

Looking Back at the Past Year (2021)

To begin I like to mention our efforts in enhancing diversity within the faculty. I am sure the chemical engineering program would be proud of its women faculty, Drs. Shahana Khurshid, an environmental engineer from UT Austin and Dr. Qandeel Almas, a catalysis expert, from Georgia Tech. Both have recently joined. Dr. Amna Ijaz, a spirited teacher and activist, has taught an exciting course on climate policy. Dr. Jawairia Ahmad is member of the [Centre for Water Informatics](#) and as a trained civil engineer from the University of Maryland and an expert in the cryosphere, she had led a course on remote sensing with a particular emphasis on climatic modeling. We are now probably the country's first University with a transgender faculty, Dr. Farzada Farkhooi, an Iranian and German physicist and mathematician who works at Berlin's Institute of Theoretical Biology and is now here at the School, teaching computational neuroscience and promising to mentor students in this forward looking area.

Dr. Zaigham Shahzad, a brilliant plant geneticist from the [John Innes Centre joined our Faculty in Life Sciences](#), enhancing our capability to foray into plant sciences and agriculture. This coincides with Dr. Abubakr Muhammad, Dr. Muhammad Tariq, Dr. Khurram Shahzad and Dr. Murtaza Taj's field experiments on our agricultural testbeds situated on LUMS premises. Dr. Nauman [Butt's exploration intro agrivoltaics](#) promises to use enhancing crop yield using solar energy. Quite an interesting undertaking! Dr. Faheem Akhtar in Chemistry and Chemical Engineering, graduated from KAUST, Saudia Arabia and now leads our efforts in membrane based separation processes.

This past year, we had the distinct pleasure of hosting and learning from some distinguished colleagues who spent extended periods of time in our School. Dr. Shahid Khan, a pioneer in life sciences at SSE, mentored Faculty and students in the area of biophysics and was also the speaker for the [eighth Abdus Salam Memorial Lecture](#) which was a personal memoir of academic pursuits and interestingly titled *A Personal Exploration of the Molecules of Life*. University of Alberta's [Dr. Ahmed Qureshi](#) spent some time with us motivating us to explore new directions in contemporary manufacturing and mechanical engineering. Dr. Abdul Bais is an Associate Professor in the University of Regina and a world renowned figure in employing machine learning and computer vision to problems in precision agriculture. We were fortunate to have him spend a year-long sabbatical in our Computer Science Department. Partnering with Nvidia's Deep Learning Institute, Dr. Bais orchestrated a [workshop on deep learning](#) which evidently became a through success.

We see a [blossoming of new courses](#), many of which are truly inter-disciplinary and are diversely pitched for a wide variety of student inclinations and dispositions. I call some of these 'synthesis' courses. For example, the EE100 experiment is our flagship course that promises to bridge the gap between practicum and theory, by repackaging Faculty research in a manner amenable to first year students. Many courses are now being tied up to identify useful continuums and advertised as such. Key examples are longitudinal trajectories in the sub-areas of machine learning and artificial intelligence, environment, quantum

technologies and the molecular basis of drug discovery. My own course titled [Life as you may have never seen before: a physics perspective](#) was aimed at beginners introducing them to physical and quantum processes that lie at the heart of physiology, locomotion and sensing. We introduced the course [From mind to pen; clarity in technical writing](#), taught by our Award-winner teacher Dr. Imran Cheema. The intent of this course was to encourage students to write accurate, gripping and honest accounts of their scientific investigations. We also launched the [Sir Sayyed Ahmad Khan and Jacob Bronowski Writing Prizes](#) for best BS and MS written dissertations. The winners from the first year were Irfan Javed and Muhammad Basit, interestingly both from Physics.

Yes, Dr. Imran Cheema and three other members of the SSE became recipients of this year's VC's teaching Excellence Awards, a befitting testimony to our existential mission to mentor and create students who can become example-setters in the modern world. These outstanding teachers were Drs. Imran Cheema, Haniya Azam, Hamad Alizai and Rahman Shahzaib Saleem.

Recently we've also been doing a lot of soul-searching at the programmatic level. This exercise has led us to contemplate the initiation of new specialized programs at the graduate level that can bridge the gap between pure science and applied technologies. Reports from these task forces I set up in digital and embedded systems, power systems, biomedical systems, optics and lasers, earth systems, machine learning and artificial intelligence have now come in and are being discussed at various stages.

In my opinion, the re-envisioning of our graduate programs is reassuring as by design, it would not compromise the fundamental rigor we promise to our undergraduate students, some may contribute to financial sustainability and promise appeal to a bigger pool of prospective students. I am also considering initiating dialogue to launch programs in the areas of mechanical engineering, which may close the loop on our engineering and technology realms, with important ramifications for entrepreneurship and productization as well as space exploration, that is considered to be the next frontier for habitation, discovery and exploration. The expanding frontiers of our disciplinary concentrations have also led us to the [renaming of the Department of Biology to Life Sciences](#) reflecting an increased emphasis on applied health care, informatics, agriculture and drug discovery.

In the same vein, it's been highly refreshing to see our first industrially sponsored masters program in integrated circuit design take root, sponsored by the NECOP. A similar agreement is in the offing *visa vis* chemical sciences. As part of this overarching theme, our electrical engineers are making advanced efforts on stoking [national debate on IC design](#).

Faculty from the School march on in their never-ending advance on the frontiers of research. The computer science faculty Dr. Naveed Arshad has [produced a comprehensive report](#) on electric vehicles and technological and economic implications for this market in Pakistan. Physics faculty members find niche in exploring new areas quantum information processing and [spectroscopy of quantum objects](#). Some of the most important research in [algebra and topology](#) is coming to the fore. Electrical engineers are carving out new

synergies in agrivoltaics, biosensing and employing techniques in learning theory and data science to sustainably manage the megalopolis of Lahore. Chemists and biologists have teamed up to [synthesize new compounds for treating Alzheimer's](#) and continually [reprogram chemicals](#). Dr. Agha Ali Raza uses [voice to access reliable health care](#). His system is named *Baang*. This research is supported by many national and international grants and powers the research of 100+ PhD students, about twenty-five of whom have completed their dissertations in just the past year. The 200+ research talks and seminars in the School, many led by students, and many of them strung together in signature chains such as the [John Conway Spirited Seminar Series](#), the [CCEW series](#), [zooming molecular and cell biology](#), [conversations with women in science and technology series](#), are new additions to our portfolio of bringing experts together to a common platform.

The LUMS *Kargaah* is a field lab coming up behind the SSE Complex that will house an animal room, greenhouse, labs for field research in robotics, electric vehicles, workshops that require ambient access and the ICC accredited cricket lab.

Sustainability is central to our academic and research mission. Considerable effort has thus been expended on fundraising. Our [Central Labs](#)'s revenue has gone up. Pakistan's pharmaceutical industry convened in a signature assembly to initiate the fundraising for extending biomedical research laboratories through a fifteen million seed grant. This will help fund expansion of life sciences in the unpopulated areas of the SSE complex. A discretionary endowment fund set up by prominent Pakistani and American engineer, Dr. Khalid Aziz and member of our Advisory Boards also promised to help further our research agenda. The Electrical Engineering Department have also created a Product Development Fund that is sponsored by external donors.

The [newly established Instrument Cell](#) has resulted in major savings in the head of repair and maintenance of scientific equipment and is now poised to becoming an important source of revenue through commercial activity outside LUMS. Finally, it's public benefit is in front of us with repair-worthy articles from the industry coming in. Muhammad Rizwan, an important component of Physics and the Instrument Cell recently [won the VC's Service Excellence Award](#) for his contributions to instrument making and repair.

The [Syed Babar Ali Research Awards](#) continue to celebrate and honor PhD students whose work promises far-reaching impact. Furthermore, our efforts culminated in the creation of [24 new Fellowships](#) for students in the basic sciences in honor of four doyens in science and technology, Nobel Laureates Ahmed Zewail and Subrahmanyam Chandra Sekhara, nematologist Dr. Bilquees Mujeeb and mathematics educationist and author Khwaja Dil Muhammad. The recently announced [100% scholarships supported by Sekha](#) are meant to fully support top students from the FSc stream. Hopefully this will enable our dream to make LUMS science and engineering accessible to everyone.

Over the past year, we have placed immense focus on internationalization. This is demonstrated by targeting educational institutions in the developing world to seek international PhD students. We have made significant strides in preparing for an

international masters program in mathematics under Abdus Salam International Centre for Theoretical Physics [IMM program](#). Earmarked by the European Mathematical Society, we have invited talented Afghan women to study at the School. The [CIMPA School on combinatorial geometry](#) attracted talented and leading experts from around the developing world to Lahore just a couple of months into 2022. All of this work continues as we keep on touching base with Pakistani embassies around the world, collaborate with the Science Diplomacy Unit in the Ministry of Foreign Affairs in launching its first science diplomacy magazine and continue to host foreign ambassadors in the School, with the sole intent of creating academic linkages. A postdoctoral program meant for international postdocs has also been launched and is being funded by the Abdus Salam endowment. I do like to mention that [postdocs are now being a more regular feature](#) of our academic ecosystem.

Last but not the least, over the last year, we have set up a self-contained cell in [Innovation and Enterprise](#). Led by the School's first Associate Dean in Innovation and Enterprise, an energetic and thoroughly accomplished young Dr. Tauqeer Abbas, this unit aims at helping us showcase our work *beyond academic publications*; will help forge new partnerships with the industry, accelerate the route to commercialization and facilitate faculty and students in creating new spinoffs and start-ups, thus paving the way for knowledge-based contributions to the economy. Part of this initiative is our effort in creating a well-equipped water quality lab that will serve the Pakistani corporate, government, and civic activist groups. A similar initiative for biomass conversion is also being considered. The cell has orchestrated many useful dialogues with the industry through open houses and one-on-one meetings.

Most of our work is well documented in our flagship magazine [The Particle](#) and some part of it gets routed to our [active website](#) as well. I look forward to hearing back from you; you will find in us receptive activists for the cause of science, technology, innovation, and education.

At the Syed Babar Ali School of Science and Engineering, the discovery of new challenges keeps us going. I think this journey will never stop. Thankyou for reading this much.

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Warm regards,

Muhammad Sabieh Anwar

Professor of Physics

Ahmad Dawood Chair and Dean