



# Greening Labs

 my green lab.

# How I Got Here



# How I Got Here

- Raised by hippy parents





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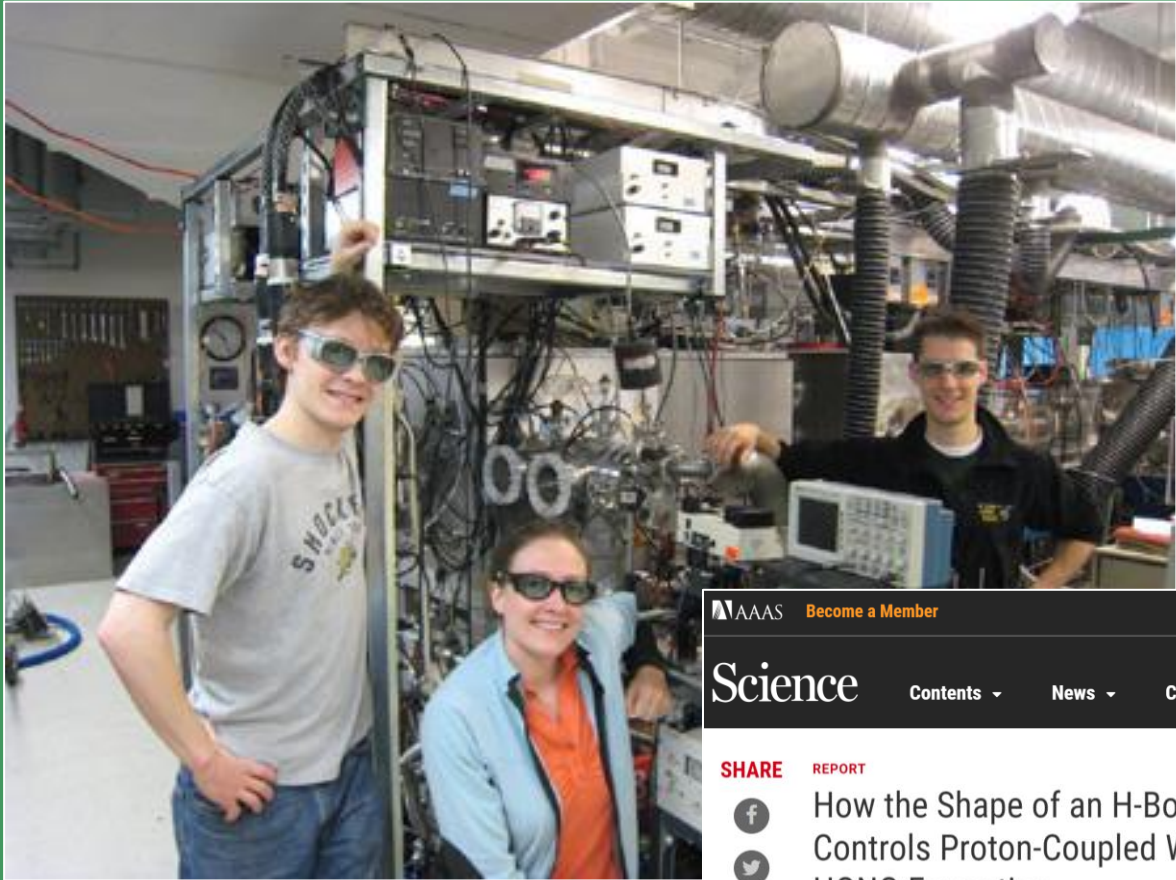


- Raised by hippy parents
- Went to a hippy college



# How I Got Here






- Raised by hippy parents
- Went to a hippy college
- Took science seriously for a while



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## How the Shape of an H-Bonded Network Controls Proton-Coupled Water Activation in HONO Formation

Rachael A. Relph<sup>1</sup>, Timothy L. Guasco<sup>1</sup>, Ben M. Elliott<sup>1</sup>, Michael Z. Kamrath<sup>1</sup>, Anne B. McCoy<sup>2</sup>, Ryan P. St...

[+ See all authors and affiliations](#)

Science 15 Jan 2010:  
Vol. 327, Issue 5963, pp. 308-312  
DOI: 10.1126/science.1177118



# How I Got Here



- Raised by hippy parents
- Went to a hippy college
- Took science seriously for a while
- Sampled corporate sustainability

# How I Got Here



- Raised by hippy parents
- Went to a hippy college
- Took science seriously for a while
- Sampled corporate sustainability
- Joined My Green Lab





# Science Is Amazing

- Provides insights into the world above, below and around us
- Creates the basic building blocks for materials, technologies and even food
- Advances human health and well-being





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## Coronavirus pandemic highlights importance of life sciences industry

APR. 1, 2020 BY [ADAM LOHR](#)



While the coronavirus pandemic [has slowed growth in the life sciences sector](#) this year, it has also highlighted the importance of the biotech and pharmaceutical industries as the whole world battles the COVID-19 disease and its impacts. This industry focus could have a lasting impact in shifting consumer and policymaker perspectives about these sectors in a positive direction.



# But the Impact is Also Huge

- Labs consume **5-10x more energy**
- **CO<sub>2</sub> emissions are 55% greater** than the automotive industry
- Typical lab building uses more than **2 million gallons of water** a year



[https://www.i2sl.org/documents/toolkit/lowenergy\\_508.pdf](https://www.i2sl.org/documents/toolkit/lowenergy_508.pdf)

<https://doi.org/10.1016/j.jclepro.2018.11.204>

<https://theconversation.com/big-pharma-emits-more-greenhouse-gases-than-the-automotive-industry-115285>



California labs alone  
consume 3,000 GWh each year  
- the **equivalence of**  
**450,000 passenger cars**



# A Closer Look at Energy

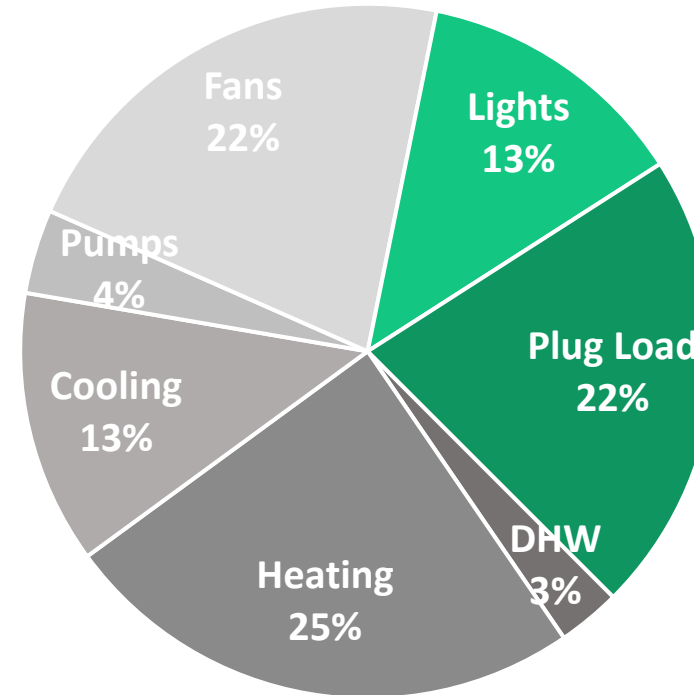
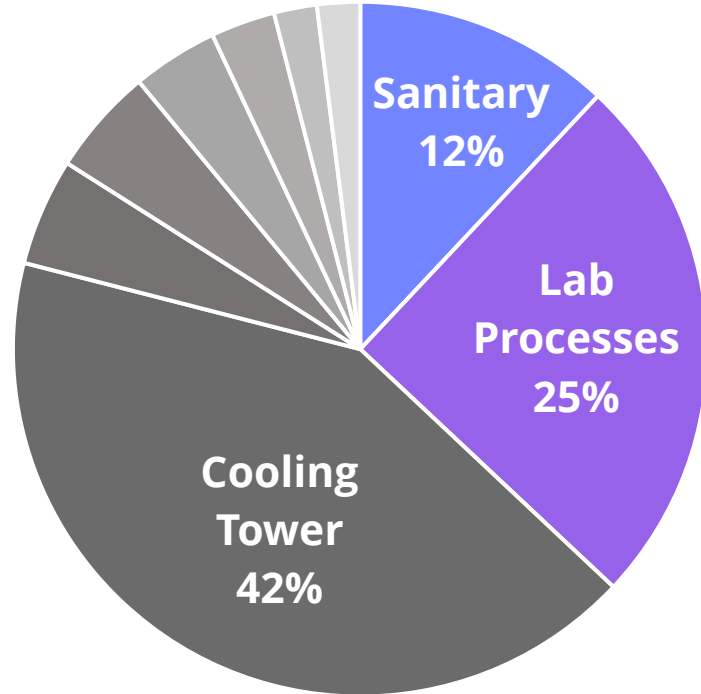


chart from Alison Farmer, kW Engineering

Most energy consumed in a lab is related to heating and cooling but over 1/3 is in direct control of the lab



# A Closer Look at Water



- A typical autoclave uses more than 19,000 liters a week
- Single-pass cooling in one lab used nearly 50,000 liters of water in a year



# A Closer Look at Waste

## Common Large Waste Sources

- Gloves and gowns
- Single use plastics
- Pipette tips
- Chemicals
- Packaging
- Corrugate



# Single Use Plastics

Average German → **175 kg/year**

Average Scientist → **1000 kg/year**



Labs discard **5.5 million tonnes** of plastic a year

<https://doi.org/10.1038/528479c>



Image: <https://pprc.org/2014/blog/trash-sort-shines-light-on-uw-lab-waste/>







**Yikes!**

**...but it doesn't have to  
be this way!**





If every lab **turned off one piece of equipment** over night, it could save the equivalent of **taking over 10,000 cars off the road**



## Rethinking Energy



- › Lighting accounts for around 13% of the energy used – make sure **lights get turned off** in the lab and support rooms



- › **Turn off equipment** when it is not in use
- › Use sleep and **energy saving modes**



- › **Biosafety cabinets** can consume as much energy as half a house (15 kWh/day) – make sure these get shut off at night
- › Use a cold trap with **vacuum pumps** to prevent volatiles damaging the pump
- › **Don't use screensavers** on your computers – allowing your monitor to turn off can save the equivalent of driving your car nearly 25 miles!



# Be Good in the Hood

- › Fume hoods can consume as much as **3.5 homes worth of energy!**



- › **Shutting the sash** on your fume hood could **save 2 homes worth of energy**
- › Make sure **excess equipment and supplies** are not stored in hoods, blocking air flow
- › **Turn off the lights** when not in use



# Cold Storage Best Practices

- › **-80°C freezers** can consume **as much energy as a house**
- › **Chilling up -80s to -70°C** can save around 30% of the energy consumed
- › Keep an **inventory** of frozen samples
- › Keep cold storage operating at **maximum efficiency**:
  - › Maintain door seals
  - › Defrost and remove ice
  - › Clean filters and vacuum coils – this can save 10%



=



# Join the International Freezer Challenge

- › Deadline extended to **August 1<sup>st</sup>**
- › Join labs all around the world and kick start your cold storage best practices
- › The freezer challenge has saved 8.5 million kWh of energy!



freezer  
challenge

[www.freezerchallenge.org](http://www.freezerchallenge.org)







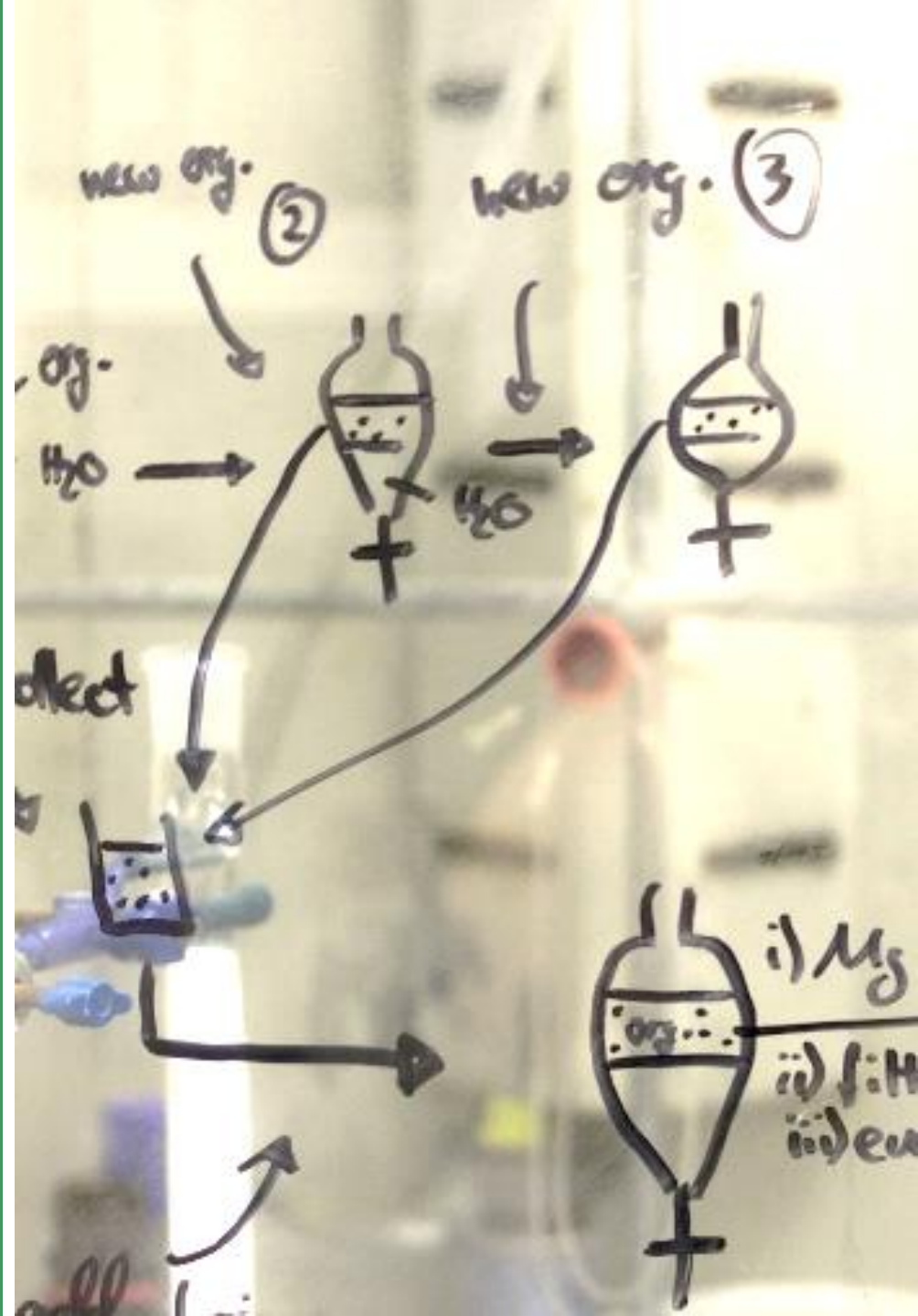
# Water Wisdom

- › Check faucets for **low-flow aerators** – they can reduce water usage at the tap by 50% - 70%
- › Use **alternatives to single-pass cooling** like recirculated water or a Fin denser
- › Run **autoclaves and dishwashers** when full as much as possible
- › Use the **right quality water** for the task – it takes 3 gallons of water to make 1 gallon of DI water
- › Explore **alternatives to ice** in your water bath and ice buckets



# Reduce Waste With Green Chemistry

- › Discuss the **12 Principles of Green Chemistry** as a lab – these can help you identify and reduce waste in your experiments
- › Look for reactions that can be conducted at **ambient temperatures and pressures**
- › Use **solvent selection guides** or greener alternative tools to identify safer, less hazardous reagents
- › Identify and use reagents that are sourced from **renewable feedstocks**





# Reduce, Reuse, Recycle

- › Get to know your waste and **identify your largest waste streams** – check recycling and landfill bins
- › Work with suppliers to **explore product alternatives** that can help you minimize waste, reduce hazards and/or decrease energy and water usage
- › Take advantage of **vendor take-back and recycling programs** for EPS coolers, gloves, flexible packaging, pipette tip boxes, and more
- › Use a **shared supply of common reagents** and materials to prevent over-purchasing
- › Explore options to **consolidate orders**



# Make Informed Purchasing Decisions

- › **240 labels** currently available
- › Labels for **consumables, equipment and chemicals**
- › **Manufactures big and small** such as Thermo, VWR, Priorclave, Merck, Labcon, Agilent and more
- › **Diverse products** including pipette tips, reagents and ULT

[www.act.mygreenlab.org/](http://www.act.mygreenlab.org/)

# ACT.

Accountability Consistency  
Transparency

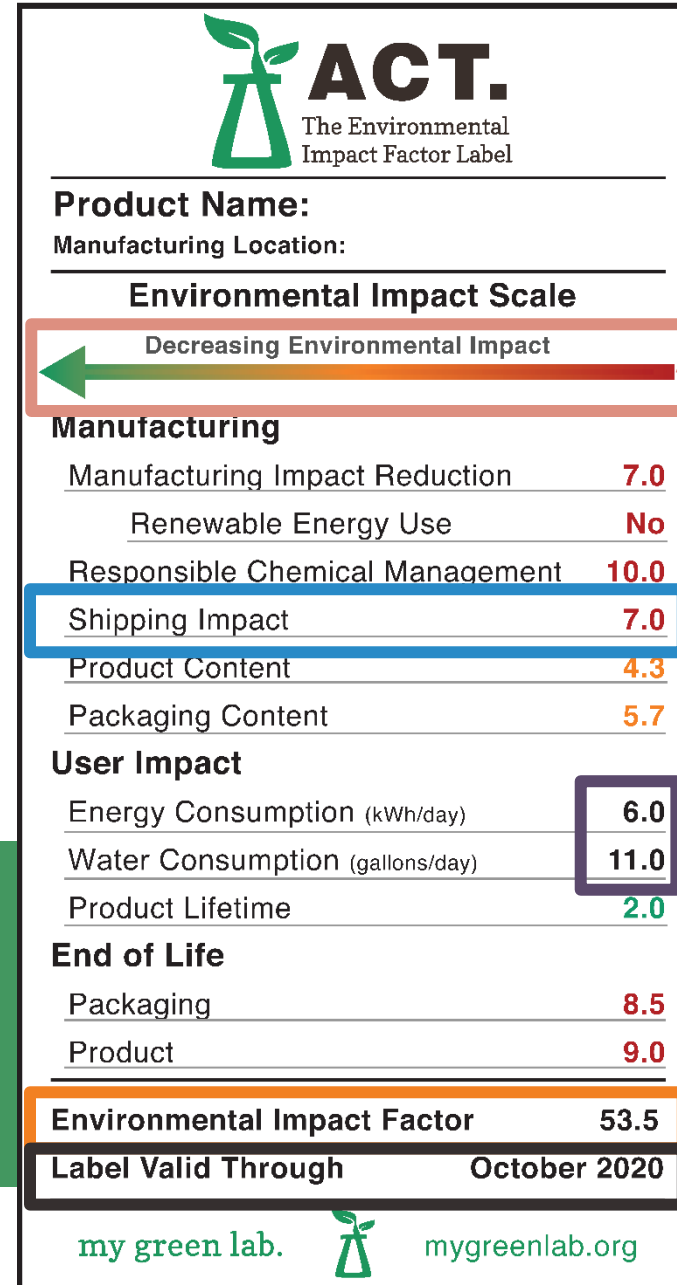


# ACT.

Accountability Consistency  
Transparency

an eco-nutrition label for  
laboratory products

[www.act.mygreenlab.org/](http://www.act.mygreenlab.org/)



Simple color scale indicates environmental impact, with values on a scale of 1 to 10

Additional information about categories available online

Energy and water consumption data help drive sustainable lab practices

Total Impact Factor enables quick comparisons

Expiration date keeps data current and drives continuous improvement

# Taking the Next Steps

## Educate Yourself

- › Join the MGL Newsletter
- › Become a Green Lab Ambassador

## Start Making Change

- › Pick 3 – 5 things to change in your lab
- › Grow your green labs community

## Take it Further

- › Start a Green Labs Program
- › Get Green Lab Certified

<https://www.mygreenlab.org/ambassador-program.html>



Success is the sum of small efforts, repeated day-in and day-out.

-Robert Collier





**You cannot get through a single day without having an impact on the world around you. What you do makes a difference, and you have to decide what kind of difference you want to make.**

**-Jane Goodall**



**Start Your Green Lab  
Journey Today**

[mygreenlab.org](http://mygreenlab.org)  
[info@mygreenlab.org](mailto:info@mygreenlab.org)

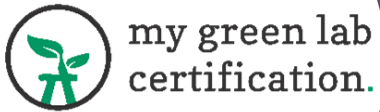
# Creating a Culture of Sustainability Through Science

## At My Green Lab We

- Bring awareness to the environmental impacts in a laboratory
- Share best practices, case studies, and more to support green labs projects
- Help scientists explore ways to reduce the impact of their work
- Engage the whole community in the green lab movement



# Our Programs



## Green Lab Certification

Standard for laboratory sustainability best practices



## ACT Label

World's first eco-label for laboratory products drives accountability, consistency and transparency



## Freezer Challenge

International competition to encourage cold storage best practices



## Center for Energy Efficient Laboratories

Gather data on energy usage in labs to inform rebate and eco-efficiency programs



## Green Chemistry

Education on the selection of less hazardous, more benign chemicals



# My Green Lab Certification

- Online self-assessment to gauge your lab's sustainability practices
- Comprehensive assessment that covers 14 topics around energy, water, waste, chemicals and community
- Questions look at how equipment is used and maintained, whether certain procedures are used, how materials are purchased, used and discarded, and more
- Focus is on lab behaviors and actions lab members can take to be greener



Infrastructure  
Energy



Plug Load



Fume  
Hoods



Large  
Equipment



Cold  
Storage



Water



Purchasing



Resource  
Management



Green  
Chemistry and  
Green Biologics



Recycling  
& Waste  
Reduction



Vivaria



Field  
Work



Travel



Community

# Certification Process

## 1. Assess Baseline

- Survey lab members to understand current practices
- Make recommendations for improvement



## 2. Implement Changes

- Labs discuss solutions and implement behavior change practices
- Labs and Green Teams coordinate additional work



## 3. Get Certification

- Re-assessed lab practices
- Certification level given
- Make recommendations for further improvement based on progress



## 4. Make More Changes

- Labs adopt additional policies and best practices
- Green Teams support further improvement projects



## 5. Do Re-Certification

- Re-assessed lab practices
- New certification level
- Make recommendations for further improvements



# Get Recognized For Your Hard Work

## Green

**80% or more** of Green Lab assessment actions implemented



## Platinum

**70% or more** of Green Lab assessment actions implemented



## Gold

**60% or more** of Green Lab assessment actions implemented



## Silver

**50% or more** of Green Lab assessment actions implemented



## Bronze

**40% or more** of Green Lab assessment actions implemented



# Join a Global Community

There are green labs  
in the US, Canada,  
Ireland, UK, Sweden  
and beyond!

