Pacific Northwest Chapter

Professional Development Seminar

with

Connecting Students to the Semiconductor Industry

April 11th, 2024
Thank you to our Hosts!

Julie Brandis  
Executive Director of Strategic Partnerships, College of Engineering

Lanell Nolf, Employer Relations Manager  
School of Mechanical, Industrial and Manufacturing Engineering

Tina Batten, Corporate Relations  
School of Electrical Engineering & Computer Science

Josefine Fleetwood, Employer Relations Manager  
School of Chemical, Biological and Environmental Engineering  
School of Nuclear Science and Engineering  
Department of Biological and Ecological Engineering
<table>
<thead>
<tr>
<th>Claire Coxen</th>
<th>Lesly Rojas</th>
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<tr>
<td>Erika Donner</td>
<td>Miranda Schmitz</td>
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<td>Tiffany Fritz</td>
<td>Mayra Solorio</td>
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<td>Riley Garnett</td>
<td>Hannah Summers</td>
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<td>Will Garrison</td>
<td>Carly Thorkildson</td>
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</table>
Thanks to our Sponsors and Speakers!
10:00 Welcome & Introduction to SEMI  
Leonard Weitman, Principal, Weitman Consulting

10:05 Welcome  
Julie Brandis, David Blunck, Jeffrey Nason, Eduardo Jose Cotilla-Sanchez  
Oregon State University

10:10 Industry Overview and Career Opportunities  
Leonard Weitman, Principal, Weitman Consulting

10:45 Preparing to Go Pro: Resume Building & Interview Skills  
Robyn Chupka, Human Resources Manager, HORIBA Instruments Inc.  
Carly Petrovic, Sr. HR Manager, Microchip Technology Inc.

11:10 Current Job Opportunities, Seven Industry Partners

11:25 Lunch

“Day In the Life” of SEMI Industry Engineers:

11:50 Fab Process Engineer  
Masen Kennish, Process Engineer II – Etch, Microchip Technology Inc.

12:05 Implantable Medical Device Design Engineering Director  
Java Von Arx, Senior Director, Technology and Platform Development, Biotronik/MSEI

12:20 Facility Design Engineer  
Mike Machinski, Principal, Corbin Consulting Engineers

12:35 Software Engineer (including AI)  
Adam Sohn, Data Engineering and Advanced Analytics Manager, Tokyo Electron
12:50 Networking with Industry Leaders
Participating Companies Include:
Acara Solutions
Analog Devices
Corbin Engineering
Horiba Instruments
Intel Corporation
JE Dunn Construction
Mortenson
Microchip
Micro Systems Engineering-Biotronik
Nvidia
SEMI
SSOE Group
TEL
Thomas Scientific
Weitman Consulting

3:00 Adjourn
Welcome!

Julie Brandis  
Executive Director of Strategic Partnerships  
College of Engineering

David L. Blunck, PhD  
Associate Dean for Undergraduate Programs  
College of Engineering

Eduardo Jose Cotilla-Sanchez  
Associate School Head for Graduate School  
Electrical Engineering and Computer Science

Jeffrey Nason, Ph. D.  
Professor and School Head  
Chemical, Biological, and Environmental Engineering
What is SEMI?

Leonard Weitman
Principal, Weitman Consulting
SEMI provides a platform for the global electronics manufacturing supply chain to:

Connect ♦ Collaborate ♦ Innovate ♦ Grow ♦ Prosper
SEMI’s Network Aims to Enable Industry Success

**Members**
- 1,270,000+ individual members
- 2,086 member companies

**Expositions**
- 322,076 attendees
- 7 SEMICON expos
- 4 other expos
- 4,068 exhibitors

**Special Interest Groups (SIGs)**
- 13 SIGs
- >1,850 members

**Programs**
- 170 programs
- >27,000 attendees
- >2,300 hours

**Standards**
- 970 Standards
- >5,128 volunteers
Semiconductor Industry Overview

Leonard Weitman
Principal Consultant, Weitman Consulting
SESSION GOALS

• Introduce/orient you to the global semiconductor/ microelectronics industry and its core processes
• The American CHIPS Act and what it can mean for you…
• Skills beyond the technical that will make you successful in this industry

Mostly, we want to get you excited and enthusiastic about this industry by making it feel real and attainable as a career opportunity.
Think about the ways that microprocessors impact your daily life...

Large- and Small-Scale Engineering – The Journey to Nano and Back
Fabrication Facilities

Cleanroom Airflow/Circulation
Fab Facts

- 85,000+ square feet of sub-class 1 clean room space supporting wafer capacity of 8,000 WPW
- Approximately 750 people working at OHT-Fab
- Factory operates 24 hours per day, 364 days per year
- Factory moves ~6,400,000 CFM, enough to fill 120 hot air balloons every minute
- 9,300 tons of refrigeration capacity, sufficient to cool 2,800 homes
- Factory uses 44,000,000 gallons of water/month, equivalent to 4,400 homes
- Factory uses ~215,000,000 KWH per year, equivalent to 6,000 homes
- Factory has more than 17 miles of stainless steel piping and more than 50 miles of electrical wiring

- Controlled temperature: 71 ± 0.5˚F
- Controlled humidity: 45 ± 2.5% RH
- Recirculating fans ~300 units at 5 million CFM
- Air exchanges: ~400-500 per hour
- 100% laminar flow
- Facilities: process chilled water, water recycling systems, high purity gases, gas delivery, liquid delivery, exhaust handling, liquid waste handling, etc.
Daily Operations…Complexity!

Think about the complexities that compromise not only the design of a fab, but the daily operation of a facility:

**Environmental**
General exhaust, exhaust for HPMs (hazardous process materials), metallic and non-combustible nonmetallic exhaust, exhaust duct sprinkler systems, storage & drainage of HPMs, storage/use of pyrophoric liquids and water-reactive liquids, hazardous waste, acid, basic, solvent waste, wastewater remediation, air pollution control systems (eg. VOCs, NH₃)

**Safety**
Fire and smoke alarm systems, emergency alarm systems/egress, continuous gas detection systems, emergency power systems, detection and alarm systems for pyrophoric liquids, exhaust ventilation flow alarm devices for pyrophoric liquids and water-reactive liquids

**Process**
Power, cooling water, gas delivery (inerts and HPM), liquid chemical delivery and drainage, telecommunications and automation: factory automation, material handling system, metrology data collection, yield data collection, controls/report outs for factory productivity
Wafer and Device Manufacturing
Wafer Manufacturing

Crystal growth → Wire Saw → Water Polishing → Epitaxial deposition → Wafer bonding

Polysilicon

Polished wafers → EPI wafers → SOI wafers

Seed crystal
Single crystal silicon
Quartz crucible
Water-cooled chamber
Insulation cylinder
Heater
Graphite crucible
Crucible support
Spill tray
Electrode

Freescale

Semiconductor 101: Functionality and Manufacturing of Integrated Circuits, John Cotner
Device Development

[Diagram showing the process flow of semiconductor manufacturing, including Product Design, Front End, Back End Process, and Board Assembly stages with sub-processes such as Circuit Design, Wafer Fabrication, Probing, Assembly, Test, Board Assembly, Design House, Foundry, Assembly House, Module, Board Assembly & Test, Engineering Test, Wafer Bumping/Probing, Final Test, and BIN Inventory.]
Device and Circuit Design

The CMOS Inverter

Digital Logic Standard Cells

- Booleans:
  - INV
  - NAND
  - NOR
  - AOI / OAI

- Complex
  - Flip-Flops
  - Multiplexers
  - Transmission Gates

- Clock, etc.
  - Gated Clock
  - Buffers, Delay
  - Level Shifters
Translating the Design to Silicon

Semiconductor Overview
Fundamental Processes

- Raw silicon substrate
- Diffusion: grows or deposits a layer of oxide, nitride, poly or similar material.
- Photo: spins on photoresist, aligns reticle and exposes wafer with reticle pattern. Develop removes resist from exposed areas.
- Etch: removes film layer that was uncovered during develop. Strips resist.
- Implant: dopants are implanted for electrical characteristics.
- Metals/Films: connects devices electrically and isolates circuit pathways.
- CMP: polishing technique to keep surfaces flat so more layers can be added.
- Probe/Test: test device functions.
This process requires more than 190 stages. Each stage contains multiple substeps.
Device Cross-sections

Figure 1: 10nm Interconnect Stack
A. Yeoh, et. al., IITC, 2018

Figure 7: Transistor Fin and Gate-Cut Images
C. Auth, et. al., IEDM, 2017

Introducing the world's first 2 nm node chip | IBM Research Blog
Defects – what’s the big deal?

Figure 4: Micrograph showing a particle embedded in an aluminum layer, which was revealed by an E-beam defect review tool.
S. Blanc-Coquand, Micromagazine, 2007

Figure 8: Cross-sectional images of a copper interconnect layer showing five types of defects: (a) a bump in the dielectric, (b) bad metal filling during first-level copper deposition, (c) missing metal at the bottom of the interconnect, (d) oxide underetch, and (e) bad metal filling during second-level deposition.
Microcontamination

The dirtiest things in the clean room are the people. Cleanroom suits and wafer pods are used to protect the wafers from the people.

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The skin we shed

Source: Dr. Ken Goldstein Cleanroom Consultants, and Mike Fitzpatrick, Lockwood Greene, Cleanrooms East 99
The CHIPS and Science Act of 2022
How many of you heard about the global chip shortage over the past few years?

Why the global chip shortage threatens the economy, national security and Americans' 'status quo'

"It is both an economic and national security imperative to solve this crisis."

‘It’s a Roller-Coaster Ride’: Global Chip Shortage Is Making Industries Sweat

The internet-connected world is completely dependent on the production of semiconductors. That’s become a problem now that supplies are running short.

Why is there a chip shortage for computers and cars?
The CHIPS and Science Act of 2022

- The CHIPS and Science Act of 2022 is a **$280 billion** legislation that authorizes funding to boost semiconductor and science innovation in the U.S. The bill was signed into law by President Biden on 11/25/2022.
  - The CHIPS Act fund allocates up to **$54.2 billion for chip companies** to open new factories in the U.S.
  - The funding comes with conditions to prevent recipients from expanding production of advanced chips in China. The bill aims to address the chip shortages that have affected various industries and to compete with rivals like China in the semiconductor market.
- The goals of this money include lowering chip costs, creating jobs, strengthening the US supply chain, countering China’s CHIP strategy, preserving US leadership in the industries of the future, and preserving American national and economic security.
- The money is invested across R&D, Manufacturing, Workforce Development, and establishing a National Center of Semiconductor Technology.
What does this mean for you?

• Workforce development (~3-5 years)
  • Community Colleges/ Colleges/Universities will likely add classes and programs targeting training and skills development that are directly applicable to the semiconductor industry

• Jobs!
  • This is a growing industry with incentives to continue to grow in the US and provide good paying jobs.
Success in this Industry
Your Skills *Beyond the Technical* are also Key to Career Success

- Beyond the scientific and engineering brain power… we are people working together to achieve big goals!
- Ultimately, what will make you successful?
  - Teamwork and cross-discipline collaborations are essential
  - Being open to and adaptable to change; this industry moves fast!
  - Make data-based decisions and use data to drive your proposals
  - Be creative and innovate
  - Be self-motivated and ask questions
  - Continuously learn, read, and grow your knowledge and skills
  - Learn to think in terms of risks, reward, and return on investment (ROI)
  - Be open to understanding and growing your knowledge of the business-side (as the business-side drives key company decisions, including technology decisions)
  - Be open to parallel career transitions
- Opportunities abound in this industry for engineers/scientists with your skillsets
Prepare To Go Pro

Best Practices on Landing Your First Job in Semiconductor

Presented by:
Robyn Chupka, HR Manager
HORIBA Instruments

Carly Petrovic, Sr. HR Manager
Microchip Technology, Inc.
Agenda

• Assessment process
• Resumes
• Cover letters
• Preparing for the interview
• Behavioral interviews
• Post Interview
• Q & A
Candidate Assessment

• Begins at first contact:
  • Career Fairs
  • Networking events
  • Informal introductions

• Continues with:
  • Resume review
  • Cover letters
  • Phone calls
  • Voicemails—including timeliness of responses when received
  • All interviews including lunches and dinners
  • Offer process

• Ends on your first day
Resumes

- Recruiters spend 6-8 seconds on initial scan of resumes
- Use simple layouts to highlight
  - Objective
  - Degree in pursuit with projected graduation date
  - Internships & Co-Ops
  - Relevant projects, publications, and coursework
  - Relevant work history
    - Do not include every part time job held since high school. Select a few that demonstrate commitment, continuity and responsibility
- Avoid graphics or non-traditional bullet points
  - These often become garbled in applicant tracking systems and are not easy on the eye
Resumes

• Early Career/New Grad – 1 page only
• List Employers/Internships in reverse chronological order (current/most recent first)
• Showcase relevant class projects
• Awards and activities
• Proofread carefully! Avoid grammatical errors and misspellings
• Be specific and quantify when possible but leave them wanting to find out more
  • Avoid a long list of your duties, but instead showcase achievements or results achieved in your roles
• Use professional email address
• Ensure your voicemail is set up, has a professional greeting and check it regularly.
  • Be sure your voicemail is not full.
Cover Letters: An Opportunity to Elaborate

• If a company asks for cover letters, they want them
  • If not, make yourself stand out from the others
  • Opportunity to show off your written communication skills
• Make it personal
• Explain how you meet the minimum requirements, and if you don’t have all the requirements, you can address them here (including how you plan to meet the qualifications
• Show your company knowledge-why you want to work for the company and why they should pick you.
I am writing to express my enthusiastic interest in the Firmware Engineer position at HORIBA. As a recent college graduate holding bachelor's degrees in both Economics and Computer Science, I am eager to contribute my academic knowledge and dedication to learning in a role that aligns with my passion for firmware development and technology.

The opportunity to work as a Firmware Engineer at HORIBA, a globally recognized company with a focus on scientific advancement and societal responsibility, is incredibly appealing. Despite my limited professional experience, I am confident that my educational background, coupled with my enthusiasm for firmware development, makes me a valuable candidate for this position.

I am particularly attracted to the HORIBA culture, as reflected in the company's emphasis on employee growth, creativity, and entrepreneurial spirit. I am excited about the opportunity to work with the global HORIBA team and contribute to the development of state-of-the-art products that protect health, safety, and the environment.

My academic journey has equipped me with a solid foundation in computer science principles, including proficiency in C/C++, Linux, and Object-Oriented Design Principles. Additionally, my economics degree has provided me with a unique analytical perspective that I believe will contribute to the innovative and interdisciplinary approach required in developing firmware for a diverse range of applications.
Cover Letters: Example

While my professional experience is currently limited, I am eager to leverage my skills and knowledge to quickly adapt and contribute effectively to your dynamic team. The prospect of working with cutting-edge technology, collaborating with multi-disciplinary teams, and providing post-delivery customer support aligns perfectly with my career aspirations.

I am aware that my experience may differ from more seasoned candidates; however, I am confident that my eagerness to learn, strong work ethic, and dedication to excellence will make me a valuable addition to your team. I am excited about the prospect of contributing to HORIBA’s success and further developing my skills as a Firmware Engineer.

Thank you for considering my application. I am available at your earliest convenience for an interview and can be reached at XXX-XXX-XXXX or via email at XXXX@gmail.com. I look forward to the opportunity to discuss how my unique background and passion for technology can contribute to the innovative work at HORIBA.

Thank you for your time and consideration.
Preparing for the Interview

• Buy a suit or professional attire. Ensure good fit and laundering
  • Your college clothes are probably not sufficient

• Do your homework about the company and position

• Search common new graduate questions in your field and practice answering
  • Use flash cards and practice with a friend before your interview

• Brush up on technical acumen and jargon related to your desired field. Speak their language!

• Reflect on your work experience, projects, curriculum and hobbies. Formulate ahead of time what stories you can tell about yourself that demonstrate you are the best person for the job.
Behavioral Interviews

What is a behavioral interview?

Behavioral interviews focus on a candidate’s past experiences to assess how they’ve navigated specific situations and utilized skills relevant to the position.

The idea is that past behavior is the best predictor of future performance in a similar situation.

At Microchip we call this Hiring for Attitude.
Behaviors of High Performers

• Highly Collaborative
• No Excuses
• Takes Ownership
• Meets Commitments
• Self-Directed
• Innovative
• Empathetic

Your answer to any interview question should demonstrate these behaviors
Behavioral Question Examples

• Tell me about a colleague you found particularly difficult to work with.

• Tell me about a time when you were struggling to meet a deadline or commitment you had made.

• Tell me about a time when working on a team was challenging.

• Tell me about a time when you had to think outside the box to solve a problem.

• Tell me about a time you didn’t know how to do something that a superior asked you to do.
Behavioral Questions

Tell me about a colleague you found particularly difficult to work with.

Your response should demonstrate:

• You show empathy for others
• You flex your style/approach to find common ground
• You take the initiative to work it out or overcome the difficulty before involving superiors
Behavioral Questions

Tell me about a time when you were struggling to meet a deadline or commitment you had made.

Your response should demonstrate:

- You take ownership of problems or delays
- You do not make excuses or blame others
- You are proactive and communicate effectively to stakeholders
- You provide alternatives or other solutions to make it right
Behavioral Questions

Tell me about a time when working on a team was challenging.

Your response should demonstrate:

• You are highly collaborative
• You are comfortable assuming a leadership role in a group, even without formal authority
• You are proactive and communicate effectively to team members
• You are flexible and adaptable to changing or conflicting priorities
Behavioral Questions

Tell me about a time when you had to think outside the box to solve a problem.

Your response should demonstrate:
• You are a self-directed learner
• You are pragmatically innovative
• You take ownership of problems

This question is your opportunity to flex your technical engineering muscles!
Behavioral Questions

Tell me about a time you didn’t know how to do something that a superior asked you to do.

Your response should demonstrate:

• You are highly collaborative
• You do not make excuses
• You take ownership of problems
• You meet commitments
• You are a self-directed learner
• You are pragmatically innovative
• You are empathetic towards superiors or colleagues
Behavioral Interviewing

Traits of outstanding behavioral interviews:

- Provided real situations you were involved in and worked through
- Identified the scenario with details (who, what, when, where, etc.)
- Painted a clear picture
- Identified the issue/problem/challenge
- Explained how you solved the problem and/or the value gained from the experience
  - Identifying a problem with no solution or lesson-learned is a major red flag!
Nailing the Interview

• Arrive 10-15 minutes early
• Leave your cell phone in the car. Avoid playing on it while you wait in the lobby
• Dress professionally and ensure good hygiene
• Strong handshake, eye contact and a smile upon greeting
• Speak confidently and clearly
• Be aware of your body language
• Show energy, enthusiasm and gratitude for the opportunity
• Come prepared with some thoughtful questions to ask the recruiter or hiring manager.
  • Keep these questions positive and curious about the future of the company and role – not how much does this job pay or when the first advancement opportunity will be.
After the Interview

- Always follow up with a “Thank You” email to the interview team
- Regularly check your email and voicemail. Ensure your voicemail isn’t full
- Be willing and prepared to come back for additional interviews
- Accept rejection gracefully
  - They can only hire one person – it’s not personal
  - Consider writing a follow up note to the hiring manager expressing how much you appreciated the opportunity to interview and that you hope they’ll keep you in mind for future opportunities
- Don’t get discouraged. Everyone fumbles a few interviews. Learn, practice and keep at it!
Questions?
Current Industry Opportunities

- Analog Devices, José J. García
- Biotronik / Micro Systems Engineering, Java Von Arx
- Corbin Engineering, Gaonou Her
- Horiba Instruments, Robyn Chupka & Derek Montemayor
- JE Dunn Construction, Robbie Maxey
- SSOE Group, Mark Redlinger
- TEL, Adam Sohn & Cactus May
Analog Devices, Inc. is a global semiconductor leader that bridges the physical and digital worlds to enable breakthroughs at the Intelligent Edge. ADI combines analog, digital, and software technologies into solutions that help drive advancements in digitized factories, mobility, and digital healthcare, combat climate change, and reliably connect humans and the world. With revenue of more than $12 billion in FY23 and approximately 25,000 people globally working alongside 125,000 global customers, ADI ensures today’s innovators stay Ahead of What’s Possible.

ADI has ambitious **environmental sustainability goals** such as: Migration to 100% renewable energy for its manufacturing facilities by 2025, absolute reduction of Scope 1 and 2 greenhouse gas emissions by at least 50% despite doubling in production capacity by 2025, water use efficiency improvement of 50% by 2027 despite doubling of production capacity, Carbon Neutrality by 2030, and Net Zero by 2050.

Examples of **Full-time opportunities** at our **Beaverton, Oregon** facility:

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<th>Title</th>
<th>Requirements</th>
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<td>Associate Process Sustaining Engineer</td>
<td>Bachelor’s in Chemistry, Physics, Chemical Engineering, Materials Science, Electrical Engineering, or a related field of study</td>
<td>R237024</td>
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<tr>
<td>AMTS/MTS Application Engineer</td>
<td>Bachelor’s degree in Electrical Engineering plus 2 years of relevant work experience, or Advanced degree.</td>
<td>R236981</td>
</tr>
<tr>
<td>Engineer, Product Engineering</td>
<td>MS/PhD degree in Electrical Engineering, Applied Physics, or Material Science</td>
<td>R237011</td>
</tr>
<tr>
<td>Senior PDK Engineer</td>
<td>BS/MS in Electrical or Computer Engineering with an emphasis on IC design and semiconductor processes.</td>
<td>R238844</td>
</tr>
<tr>
<td>Manufacturing Wafer Operations Supervisor</td>
<td>BS degree and study in Industrial Engineering, Business Administration or other technical fields is preferred</td>
<td>R240084</td>
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# ADI Beaverton Oregon Internship Opportunities

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<th>Title</th>
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<tr>
<td>Equipment/Process Engineering Intern (Internal Wafer Fab)</td>
<td>Pursuing Bachelor’s degree in Mechanical Engineering, Electrical Engineering, Material Science, Chemical Engineering, Applied Physics, Physics, or a related field of study.</td>
<td>R237555</td>
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<tr>
<td>Mechatronics Engineering Intern</td>
<td>Pursuing B.S. in Mechanical, Mechatronics, Electro-Mechanical, or Electrical Engineering,</td>
<td>R237564 R237565</td>
</tr>
<tr>
<td>Net Zero Engineering Intern</td>
<td>Pursuing a B.S./M.S./Ph.D. in Chemical, Mechanical, Electrical, or Environmental Engineering degree</td>
<td>R237562</td>
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<tr>
<td>Intern, Mechanical Engineer (Hardware Development)</td>
<td>Pursuing Bachelor’s degree in mechanical engineering, industrial engineering, or electrical engineering.</td>
<td>R238621</td>
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<tr>
<td>Verification Intern</td>
<td>Pursuing B.S. Electrical Engineering, Exposure to UVM/SV, Simulation &amp; debug, Scripting: Python/Perl/Tcl</td>
<td>R237360</td>
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Current Industry Opportunities

• Analog Devices, José J. García
• Biotronik / Micro Systems Engineering, Java Von Arx
• Corbin Engineering, Gaonou Her
• Horiba Instruments, Robyn Chupka & Derek Montemayor
• JE Dunn Construction, Robbie Maxey
• SSOE Group, Mark Redlinger
• TEL, Adam Sohn & Cactus May
About Microsystems Engineering Inc.

Working for Micro Systems Engineering, Inc. (MSEI) means joining an elite team to work on some of the most exciting challenges in medical technology today.

We are a pioneer in developing innovative implantable medical device technologies and devices that save and enhance the quality of life for millions of individuals living with cardiovascular and chronic neurologic pain disorders.
With more than 40 years of experience in design and manufacturing of active implantable medical devices, our continuing success is based on our company’s core values - innovation, quality, reliability, integrity, teamwork, and undisputed expertise - thus enabling us to inspire confidence and trust in physicians and patients worldwide.

Located in Lake Oswego, Oregon, we are continually looking for talented engineers, scientists, and professionals to share in our mission.
CAREER OPPORTUNITIES

MANUFACTURING SPECIALIST (ALL(shifts))
MANUFACTURING SPECIALIST, QUALITY CONTROL INSPECTION
MEDICAL PRODUCT SOFTWARE DEVELOPMENT ENGINEER
NEUROMODULATION PLATFORM ENGINEER
NEUROMODULATION TECHNOLOGY ENGINEER
Current Industry Opportunities

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• SSOE Group, Mark Redlinger
• TEL, Adam Sohn & Cactus May
DEDICATION. EXPERTISE. RESULTS.

Our History
- Founded in 1999
- Established in Beaverton, OR
- 120+ employees

Engineering Services
- Code Studies
- Structural Engineering
- Mechanical Engineering
- Process Engineering
- Electrical Engineering
- Instrumental Controls
- Telecommunications
- Revit/AutoCAD Modeling
CAREER OPPORTUNITIES

• Internship opportunities through MECOP
  • MECOP · Student Focused Internships Driven by Industry (mecopinc.org)
Current Industry Opportunities

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HORIBA Provides Solutions from the Lab to the Fab

Materials & Semiconductor Business Field

Materials & Semiconductor

Research
- New Advanced Materials
- Materials Research
- Laboratory R&D
- Academia

Solutions
- Optical Solutions
- Thin film Metrology
- Integrated Metrology
- Facility Solutions

Manufacturing
- Technical Marketing
- Applications
- Process Modules

Target / Activity
- Product Technology
- Fields

Semi Process Control
- Technical Marketing
- Applications
- Process Modules
Open Positions
• Embedded Linux (Firmware) Engineer – Reno, NV
• Electrical Hardware Engineer – Reno, NV
• Sales Engineers – Various locations
• Field Service – Various Locations

Coming Soon
• Quality Assurance Engineer – Reno, NV
• Summer Internships – Various Locations

Contact
Robyn Chupka
Semiconductorjobsus@horiba.com
800 446-7422 ext. 7528
JE DUNN ESTABLISHED IN 1924
GENERAL CONTRACTOR
CONSTRUCTION MANAGEMENT SERVICES, DESIGN-BUILD AND INTEGRATED PROJECT DELIVERY
& HEADQUARTERED IN KANSAS CITY, MO
150+ Projects Completed

3rd ENR Ranking
Semiconductor Manufacturing

$4B Revenue
$650 Million 2022

1st Portland Business Journal
General Contractor

2023 US Best Managed Companies

Performed ACROSS THE COUNTRY 2022
**CURRENTLY HIRING FOR**

- Campus Intern (traveling)
- Project Engineer (traveling)
- Project Engineer
- Field Engineer/Project Engineer

"Get the best people you can get, give them interesting and challenging work and let them share whatever rewards there are in the company."

~ Ernie Dunn S. (1893-1964), Founder, JE Dunn Construction

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<th>ENR Rankings</th>
<th>Top 100 Contractors by New Contracts: 12</th>
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Robbie Maxey
Email: robbie.maxey@jedunn.com
TEL: 503.819.2364
Website: www.jedunn.com

THANK YOU
Current Industry Opportunities

• Analog Devices, José J. García
• Biotronik / Micro Systems Engineering, Java Von Arx
• Corbin Engineering, Gaonou Her
• Horiba Instruments, Robyn Chupka & Derek Montemayor
• JE Dunn Construction, Robbie Maxey
• SSOE Group, Mark Redlinger
• TEL, Adam Sohn & Cactus May
SSOE Group
Mark Redlinger, PE, SE
Base Build Structural Department Manager

• Established in 1948
• Privately-owned

Our Mission:
To deliver unparalleled client value that advances the AEC industry.

Our Vision:
Designing and building the future for our clients, colleagues, and communities.
Where do we do SEMI? Everywhere.

SSOE Offices
- Austin, TX
- Columbus, OH
- Hillsboro, OR
- Nashville, TN
- Santa Clara, CA
- Toledo, OH

Client-Site/Remote Only
- Phoenix, AZ
- Boise, ID
- Rio Rancho, NM

SSOE International Tool Install
- Leon, Mexico
- Mumbai, India

Other U.S. Offices
- Alliance, OH
- Atlanta, GA
- Birmingham, AL
- Cincinnati, OH
- Columbia, SC
- Huntsville, AL
- Kalamazoo, MI
- Lima, OH
- Midland, MI
- St. Paul, MN
- Troy, MI
Facilities Engineering

- Full discipline firm - ME, EE, PE / CE, Architecture, Project Management
  - Professional practice groups, full career path strategy
- #2 Semiconductor Design Firm: big enough to get the interesting jobs, small enough for a great corporate culture (we're a certified Great Place to Work)
  - CHIPs Act and markets mean this isn't slowing down any time soon
- Tool Install Design - specialty of ours with its own career path and professional development
- Some cool things we're doing:
  - Modular and offsite fabrication for subfab lateral design
  - Design process automation leaders
  - New build and Retrofit projects with the top semiconductor companies (but we can't mention states/companies or countries for international)
Engineering Tools

SSOE has an Enterprise level agreement covering worldwide licensing with Microsoft, Autodesk, and Bentley Systems. All software used by SSOE is purchased and maintained at a corporate level and is actively licensed for use in all locations. BIM2Fab utilizes those in bold.

**ELECTRICAL**
- Autodesk Revit (MEP)
- EasyPower®
- SKM
- 3EPus
- AGI32
- AutoCAD Electrical
- AutoCAD Electrical
- AutoCAD MEP
- AutoLux
- Bentley Building Electrical Systems
- **Elum Tools**
- Visual Pro
- ETAP
- Paladin DesignBase (EDSA)
- PLS CAD

**MECHANICAL / PIPING**
- Autodesk Revit (MEP)
- TRANE / TRACE7000
- AutoCAD MEP
- Bentley Building Mechanical Systems
- Duct32
- TriForma

**PROCESS PIPING**
- AutoCAD Plant3D
- Caesar II
- PIPE-FLO Compressible & Pro
- AutoCAD P&ID
- **Bentley AutoPIPE**
- Bentley Microstation XM PlantSpace
- Bentley PlantSpace P&ID
- CHEMCAD
- IsoGen
- TRICAD

**STRUCTURAL**
- Autodesk Revit (Structure)
- AutoCAD Advanced Steel Detailing
- Autodesk Robot / React
- Bentley Generative Components
- Bentley Integrated Structural Modeler (ISM)
- Bentley Structural
- RAM: Elements, Structural System, and Concept
- RAM: Sbeam & Connection
- **Risa: 2D & 3D**
- STAAD.Pro 3D
- SDS/2 Detailer and Connection
- TNX Tower
Engineering Tools (cont.)

**CIVIL**
- AutoCAD Civil 3D
- AutoCAD Map3D
- Autodesk Infraworks
- Autodesk Vehicle Tracking
- Bentley InRoads
- ParkCAD
- Pondpack
- StormCAD

**MACHINE DESIGN**
- Autodesk Inventor
- Autodesk Mechanical
- SolidWorks

**VISUALIZATION / ANIMATION**
- Autodesk 3DS Max
- Lumion

**GENERAL DESIGN**
- Architecture
- AutoCAD
- AutoCAD Architecture (MEP)
- Autodesk Revit (Architecture)
- Bentley Architecture
- MicroStation V8i

**DOCUMENT MANAGEMENT**
- Autodesk Vault Collaboration
- NewForma
- PDMW Enterprise
- ProjectWise Explorer
- Revit Server

**COLLABORATION**
- Autodesk BIM360
- Autodesk Navis
- Autodesk ReCap
- Autodesk TrueView
- Bentley Navigator
- Bluebeam Revu
- iConstruct
- Kanbanize
- Microsoft
SSOE Group is an internationally ranked architecture and engineering firm.

200+ Co-ops / Interns Hired In the past 3 Years

No 2 Semiconductor Design Firm (ENR 2023)

No 2 Manufacturing Design Firm (ENR 2023)

We employ over 1,400 people, in 20 offices, across 3 countries because we offer:

- Hybrid Work Model
- Early-Career Support
- Industry-Leading Benefits
Career Opportunities at SSOE

1. Fall Civil Engineering Co-Op (Toledo, OH)
2. Summer Structural Engineer Design Intern (Hillsboro, OR)
3. Summer Mechanical Process Designer Co-Op (Lima, OH)
4. Summer Architecture Internship (Toledo, OH)
5. Summer Engineering Intern (Santa Clara, CA)
6. Summer Architectural Design Intern (Nashville, TN)
7. Summer Architectural Design Intern (Columbia, SC)
Current Industry Opportunities

• Analog Devices, José J. García
• Biotronik / Micro Systems Engineering, Java Von Arx
• Corbin Engineering, Gaonou Her
• Horiba Instruments, Robyn Chupka & Derek Montemayor
• JE Dunn Construction, Robbie Maxey
• SSOE Group, Mark Redlinger
• TEL, Adam Sohn & Cactus May
Tokyo Electron Limited Profile

- Area of activity: As a leading global company of semiconductor and flat panel display (FPD) production equipment, Tokyo Electron Limited (TEL) engages in development, manufacturing, and sales in a wide range of product fields.
- Revenue - $2,003 billion yen
- Number of employees – 15,634
- Locations – 28 companies at 76 sites in 18 countries

Differentiators / Impact

- TEL pursues technological innovation in semiconductor that supports the sustainable development of the world.
- TEL builds a sustainable society by creating innovative technologies, provides products and services that are conscious of the environment; collaborating with partner companies, consortiums and academia

Types of Jobs

- Field Service, Accounting, Physicist, Computational Fluid Dynamics, Data Science, Government Relations, Modeling/Simulation, Research Science, Business Intelligence, Marketing, Human Resources, Legal, Supply Chain
- Please check www.TEL.com for job postings as they are always changing

Internship Opportunities

- We anticipate around 50 Intern/Co-op openings during 2023-2024 academic cycle.
- Internships in Process, Software, Electrical, and Mechanical Engineering are expected to be posted through Spring 2024
- Intern opportunities are available in Albany, NY; Austin, TX; Chaska, MN; Portland, OR
“A Day in the Life of …”

• **Fab Process Engineer**
  Masen Kennish, Process Engineer II Etch, Microchip Technology Inc.

• **Implantable Medical Device Design Engineering Director**
  Java Von Arx, Senior Director, Technology and Platform Dev.
  Biotronik/MSEI

• **Facility Design Engineer**
  Mike Machinski, Principal
  Corbin Consulting Engineers

• **Software Engineer (including AI)**
  Adam Sohn, Data Engineering and Advanced Analytics Manager
  Tokyo Electron
SEMI Professional Development Seminar: A Day in the Life of a Fab Process Engineer at Microchip

A Leading Provider of Smart, Connected and Secure Embedded Control Solutions

Masen Kennish
January 5th, 2024
Masen Kennish

• Education
  • Oregon State University
    • B.S. Chemical Engineering
    • Minors in Chemistry and Music Performance
    • 2015 – 2020
  • University of Arizona Global Campus
    • MBA
    • 2023 – Present

• Career
  • Microchip Technology Inc.
    • Process Engineer II
    • April 2021 – Present
• History
  • State-of-the-art 4-level fab built by Fujitsu for DRAM
  • Fab 4-1 built in 1988 (6-in), fully renovated in 2000 (8-in) AMD/Fujitsu JV-2 venture.
  • Fab 4-2 constructed in 1997 (8-in)
  • Connected by ISO Class 6 clean bridge
  • Purchased by Microchip in August 2002.

• Technologies
  • 500nm, 400nm, 350nm, 180nm, 150nm, 130nm

• Present
  • 826,000 sq. ft. of

• Ramp
  • Tripling output of the facility with an $800 million investment
    • 172 newly installed tools
  • CMP Annex consisting of 3,700 sq. ft. of additional clean room space
  • Implant Annex consisting of 8200 sq. ft. of clean room and 3000 sq. ft. of support area

• Challenges
  • Fighting obsolescence
    • Increasing capability by installing new tools that hit smaller nodes
  • Balancing throughput and footprint
Top Floor Interstitial
- HEPA air delivery
- Process exhaust
- Fire suppression

Production Floor Fab
- Process areas
- Equipment
- Clean room

Sub Floor 1 Mezzanine
- Process support
- Vacuum pumps
- Power supplies
- Gas/chemical delivery

Sub Floor 2 Sub-Fab
- Ultra-pure water distribution
- Waste collection
- Electrical distribution
- Gas distribution
Cleanroom Areas

Product wafers are only in Process Aisles and Main Aisle, never in Service Chase areas.
Semiconductor Manufacturing Overview

Cycle time depends on complexity: 3–12+ months
Internal Manufacturing Locations

- Fab
- Assembly and Test
What is a tool?

- Examples
  - $50,000 SRD
  - $21+ Million Lithocell (Track + Stepper/Scanner)

- Lithocell
  - Prime, Coat, Soft Bake, Alight/Expose, Bake, Develop

- Ownership
  - Own specific tool sets within an area
  - Become the local expert -> Blessing and a curse!
Day in the Life of a Fab Process Engineer

• Focus changes
  • Up cycle dynamics – focus less on cost savings and more on output
    • Recipe propagation
    • Increasing throughput
  • Down cycle dynamics – focus on cost savings and recipe optimization
    • “extra time”

• Typical Day (No structure, time management is key)
  • Email
    • Main form of communication -> stay on top of it!
  • Morning PE meeting
  • Putting out “fires”
    • Checking on things that happened overnight/weekend (24-7 facility)
    • Tool downs
    • SPC charts
  • Experiments/Projects
    • Additional meetings
  • Balance time between fab/desk

• Labs
  • ~3 hours
  • No time for getting additional data

• Fab
  • As much time as needed to complete the experiment
  • Take the tool away from production
  • Tools may have mechanical problems arise between experiments (consistency)

• Time
  • Takes about 3 months for a lot to be processed through the fab
  • Defect inspections can take 1-3 days
  • Shipped to map (electrical tests) takes 1 week
  • Shipped to probe (final yield) takes 2 weeks

• Experiment results
  • Can take weeks to months before you can collect all the data needed to present the results of the experiment/project

You must become the expert on your toolset!
Project Example

Projects can be short or very long!

Proposal
• Reason for the project to be initiated -> Tool Owner driven OR Management driven

Qualification
• This is the “meat and potatoes”
• This is where you must prove out the change and make sure you are not affecting the process in any adverse way

Implementation
• Plenty of “double checking” making sure only the intended change is being made
• Entails paperwork and great communication to the necessary parties

Verification
• Data collection after the project was implemented making sure there are no unintended consequences

• Example Project:
• Qualifying a metal etch process on to a new tool set

[Image of a diagram showing layers such as DARC, MiM Top Plate, MiM Bottom Plate, ARC, Barrier Metal, Dielectric, and ARC Barrier Metal. The diagram is labeled "500 nm." A notation is present, "500 nm, 7/7/2022, 10:22:07 AM." There is a Microchip logo at the bottom right.]
Advice

 Persistence  Ask questions  Take initiative  Change is inevitable  Time management
Day in the Life:
Implantable Medical Device R&D Director

Dr. Jeffrey A. Von Arx
Senior Director of Technology, & Platform Development

Jan 2024
Biotronik is a leading medical device company founded over 60 years ago in Berlin, Germany. Biotronik and affiliates have over 7,500 employees worldwide.

MSEI is Biotronik’s US based R&D and manufacturing arm. It was founded 45 years ago in Lake Oswego, OR.

Biotronik innovation saves and improves the lives of millions of patients every year.
BIOTRONIK / MSEI, Where Are We?
IMDs: What Are They?

Pacemakers

Implantable Defibrillators
IMDs: What Are They?

Neuro Stimulators

Implantable Monitors
IMDs: What Are They?

Leadless Pacemaker
IMD Non-implantable Parts
Why Work on IMDs?

Anthony Van Loo

• 20 Year-old Soccer Player with KSV Roeselare, Belgium
• Position: Defender
• ICD implanted one year prior for inherited heart disorder
• June 7, 2009: Play-Off Game KSV Roeselare - FC Antwerp
Why Work on IMDs?

• Work that matters – Saving lives.

• Work that’s challenging - Ultra low power design (System lasts 12+ years on a single battery), ultra miniaturized design, and high reliability design.

• Work that’s valued - Safety, quality, and reliability focus. Not focused on driving every penny out of a design.

• Work that’s secure - Not a cyclical business. Insulated form economic downturns.
IMDs: Who Does This Work

Electrical Engineers
- Custom ASIC and board level design
- Ultra low power design
- High reliability design
- Ultra miniaturized design

Software Engineers

Mechanical Engineers

Biomedical Engineers
A Day in the Life of a Facility Design Engineer

January 18, 2024
Who We Are

◊ Founded in 1999 – 120 Staff
◊ Multi-discipline Engineering
◊ Semiconductor and Industrial
◊ Offices in Beaverton and Tempe
◊ Active Projects Across the US

*Blue state indicates licensure.
*Corbin logo indicates employee presence.
Semiconductor Facilities

Facility Types

◊ Chip Manufacturing Facilities (Fabs)
◊ Fab Support Facilities
◊ Central Plants
◊ Tool Manufacturer Facilities
◊ Supplier Facilities
What We Do

Critical Elements of Any Project

◊ Planning/Scoping
◊ Engineering
◊ Preparing Construction Documents
◊ Supporting Construction Efforts
◊ Commissioning
A day in a Life of – A New College Grad/EIT

“Constantly Learning”

◊ Attended internal training class – pipe stress analysis
◊ Reviewed 90% HVAC Design with Client
◊ Chaired 100% tool install package review
◊ Walked Project to validate points of connection
◊ Met with Senior engineer to develop H/C load calcs
A Day in the Life of – A Process Designer

“Do not hold up Contractor”

◊ Attended construction meeting
◊ Attended to high priority response items
◊ Progressed active project design scope
◊ Walked prelim routing of process design
“Keep Client Focused at all Times”

◊ Held status meeting with staff
◊ Attended Client workgroup for 90% of design package
◊ Coordinated priorities with client and contractor
◊ Set aside an hour to progress design ...
◊ Performed QC of anchorage design as EOR
“Ensure Team has the Tools to Succeed”

◊ Chaired staff meeting

◊ Met with junior PM to develop project budget

◊ Wrote proposal for next phase of a fab expansion design

◊ Met with client to review status of all projects

◊ Walked fab project with subconsultants
A Day in the life of – In Summary/Q&A

No two days are the same….
A Day in the Life – Software Engineer

Adam Sohn
Tokyo Electron
Data Engineering and Advanced Analytics Manager
A Day in the Life of a Software Engineer

Agenda
1. Tokyo Electron (TEL)
2. SW Engineering
3. My Resume
4. Daily Life
5. What Industry Needs
TEL is a global company

Worldwide

US
A Day in the Life of a Software Engineer - Product

TEL designs, builds, and services cutting-edge Semiconductor Processing Equipment

Global market share rankings *1

Coater/Developer
Gas Chemical Etch System
Diffusion Furnace
Batch Deposition

Cleaning
Plasma Etch System
Metal Deposition
Prober

TEL Service Advantage

TEL Metrics™
Spare Parts/Repairs
Engineer Support
Total Support Center
TEL Customer .com

Source: tel.com
A Day in the Life of a Software Engineer - Roles
A Day in the Life of a Software Engineer - Workflow

PLATFROM
Source
Data Platform
Platform Apps

CITIZEN DATA SCIENTIST
Build Define Release
Proof Of Concept
Build Define Release
Minimum Viable Product

APPLICATION DEVELOPER
Build Define Release
Mature Application

MY TEAM
A Day in the Life of a Software Engineer - Resume

Degree/Role

BS, Industrial Engineering
Industrial Engineer
Operations Manager
Module Engineer
Masters, Data Science
Data Engineer
Data Team Manager

Why I did it
I like technology.
Job name is degree name.
IE is strategic. Wanted to Experience tactical.
Wanted to work w/ physics.
AI is frontier for everything.
Sticking w/ Semi. There is no AI w/o data.
I like technology.
What happens during your day?

Morning (8:00 AM – 12:00 PM):
- Scrum
- Collaboration
- Technology Exploration
- Planning
- Coding

Early Afternoon (12:00 PM – 3:00 PM):
- Coding

Late Afternoon (3:00 PM – 5:00 PM):
- Communicate w/ Japan
- Recognition
- Learning
A Day in the Life – What industry needs

- Sector, Industry
- Business Acumen
- Enthusiast
- Stay Current

- Portfolio
- Influence
- Communications

- Breadth, Depth
- Fundamentals
- Secondary Expertise
- Enthusiast
- Stay Current

- Ownership
- Awareness
- Career Plan

Industry Expertise

Ability to Deliver

Domain Expertise

Self-Motivated
Thank you to our hosts, sponsors, and participants!

SEMI Pacific Northwest Chapter
Professional Development Seminar (PDS)
*with* Oregon State University

Connecting Students to the Semiconductor Industry

January 18\(^{th}\), 2024
Networking with Industry Leaders