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Town Meeting

August 2010

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What we'll do today

- Pizza
- Changes at the Microfab
- Safety Training
- Discussion
- Feedback
- Questions

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What's a "nanofab"?

Encompasses:

- microfab with cleanroom, packaging and test areas
- Surface Science and nano Imaging lab
- "affiliated labs" scattered around campus

Becomes:
the nanofab
at the Sorenson USTAR building

Introductions

- Director - Florian Solzbacher
- Associate Director - Ian Harvey
- Surface Scientist - Loren Rieth, Brian Van Devener
- Process Engineers - Brian Baker, Tony Olsen
- IGERT Engineer - Charles Fisher (replaced Justin Millis)
- Infrastructure Specialist - Tim Jones
- Equipment Specialist - Kevin Hensley
- Safety Specialist - Paul Cole
- Software Engineer - Ryan Taylor
- Administrative Officer - Monica Heaton
- Accounting Support - Erin Phillips, Rachel Maryon
- Microfab Student Lab Aide - Stephen Naylor, Trevor Knowlton, Francois Synal, Sam Bell, David Jamison, Paul Allen, Stephen Fan,
- Surface Lab student aide: Alex Hogan, Kathryn Ecsedy, Karl Tharpe
- Lab Member Representative – Rohit Sharma

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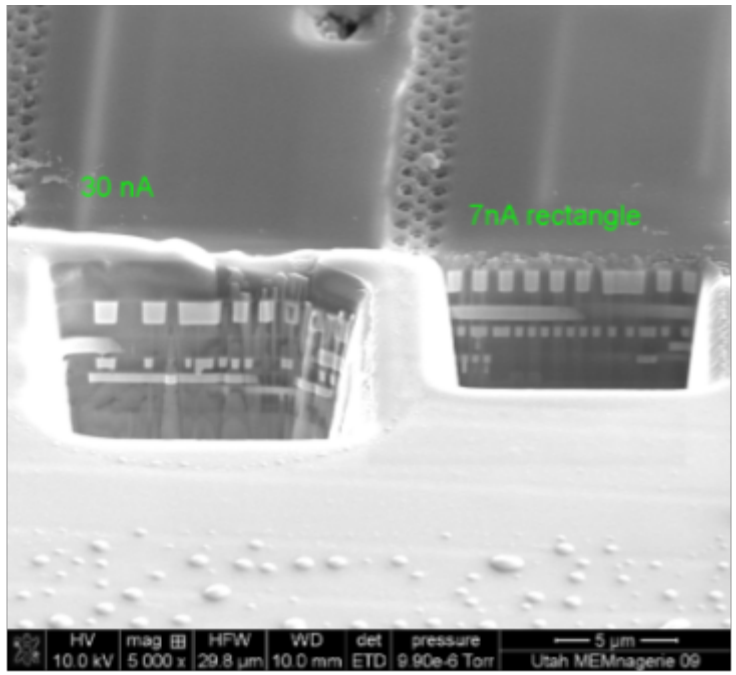
Microfab Lab Courses - Fall

- **ECE/ MSE 5202** Integrated Circuit Microfabrication
- **ME 5960-001** Microfluidic Chip Design & Fabrication
  (cross listed with ME EN 6960-001; BIOEN 5900-003, 6900-003; ECE 5961, 6961)
- **ECE/ MSE 5074** Photovoltaic Materials & Solar Cells
- **ECE 6231 / 7231** Microsensors and Actuators
- **ME 5960/Phys 5739** Scanning Electron Microscopy



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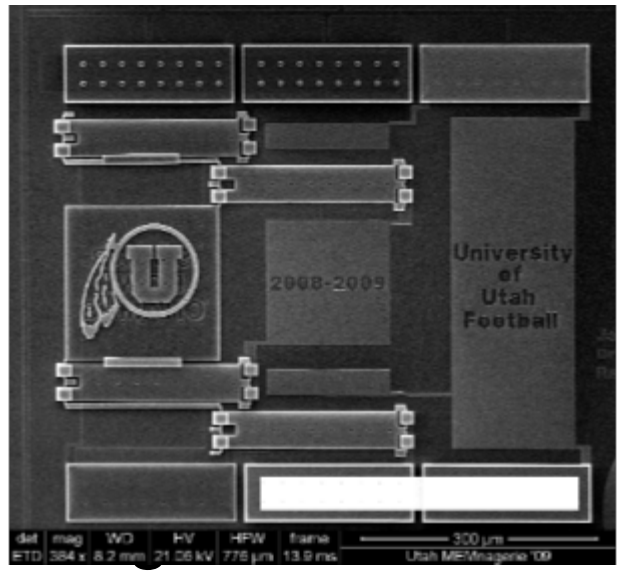
Microfab Lab Courses-Spring

- **ECE 5221 / ME EN 5050** Fundamentals of Micromachining Processes
- **ECE 6950** Heterogeneous Microsystems Technologies
  (Sandia Design Competition)



- **ECE 6962** Complex Microsystems Packaging
- **ECE 7960-004** Surface Analysis Lab
- **ECE 7960-005** Nano Science & Tech Studies

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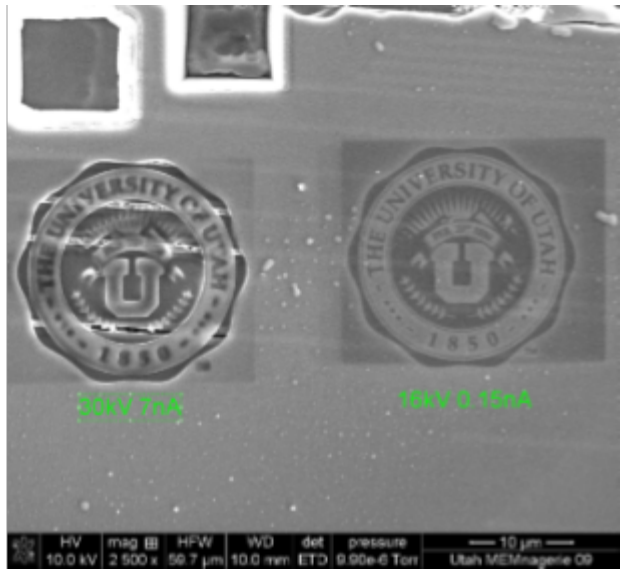
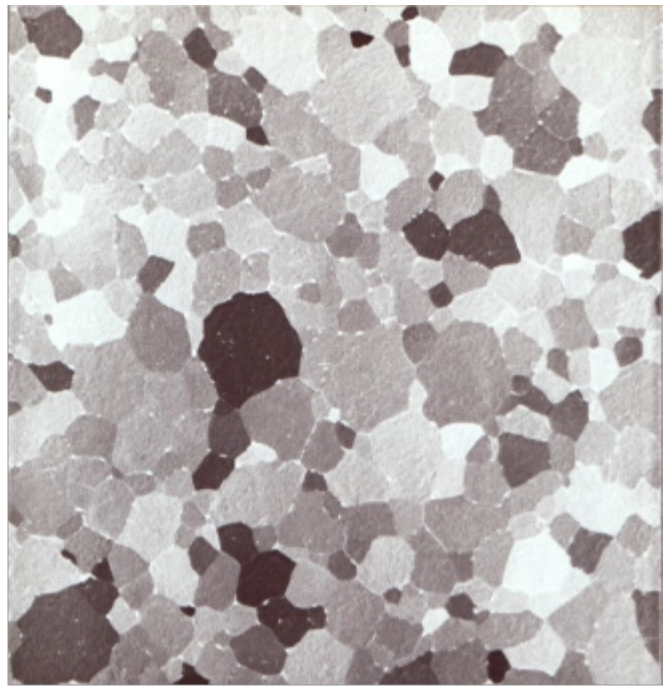
2009-2010 Accomplishments

- Increased staffing (Ryan, Charles, Kevin, Brian V.)
- New Fab tools:
  - XeF2 Etcher
  - ALD
  - K&S Dicing saw
  - EVG 520 Wafer bonder
- Surface Lab instruments:
  - FEI Quanta 3D FEG (db-FIB)





  - Veeco Dimension ICON AFM

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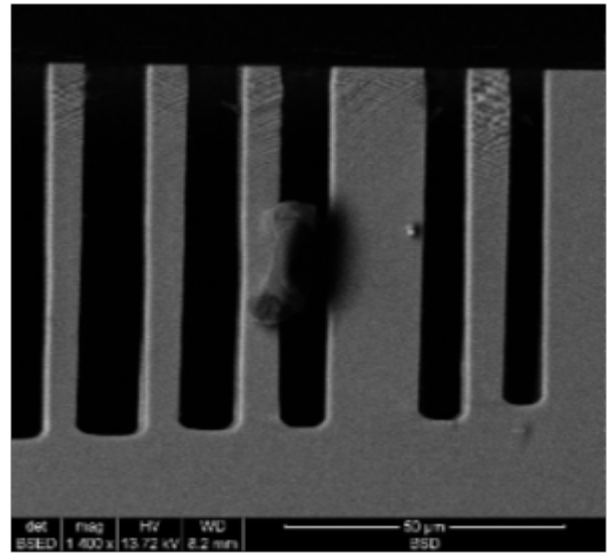
Accomplishments, cont'd

- SOP standardization
  - See website
- Process Characterization
  - LPCVD nitride
  - TMV sputter uniformity
- Upgrades:
  - Website
  - Safety test
  - "Bosch-not" process
  - Hallway Displays,Teaching and Surface Science Lab Monitors
- Simplified Staff Contact
  - Intercoms
  - Pagers
  - Trouble Ticket



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Priorities FY 2011

- Stanford CORAL administrative software
- “Save the FIB”
- TMV substrate rotation upgrade
- Chiller upgrades
- Oil-free pump upgrades
- Etcher and sputter system donations
- **Prepare for transition to USTAR building**

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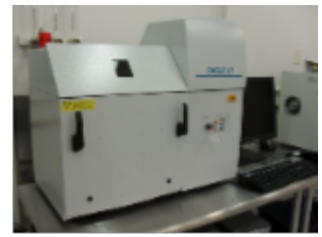
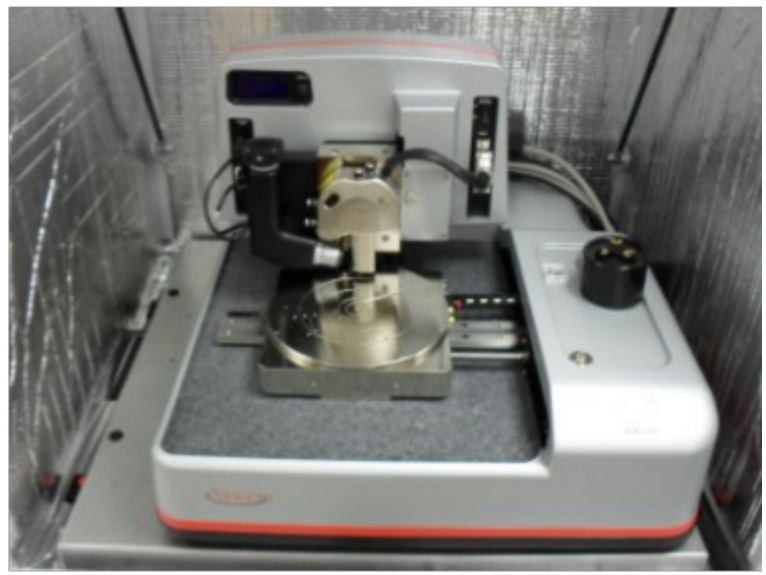
Surface Science & Nano Imaging

- Located in 1555B and 1282
- Surface Scientists: Dr. Loren Rieth, Dr. Brian van Devener





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Abstracts for student posters are due **September 1, 2010**
(Awards will be given for top three posters in each category)
See www.nanofab.utah.edu/nanoUtah10 for rules
Attendance is $25 for students, post-docs and fellows

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Nanofab Lab Member Rates

Surface Analysis & nano-Imaging Lab

	University	External
Lab Entry	$15.50/hour	$23.25/hour
XPS, XRF Equipment Use	$45/hour	$67.50/hour
SEM Equipment Use	$40/hour	$60/hour
FIB Equipment Use	$60/hour	$90/hour
Professional Tech Support Student Tech Support	$55/hour $20/hour	$82.50/hour $30/hour
Consumables (cost billed per item used)		
Failure to Card out fee (2 hr minimum)	$31	$46.50

Rates are subject to change

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Nanofab Lab Member Rates

Microfab Lab

	University	External
Monthly Maximum Lab Entry Rate	$725	N/A
Lab Entry	$62/hour	$93/hour
Mask Making (per Layer)	$35/hour	$52.50/hour
Technical Support	$55/hour	$82.50/hour
Consumables, Precious Metals & Gases (cost billed per item used)		
Reservation fee (waived if equipment used)	$25	$37.50
Failure to Card out fee (2 hr minimum)	$124	$186

Rates are subject to change

Plan for 4% annual inflationary rate changes

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Nanofab User Policy Agreement

- One addition
  - I understand that I may be included in photos and/or videos taken during lab usage and they may be shown for Nanofab purpose
- Changes to consequences

- All members must sign and submit to staff by Friday, September 10
  - PI's must sign also

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Nanofab Consequences

	Lab Protocol	**Safety or Lab Respect**
1st occurrence	1 week limited to day use	2 weeks limited to day use
2nd occurrence	2 weeks limited to day use	4 weeks limited to day use
3rd occurrence	4 weeks limited to day use	8 weeks limited to day use
4th occurrence	4 weeks suspension followed by 4 weeks limited to day use	4 weeks suspension followed by 8 weeks limited to day use
5th occurrence	Possible expulsion	Expulsion

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Nanofab Consequences

Lab Protocol violations include (but are not limited to):

- Untidy gown cubbie (sleeves hanging out, booties improperly folded to cover soles, storage of non-authorized materials, etc.)
- Storage of personal belongings (backpacks, etc) in front hall
- Improper use of lockers (leaving materials in overnight, leaving a mess…)
- Improper protocol, including gowning, safety glasses, use of tweezers, gloves, etc.
- Failure to complete lab clean (access may be suspended until completed)

Nanofab Consequences

Lab Respect violations include (but are not limited to):

- Improper entry (failure to card swipe in, using a back door, using another researcher's card, loaning card to another person, assisting another to enter improperly, propping doors open, illegal entry at night, or abuse of card swipe by being in the lab when the card manager shows you are out, etc.)
- Failure to follow standard operating procedures (SOP's) without prior approval from staff
- Failure to reserve equipment or to log equipment use and parameters
- Failure to clean up after yourself (i.e., failure to clean spinner after use, improper use of trash, tools, wet bench, chemicals, balances, samples, photoresist drips, etc.)
- Using equipment or supporting infrastructure you are not trained on or authorized to use
- Disturbing another researcher's samples (except in case of safety-related emergency or with permission from Nanofab staff)
- Removing another researcher's samples from equipment or chemicals
- Altering process parameters during another researcher's run
- Contaminating vacuum chambers, chemical baths, or another's samples
- Theft or any unauthorized removal of equipment or materials (may result in expulsion)

Nanofab Consequences

Safety violations include (but are not limited to):

- Failure to comply with the buddy policy (in the lab alone)
- Improper chemical glove use, e.g., touching equipment or door handles with chemical gloves
- Improper use of tools and equipment (e.g., wafer hot plates for hot chemical baths, use of contaminated tweezers or materials in furnace prep areas)
- Not using appropriate personal protection equipment (PPE) for the task
- Changing gas cylinder settings or configuration without lab staff approval and training
- Improper chemical handling, transport, storage, use or labeling
- Improper waste disposal or failure to clean and dispose of empty chemical bottles
- Bringing non-approved chemicals, materials, or people into the lab
- Failure to immediately respond to and/or report equipment problems, injuries, or safety hazards, including chemical spills
- Improper use of chemical fume hoods or wet benches (e.g. using or disposing solvents in wet benches)

Nanofab Member's Representative

Rohit Sharma
Research Engineer
Microsystems Laboratory/Integrated Neural Interface Program (INIP)
University of Utah
rohit.sharma@utah.edu, 801-585-6331(office)

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Nanofab Member's Representative

Joint collaboration of Nanofab staff, Users & Faculty

Nanofab's Growth

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As a Member Representative:

- Source of Interaction between the Users & Nanofab staff
- Conduct Users Group meetings (Once every semester)
- Suggestion system to be implemented on line

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OpenCoral

- OpenCoral is a widely used microfab lab management system created by Stanford
- Migration to OpenCoral has already begun with Canary Furnaces
- Single interface for reservations, tool enabling, problem reporting and data collection
- Available on any machine with Java Runtime Environment
- Project homepage: http://opencoral.org

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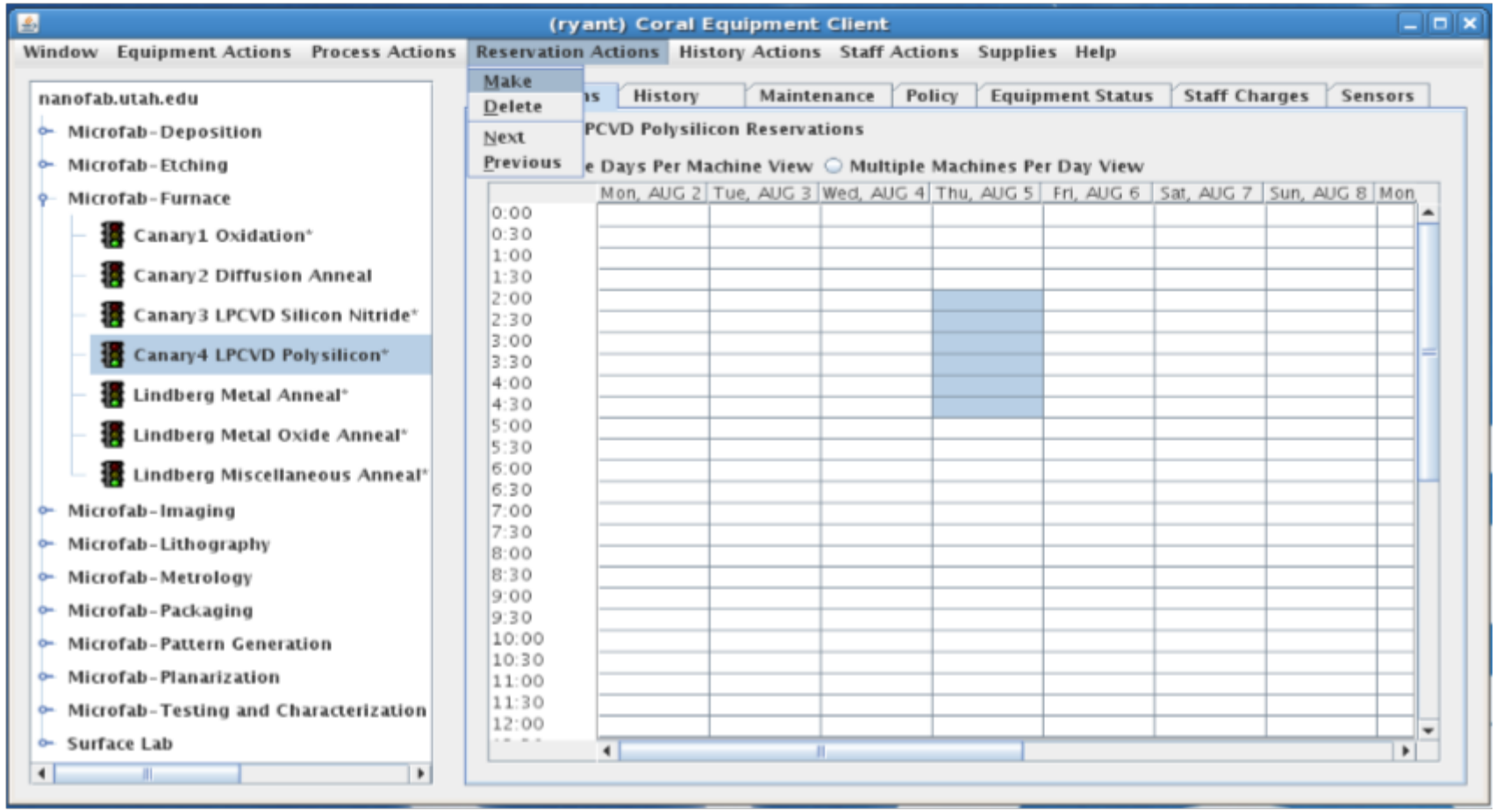
Reservations

- Make and view reservations on same page:



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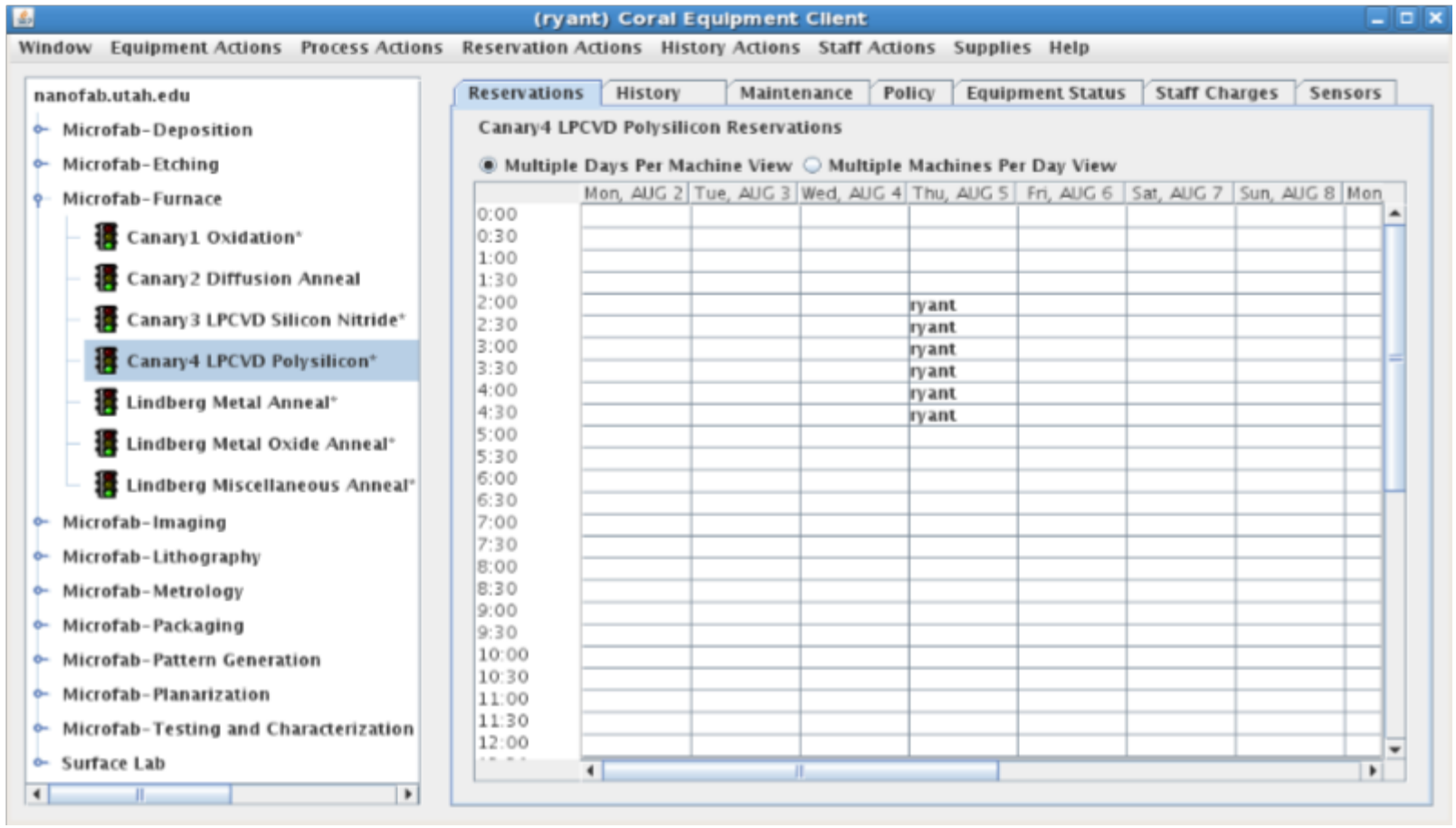
Reservations

- Reservations are displayed for entire week



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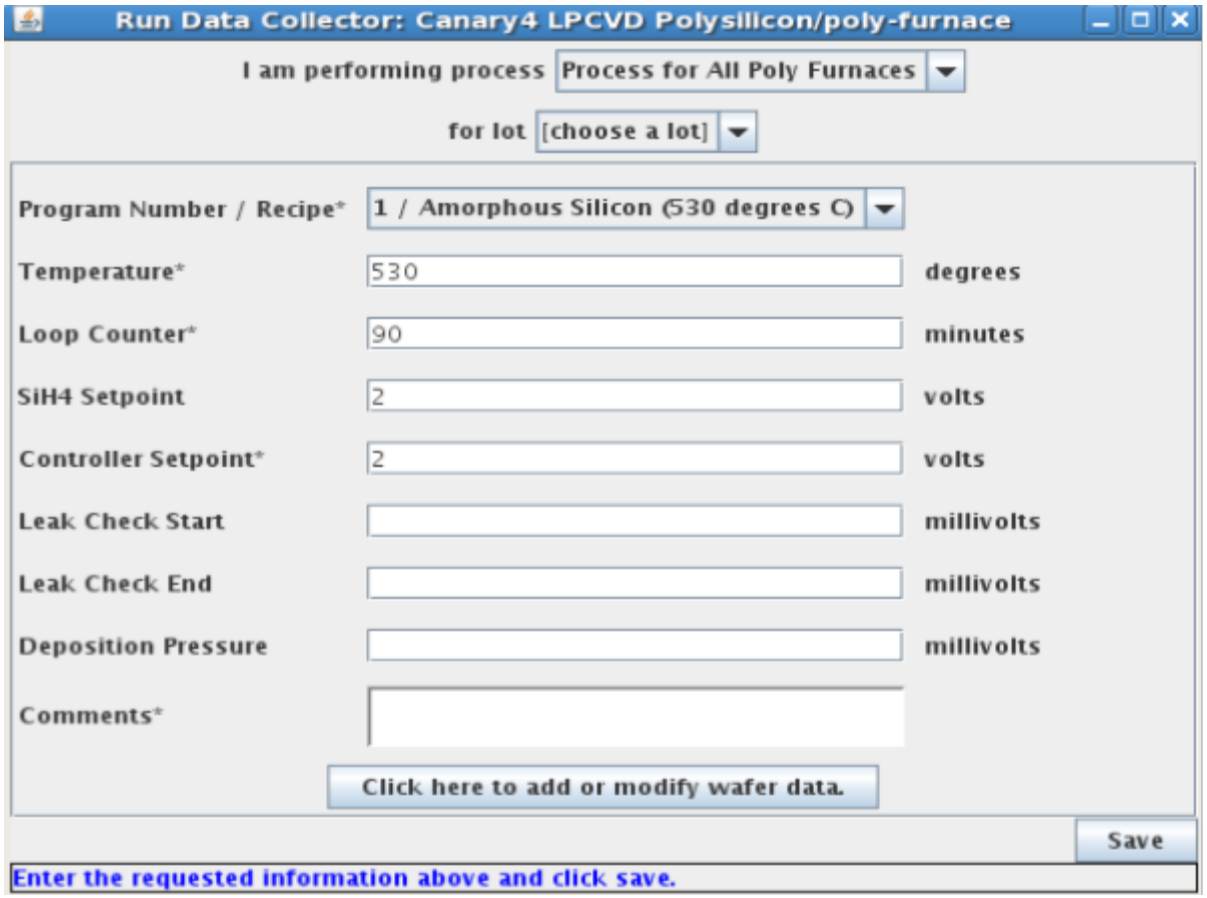
Data Collection

- Coral features integrated data collection prompts



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Coral Documentation

Access docs from the website

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Training

- Scheduled Safety Training
  - Every Tuesday, 9am
  - Others to be added, listed on website
- Reviewing Training System
  - Changes to be announced at a later date

SOP Standardization

- New format
  - Consistent sections
  - Text-formatting
  - More photos and tables
- Most SOP's have already been updated
- Available through Equipment Information link on website
  - Posted as pdf files

Website Improvements

- Process Information
- SOP access (through Equipment Information)
- OpenCoral Links
- Training videos
- Safety Test
  - Available on any computer (no longer restricted to gowning room)
- Need Help?
- Buddy System Tools

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Lab Safety

- Videos
  - General Safety (view now at: http://fab.eng.utah.edu/watch_video?file=/video/gen_safety_web.flv)
  - Chemical Safety (view now at: http://fab.eng.utah.edu/watch_video?file=/video/chem_safety_web.flv)
- New Safety and Protocol Test
  - All members need to take
    - Available Monday, Aug 30
    - Must be complete by Friday, Sep 10
  - References needed
    - Website
    - Microfab User Manual
    - SOP's
    - Material Safety Data Sheets (MSDS's)
    - Nanofab User Policy Agreement
    - Training Videos

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Buddy System

- Required by College of Engineering and University
- There are no “Safe Activities,” you must ALWAYS have another authorized lab user within the Microfab at all times
- Each lab member is responsible to schedule their own buddy
- Not dependent on time or activity in lab
- Online buddy system scheduling @http://fab.eng.utah.edu/calendar
  - E-mail list to help locate buddies
- “Buddy for Hire” system available on-line

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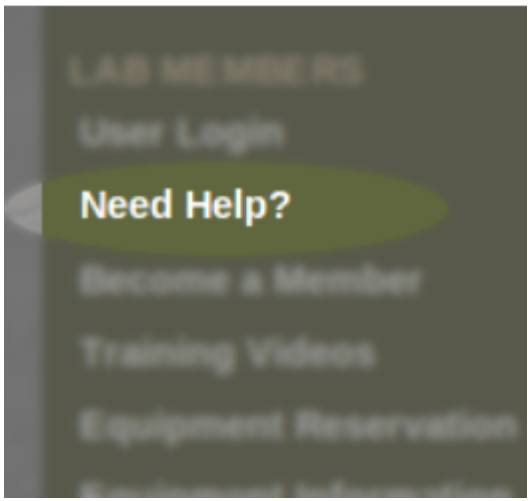
HF Exposure

- HF/BOE used in lab may not cause immediate pain sensation
  - Effects will be delayed
  - Can be fatal if not properly treated

HF Exposure

- Treatment (Instructions posted at wet benches)
  - Rinse affected area in running water at least 15 minutes
  - Remove all affected clothing
  - Get help from buddy!!!
    - Protect yourself from exposure with PPE
    - Assist victim with rinsing
    - Call Poison Control 1-2151 (or 1-800-222-1222)
      - They will notify hospital
    - Wearing chemical gloves, lightly dab affected area to remove water
    - Immediately apply Calcium Gluconate and massage into affected area
    - Ask victim about exposure event (HF solution being used, how exposed, area exposed, etc.)
    - Alert lab staff to ensure others are not exposed
    - Get victim to Emergency Room, using ambulance, if necessary
      - Treatment and travel costs covered by University
    - Take HF instruction packet, including MSDS, to ER for attending physician

Need Help?



- Need Help? - Link on website
- Emergency and Non-Emergency contact information
- **After hours technical support**
  - Fees apply
- Report a Problem
  - Use it...
  - Urgent?

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Lab Protocols

View gowning video at:
http://fab.eng.utah.edu/watch_video?file=/video/gowning_web.flv

- Gowning order
  1. Bouffant cap
  2. Snood
  3. Blue shoe covers
  4. Bunny suit
  5. White boots
  6. Safety glasses
  7. Blue nitrile gloves

Top Down

- De-gowning order
  1. White Boots
  2. Blue nitrile gloves
  3. Bunny suit
  4. Blue shoe covers
  5. Safety glasses
  6. Snood
  7. Bouffant cap

Bottom Up

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Lab Protocols

- Cubbies
  - Gowning only
  - No personal items
  - Tidy
  - No contact with soles of booties
- Scratch paper
  - Don’t use wipes (11 cents each)
  - Scratch paper provided
  - Cleanroom notebooks available
- Cleanliness
  - Loose paper
  - Aluminum foil
  - Spinners
    - No more than 1.5 ml resist needed per wafer

Lab Protocols

What is wrong?

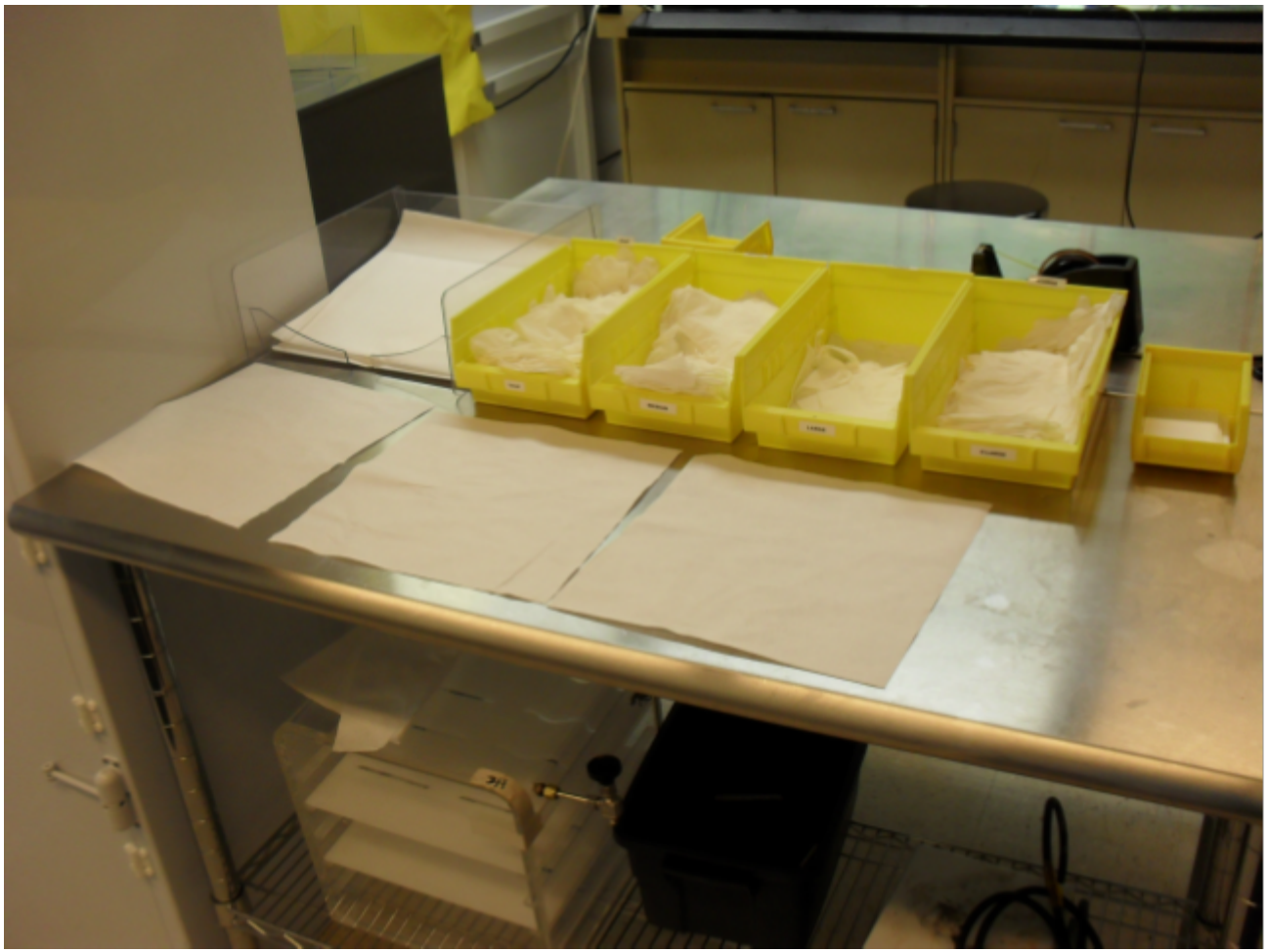
- Soles exposed

Lab Protocols

What is wrong?

- Nothing

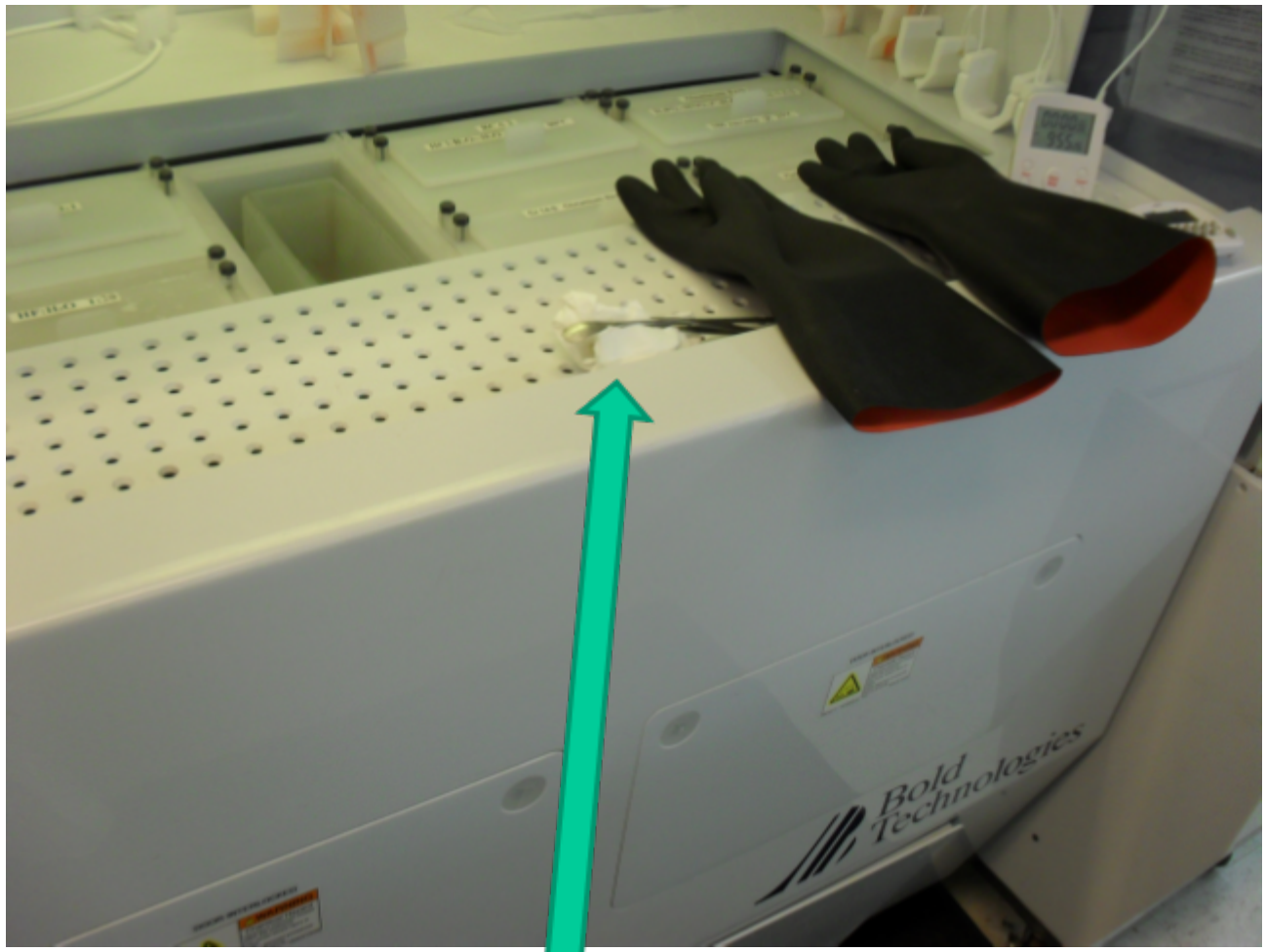
Lab Protocols



What is wrong?

- Loose texwipes

Lab Protocols



What is wrong?

- Wipe and materials left behind

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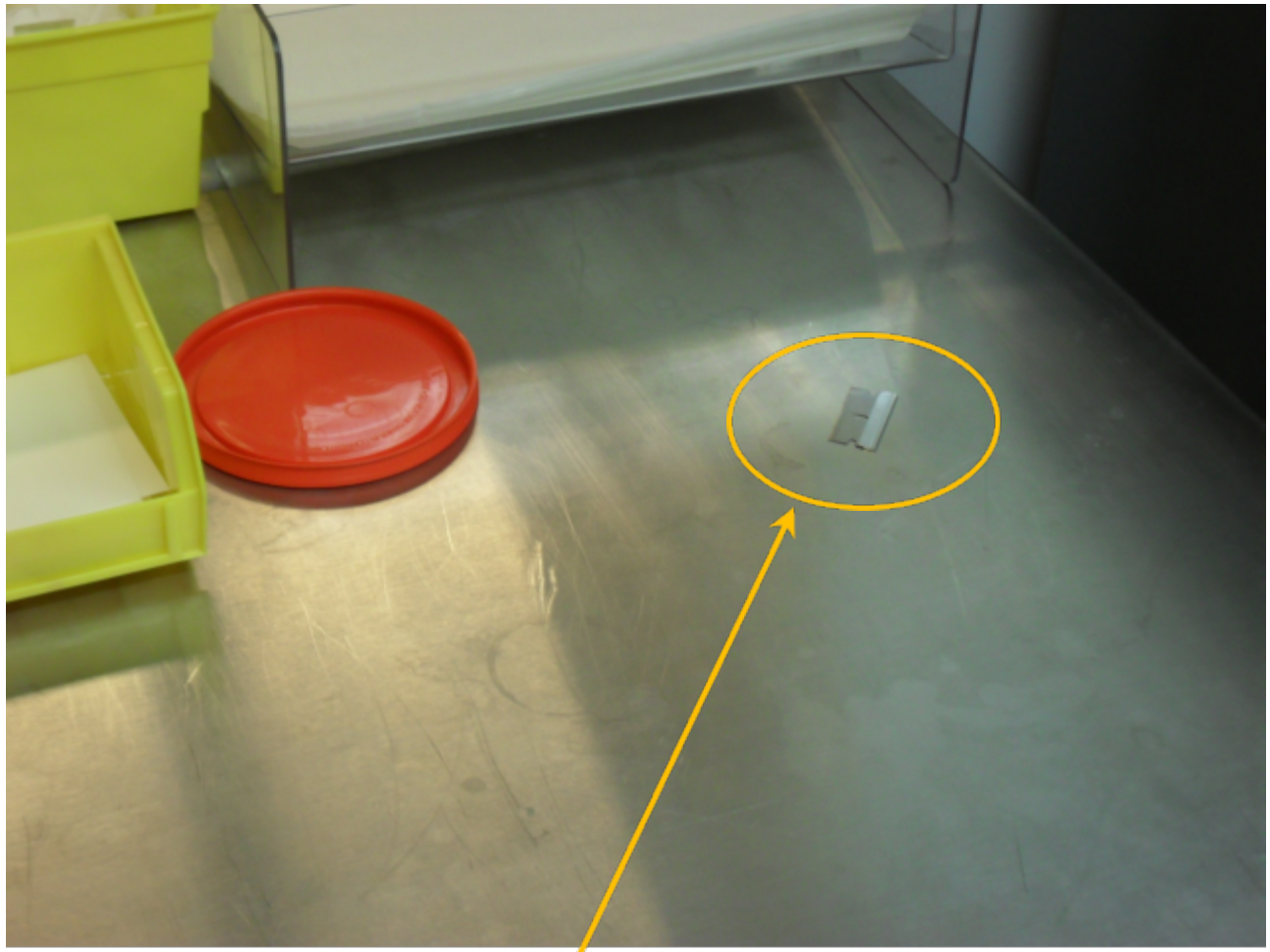
Lab Protocols



What is wrong?

- Lid left on table
- Loose razor blade!!

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Lab Protocols

What is wrong?

- Loose aluminum foil

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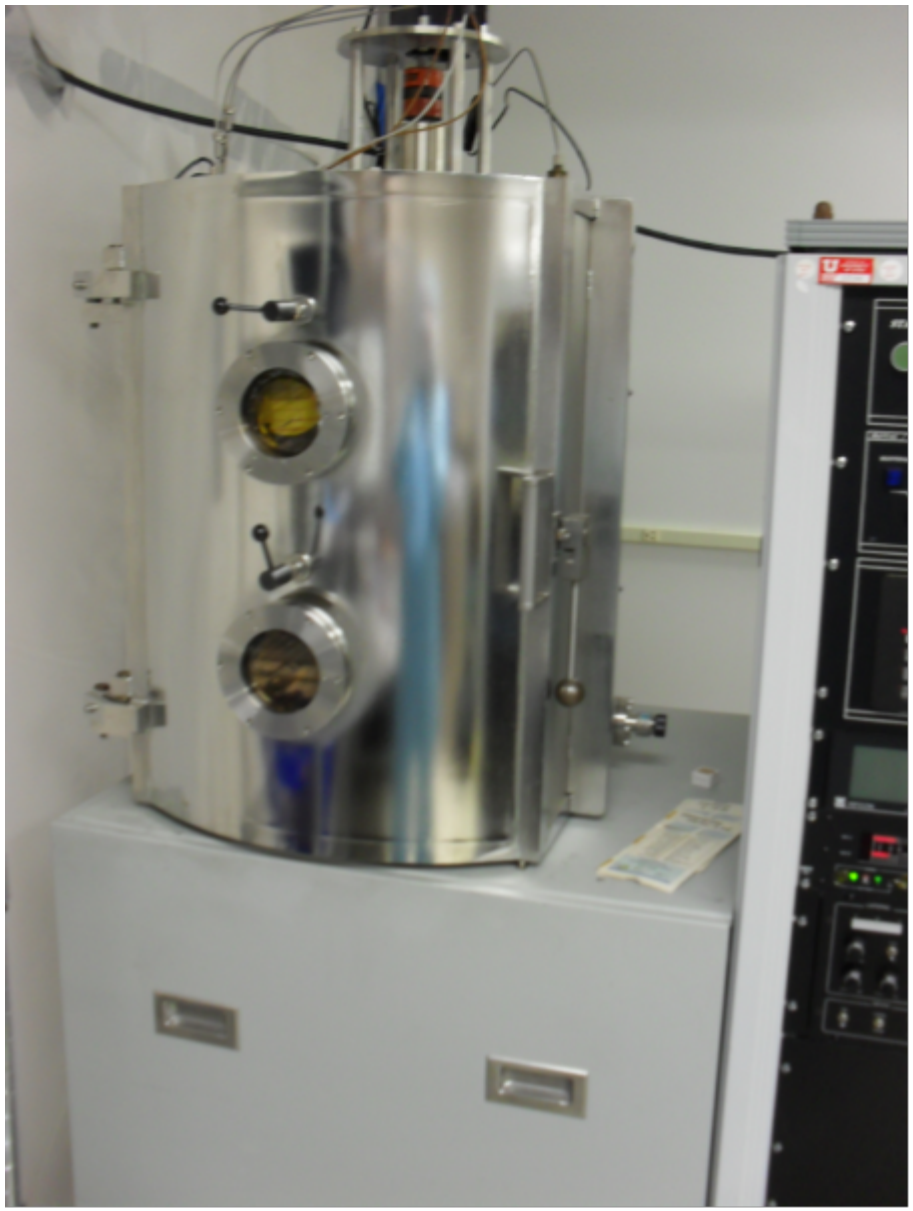
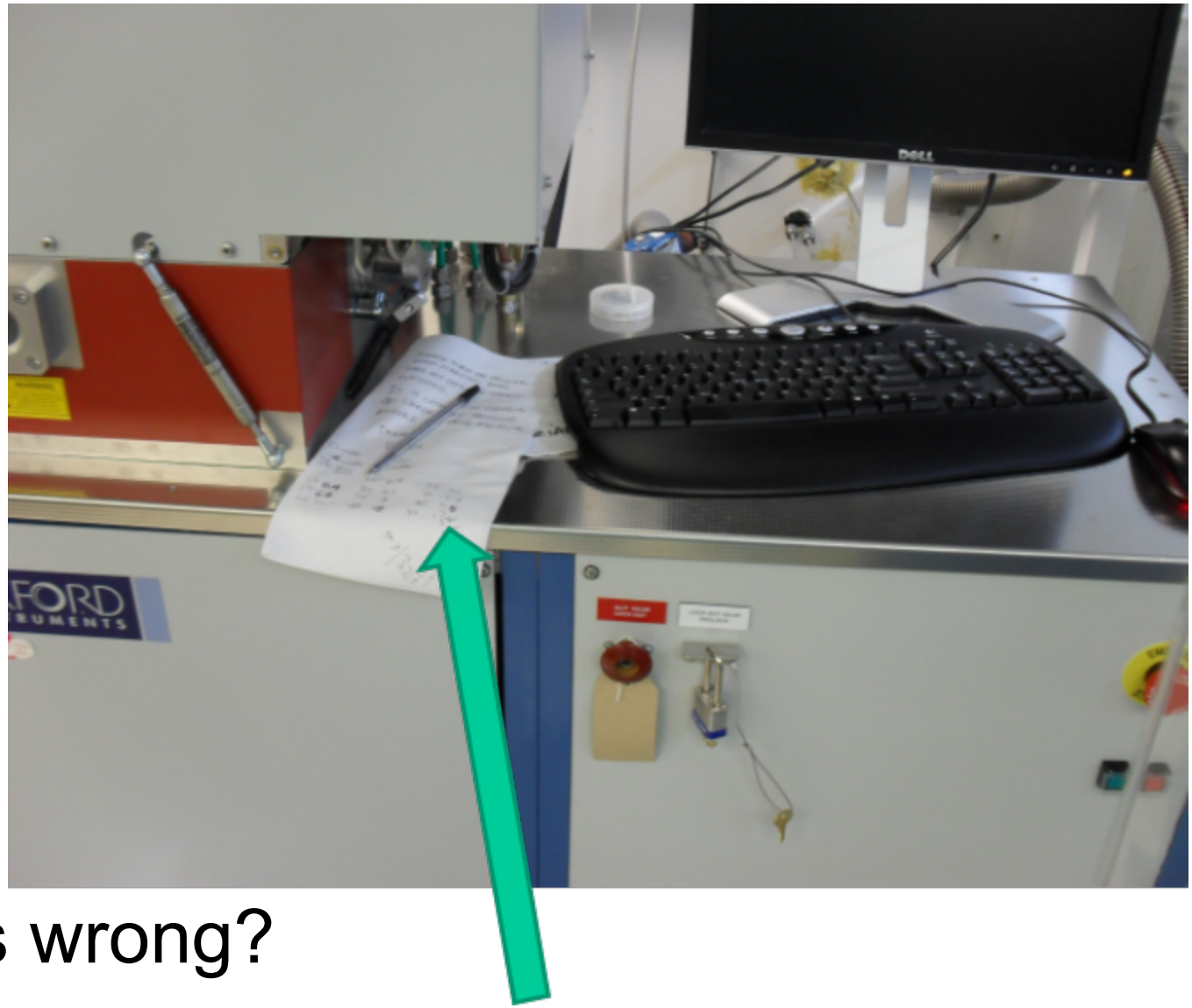
Lab Protocols



What is wrong?

- Nothing

Lab Protocols



What is wrong?

- Texwipe used as scratch paper/notebook

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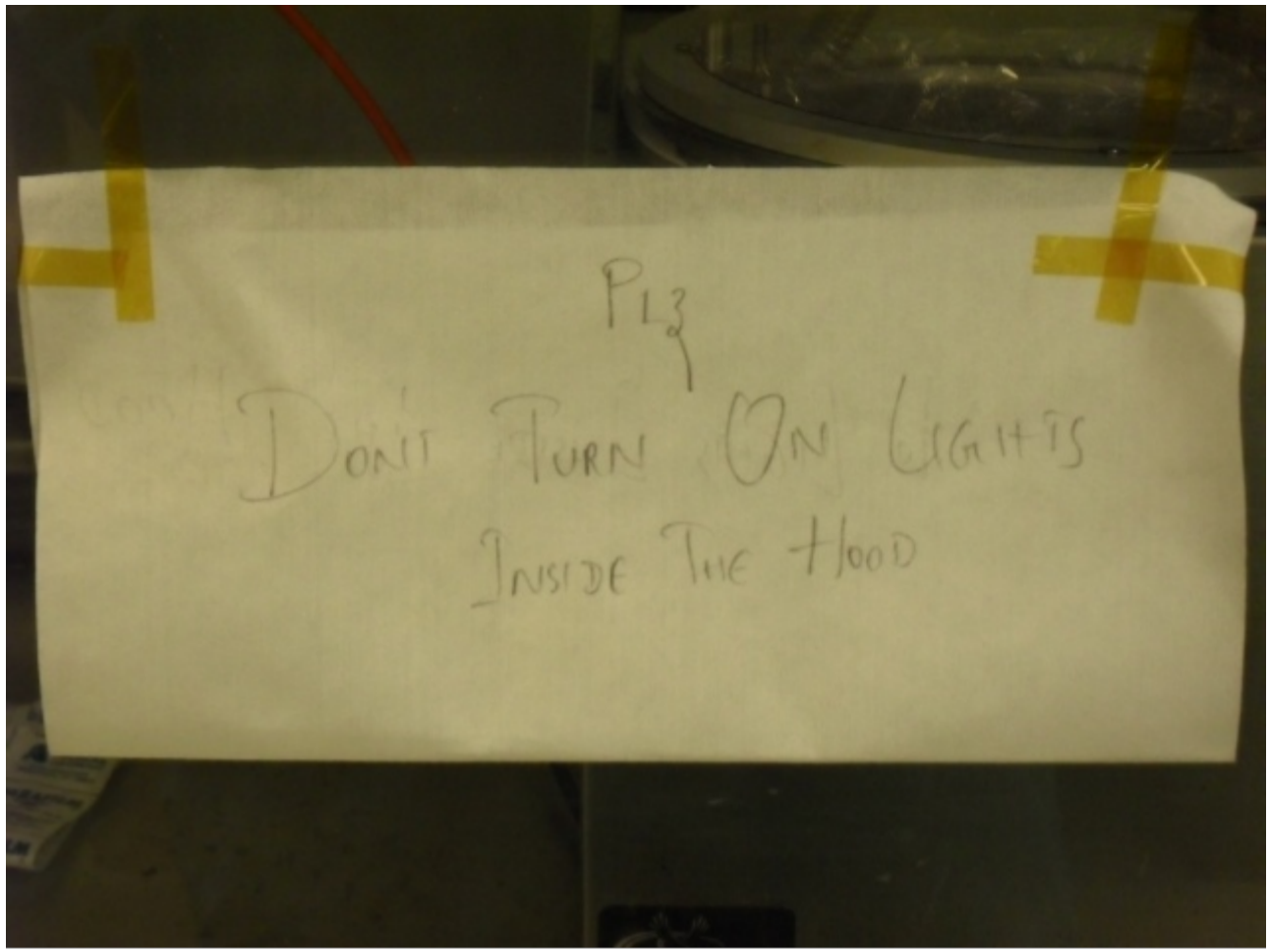
Lab Protocols

What is wrong?

- A general mess

Lab Protocols



What is wrong?

- Note on texwipe
- No date
- No name
- No staff approval

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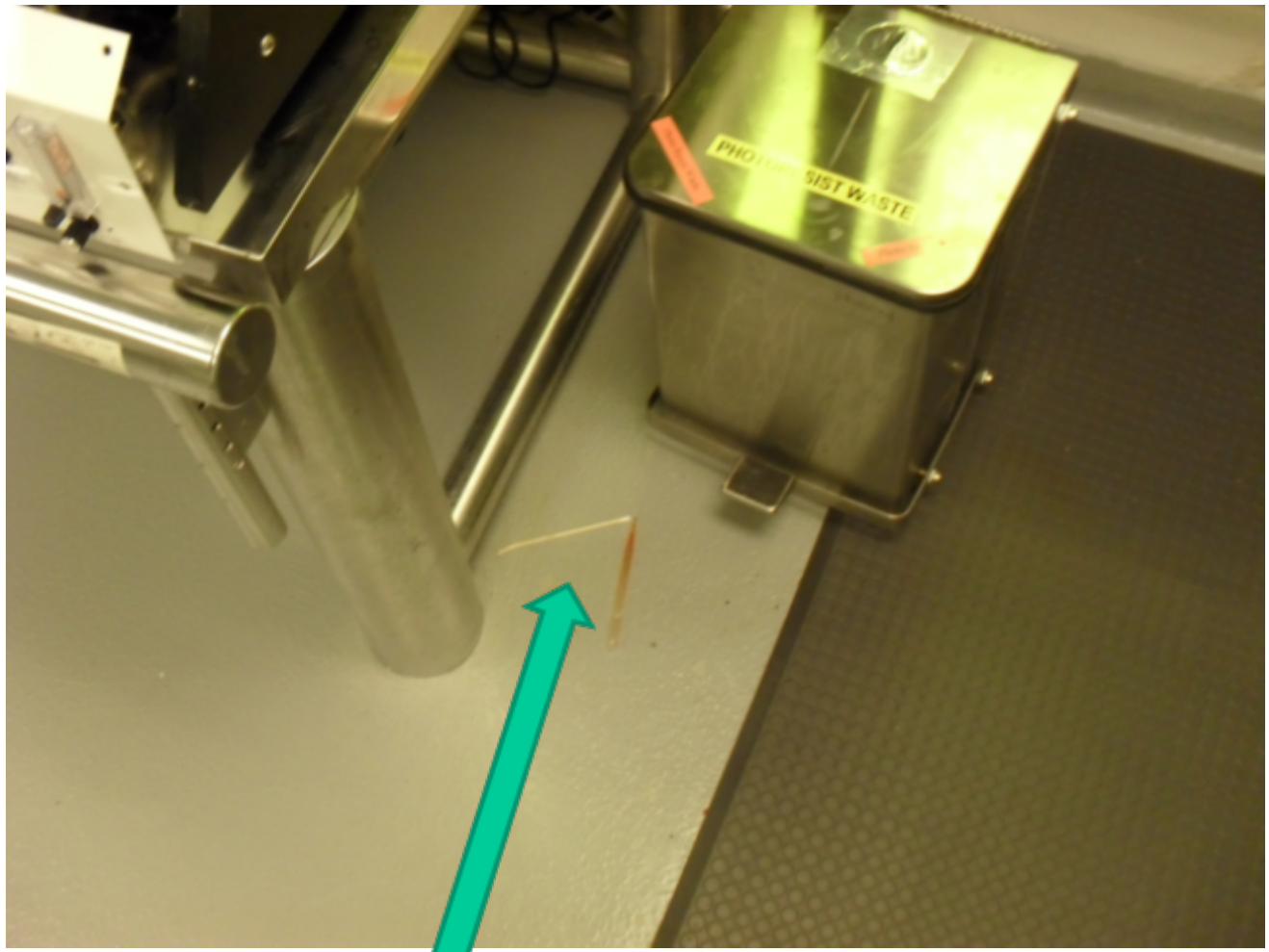
Lab Protocols



What is wrong?

- Used pipette and swab on floor

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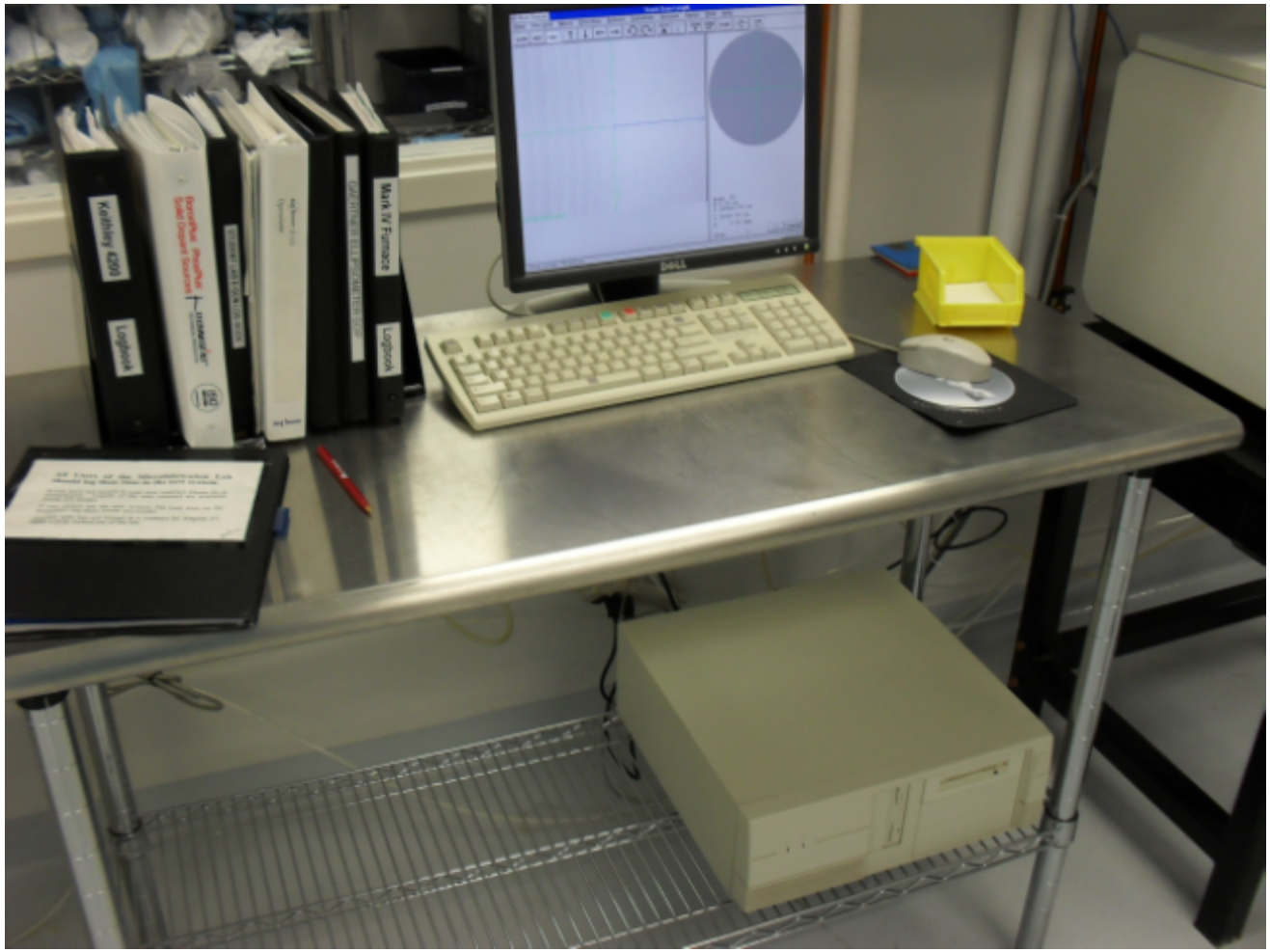
Lab Protocols



What is wrong?

- Ok (maybe loose pen)

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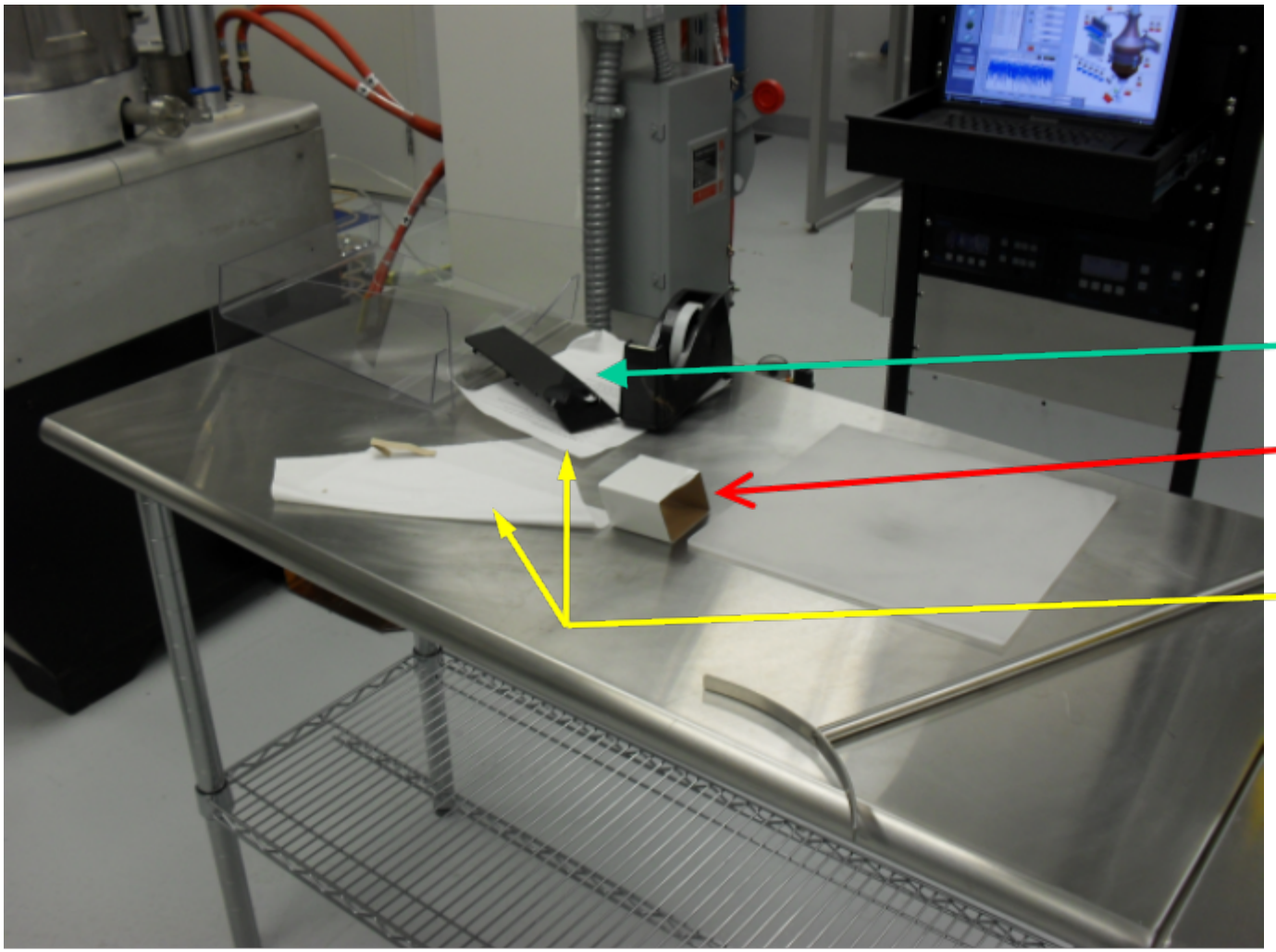
Lab Protocols



What is wrong?

- Loose part
- Cardboard
- Loose wipes

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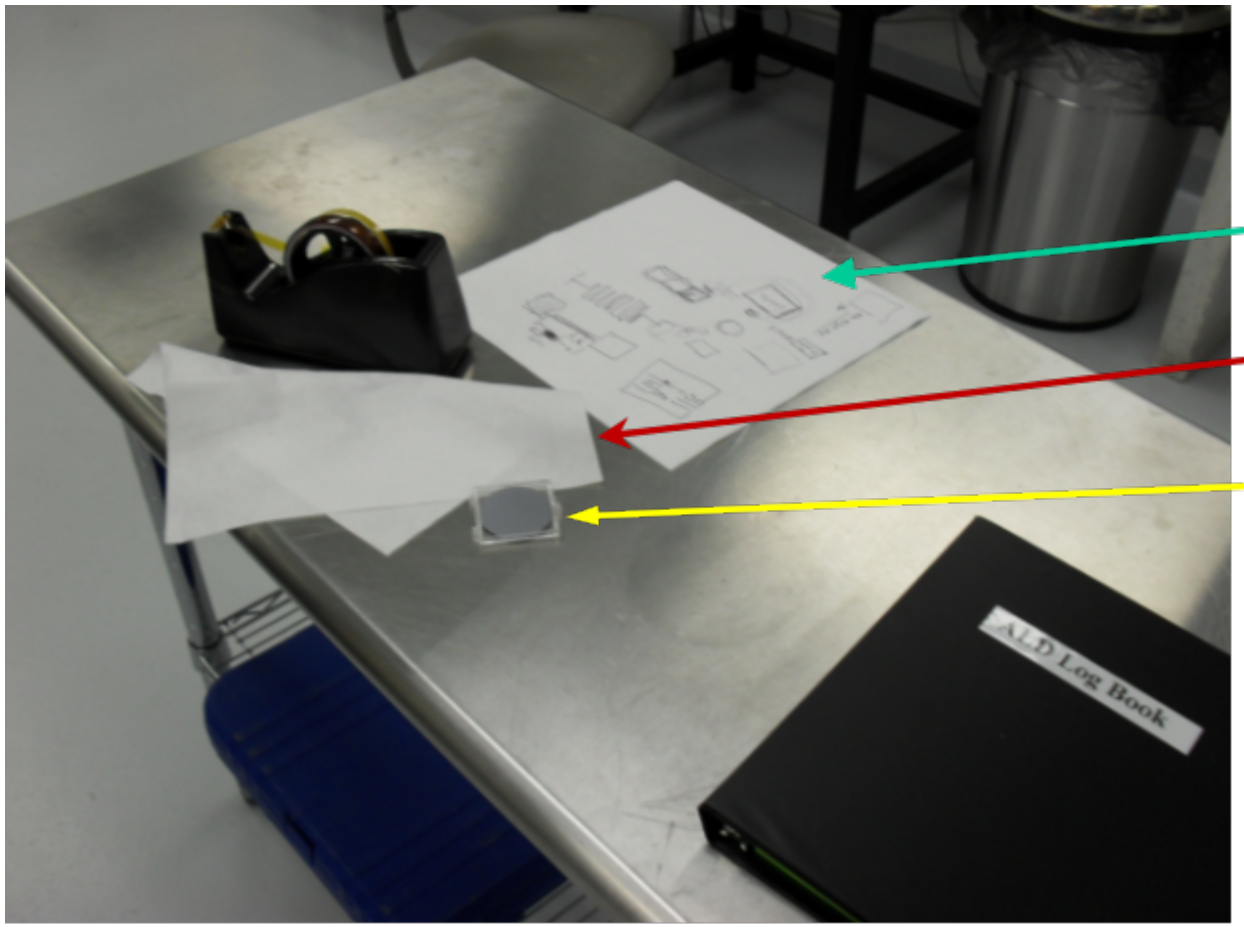
Lab Protocols



What is wrong?

- Notes on texwipe
- Loose texwipe
- Loose wafer/holder

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Lab Protocols

What is wrong?

- Note on texwipe
- No name
- No date
- No staff approval

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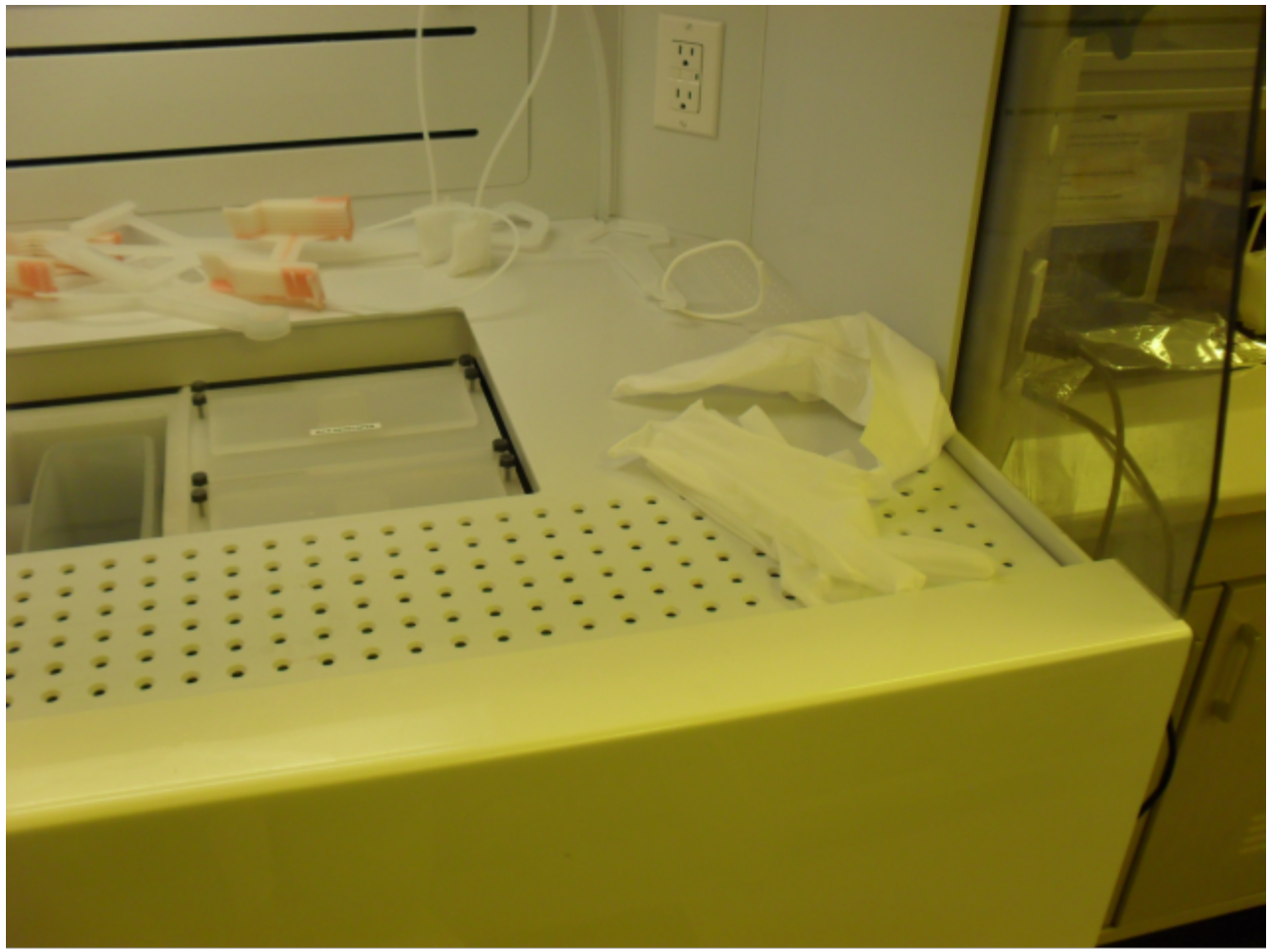
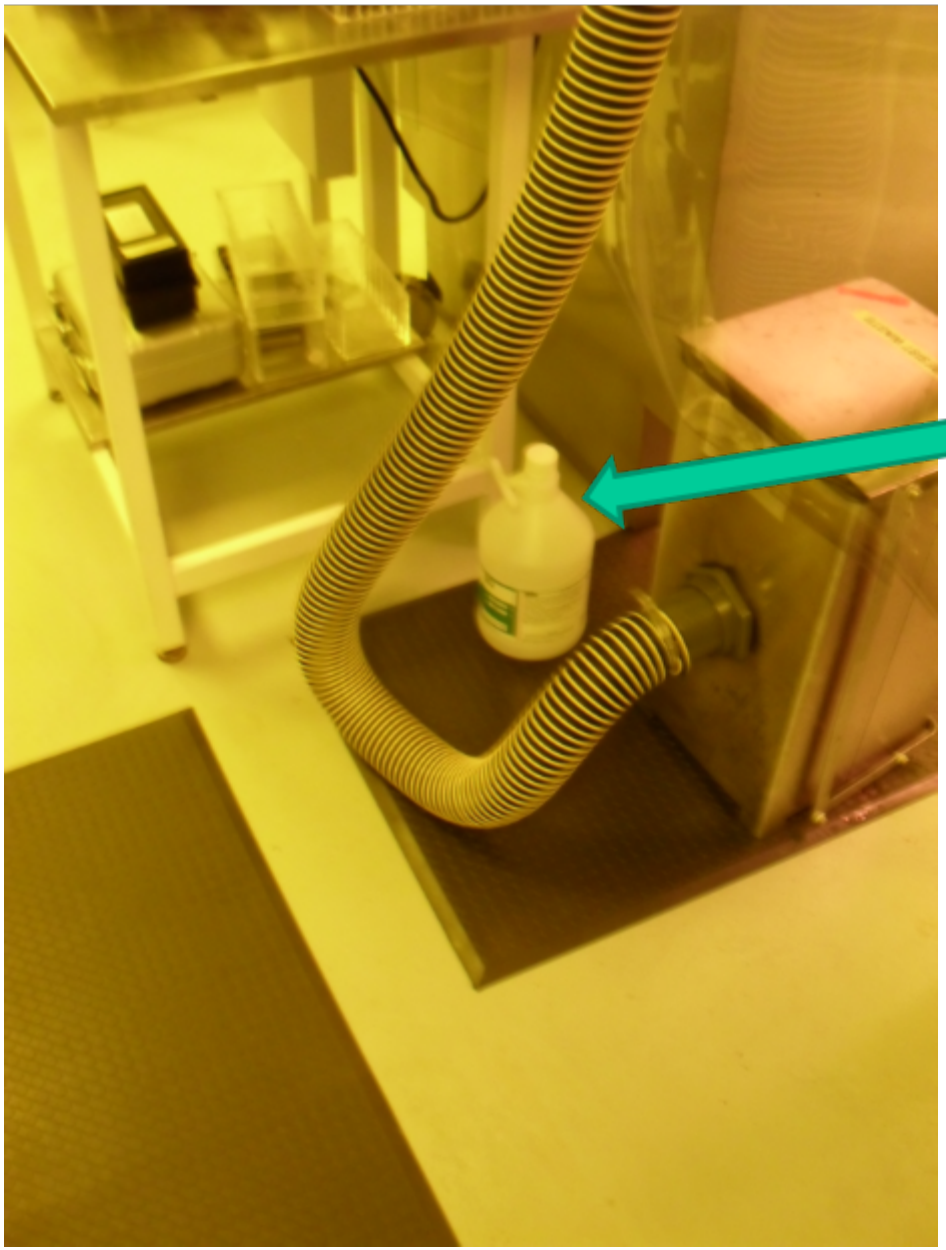
Lab Protocols



What is wrong?

- Loose wipes

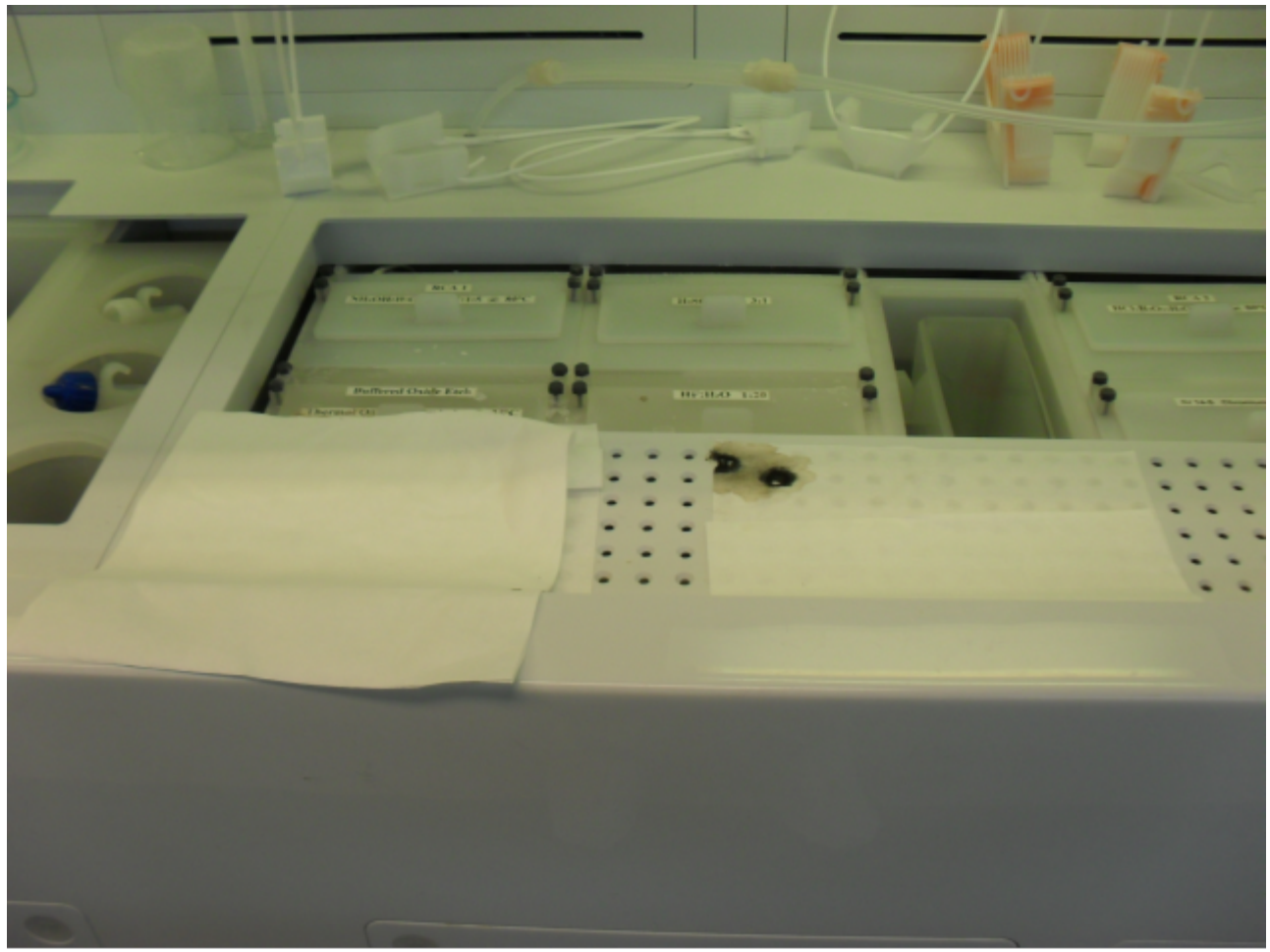
Lab Protocols



What is wrong?

- Chemical bottle on floor

Lab Protocols



What is wrong?

- Loose wipes
- Not cleaned after use

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Lab Protocols

What is wrong?

- Lower cubbie is great
- Upper cubbie has bunny-suit falling into lower cubbie

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Lab Protocols

- All but 2 of the photos were taken on a single sweep of lab (within 1 hour)
- Sense of ownership, pride and discipline needed from all

Top 10 Laboratory Rules

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Rule # 1- Laboratory Safety

- Use common sense when thinking about safety
- Read, understand, and abide by the rules and policies
- If you do not know - ASK!!
- There is no valid excuse for ignoring the rules
- If you are in the lab your name must show on the computer
  - If it does not, you should not be in the lab
- Do not lend your access card to anyone or borrow another card
- Do not open door to allow someone into the lab

Resources

- Nanofab User Manual
- Microfab webpage including training videos
- Standard Operating Procedures (SOPs) - Microfab webpage
- Material Safety Data Sheets (MSDSs) - located near entrance to the lab
- Environmental Health & Safety (EH&S) through website www.utahehs.org
- Safety Equipment - acid resistant clothing, spill kits, safety showers, etc.
- Ask us...

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Rule# 2- appropriate materials

- Leave personal belongings in hall lockers
- No food or drink in fab
- Wipe down all calculators, phones other items you bring on your person
- All new chemicals must be pre-approved
- Review the gowning video for specific protocols

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Rule #3 Personal Protective Wear

- Zero tolerance for safety glasses violations in rooms with wet benches (personal eye glasses are not sufficient)
  - Safety glasses must be ANSI Z87.1 compliant
- Safety Glasses, Bunny Suits, Snoods, Bouffants, and Gloves in all bays….
  - Blue (Nitrile) gloves for non-chemical operations
  - White (Nitrile) gloves (over blue gloves) for chemical operations
- Protective gear required for using acids and bases
- Surface lab, Room 1282 does not require gowning

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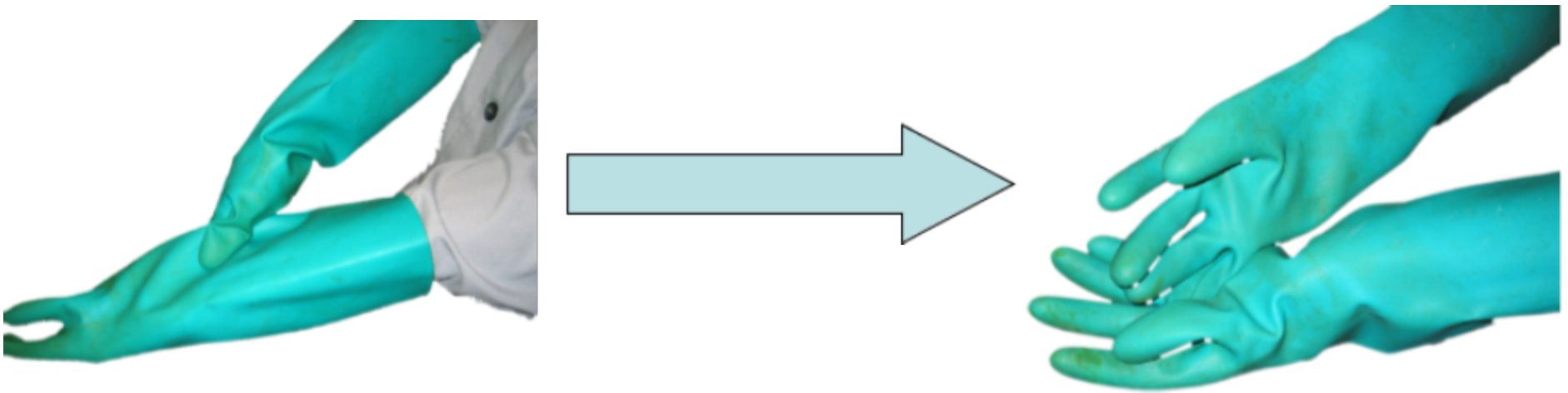
Incorrect chemical Gloving

Correct Procedure



Hang gloves in designated locations

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Rule # 4 - Equipment

- Laboratory staff provide training on equipment
- Users may only use the equipment for which they are trained and authorized
- Only use authorized materials
- Report equipment problems to the laboratory online using "report a problem"
- Repair and maintenance is performed or authorized by laboratory staff only
- All equipment use must be logged in the log sheets. Failure to log use will result in loss of lab access

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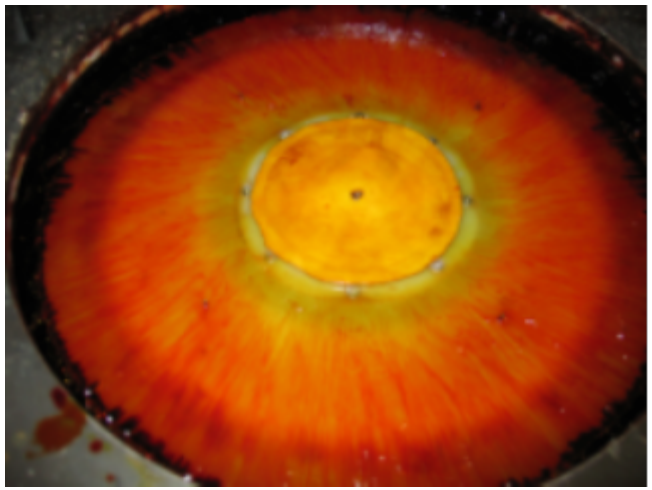
Rule # 5- Keep the lab clean

- Clean up after yourself or face the consequences.
- Leave the lab cleaner than you find it. Be a community player.
- When you use the photoresist spinner clean the chuck when you are done because it hardens and becomes a maintenance issue. Avoid negative consequences!
- Clean up wet benches & chemicals
- Put away all tools in proper locations
- No loose paper, wipes, aluminum foil, wafers, tools, etc.



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Rule # 6- Buddy System

- Required by College of Engineering and University
- Trained and Authorized lab users can work in the Microfab outside of general access hours (8am - 5pm M-F) ONLY with an authorized buddy present in the Microfab
  - No buddy necessary for Surface Science or Packaging Labs
- There are no “Safe Activities,” you must ALWAYS have another authorized lab user within the Microfab at all times
- Buddies must communicate frequently
- Users violating the buddy system rules will be subject to disciplinary action by the Laboratory Staff, College of Engineering, and/or University of Utah
- Each lab member is responsible to schedule their own buddy
- Online buddy system scheduling @http://fab.eng.utah.edu/calendar
  - E-mail list to help locate buddies
- “Buddy for Hire” system available on-line

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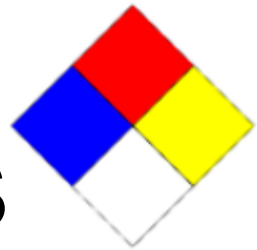
Rule # 7- Chemicals



- Laboratory staff must approve all new chemicals brought into the lab - SEE REQUEST FORM
- Only approved materials can be used in deposition systems
- An MSDS must be provided for new chemicals: SOP must include how it will be used
- Know how to tell if you have been exposed to hazardous chemicals
- Know how to use materials. Examples:
  - HMDS is a toxic chemical and must be handled properly.
  - HF handling must be done carefully. Special procedures for accidental HF exposure.

  - See links on Microfab website for glove compatibility

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Rule # 8- Label Containers

- All chemicals not in original container must be labeled
- Never pour chemicals back into source (stock) bottle
- Label must include
  - Date
  - Content
  - Name of User
  - Contact Information

- Markers and labels are provided by the laboratory

Rule # 9- Chemical Handling & Disposal

- No open chemical containers outside of hoods
- Transport chemical bottles in plastic or rubber safety containers.
- No chemicals may be stored in offices.
- Chemical Disposal:
  - Wet bench drain: Acids, Bases, 352 Developer
  - Non-Chlorinated Organic waste container: IPA, Acetone, Methanol, Photoresist
  - Close the solvent waste lid tightly
- Follow proper solid waste disposal procedures for sharps, photoresist contaminated materials, and stock bottles

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Chemical Usage

- Make certain fume hoods are working before using them
- If a fume hood fails, evacuate the room!
- Chemical safety
  - Byproducts; violent reactions; gas evolution
  - Do not mix chemicals except as directed by an SOP
    Do not try new mixtures without permission
  - Always add acids or bases to water
  - Fume hoods shut down during power outage

Rule #10- Know Emergency & Evacuation Procedures

Know the location of lab safety equipment

- If there is an emergency then evacuate the lab
  - Do not swipe out of the lab
  - Do not degown
- Know emergency phone numbers
- Know the location of MSDS's
- Know the location of laboratory exits
- Assemble southeast of MEB, account for others and know where your “buddy” is

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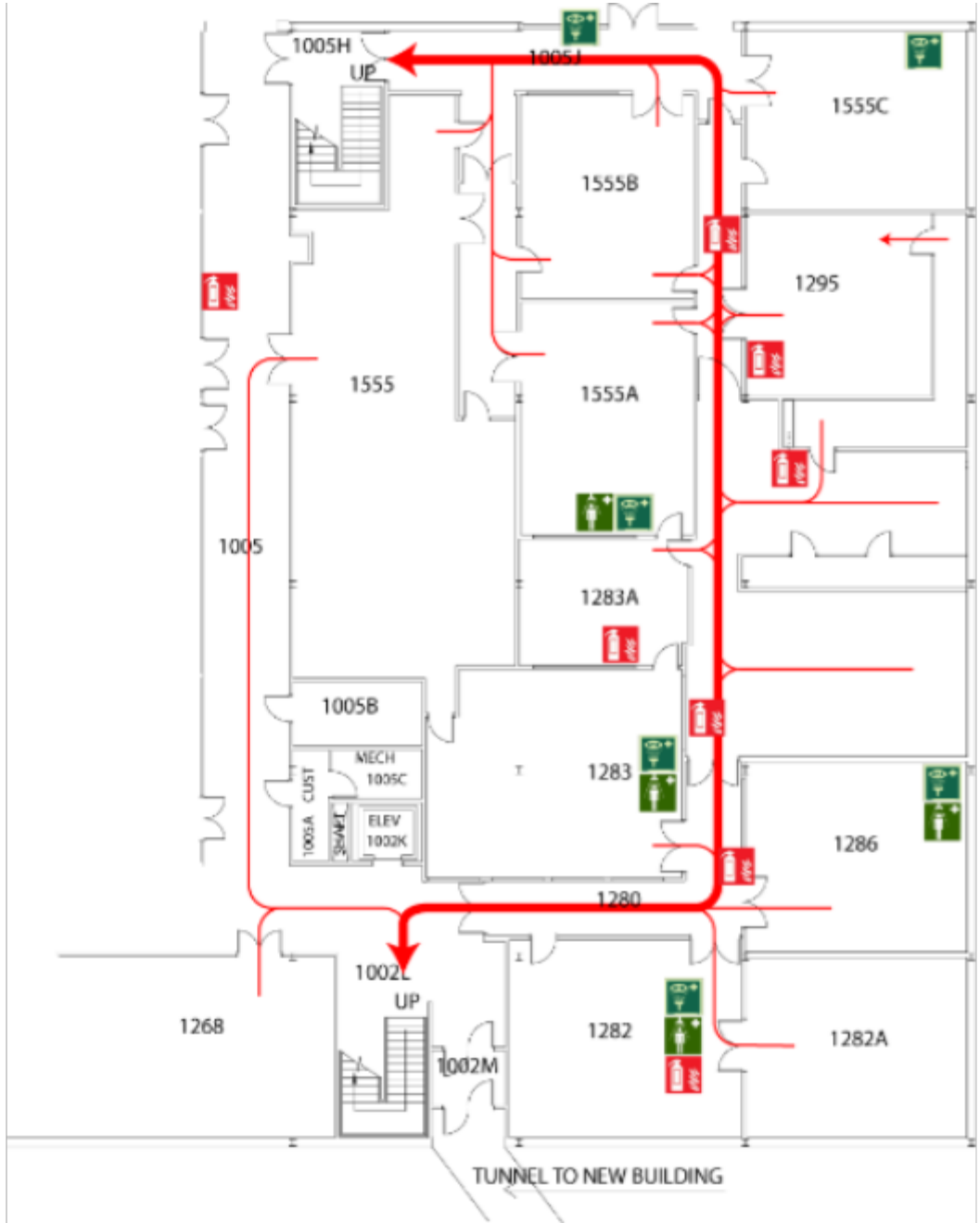
Evacuation Map



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Report Hazards & Other Emergencies

- Chemical Spills
- Fire
- Electrical
- Mechanical (such as exposed belts or shafts)
- Floods
- Loss of hood ventilation - Get out of lab!
- Any Gas Leaks/Gas Alarms
- Burnbox alarm
- Medical / other emergencies
- Theft, vandalism, & break-ins
- Personal safety concerns
- Harassment

Emergency Phone Numbers

- Staff Emergency Pager (801)339-0205
  - Must leave a call back number
- Emergency 9-911
- University Police (801)585-2677
- Environmental Health & Safety (801)581-6590
- Plant Operations (24hours/7days) (801)581-7221
- Poison Control (801)581-2151

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This is your lab!

- **Your Safety -** people who ignore the rules will have lab access revoked.
- **Your Community -** takes a cooperative effort. Is this a better place because you are here?
- **Your Responsibility -** if you see a problem, please talk to the individual or report it to the laboratory staff.
- **Your Accountability -** If you create a problem, it is far better to “own-up” to it immediately…

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