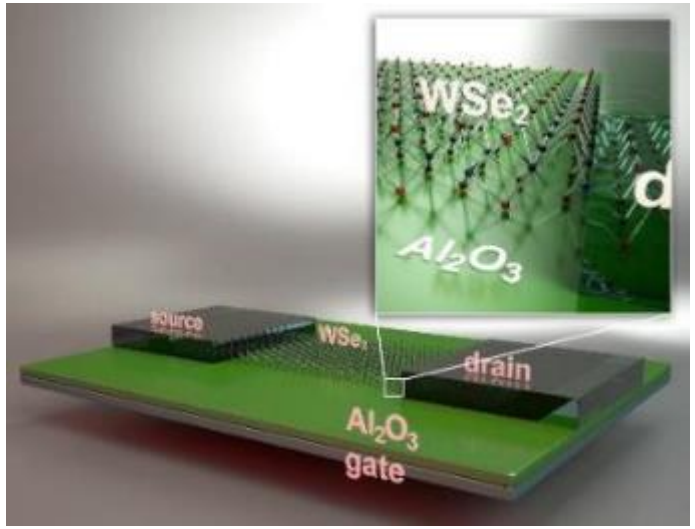
Semiconductor Research Corporation

Because the future can't wait, we bring the best minds together to achieve the unimaginable

Logic and Memory Devices
Research Program Annual Review



Oct 25 – Oct 26, 2022

Samsung Electronics Corporation, San Jose, CA

Kashyap Yellai, Science Director

Tameka Bell, Research Program Coordinator

https://www.src.org/calendar/e007523/

https://www.src.org/program/grc/lmd/

Thank you!

On Behalf of the SRC,

Thank You!

- Samsung Electronics for graciously hosting the event!!
- To all the industry members for their sponsorship and mentorship
- To all the Principal Investigators & their Students for their continued research effort
- To **Tameka Bell (SRC), Harsono Simka (SEC), Aravindh Kumar (SEC), Julia Phan (SEC)** for their time and great support with arranging the event!!
- To all of you for traveling and being in-person with us!

CoVID Safe Reminders

- Masks are highly recommended
- Testing kits are available on-site if you develop any symptoms
- Please stop attending the event if tested positive

SRC

Review Reminders

Everyone will be participating in-person	Presenters should remember to speak clearly and keep within the allotted time.
Timing: 30 min (25 min talk + 5 min Q/A)	Presentations and Q&A will be live. Please be mindful, so watch the time!!!
Informal Presentations	Please indicate if you want the audience to interrupt with questions. Q/A will occur at the end
Industry people: Evaluation form (electronic) to be collected	Submit Compelling Research Reasons (CRR) as appropriate.

Reminder: Invoicing and Deliverables

Regular invoicing

Invoice on regular basis: monthly is preferred

Excess money (calendar year) is considered profit and taxable!

Spending must occur within contract period

Invoicing expected to be at or above 95% invoiced at end of each contract period

Final invoice within 60 days after project ends

Submit deliverables on time: even 1 day is too late!

System will flag delinquencies

Late deliverables will stop invoices being paid and can jeopardize future funding

Contact SRC if there are issues with getting deliverables on time

Pre-publication drafts must be deposited at SRC > 60 days before published

Best practice: deposit draft to SRC website when submitting to journal/conference (also thesis)

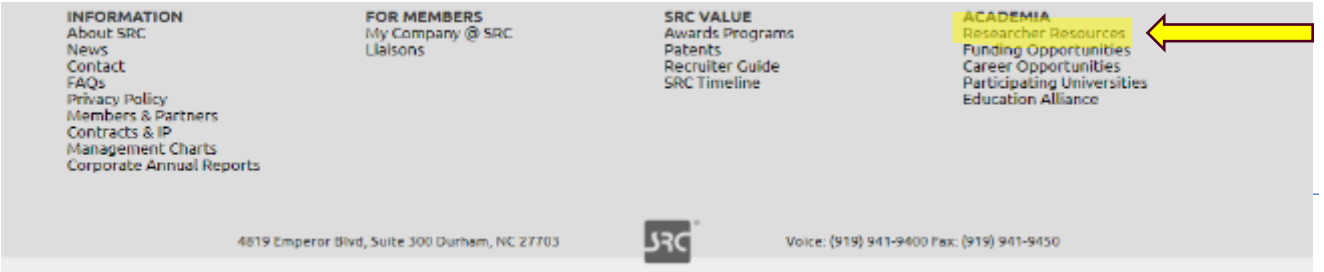
Update the draft on the SRC website with final paper after acceptance (select submit a new version)

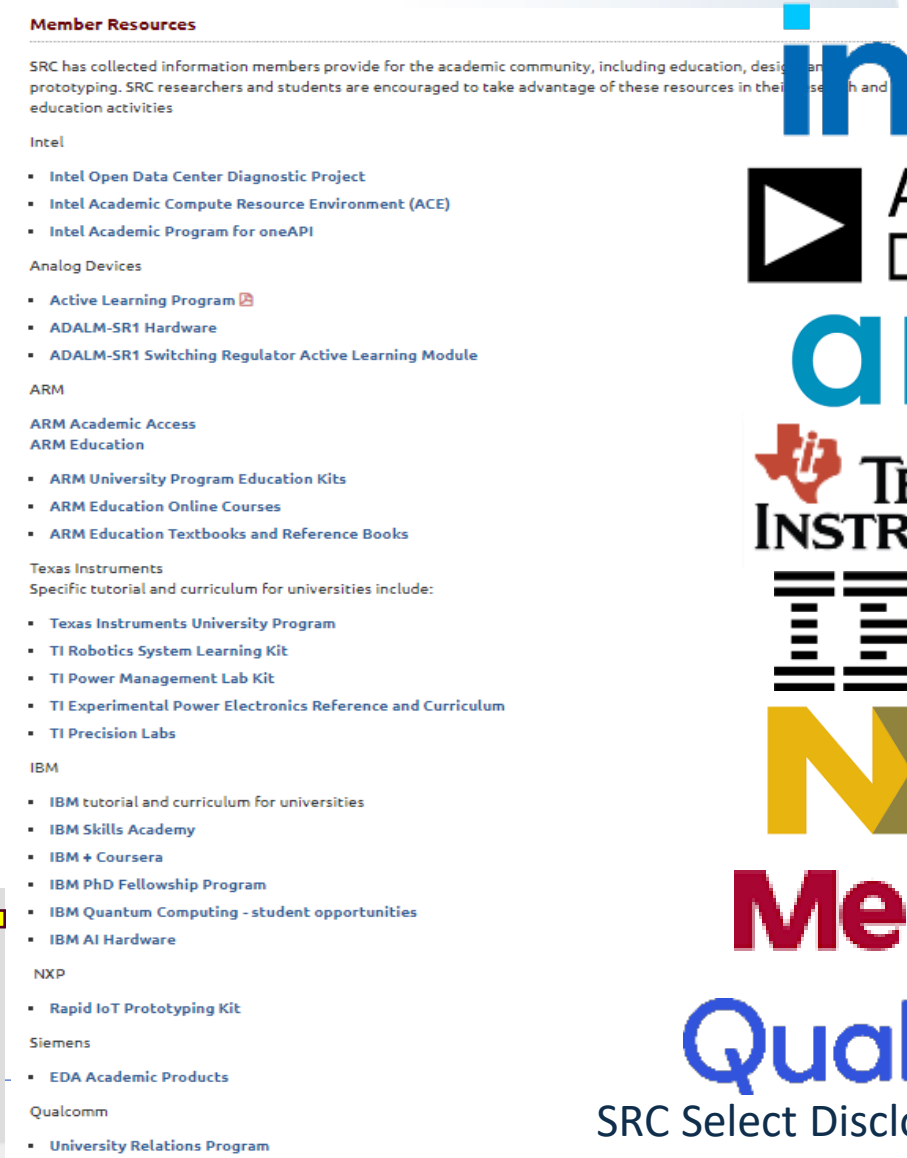
Acknowledgement of SRC funding must be added to all publications

Resources that Help Academics Evaluate, Adopt, and Amplify Emerging Member Solutions

Member Resources

- SRC has collected information members provide for the academic community, including education, design, and prototyping
- SRC researchers and students are encouraged to take advantage of these resources in their research and education activities
- Link to the resources: https://www.src.org/program/grc/guide/researcher/guidelines/





Member Resources

SRC has collected information members provide for the academic community, including education, desig an prototyping. SRC researchers and students are encouraged to take advantage of these resources in thei se h and education activities

Intel

- Intel Open Data Center Diagnostic Project
- Intel Academic Compute Resource Environment (ACE)
- Intel Academic Program for oneAPI

Analog Devices

- Active Learning Program
- ADALM-SR1 Hardware
- ADALM-SR1 Switching Regulator Active Learning Module

ARM

ARM Academic Access
ARM Education

- ARM University Program Education Kits
- ARM Education Online Courses
- ARM Education Textbooks and Reference Books

Texas Instruments
Specific tutorial and curriculum for universities include:

- Texas Instruments University Program
- TI Robotics System Learning Kit
- TI Power Management Lab Kit
- TI Experimental Power Electronics Reference and Curriculum
- TI Precision Labs

IBM

- IBM tutorial and curriculum for universities
- IBM Skills Academy
- IBM + Coursera
- IBM PhD Fellowship Program
- IBM Quantum Computing - student opportunities
- IBM AI Hardware

NXP

- Rapid IoT Prototyping Kit

Siemens

- EDA Academic Products

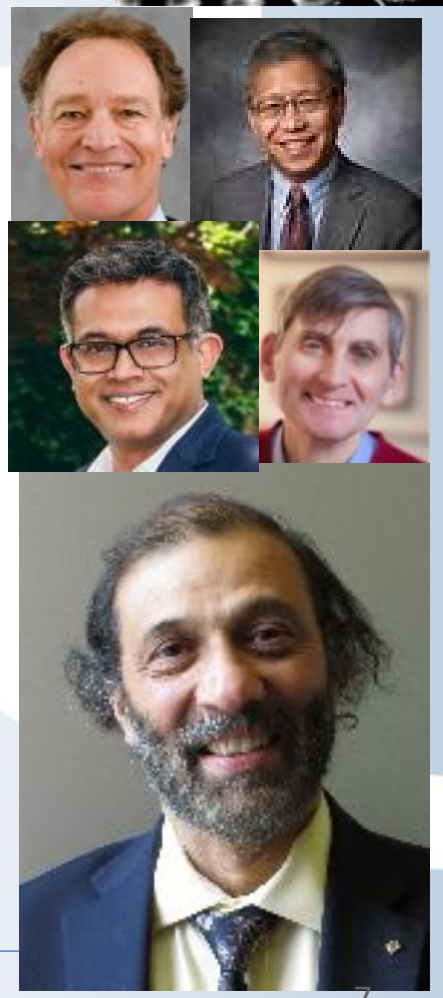
Qualcomm

- University Relations Program

New "Failure to Success" Workshops

https://www.src.org/calendar/failure-to-success/

- New workshop series to highlight challenges faced by our researchers and how they overcame them or set a new direction
  - Not all research will be successful, but we should continuously learn
  - Open to all SRC: industry, other academia, and SRC Research Scholars



- Most recent Failure to Success (5/18): "Lemons are for Lemonade?" by Professor Subu Iyer, UCLA (https://www.src.org/calendar/e007658/), over 160 people attended.

I like very much the concept you have laid out, and I think I have a very nice example to share with the SRC community.

. . .

- More workshops are coming. Please stay tunned!

Reminder: Send News Items to SRC

https://www.src.org/newsroom/newsletter/

- Send noteworthy events and announcements that you and your team are involved in to SRC

- Send this information on a monthly basis. We use what we can in our SRC newsletter and monthly emails to the Advisory Board and liaisons
  - Best Paper Awards (who, award, title of piece, where, when and photos of students/faculty)
  - Papers, posters presentations, and/or conference talks
  - Professional Recognition Awards: IEEE, teaching awards, etc.
  - Professional activities such as workshops, tutorials, and invited talks

More Than 17,000 subscribers!!

- All submissions must have a web link (URL) to the award, paper, etc.
  - If you have your own website that contains information pertaining to your research, share the link with SRC as well

New SRC Student Platform on LinkedIn (Beta)

https://www.src.org/student-center/handbook/linkedin/

Join the Beta Now!

- SRC Student Programs is rebranding to **"SRC Research Scholars" Program**
- What is the **SRC Research Scholars Program**?
  - SRC provides undergrads, graduate students, and postdoctoral researchers with a unique education consisting of traditional course work, cutting-edge research, and direct interaction with the semiconductor industry
  - These Research Scholars work on industry-relevant research with SRC-funded faculty who are recognized experts in their fields
  - Through our extensive community of academics and industry personnel, we nurture the evaluation of the talent pipeline for our industry and beyond
  - Our alumni have become industry leaders and renowned faculty researchers, creating a virtuous cycle where mojo begets mojo

SRC encourages all undergrads, graduate students, and postdoctoral researchers to join this Beta program!!!

Reminder: Student Hiring/Internship information back to SRC

- Relevantly trained students are one of the most valuable outcomes of the funded research
  - Hiring information is an important data point to highlight the value of SRC funded research to our member companies
- Include any SRC students (whether directly funded or participated in some way on the research) that graduated, were hired, or had an internship
  - **If you have a student that is working on the project but funded through other sources have them create a student account with SRC;** this allows SRC to promote them to our industry members
  - And let SRC know how they are being funded; as leveraged funding is a benefit for the members.
- Many students graduate and start the next chapter of their life but leave without updating their student record on the SRC website
  - As your students do internships or accept hiring offers,

PIs are expected to have their students update their accounts at SRC

Intellectual Property Statement

https://www.src.org/about/contracts-ip/#ip

- The information provided by researchers during this annual review
  - Is the property of the university and of the researchers presenting this information
  - May include research results sponsored by and provided to the funding members
  - May include intellectual property rights belonging to the university and SRC, to which sponsors may have license rights

- By attending or viewing this review, you are agreeing
  - Not to use this information for purposes unrelated to the review unless and until approved by SRC
  - To keep this information in confidence until the university and SRC have evaluated and secured any applicable intellectual property rights

- After any intellectual property rights have been secured, the SRC encourages the University and researchers to publish and freely disseminate this information and results of the sponsored research program.
  - Worldwide patent rights are waived if publication or public dissemination occurs prior to filing a corresponding U.S. provisional or utility patent application

General Data Protection Regulation

https://www.src.org/app/account/guide/privacy-policy/

- Applies to SRC
- Personal data regulations
- Involves privacy notices, consent, and security
- SRC Privacy Policy

Agenda for Annual Review, 25th October
https://www.src.org/calendar/e007523/ (2- days in person at SEC, San Jose)

Tuesday, October 25		
8:00 - 8:30 am	Registration / Poster Setup	
8:30 - 8:45 am	Samsung Introduction	Harsono Simka
8:45 - 9:00 am	Introduction	Kashyap Yellai / SRC
9:00 - 9:30 am	**3001.001**: Low Temperature HZO Ferroelectric Technology for FEOL and BEOL Applications	Jiyoung Kim / UT/Dallas
9:30 - 10:00 am	**3042.001**: Solving Memory Bottleneck with Transformable Logic Devices and 3D Hybrid-Core Systems	Wenjuan Zhu & Shaloo Rakheja / UIUC
10:00 - 10:30 am	**3007.001**: High Speed Ultrawide Bandgap Gallium Oxide Transistors	Uttam Singisetti & Hongping Zhao / Univ. at Buffalo
10:30 - 10:45 am	Break	
10:45 - 11:15 am	**3011.001**: Exploring Weyl Semimetals-Based Interconnect, Via, and TSV	Shengxi Huang & Swaroop Ghosh / Penn State
11:15 - 11:45 am	**3010.001**: Electrochemical Artificial Synapse (EAS) Based on Ion Intercalation	Bilge Yildiz & Jesus A. del Alamo / MIT
11:45 - 12:15 pm	**2962.001**: Thin Film Back-end Transistors for ultra-low Leakage, High-density Memory Applications	Ananth Dodabalapur & Saikat Chakraborty / UT/Austin
12:15 - 1:15 pm	Lunch / Poster Session	
1:15 - 1:45 pm	Industry Talk *"Readiness for Custom/Advanced Semiconductor Packaging: SAMSUNG DS"*	Vincent (Woopoung) Kim, EVP Samsung Packaging Solutions Center
1:45 - 2:45 pm	**2961.001**: Multi-Component Semiconducting Oxide FETs: Materials-Device Co-Design, Synthesis, NanoFabrication, Characterization and Benchmarking	Suman Datta / Univ. of Notre Dame
	2958.001: Multi-bit-per-Cell Ferroelectric FET Memory using Ferroelectric (FE) Superlattice with Anti-Ferroelectric (AFE)	
2:45 - 3:15 pm	**2956.001**: Materials Design for Steep Subthreshold Slope MOSFET with Single Atomic Scale Filament	Hyunsang Hwang / POSTECH
3:15 - 3:30 pm	Break	
3:30 - 4:00 pm	**3009.001**: CVD TMD CMOS Process Integration	Sanjay K. Banerjee & Jatin Singh / UT/Austin
4:00 - 4:30 pm	**3008.001**: The Development of a Monolayer Ferroelectric ZrO2	Charles Ahn / Yale
4:30 - 5:00 pm	**3000.001**: Ferroelectric Domain Switching in the GHz Regime	Jesus A. del Alamo / MIT
5:00 - 5:15 pm	Break	
5:15 - 6:15 pm	TAB Caucus - **TAB Members Only**	
6:15 pm	End of Day 1	

Agenda for Annual Review, 26th October
https://www.src.org/calendar/e007523/ (2- days in person at SEC, San Jose)

Wednesday, October 26		
8:00 am - 8:30 am	Registration / Poster Setup	
8:30 am - 8:45 am	Introduction	
8:45 am - 9:15 am	**3006.001**: Non-volatile Magnetoelectric Switching of a Nanomagnet Below 250 mV and 100 aJ Dissipation Through Enhanced Thin Film Magnetostriction	John T. Heron / Univ. of Michigan
9:15 am - 9:45 am	**3004.001**: Interfacial Phase Change Memory (IPCM): Multi-bit/Cell Storage, Scaling, Performance Optimization and Understanding	Kenneth E. Goodson & Mehdi Asheghi-Roudheni / Stanford
9:45 am - 10:15 am	**3002.001**: New Layered 2D Gate Dielectrics for Scaled BEOL Transistors	Christopher Hinkle / Univ. of Notre Dame
10:15 am - 10:30 am	Break	
10:30 am - 11:00 am	**2957.001**: Advanced Computational Modeling for Reliable Design and Processing of Dielectric Materials	Reinhold H. Dauskardt / Stanford
11:00 am - 11:30 am	**3003.001**: Anti-damping Field-free SOT-MRAM with Out-of-Plane Polarized Spin Injection	Luqiao Liu / MIT
11:30 am - 12:00 pm	**2963.001**: Low-Temperature 3D Integration of Wide Bandgap RF and Power Electronics on Si CMOS Platform	Tomas Palacios & Xi Ling / MIT
12:00 pm - 1:30 pm	Lunch / Poster Session	
1:30 pm - 2:00 pm	**3107.001**: Development of Deep Level Transient Spectroscopy (DLTS) and Impedance Spectroscopy for the Electrical Characterization of the Semiconductor in Semiconducting Oxides	Paul Hurley / Tyndall
2:00 pm - 2:30 pm	**2955.001**: Doped Aluminum Nitride Ferroelectric Memories	Roy Olsson & Jeffrey Zheng / Univ. of Pennsylvania
2:30 pm - 3:00 pm	**2959.001**: Material, Device and Circuit-Compatible Modeling of HZO based Ferroelectric and Anti-Ferroelectric Transistors	Sumeet K. Gupta / Purdue
3:00 pm - 3:30 pm	**2999.001**: Understanding the Interplay between Charge Trapping and Polarization Switching Through Complementary Ferroelectric FETs and Exploring Novel Technology Applications	Kai Ni & Zhouhang Jiang / RIT
3:30 pm - 3:45 pm	Break	
3:45 pm - 4:45 pm	TAB Caucus - **TAB Members Only**	
4:45 pm	End of LMD Review	

Semiconductor Research Corporation

Coming to SRC in Q1 2023

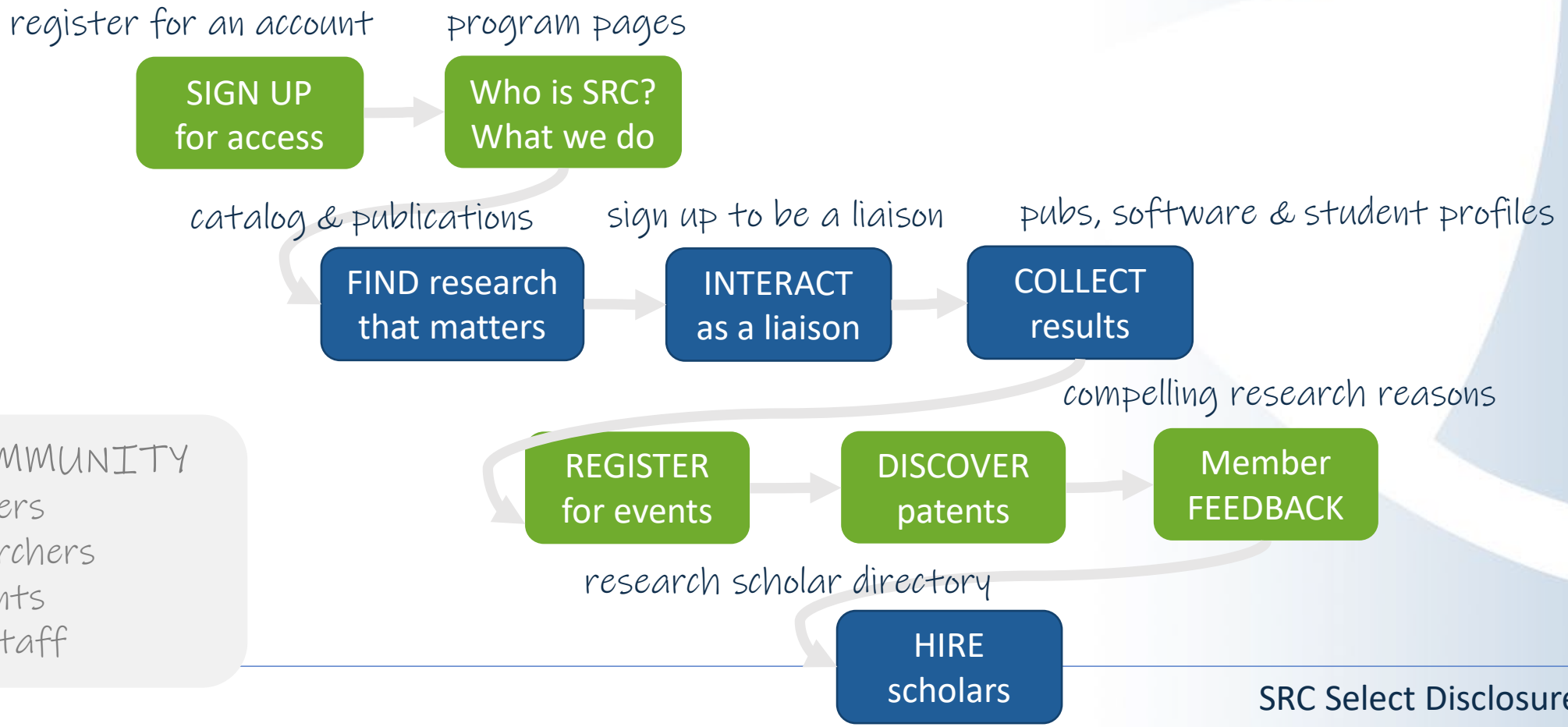
New Research Management System

PILLAR SCIENCE

www.src.org TODAY

What do we use our website for?

Today we use our website to…



SRC COMMUNITY

- Members
- Researchers
- Students
- SRC Staff

www.src.org Q1 2023

What will we use it for *after* Pillar launch?

We will use our website to…

register for an account

program pages

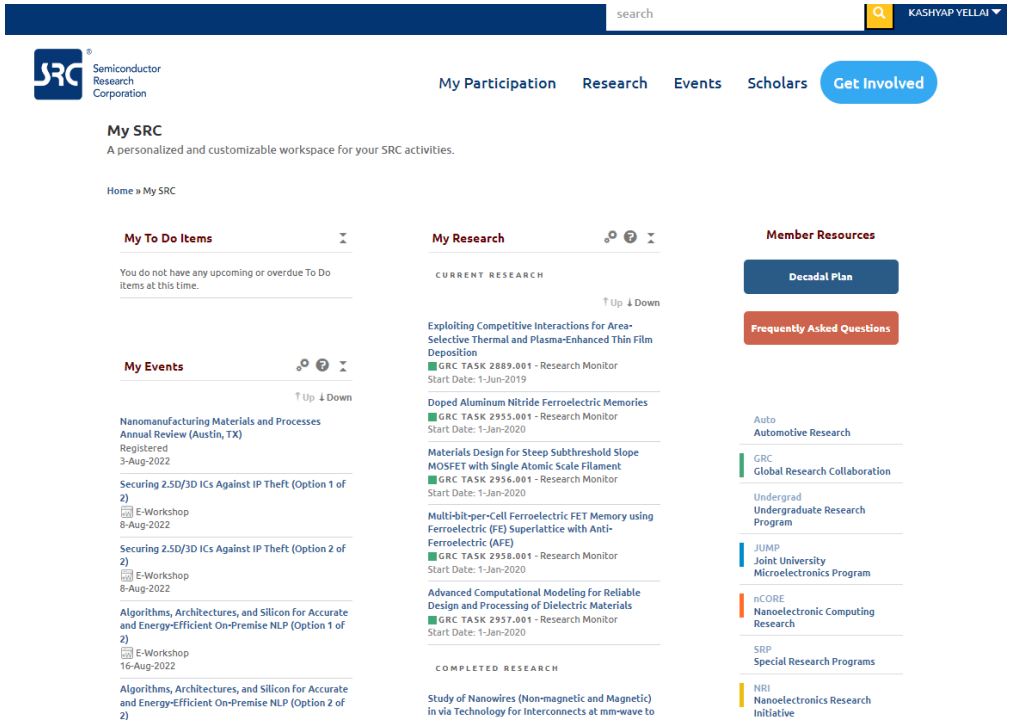
SIGN UP for access → Who is SRC? What we do

REGISTER for events → DISCOVER patents → Member FEEDBACK

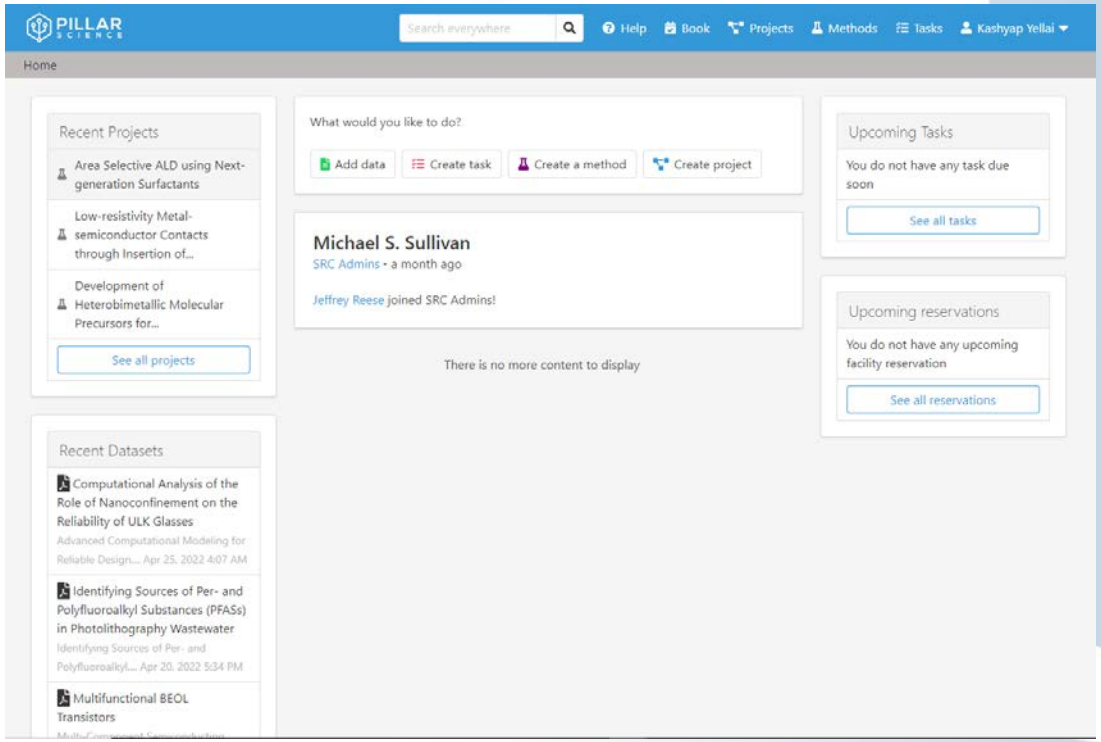
compelling research reasons

Sneak Peak – Subject to Change

SRC.ORG – My SRC



Pillar Science – Home



Looking for Beta Testers

- If interested, contact kashyap.yellai@src.org to participate in beta testing of Pillar Science

Thank You!

Kashyap Yellai

Kashyap.Yellai@src.org

July 21, 2022