DEAN'S MESSAGE

Dear Alumnus,

Warm wishes from your alma mater.

Let me begin with some exciting news for you:

IIT Bombay has been placed second in India and 172nd overall (2023) in this year's Quacquarelli Symonds (QS) World University Rankings. The Institute has moved up five positions from its overall performance in this recent ranking in 2022. We are slowly, but surely, making our way to our 2030 goal of making it to the top 50 universities in the world.

I am delighted to inform you that IIT Bombay's annual CSR Conclave, Tech for Sustainable Development, was held on July 6, 2022. Socially conscious corporates and CSR heads witnessed ground-breaking research and infrastructure projects currently underway at the Institute. They will partner with researchers and faculty members from the Institute on several pioneering projects based on the core themes of this year's conclave – education, healthcare, rural development and agriculture, sustainability, skills and entrepreneurship, and women empowerment, social and policy development. You can find more details on the conclave at:

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We will also host our alumni from the Indian Civil Services for a three-day weekend reunion in July. It is a chance for them to reacquaint themselves with their old classmates, take a trip around campus, and enjoy the many activities planned over the weekend. I am eagerly looking forward to meeting with them.

Let me now share with you some of the key events that took place at the Institute over the past month.

- I want to begin by congratulating Dr. Marlene Kanga (B. Tech, Chemical Engineering, 1976) who was recently appointed an Officer of the Order of Australia for her distinguished service to engineering. This is just one more in a long list of accolades that Marlene has received over the years. I wish her all the very best moving forward.

- Dr. Ananth Iyer (B. Tech, Mechanical Engineering, 1982) was recently appointed as the Dean of the University at Buffalo's School of Management after a remarkable academic stint at Purdue University. I have no doubt that Ananth brings to this new role all of his knowledge, experience, and wisdom to his students at Buffalo. My heartiest congratulations and best wishes to him as he takes up this new and challenging position

- Please join me in congratulating Dr. Urmila Diwekar (M. Tech & Ph.D., Chemical Engineering, 1988) who has won the very prestigious 2022 Cast Computing Practice Award. The award recognises outstanding practices or applications of chemical engineering to computing and system technology. I wish her many more awards in the future.

- Sharad Saraf (B. Tech, Electrical Engineering, 1969) who was instrumental in setting up TCA2I at the Institute recently was conferred with an Honourary D. Litt degree (a post-Doctoral degree) by Shri Jagdishprasad Jhabarmal Tibrewala (JJT) University at Raj Bhavan, Mumbai. This was a timely and distinguished gesture from JJT University for a very deserving IIT Bombay alumnus. Undoubtedly, Sharad will mentor the students of JTT university and help accelerate its growth in the days to come. My best wishes to him.

- Our very own current faculty member, Prof. Guruswamy Kumaraswamy, from the Department of Chemical Engineering, IIT Bombay, has been appointed as an Associate Editor for the prestigious magazine, Soft Matter. I am sure that his contributions to the editorial board will greatly elevate the journal in the national ecosystem as well. Our hearty congratulations and best wishes to Guru as he takes up this new role.

- I feel thrilled to convey that Suraj Saharan (B. Tech, Mechanical Engineering, 2005) recently took his new-age logistics and supply chain startup company, Delhivery, public. Since its launch in 2011, Delhivery has risen meteorically over the past decade and has set standards that have changed the very paradigm of the business. Congratulations to Suraj and we look forward to witnessing new and exciting growth for Delhivery.

- Seventeen-year-old Apeksha Fernandes, resident of IIT Bombay, and daughter of Prof. Bavlon (Faculty and Former Head, EE, IITB) and Mrs. Shalet Fernandes won 4 individual swimming gold medals, and one gold and a silver medal in two team events, in the recent Khelo India youth games held at Ambala. She also broke the long-standing Indian record in the 200m butterfly race. Heartiest congratulations to this rising young swimming talent. The IIT Bombay fraternity feels proud of her achievements. I am also very delighted to convey that the Rahul Bajaj Technology and Innovation Centre (RBTIC) was formally inaugurated on June 10th, 2022 (coinciding with the birth anniversary of Late Shri Rahul Bajaj). The centre was inaugurated in the august presence of Dr. R. A. Mashelkar and the entire Bajaj family. I invite you to visit this very nice and eco-friendly building when you visit the Institute next. Given that the SINE, IDC, and IRCC will be housed in this building, it is a unique confluence of research, innovation, and design in this building…indeed an epitome of 'Buland Bhaarat ki Buland Tasveer'.

- The Institute inaugurated the Tinkerers' Lab at its Department of Chemical Engineering on June 13, 2022, with an official ceremony. Padma Vibhushan awardee, and Emeritus Professor of Eminence, Institute of Chemical Technology, Prof. M. M. Sharma graced the occasion as the chief guest. I was honoured to give the welcome speech on the occasion. Tinkerers' Lab is designed to be a space that will encourage "hands-on" learning for IIT Bombay's engineering students. I am extremely thankful to Shri Yogesh M. Kothari, Chairman and Managing Director of Alkyl Amines, and our very own, IIT Bombay alumnus, Mr. Kirat Patel (B. Tech, Mechanical Engineering, 1975), and Executive Director of Alkyl Amines, for their generosity in funding the Lab through their CSR initiative.

A large number of alumni have generously funded and established Chair Professorships at the Institute along areas that they envision the Institute's contributions to national growth. Beginning this newsletter issue, I will feature the recent Chair Professorship appointments and the thrust of research that the incumbent faculty at IITB has been engaged in.

Before I sign off – I want to sincerely acknowledge all your love and affection for the Institute and your continued generosity, and trust that you will continue to support your cherished alma mater in the future, as well. Your spirited involvement has contributed immensely to the Institute's advancement. Now that our lives are slowly returning to normal, I hope you will come by and visit us on campus soon.

Sincerely,

Prof. Ravindra D. Gudi, Ph.D., FNAE and FIIChE
Dean – Alumni and Corporate Relations
Institute AI & ML Chair Professor

FACULTY INTERVIEW

Professor Prita Pant

From pursuing a career in a niche domain to managing the Institute's academic programs during the pandemic, Prof. Pant has demonstrated extraordinary skills, strength, and patience throughout her career. She's also taken up varied causes that support the Institute and the world around us like IIT Bombay's Women's Cell and more.

Join us as we learn more about Prof. Pant's journey.

Prof. Pant, you completed your B. Tech in metallurgical engineering from Roorkee University (now IIT Roorkee), Roorkee, India, in 1997, and received your M.S. and Ph.D. in Materials Science from Cornell University Ithaca, NY.

What compelled you to pursue this field of engineering? How has the scenario changed for women from then till now in this domain?

The first degree was decided by my rank in the entrance exam. I did not know much about metallurgical engineering when I joined IIT but was fortunate to have a couple of excellent teachers who kindled my interest in the subject. And subsequently, I decided to pursue a Ph.D. degree in the area. When I started my undergraduate studies, there were limited opportunities for women in metallurgical engineering – steel plants or auto manufacturing companies were the primary recruiters. However, when I went to the US, metallurgical engineering programs had morphed into materials science and suddenly the scope for employment expanded manifold – glass-making companies, semiconductor industries, companies that make equipment for the semiconductor industries, and so on, were recruiting from materials science. Unfortunately, that level of variety in industrial R&D positions is not yet available in India. But companies such as GE, Applied Materials, TATA Steel, and others have made a start and now have a fairly substantial R&D footprint in India.

Your research interest areas vary from Mechanical Behavior of Thin Films, Dislocation Dynamics Simulation of deformation, Nanoindentation studies of heterogeneous deformation in metals, to Ni-Ti based shape-memory materials. Can you explain your research in layman's language and speak about its implications for society and mankind?

My research interest lies in the area of the microstructure of materials and how it influences their properties – such as strength, and deformation. All materials are made of atoms or molecules, and their properties depend on how the atoms are arranged and bonded to each other. Think of a group of people (say on a train station in Mumbai) and you have to get through them to reach your train. If they stand close to each other and interlock their arms, it would be very difficult for you to get through. This group of people is like a strong material. If the same group of people was standing further apart and holding each other's hands loosely, you could push through them relatively easily because the "strength" is low. Also, no real material is perfect – they have defects that play an extremely important role in how strong or weak a sample is. Think of a chain made up of many links – when the chain is pulled, it would break from the weakest link. So, one weak link (or defect) could weaken an otherwise strong chain.

The popular notion is that the second wave of scientific inventions will emerge from the materials domain. Can you talk about how the future looks in the materials area?

Yes, it does seem like all research at this point is in the area of materials – be it in biology, where work is ongoing on making treatment affordable and accessible, or manufacturing where there is a lot of excitement about building things "additively" and thus saving on time and money in the repair of expensive components such as turbine blades in jet engines. Then there is renewable energy generation and energy storage, which is expected to slow down the environmental degradation that fossil fuels have exacerbated. With an increase in computational resources, there is an extensive ongoing effort to use machine learning to predict the properties of materials, thus reducing the time, and money required to develop new materials or tailor the properties of existing materials.

Changing gears…you served as Associate Dean for Academic Programs for four years and your tenure ended recently. How was your overall experience as Associate Dean?

It was a very good learning experience. I worked with Prof. Amitava De (Dean of the Academic Programme and a storehouse of information) and staff members of the academic programme who manage a very diverse and flexible curriculum for about 12,000 students of IITB. I also understood how academic programmes are administered, interacted with various academic units, and dealt with academic issues that involved students. I maintained an "open door" policy as far as students were concerned, and found that, often, problems can be resolved by hearing out students and then explaining your perspective/constraints to them.

Prof. Pant, you shouldered the responsibility of managing the Institute's academic programs while the country was battling the deadly pandemic. How tough was it to keep our students engaged and pursue their academics during this very tough time?

Well, I was not responsible for keeping all of the students engaged – that was still the responsibility of individual course instructors. My responsibility involved implementing changes that were essential to the online mode of teaching and learning like rules related to student attendance. We also had to revise some of the set courses since it wasn't possible to run labs in a distance mode. Most importantly, we had to be mindful that the pandemic affected both the mental and physical well-being of our students, faculty, staff, and their family members. We also had to handle requests for monetary concessions, issues about bereavement in families, and other sources of emotional distress, and consider them on a case-to-case basis.

You also supervised the complex task of rebooting IIT Bombay and bringing our students back to campus - all while following the strict norms of the pandemic and guarding our students' overall health. Can you take us through that process?

This was a task for which I was never trained. With the help of several faculty colleagues and student members, we first came up with a priority list of those who needed to return to campus urgently – starting with the senior-most Ph.D. students. These students needed to finish experiments, run simulations or analyze their data – which (in most cases) needed resources that were only available in their labs at IITB. Considering that they are given a stipend for only a limited number of years added to their stress levels.

Also, as students started trickling back, the Dean and Associate Dean of Student Affairs had to deal with Covid 19 protocols including isolation, sanitation, and quarantine in hostels, which have traditionally been places of togetherness and camaraderie among students.

Another category of students who needed to return to campus was the "resource-constrained" students – those who could not continue to attend classes from home because there wasn't adequate internet access, hardware, space, or other personal issues. I learnt so much about the personal challenges that some students deal with, and it gave me immense respect for their academic achievements in the face of the hurdles that they face.

Changing tracks again – you're very actively involved in women's rights and women's issues and served as the convener for the Women's Cell at IIT Bombay. Can you talk a little bit about the Women's Cell and what it does on a day-to-day basis at the Institute?

The name of Women's Cell has now changed to Gender Cell to accommodate various gender identities. IIT Bombay's Gender Cell investigates sexual harassment complaints through the Internal Complaints Committee. The broader mandate of the Gender Cell is to foster an environment where people can work harmoniously irrespective of their gender. The Gender Cell organizes awareness sessions, workshops, and discussions and has recently rolled out a course on Gender Awareness which is mandatory for all students.

Can you talk to us a little about your own personal journey here at IIT Bombay?

When I joined the Department of Metallurgical Engineering and Materials Science in 2006, I was the first woman faculty member. I was apprehensive about the challenges that would come my way. But over the years, I learnt a lot from colleagues, students, and staff members that I have interacted with and it's been a highly rewarding experience so far. The experiences that I cherish the most are when I have been able to help students who were dealing with problems or, at least, lend them an ear when all that they needed was an empathetic listener.

Finally, what advice would you give young girls who wish to become engineers?

Go ahead and do it. As long as it makes you happy, and you are willing to work hard, you can do anything that you set out to do. Don't let others decide what goals you can or can't achieve.

On that extraordinarily positive note, we'd like to thank Professor Pant for speaking with us. She is truly an inspiration to young students, especially young girls, as they pursue a career in engineering.

SPECIAL REPORT

Centre (RBTIC) – A Fitting Homage to an Industry Magnate

The Rahul Bajaj Technology Innovation Centre (RBTIC) was inaugurated on June 10, 2022, at IIT Bombay. Present on the occasion were Chief Guest, Dr. R. A. Mashelkar, former Director-General, Council of Scientific and Industrial Research (CSIR), Mr. Niraj Bajaj, Chairman, Bajaj Auto Limited, Director of Bajaj Group of companies, and Director of IIT Bombay, Prof. Subhasis Chaudhuri. Several members of the Bajaj family also attended the function.

The foundation stone of the RBTIC was laid on November 14, 2018, by then Chairman of Bajaj Groups, the late Shri. Rahul Bajaj himself. His generous donation helped the Institute build a Centre that brings together innovation, entrepreneurship, and R&D activities, under one roof. Fittingly, an entire floor in the 7-storey building has been reserved for the Society for Innovation and Entrepreneurship (SINE), Industrial Research and Consultancy Centre (IRCC), and the IDC School of Design.

Dr. Mashelkar, in his inaugural address, hailed the late Shri. Rahul Bajaj as a bold visionary and urged the next generation of IITians to be inspired by his courage, conviction, compassion, innovation, and passion. Mr. Mashelkar said, "I am sure that RBITC, inspired by this legendary icon of our times, will be a thriving platform for nourishing NextGen innovation-led world-class game-changing entrepreneurs."

Mr. Mashelkar and Mr. Niraj Bajaj also launched a technology book published by the Industrial Research and Consultancy Centre titled, "IIT Bombay's Ideas and Innovations for Society' (IBIS). The book highlights more than 100 technologies developed in-house and which are at various technology-readiness levels. Showcased technologies in the book span from defense to healthcare, robotics to environment and sustainability, communication to clean energy, and more.

Finally, Mr. Niraj Bajaj thanked the Institute for building an iconic technology innovation centre. He said he was gratified with the inauguration of RBTIC, which is a fitting homage to a man who dreamt of establishing a state-of-the-art research and innovation facility to ignite the minds of budding students and benefit society at large. He remarked, "Shri Rahul Bajaj's dreamt of establishing a centre for innovation, entrepreneurship, and R&D. The future belongs to the young and RBTIC will always support them."

Please also see the article in the earlier newsletter reminiscing Late Shri Rahul Bajaj's many distinguished contributions to IIT Bombay.

https://10.199.4.220/iit-bombay-pays-homage-to-indian-industry-magnate-late-mr-rahul-bajaj/

DONOR INSTITUTE CHAIR PROFESSORSHIPS

Prof. Malhar Kulkarni appointed as Sumati and Atmaram Kotwal Sanskrit Acharya Chair

About the Donor:

Mr. Deepak Kotwal, (B.Tech, 1970, Mechanical Engineering) donated generously towards setting up the "Sumati and Atmaram Kotwal Sanskrit Acharya Chair" to promote the pursuit of education in the field of science and technology in Sanskrit.

About the Appointee:

Prof. Malhar Kulkarni was recently appointed the Sumati and Atmaram Kotwal Sanskrit Acharya Chair.

Prof. Kulkarni has a long and illustrious career in the Sanskrit language. After completing his Ph.D. in Sanskrit from the University of Pune, he trained in traditional and modern methods of Sanskrit learning. After joining IIT Bombay, he collaborated with Professor Pushpak Bhattacharyya, Department of CSE, IIT Bombay, and developed the Sanskrit Wordnet.

Prof. Kulkarni has also created the Corpora and Dependency Tree Bank of Marathi which can be applied in the field of Natural Language Processing (NLP) and Computational Linguistics. He is a member of the Centre for Indian Language Technology (CFILT), CSE, IIT Bombay. As part of CFILT, he worked towards developing a language teaching/learning aid called Shabdamitra.

His other accomplishments in Sanskrit include contributing to the development of the Textual History Tool (THT) which uses phylogenetic methods to track down the history of texts. He is currently collaborating with Eivind Kahrs, University of Cambridge, UK, on a critical edition of the Kasikavrtti (7th Century CE). He is also editing the 16th century commentary, Suktiratnakara, on the Vyakarana Mahabhasya of Patanjali, for publication.

Over the years he has published his creative writing extensively in Sanskrit, as well. These include short stories, verse poems, plays, and translations. He also provides cricket commentary in Sanskrit.

He is the recipient of multiple accolades including the Maharshi Badarayana Vyas award from the President of India in 2009, and the Excellence in Teaching Award at IIT Bombay in 2017.

Prof. Malhar Kulkarni teaches Paninian grammar and Philosophy of Language at the Department of Humanities and Social Sciences, IIT Bombay.

Prof. Ranjith Padinhateeri appointed as Dr. P. V. Sukhatme Chair Professor

About the Donor:

Padma Shri awardee, Prof. S. P. Sukhatme, has kindly donated to IIT Bombay establish a Chair Professorship in memory of his late father. The "Dr. P. V. Sukhatme Chair in Biostatistics" is an honour awarded to faculty members to acknowledge their contributions to high-impact research and teaching in biostatistics and associated applications. This Chair Professorship will pay homage to the late visionary's pioneering work.

About the Appointee:

Prof. Ranjith Padinhateeri, Department of Biosciences and Bioengineering, was recently appointed as the Dr. P.V. Sukhatme Chair Professor.

Prof. Padinhateeri brings to the Chair Professor position an enviable academic and research background, as well as several awards to his name.

Prof. Padinhateeri got his M. Sc (2000) and Ph. D. (2005) in Physics from IIT Madras. His inter-disciplinary research in biological physics led to his Post-Doctoral Fellowship (2005-2009) from the University of Illinois at Chicago, Northwestern University, Evanston, USA, and Institute Curie, Paris.

Prof. Padinhateeri joined IIT Bombay as an assistant professor in 2009. Prof. Padinhateeri's team developed computational models to discover how genetic information is organized inside living cells and explained the statistical nature of the organization of the genetic information into a folded polymer structure called chromatin.

Prof. Padinhateeri's research has been published in reputed international journals like PNAS, Nucleic Acids Research, JACS, PLOS Computational Biology, and Biophysical Journal.

He has also won several awards including:

– IIT Bombay Research Publication Award, 2020

– National Bioscience Award, Department of Biotechnology (DBT), India, 2018

– Excellence in Teaching award – IIT Bombay, 2014

– Senior Innovative Young Biotechnologist Award (Sr. IYBA), DBT, India, 2013-14.

– Innovative Young Biotechnologist Award (IYBA) DBT, India, 2009-10.

Prof. Padinhateeri teaches courses on Mathematical Modeling and Simulation of Biological processes, Biostatistics, Biological Thermodynamics, and Biophysics at IIT Bombay.

STUDENT SUCCESS STORY

IIT Bombay General Elections 2022 were held on campus in March 2022

Here, he takes us through the thrill of winning this election, what sports mean to him, and how he plans to fulfill the mission he laid out in his Sports Manifesto.

Read on for more on Ketan's journey.

Ketan, many congratulations on becoming the General Secretary of Sports Affairs (GSSA). Take us through how you feel after winning this position.

'Vision with action makes a powerful reality.'

These words by Ron Kaufman have always motivated me to be a better version of myself and work towards turning my dreams into reality. I did not go through this process on my own. The support I received from my friends and campaign volunteers made it easier as I navigated through this tough journey. I also want to thank my seniors, fellow councilmates, and SAC functionaries who helped me understand the current needs of the community. IIT Bombay has always been open to all sports enthusiasts, amateurs, and experts, and we hope that everyone gets an opportunity to stretch their sporting abilities.

You're a sports player yourself and you connect with the concerns of other athletes and sportspersons. What are some of the key issues facing sports players at IIT Bombay and how do you plan to address them?

I've observed IIT Bombay's sports community for almost 3 years now and I think fledgling sportspersons are extremely enthusiastic but need more supervision. My goal is to ensure that sports secretaries are in touch with their respective coaches and help identify potential players and keep them motivated.

Since we've had a break of almost two years a lot of juniors are unaware of the importance of the Inter IIT and GCs. I have planned a Blackcats' Convention to enthuse budding athletes and inspire them to clinch the Inter IIT competition. For resolving any team-related issues, there will be a Grievance Redressal portal that will ensure prompt action. The mental well-being of an individual is as important as their physical well-being. We will hold psychological evaluation camps bi-annually to enrich the mental health of all our sportspersons at IIT Bombay. For beginners who are just starting on their fitness journey, we are planning on a Personal Fitness Regime Planner (PRFP) in accordance with the IITB Sports App.

IIT Bombay has a long-standing legacy in sports. What are some strategies you have planned to elevate the Institute's name across various sporting platforms during your tenure?

IIT Bombay offers endless opportunities and world-class facilities for its sportspersons. The Institute's support and encouragement allowed me to make it to the Inter IIT Hockey team in my freshman year. My senior team players and coaches had a strong influence on a budding athlete like me and I want my juniors to have the same zeal and support that I got. For the upcoming Inter IIT, we will focus on intra-contingent bonding by organizing several events. We also plan to have competitive but informal offline events like the Tour De Insti, a cycling marathon, to better engage our cycling enthusiasts and create a cycling club in the process. IIT Bombay's Indian Games team participates in Udghosh every year. To better equip them for the tournament, we will organize the Indian Sports Extravaganza.

In your manifesto, you said that you will cater to the fast-evolving new normal of sports. What does that mean for those of us who aren't particularly savvy about sports in general?

As the pandemic has slowly loosened its grip on us, we are shifting toward more offline events. Focusing on the physical and mental well-being as we start fresh after the pandemic will be our top priority. Apart from the events conducted for students, we will organize other events like staff matches and workshops for our campus residents as well. As students slowly return to campus, we will organize Sophiesta, which will cater specifically to our incoming sophomores. We also plan an inauguration event, La Cérémonie, to showcase the grandeur of the Sports GC. We will also establish one-to-one mapping among sports and hostel representatives for better accountability.

Nothing brings together people more than sporting events and cultural activities. Are there any plans in the upcoming future to engage more alumni members with their alma mater by way of organizing sporting events just for them?

The contributions made by our beloved alumni in building the sports culture of IIT Bombay are immense. We want our new players to understand and appreciate the dedication and motivation that our seniors had towards the GCs and Inter-IIT. We plan to invite our alumni to the Blackcats Convention which will be held 100 days before Inter IIT 2022. We are also planning Blackcat Expeditions which are short contingent excursions geared toward increasing the camaraderie among the members of the Inter-IIT contingent where our alumni will be invited to play and connect with the players. Finally, on December 22, 2022, Alumni Day, we will organize sporting events for our alumni so that they can relive their time at their alma mater all over again.

On a lighter note, can you share a happy moment or funny anecdote from the election campaign?

The election journey has been a great learning experience on multiple fronts. If I had to highlight one specific event it would be the SOAP Box. This is when students get an opportunity to connect with the candidate and get to know their views and make an informed decision while voting. Getting asked questions by those who had different opinions and views really allowed me to present my arguments more cogently and logically. On the day of the SOAP Box, all my friends and supporters turned out in huge numbers to cheer for me.

And, finally, on March 26, 2022, I won IITB's General Election - Sports. Our team was thrilled since we won by a huge margin. It felt surreal. All the sleepless days and nights of hard work had finally paid off. My friends gathered in large numbers and carried me on their shoulders from Hostel 1 to Hostel 3 where I gave my Thank You speech and thanked all my supporters. Everyone cheered for me throughout. It was a total dream come true moment for me.

And on that wonderful and cheerful note – we wish Ketan the very best as he takes over as the General Secretary of Sports Affairs at IIT Bombay for 2022-23. Undoubtedly, IIT Bombay will excel in sports with such an enthusiastic and hardworking secretary at the helm.

NEWS FROM IIT BOMBAY

Dr. Marlene Kanga Appointed Officer of the Order of Australia for Distinguished Service to Engineering

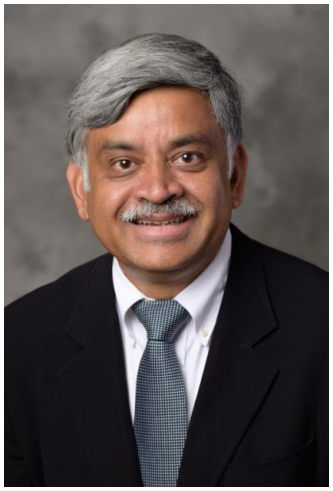
Distinguished Alumnus of IIT Bombay, Marlene Kanga (B. Tech, Chemical Engineering, 1976), was recently appointed an Officer of the Order of Australia for her distinguished service to engineering.

Kanga's long and illustrious career began when she was only the third woman to graduate in Chemical Engineering from IIT Bombay. She now sits on several boards in Australia – the Sydney Water Corporation, Air Services Australia, Standards Australia, and other boards involving innovation and the commercialization of new technologies.

IIT Bombay's CSR Conclave, Tech for Sustainable Development, 2022, Is A Huge Success

Tech for Sustainable Development- IIT Bombay's Annual Corporate Social Responsibility Conclave 2022 was held at Victor Menezes Convention Centre at the Institute's campus on July 6, 2022. Despite heavy rains in Mumbai, a significant number of India's biggest corporates attended the conclave and made it a huge success. Throughout the day IIT Bombay demonstrated its forays into ground-breaking research and infrastructure projects currently underway at the Institute that can be supported through CSR initiatives. Corporates in attendance were very responsive and appreciative of the Institute's efforts in this domain.

Mr. Amarjeet Sinha, Former Advisor in the Prime Minister's Office and Retired IAS officer, presided over the event as the Chief Guest in virtual mode. Ms. Sujata Saunik (IAS), Additional Chief Secretary, General Administration Department (GAD), Government of Maharashtra (India) and Takemi Fellow, Harvard University, graced the conclave as the Guest of Honour.



Dr. Ananth Iyer Appointed Dean of the University at Buffalo's School of Management

Ananth Iyer (B. Tech, Mechanical Engineering, 1982), an IIT Bombay alumnus, was recently appointed as the Dean of the University at Buffalo's School of Management. Iyer, an expert in operations and supply chain management, had a stellar academic stint at Purdue University where he was senior associate dean at Purdue University's Krannert School of Management, the Susan Bulkeley Butler Chair in Operations Management, a Purdue University Faculty Scholar, and head of the management department. He is also a visiting professor at the Wharton School and MIT Operations Research Center.

Iyer has authored several scholarly articles and five books in the field of operations and supply chain management. Iyer was an American Council of Education Fellow and his work has received numerous grants from various organizations such as the National Science Foundation, U.S. Coast Guard, and the Indiana Department of Transportation. In addition, he has consulted for companies such as Turner Broadcasting, Sara Lee, and Daymon Associates and worked pro bono as a consultant for the Chicago school system and the city's Streets and Sanitation Department.

Dr. Urmila Diwekar Wins the 2022 Cast Computing Practice Award

IIT Bombay alumnus, Dr. Urmila Diwekar (M.Tech & Ph.D., Chemical Engineering, 1988) has won the 2022 Cast Computing Practice Award. The award recognises outstanding practices or applications of chemical engineering to computing and system technology. The award is sponsored by Aspen Technology Inc. and ExxonMobil Research and Engineering Company.

Dr. Urmila Diwekar is the President of Stochastic Research Technologies LLC. She is also the president of Vishwamitra Research, a non-profit research institute that conducts research in areas such as optimization under uncertainty and computer-aided design applied to energy, environment, and sustainability.

She is the author of more than 190 peer-reviewed research papers, has written several books and authored software packages, and is a Fellow of the American Institute of Chemical Engineers (AIChE). She also won the coveted Cecil Award for Environmental Chemical Engineering from the Environmental Division of AIChE in 2011, the Clarence Gerhold award in 2018, and the NESIN best researcher award in 2020 from ScienceFather International.

IIT Bombay places 2nd in India in the Quacquarelli Symonds (QS) World University Rankings (2023)

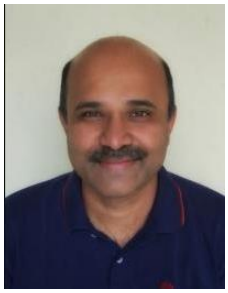
IIT Bombay placed second in India and 172nd overall (2023) in this year's Quacquarelli Symonds (QS) World University Rankings. The Institute has moved up five positions from its overall performance in 2022.

Professor Subhasis Chaudhuri, Director of IIT Bombay, said, "While it is good to know that IIT Bombay has improved in the international ranking, our collective effort in achieving excellence in teaching, research, and industry outreach continues".

Sharad Saraf Conferred with an Honourary D. Litt degree from JJT University

IIT Bombay alumnus Mr. Sharad Saraf (B. Tech, Electrical Engineering, 1969) was conferred with an Honourary D. Litt degree (a post-Doctoral degree) by Shri Jagdishprasad Jhabarmal Tibrewala (JJT) University at Raj Bhavan, Mumbai. During the event, Dr. Vinod Tibrewala, the Chairperson of the University, provided an overview of Mr. Saraf's invaluable and commendable contributions to society over the years.

Mr. Saraf is the Chairman and Managing Director of Technocraft Industries India Ltd. After graduating from IIT Bombay in 1969, he completed a one-year industrial training course in Germany. Mr. Saraf is also a generous philanthropist who set up the Technocraft Centre for Applied Artificial Intelligence (TCA2I) at IIT Bombay. The Centre hopes to leverage the benefits of Artificial Intelligence and Machine Learning techniques for both academia and industry.



IIT Bombay Professor, Guruswamy Kumaraswamy, Appointed Associate Editor, Soft Matter

Professor Guruswamy Kumaraswamy from the Department of Chemical Engineering, IIT Bombay, has been appointed as an Associate Editor for the journal, Soft Matter.

Prof. Kumaraswamy's research interests include structure-property relations in polymers and nanocomposites, waste valorization, and sustainable materials. Prof. Kumaraswamy

is also an experimentalist and uses tools such as rheology and small-angle X-ray and neutron scattering to probe microstructures of materials.

Speaking about his appointment as associate editor of Soft Matter and his hope for the journal going forward, Prof. Kumaraswamy says, “Soft materials are likely to become even more pervasive in our experience – from the humble flexible packaging that increases the shelf life of foods, to highly engineered lipid nanoparticles that envelop mRNA. With increasing usage, comes great responsibility, to ensure that we do not overwhelm the environment. Therefore, I anticipate that our community will emphasize research that optimizes the use, and increased functionality of soft materials. I hope to see this emphasis reflected in the articles published by Soft Matter.”

Suraj Saharan Takes His Company, Delhivery, Public

IIT Bombay alumnus, Suraj Saharan (B. Tech, Mechanical Engineering, 2005), recently took his new-age logistics and supply chain startup company, Delhivery, public. Since its launch in 2011, Delhivery has risen meteorically over the past decade and has set standards that have changed the very paradigm of the business. Under Saharan’s helm, Delhivery has brought unparalleled efficiency to the country’s $160 billion logistics industry.

IIT Bombay Campus Resident Clocks India Best Timing at Khelo India Youth Games 2022 held at Ambala

IIT Bombay resident Apeksha Fernandes won 4 individual swimming gold medals, and one gold and a silver medal in two team events, in the recent Khelo India youth games held at Ambala. She also broke the long-standing Indian record in the 200m butterfly race.

Apeksha is the daughter of Professor Bavlon and Mrs. Shalet Fernandes and hails from Mangaluru. She is currently a student of Bunts Sangha’s S. M. Shetty International School and Junior College, Powai. Apeksha trains under Dr. Mohan Reddy at the IIT Bombay pool and the Hiranandani Forest club.

TECH NUGGETS

The DELTAs-2022 Conference Was A Huge Success

The Design and Engineering of Lighter-Than-Air Systems – 2022 (DELTAs-2022) conference gathered global experts in the field of LTA systems to discuss the current and future developments in this field. DELTAs-2022 provided an international forum for researchers, practicing engineers, students, and scientists to disseminate their latest accomplishments in the field of LTA systems.

The event hosted several eminent academicians, scientists, and scholars from all over the globe, who spearhead developments in LTA technology.

A Technology Showcase was also conducted to enable industry professionals and software vendors to demonstrate the application and efficacy of their products.

Conference Chair, Dr. Rajkumar S. Pant said, “LTA technology advancement imbibes potential for developing an eco-friendly, economical, and efficient aerial vehicle for aerial surveillance and scientific research.”

The last two days of the conference were dedicated to a “hands-on” exposure to Airship Technology through a Model Airship Regatta Event.

INSTITUTE HIGHLIGHTS

Powai Lake Cleanup and Awareness Campaign on World Environment Day

Maharashtra Environment Minister, Shri Aditya Thackeray, and Higher and Technical Education Minister, Shri Uday Samant, kick-started a state-wise collective effort towards environmental awareness between June 7-June 13.

IIT Bombay was among the first to respond to this clarion call when 300 volunteers from the Institute cleared approximately 2.5 tonnes of garbage on a 2-km stretch along the Powai Lake on World Environment Day.

NCC Celebrates World Environment Day

On the eve of World Environment Day, approximately 70 residents and the National Cadets Corps (NCC), IIT Bombay collected nearly 100 bags of plastic bottles and 50 bags of glass bottles from the Powai lake bed. This event was organized as part of the many activities that the Institute conducts to protect and conserve Powai Lake. These include documenting resident and migratory birds that visit Powai Lake, protecting flora and fauna along the lakefront, documenting the bio-diversity along the lakefront, conducting bird walks, etc. IIT Bombay continues to help restore Powai Lake and its surrounding environment to a natural and clean state and help in other conservation efforts.

IIT Bombay celebrates International Day of Yoga

IIT Bombay celebrated the eighth International Yoga Day today with great enthusiasm and vigour. Celebrated worldwide on June 21 the International Day of Yoga is celebrated every year to raise awareness of the impact of yoga on people's health and well-being. The Chief Guest for the occasion was renowned neurosurgeon and yoga therapist, Dr. Mayur V. Kaku. Prof. T. Kundu (Dean, Student Affairs) and Mr. Ganesh Borkhade (registrar) graced the occasion. More than 200 people including students, faculty, staff and their family members participated in the event held at the indoor badminton court.

TEAM SHUNYA
Building a sustainable future

Webinar on Net Positive Energy Houses and Role of Green Building

On World Environment Day 2022, Team SHUNYA, IIT Bombay, in collaboration with Indian Oil Corporation Limited, conducted a webinar on Net Positive Energy Houses for the employees of Indian Oil Corp Limited.

Ankush Shankar Pujari and Prabhat Sharma led the webinar which included presentations and discussions on various topics such as the role of Green Building and how it works, and how CII – Indian Green Building Council (IGBC) certification help improve building performance. The webinar also included a demonstration of Project Vivaan – a single-family Net Positive Energy Home.

Invention Factory Program is off to a Great Start

The Invention Factory Program at IIT Bombay kicked off on May 19, 2022, and has had a great start. A total of 19 students from all IITs (including 7 from IIT Bombay) have enrolled in the program. The students are working in teams and have successfully formulated compelling ideas for their inventions. Over the past few weeks, evaluation sessions were held where students presented their ideas to a panel of six to eight judges. The students strongly defended their ideas

and methodology in rigorous Q&A sessions. The judges also provided expert inputs and suggestions for enhancing the scope of their ideas.

Spearheading the program are co-inventors, Prof. Alan Wolf, Professor of Physics and U.S. Patent Attorney, and Prof. Eric Lima, Professor of Mechanical Engineering, along with faculty members from IIT Bombay, Prof. Amber Shrivastava, Assistant Professor, Department of Mechanical Engineering, and Prof. Sandip Mondal, Assistant Professor, Department of Electrical Engineering. All four professors are delighted at the quality and enthusiasm shown by the students participating in this year's program.

To learn more about this program and future participation, visit this link: https://acr.iitb.ac.in/InventatIITB/

Tinkerers' Lab Inaugurated at IIT Bombay

IIT Bombay inaugurated the Tinkerers' Lab at its Department of Chemical Engineering on June 13, 2022, with an official ceremony. Padma Vibhushan awardee, and Emeritus Professor of Eminence, Institute of Chemical Technology, Prof. M. M. Sharma graced the occasion as the chief guest.

The event began with a warm welcome address by Prof. Ravindra D. Gudi, Dean, Alumni and Corporate Relations, IIT Bombay. Prof. Gudi acknowledged Alkyl Amines Chemicals Limited, Shri Yogesh M. Kothari, Chairman and Managing Director of Alkyl Amines, and IIT Bombay alumnus, Mr. Kirat Patel (B. Tech, Mechanical Engineering, 1975) and Executive Director of Alkyl Amines, for their generosity in funding the Lab through their CSR initiative. He added that Tinkerers' Lab will facilitate experiential learning for IIT Bombay's engineering students and contribute significantly to their academic and research pursuits.

Chief guest, Prof. Sharma, gave an inspiring speech on how perseverance and innovation are key to success. Mr. Sharma urged students to think out of the box to solve important chemical engineering problems. The event concluded with Prof. Sharma performing the ribbon-cutting ceremony of Tinkerers' Lab.

WRCB organized Low-Cost Diagnostics for Affordable Healthcare

IIT Bombay's Wadhwani Research Centre for Bioengineering (WRCB) organized the 'Low-cost diagnostics for affordable healthcare' on June 03, 2022, as a way to brainstorm with different stakeholders who are involved in the development of low-cost diagnostic solutions. The event was a huge success and witnessed a terrific turnout by IIT Bombay's faculty members, students, R&D industry representatives, clinicians, and startups.

The one-day in-person event held informative talks and thought-provoking discussions by the invited speakers and panelists and hosted poster presentations on unique projects in the healthcare space by IIT Bombay, as well as startups across India.

Key highlights of the programme included:

Dr. Debojyoti Chakraborty, senior scientist, Institute of Genomics and Integrative Biology, Council of Scientific & Industrial Research, delivered the keynote speech on 'Reading and writing the genome with precision.'

Dr. Satya Dash, scientist, Toronto General Hospital Research Institute (TGHRI) shared his insights on ways the diagnostics startup space can be leveraged to reduce fatalities.

Prof. Ravi Elangovan, IIT Delhi, and Prof. Mudrika Khandelwal, IIT Hyderabad, gave an overview of their research pursuits.

Not-for-profit organizations including PATH and the Bill & Melinda Gates Foundation made presentations on their inspiring work in the social development sector.

Mr. Anurag Meena, the co-founder of NeoDocs, shared his experiences as a student entrepreneur.

UPCOMING EVENTS

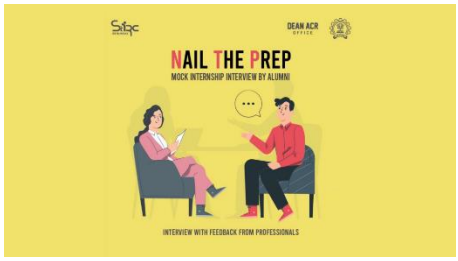
Civil Services Reunion

IIT Bombay is organizing a three-day weekend reunion for our alumni members who are part of the Indian Civil Services. The festivities planned will allow our alumni to take a trip back in time and relive their time at IIT Bombay, get together with their old friends and hostel mates, revisit their favourite hangout spots on campus and reminisce about their times there, and enjoy the many fun activities organised by the IIT Bombay community.

Day & Date: July 8 to 10, 2022
Time: All Day
Venue: In and around IIT Bombay

Phonathon 2022

The Student Alumni Relations Cell (SARC) will organize the annual 10-day mega telephonic jam – Phonathon 2022. The event will allow students to interact with a diverse group of alumni members from all over the world via phone calls. The annual Phonathon allows students to get an insight from alumni about life after IIT Bombay, while alumni members get the most recent updates on their alma mater from current students of the Institute.



Nail The Prep 2022

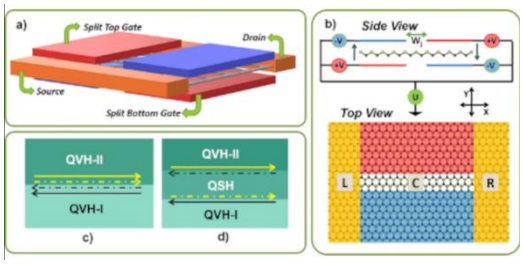
Third-year undergraduate students from IIT Bombay have the opportunity to attend a mock internship interview program called Nail The Prep 2022. Alumni members will engage students in mock interviews and provide them with their immediate and personalized feedback. Nail The Prep allows students to prepare for their future real-life interviews by using the detailed insights provided to them by the alumni.

The mock interviews will be held in the fields of Management – Consulting, Analytics, Finance, IT/Software, FMCG, HR, and more.

Interested alumni can register here: https://forms.gle/wcBrbXvDS5ZUqTPh8

Day & Date: 30 July 2022 – 31 July 2022
Time: TBA
Venue: IIT Bombay

STUDENT RESEARCH ARTICLE



Channelising the Exemplary "Lane Discipline" of Electrons in Quantum Materials for Next-Generation Computing

Name: Koustav Jana
Department: Electrical Engineering
Programme: Dual Degree (B.Tech + M.tech)

Significance/Application

Back in 1965, the then director of R&D at Fairchild Semiconductor, Gordon Moore – who later went on to found the global chip manufacturer Intel – predicted the future of semiconductor chips. The prediction, which he described as a mere extrapolation of the current rate of progress of the semiconductor industry, later became the

guiding principle of the semiconductor industry for years to come and was called Moore's Law. However, in the past few years, the transistor scaling seems to have reached its saturation point. Another key issue associated with the ultra-scaling of devices, leading to denser circuits, is the associated surge in power density of the chips. This causes heating issues in modern gadgets and compromises energy efficiency, which is indispensable in this era of portable devices desiring longer battery life. To keep up with the burgeoning demand for computational power along with energy efficiency, researchers have been exploring alternatives beyond CMOS technology, which is the backbone of modern-day electronics.

On the other hand, several researchers are looking at novel computing paradigms such as in-memory computing, probabilistic computing, and hot quantum computing. The hardware for quantum computers if realized feasibly would significantly boost human capabilities. Currently, there is an enormous effort being instilled into the realization of qubits – the quantum analogue of bits '0' and '1' - which are the basis of today's information processing.

Valleytronics is a promising platform that can achieve the aforementioned goals to reshape the future of computing systems. So far, the logic and memory device technologies have been using the electrons' electrical charge for representing the bits '0' and '1'. Similar to the electronic charge, one can also exploit the quantum properties of electrons, like the spin and the valley degrees of freedom, as alternative information processing platforms. The valley degree of freedom corresponds to the local extrema in the electronic band structure of certain special materials, which can be used to create the two binary stable states - the 2D honeycomb materials (like graphene and its derivatives) and transition metal dichalcogenides (TMDCs). Exploiting the so-called 'valley' degree of freedom for information processing, analogous to the spin degree of freedom in spintronics, is known as 'valleytronics'. Valleytronics also allows quantum encoding of information through valley qubits, thus opening the doors for quantum computing.

Methodology and Key Results

Our work focuses on a robust and efficient implementation of a valleytronic device, known as a valley polarizer, using quantum materials. Quantum materials like topological insulators are emerging condensed matter systems. Their bulk emulates conventional insulators, while their edges conduct similar to metals. This special property is a result of some non-triviality in their bulk band topology, along with 'bulk-boundary correspondence'. Some notable examples of topological insulators include 2D monolayer group-IV and V Xenes (like silicene, germanene, antimonene, bismuthine, etc.), 3D Bi_2Se_3, etc. Since we are targeting valleytronics applications, we focus mainly on 2D topological insulators like 2D-Xenes with buckled honeycomb lattices. These materials have a non-zero intrinsic spin-orbit interaction (SOI) that leads to the quantum spin Hall phase with non-trivial band topology.

What makes these materials stand out when compared to their conventional counterparts widely used in modern electronics is their robust edge modes equipped with 'lane discipline'. To better understand its implications for futuristic ultra-low energy devices, one needs to draw an analogy to road traffic. On one hand, there are 'busy city roads' where vehicles move chaotically and don't follow the rules. On the other hand, there are the 'more systematic highways' where there are dedicated lanes for vehicles and there is barely any risk of inter-lane transfer. Along similar lines, the robust conducting modes in topological insulators with the enforced 'lane discipline' provide dissipationless channels for carrier transport, which is unaffected even in the presence of scattering centers-–the main source of energy dissipation in modern semiconductor devices. One interesting aspect of these robust conduction channels is that they can not only be hosted at the edges of topological insulators but also the interface between topologically different materials. In our case, we leverage such interface states hosted at the domain wall between the topologically non-trivial quantum spin Hall phase and the trivial quantum valley Hall phase for interesting valleytronic applications.

We have proposed a device structure, as shown in Fig.1 for the valley polarizer with a single layer of 2D Xene nanoribbon hosting the valley-polarized conducting channels. A terminal called a gate controls the electric current flowing through the channel, similar to that in the modern transistor design. The buckled honeycomb lattice structure of Xenes, with vertical separation between the sublattices, enables an electric field-based control of the material band structure. The gate structure, which is also used to create the valley separation, sandwiches the 2-D Xene ribbon. The top and bottom gates are split into two parts—say A and B—along the direction of the current flow. Top-A and bottom-B are connected to the positive terminal, and top-B and bottom-A are connected to the negative terminal of the supply and this results in opposite electric fields on either side of A and B.

Swapping the perpendicular electric fields on both the sides reverses the polarization of the valley polarizer, as depicted in Fig.2. The split-gate structure with an increased split-gate separation ensures that the valley-polarized interface states are spatially separated and also stay robust against typical disturbances due to material defects and disorders.

We did extensive quantum transport simulations using the KWANT python package to calculate valley resolved transport coefficients and, hence, the conductance and valley polarization for varying strengths of intrinsic SOI and scatterers. The latter is modeled as random impurity potentials in the Hamiltonian device. Our calculations suggested that apart from the case of strong SOI with large split-gate separation, the valley filter showed a significant degradation in conductance and valley polarization with increasing scatterer strength in all the other cases, as shown in Fig.3. However, the large SOI and split-gate separation case showed excellent immunity to scatterers with an unperturbed conductance and a slightly degraded valley polarization.

Finally, we also showed that having high SOI or large separation can degrade the results, contrary to our expectations of improved performance, because of constraints in the applied perpendicular field and nanoribbon width. Based on this we presented a scheme to come up with optimal values for intrinsic SOI and split-gate separation that would ensure the best performance in terms of both conductance and valley polarization.

Novelty

The split-gate structure used in our valley polarizer has been inspired by previous experimental works [1,2] in the literature which demonstrated valley-polarized conducting channels in bilayer graphene, which does not possess a non-trivial band topology. Several theoretical proposals [3,4] studied the viability of such channels for valley polarizers but found that significant degradation in performance when subject to scatterers is unavoidable in actual experimental samples. In our work, we go one step further by using 2D topological insulators like buckled 2D Xenes with intrinsic SOI as the channel. These 2D TIs possess a non-trivial QSH phase that has been exploited to engineer spatially separated valley-polarized conducting channels, as confirmed by the local density of states plot corresponding to Fig.4.f. To simplify, the channels supporting the flow of electrons in the opposite direction w.r.t each other, are now at different locations. This suppresses any form of backscattering (scattering into a state/channel supporting electron flow in a backward direction) that can be induced by the scatterers. The success of our idea was well supported by our quantum transport simulations.

Conclusion

Our paper proposes an all-electrical device structure to generate valley polarized states. While drawing inspiration from previous works in the literature, our work promotes the exploitation of robustness offered by topological insulators and for valleytronics applications. The proposed structure can be easily experimentally realized using existing gating technologies found in typical transistor structures, thus allowing seamless integration with modern-day electronics. The demonstrated topological robustness of our devices not only addresses the issues faced by previous bilayer graphene-based proposals due to coherent disorder scattering but also opens the doors to ensure a high degree of valley coherence which is critical for success in valley-based quantum computing.

We have published the work in npj 2D Materials and Applications (IF: 11.44), https://doi.org/10.1038/s41699-022-00291-y.

The authors of this work are Koustav Jana and Prof. Bhaskaran Muralidharan of the Electrical Engineering Department, IIT Bombay.

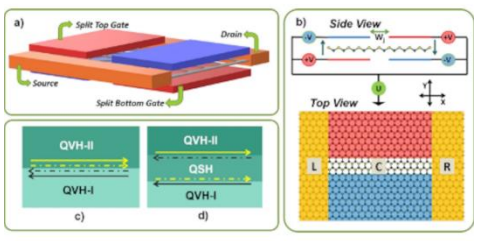


Fig.1. Proposed dual split-gate device structure for the valley polarizer with a monolayer 2D-Xene nanoribbon as the channel.

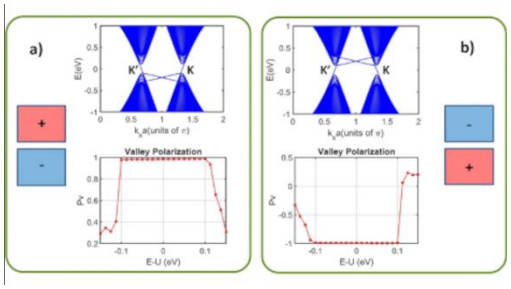


Fig.2. Demonstration of the valley polarizer operation.

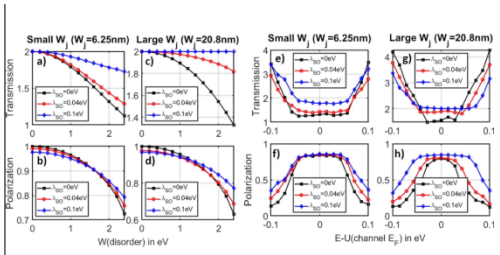


Fig. 3. Valley polarizer performance for different cases of intrinsic SOI strength and split-gate separation

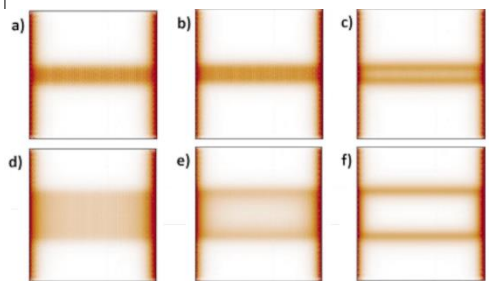


Fig. 4. Local density of states plot illustrating the valley-polarized conducting channels for different cases of intrinsic SOI strength and split-gate separation

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