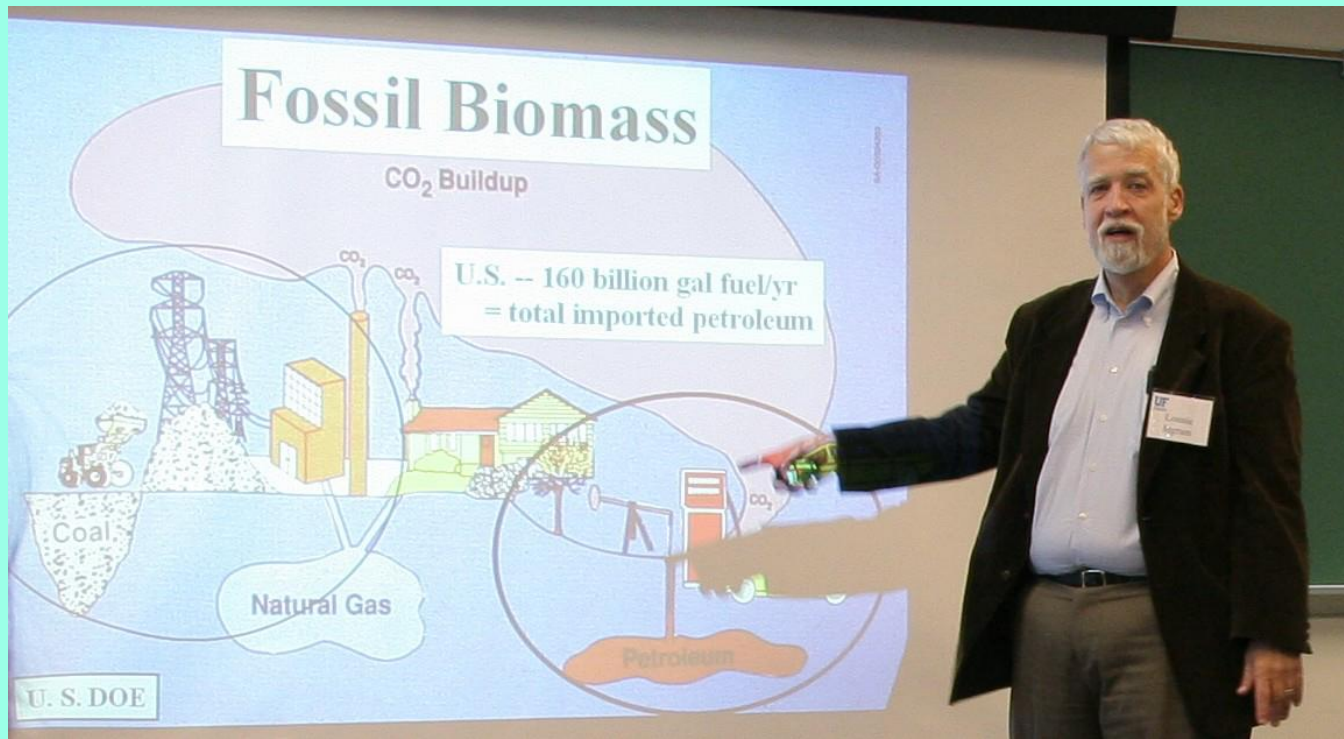
**I feel very sad.**

**Alfredo Martinez-Jimenez**

**(Professor, UNAM, Ingenieria Celular y Biocatalisis)**













D-lactic acid plant in Spain

# STAN MAYFIELD

## BIOREFINERY PILOT PLANT

Lonnie O. Ingram,  
Executive Director & Chief Scientist

Florida Center for Renewable Chemicals and Fuels





**UF | IFAS**  
UNIVERSITY of FLORIDA

**STAN MAYFIELD**  
Cellulosic Research  
and Demonstration Plant

# Operations



**Dr. Lonnie Ingram**  
Executive Director  
& Chief Scientist



**Dr. K.T. Shanmugam**  
Science Advisor



**Dr. Ismael Nieves**  
Project  
Director &  
Chief Process  
Engineer



**Dr. Greg Luli**  
Consultant



**Dr. Eulogio Castro**  
Laboratory  
Director



**Joe Sagues**  
Director of  
Operations



**Dr. Irina Kataeva**  
Research  
Scientist



**Vanessa Rondon**  
Biochemical  
Engineer



**Dr. Marco Fernandez**  
Biochemical  
Engineer



**Calvin Weeks**  
Process  
Engineer



**Paul Windham-Milton**  
Process  
Engineer



**Peter Grant**  
Process  
Engineer



**Kevin Luther**  
Process  
Operator



**Tommy Luther**  
Process  
Operator



**Randy Spradley**  
Process  
Operator



**Jeff O'Brien**  
Process  
Control  
Operator



**Chris Self**  
Process  
Control  
Engineer

# Stan Mayfield Biorefinery Pilot Plant



Lonnie  
Ingram

Rep. Leonard  
Bembry

Rep. Ralph  
Poppell

Mrs. Debbie  
Mayfield

John Crow  
CEO BKI

Pres. Bernie  
Machen

Trustee Cindy  
O'Connell

VP Larry  
Arrington

# Stan Mayfield Biorefinery





Indian team visiting SMB (2014)



**Florida Center for Renewable  
Chemicals and Fuels (FCRC)**

<http://fcrc.ifas.ufl.edu>

## Realization Through Research

Research projects coordinated by FCRC focus on:

- **Microbial Metabolic Engineering**  
Development of bio-catalysts for the production of fuel ethanol and other chemicals from renewable plant biomass.
- **Depolymerization of Cellulose and Hemicellulose**  
Development of microbial enzyme systems to solubilize cellulose and hemicellulose in the cell walls of plants into sugars that can serve as inexpensive renewable sources for conversion into fuels and chemicals.
- **Hydrogen Research**  
Development of applications of physiology, biochemistry, genetics, and regulation of hydrogen metabolism in microbes.
- **Environmental Microbiology**  
Development of processes and organisms to remove biological and chemical hazards in contaminated soil and water.
- **Comparative Genomics and Experimental Evolution**  
Efficient use of genomic information to find new enzymes and pathways for biocatalyst development.

FCRC research has produced 27 U.S. and international patented solutions for the conversion of renewable biomass to chemicals and fuels.

### Visit

<http://fcrc.ifas.ufl.edu>  
<http://microcell.ufl.edu>  
for more information

## Participating UF Departments

Agronomy  
Agricultural and Biological Engineering  
Chemistry  
Chemical Engineering  
Environmental Engineering Sciences  
Horticultural Sciences  
Microbiology and Cell Science  
School of Forest Resources and Conservation  
Soil and Water Science

## Sponsors

BioEnergy International, LLC  
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U.S. Department of Energy  
University of Florida Foundation  
Verenium Corporation

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# Florida Center for Renewable Chemicals and Fuels FCRC



**UF** UNIVERSITY of  
FLORIDA  
IFAS

# FCRC...

## Providing Energy Solutions

The Florida Center for Renewable Chemicals and Fuels acts as the hub for multi-disciplinary education and research in producing chemicals and fuels from biomass. FCRC:

- SOLVES new technological challenges in renewable energy production;
- CONNECTS faculty and students in productive communication;
- ASSISTS faculty in the development of competitive research grants; and
- MAKES VISIBLE and VIABLE the possibilities in renewable chemicals and energy sources at the state and national levels.

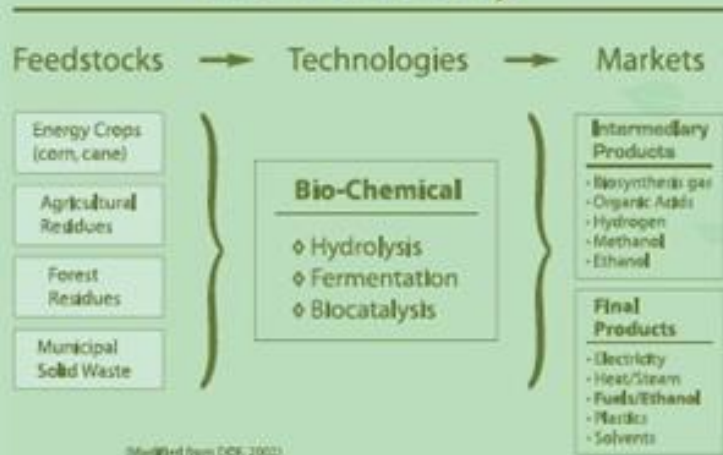
## A Catalyst for Change

Biorefineries producing ethanol in the U.S. currently meet only about 2.5% of automotive fuel demands.

FCRC seeks to expand and enhance the efficiency and sustainability of ethanol and hydrogen fuel production through the creation of new biorefineries that use biomass and energy crops to replace petroleum-based fuel and chemical products. Using these feedstocks can triple biofuels production without competing with crops for food and feed consumption.

The collective vision of the FCRC is a future independent of petroleum as the sole source for energy and chemical needs, resulting in a cleaner environment, a stronger economy, and a more secure source of energy.

## Bio-Refinery



## Fellowships in Biochemicals and Fuels Technology

Four to six graduate research fellowships are awarded each year on a competitive basis to outstanding students pursuing careers in biotechnology. Research fields in microbiology include:

- Biotechnology
- Biochemistry
- Molecular Genetics
- Metabolic Engineering
- Genomics and Proteomics



## Clearing the Path for Progress

FCRC assists faculty in preparing and submitting research proposals, alerts members to new funding opportunities, sponsors meetings and seminars, and shares data and information on metabolic engineering of bacteria for the production of ethanol/hydrogen fuels and chemicals.





There was reason for a cellulosic ethanol celebration at the second annual Farm to Fuel Summit held in St. Petersburg last week.

In this photo released from the University of Florida's Institute of Food and

Agricultural Sciences, UF Senior Vice President for Agriculture and Natural Resources Jimmy Cheek (left), UF Distinguished Professor of Microbiology Lonnie Ingram (center) and Verenum Vice President for Business Development Tim Eves (right) raise a toast to celebrate the first payment from Verenum to UF for use of cellulosic ethanol technology developed by Ingram. *(AP photo/University of Florida/IFAS/Thomas Wright)*







*Good Luck Berenice!*

July 19, 2010

Ingram Lab: Judaeag, Sheila, Peter, Xuan, Ralph, Ismael, Claudia, LOI, Mike, Lorraine, Sean and Fu.









# Celebrating the careers of

**Dr. Lonnie O. Ingram**

**Dr. James F. Preston, III**



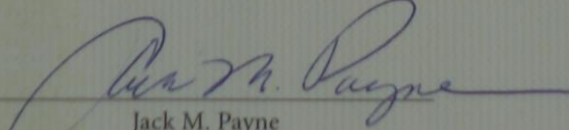


# Certificate of Retirement

The University of Florida  
Institute of Food and Agricultural Sciences  
presents this certificate of appreciation to honor

*Lonnie O. Ingram*

and to express our gratitude for his 45 years  
of loyal and dedicated service to  
Florida's agricultural research and education programs.

  
\_\_\_\_\_  
Jack M. Payne  
Senior Vice President  
Agriculture and Natural Resources





















