SCIENCE ALERT

- Microorganisms for Aviation Safety
- Rare Earth Elements (REE) as mineral resources

NEWSLETTER

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ACKNOWLEDGEMENTS

The Dean, Heads of Departments, all the academic staff and the FAS students are greatly appreciated for providing information for this newsletter.

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1. ANNOUNCEMENTS AND APPOINTMENTS

1.1 Establishment of the Department of Computer Science

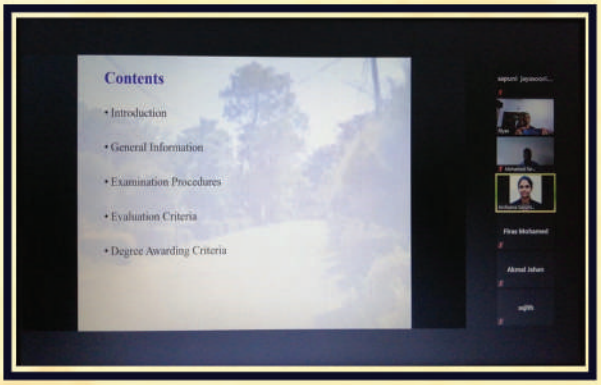
The proposal for the establishment of the Department of Computer Science was officially approved by University Grant Commission in 2020. As one of the fastest-growing fields in the world, computer science offers a wide range of academic and professional opportunities for those who seek high profile and satisfying careers. Applications of computer science have contributed significantly to the advancement of human civilization and have been a vital sector of the modern industrialized economy. Thus, the new department of computer science will definitely bring numerous benefits to the students and will be immensely helpful to undertake research and other relevant activities more effectively.

1.2 Appointments

Dr. M.I.S. Safeena was appointed as a member of the Standing Committee on Higher Education of the National Education Commission (NEC) from 1st July 2020. A member of the South Eastern University of Sri Lanka has gained this prestigious national level appointment for the first time in its history. As a member of this expert group and advisory body of the NEC, she involves in the discussion of the current status of higher education with special emphasis on access, equity and equality in opportunities, quality and relevance of study programs, research and innovations, outreach and community engagement. She assists the commission in formulating policies and strategies for addressing identified gaps, issues and disparities. In addition, she involves and assists the commission in formulating National Education policy and Higher Education Sector-specific policies periodically.

Dr. H.M.M. Naleer, one of the senior members of FAS, was elected as General Secretary for the Teachers' Association of South Eastern University of Sri Lanka (TASEU) by SEUSL academic staff. He was chosen to the position during the Annual General Meeting held in 2020 at FIA Auditorium, SEUSL. While congratulating him for his new position, FAS wishes him great success in his academic and professional life.

1.3 Enrollment of new students



Under the prevailing COVID 19 situation in the country, FAS was compelled to organize a virtual orientation program for the enrolled students for the Academic Year 2018/2019. Although this was a very new concept, FAS academic and administration staff conducted orientation programme via zoom with great success. The programme commenced with the inauguration session on 27.05.2020 and continued for a week till 03.06.2020. The faculty has taken innovative initiatives to facilitate the Fresher's to handle the virtual teaching, learning, and evaluation platform. Further to that, all the essential details and the information were provided to step into their university life mentally.

1.4 Bidding farewell to our senior colleague - Mr. A. N. Ahmed

The Senior Common Room Association (SCRA) of FAS, whose members are the academic staff of the faculty, arranged a farewell party on October 6, 2020, to honor Mr. A.N. Ahmed (Senior Lecturer) to his retirement.

After serving almost 4 decades in the university system and nearly half of the period at FAS, Mr. Ahmed retired from service on September 30, 2020. At FAS, he served as the Dean of the faculty and Head of the Department of Biological Sciences.

With his vast experience, he contributed greatly to the University Council Senate as well as the Faculty Board. Apart from his academic duties, he was a pious and generous personality, so helpful to his younger colleagues in numerous ways. The SCRA wishes him to have a healthy, peaceful retired life.

M.F. Nawas
President / SCRA

1.5 Higher Studies

Mrs. I.B.K. Thomas, Lecturer (Probationary) in Applied Biology at the Department of Biological Sciences, joined the Faculty of Natural Sciences, the Open University of Sri Lanka, Nawala, to pursue her Ph.D. Her research work entails "*engineering of immobilized DNAzyme fluorescence sensors for environmental on-site monitoring of water bodies for metal contamination*" and "*exploring the metal-protein interaction on specific proteins in selected non-communicable diseases*".

Mrs. M.A. Haalisha, Lecturer (Probationary) in Applied Statistics at the Department of Mathematical Sciences, joined with the School of Quantitative Science of University Utara Malaysia to pursue her two years full-time Master's degree by research. Her research work will focus on "*Group Chain Acceptance Sampling Plans for Truncated Life Test of Non-symmetrical Data under Quality Control Statistics*".

Miss. Thasajini Nagendran, Lecturer (Probationary) in Botany at the Department of Biological Sciences joined with the Research and Third Mission unit, Department of Earth and Environmental Sciences – XXXVI Cycle, University of Pavia, Italy to peruse her Ph.D. Her research work will focus on "*Seed ecology and conservation status of wild rice*".

Mr. M.M. Mohamed Mufassirin, Lecturer (Probationary) in Computer Science at the Department of Mathematical Sciences, received an offer to pursue his Ph.D. at the Griffith University, Australia. He has won Griffith University Postgraduate Research Scholarship (GUPRS) and Accelerating Higher Education Expansion and Development (AHEAD) scholarship to carry out his Ph.D. research. His research work will focus on "*A Meta-heuristic Computational Approach for Protein Structure Prediction using Artificial Intelligence Techniques*". He is one of the young Computer Scientists at the South Eastern University of Sri Lanka, completed his B.Sc. (Hons) in Computer Science at FAS and his M.Sc. in Computer Science at the University of Peradeniya, prior to his journey for Ph.D. study.

Mrs. A.B. Fathima Rifana, Lecturer (Probationary) in Chemistry at the Department of Chemical Sciences, has been awarded a Ph.D. scholarship under the Accelerating Higher Education Expansion and Development (AHEAD) to undertake her postgraduate studies at the University of Canterbury, New Zealand. She is a one of FAS's graduate completed her B.Sc. (Hons) in Chemistry with first-class honour prior to begins her Ph.D. studies. She is investigating the *Application of Mass Spectrometry to FVP-GED for Gaseous Structure Determination* for her Ph.D. under the supervision of Associate Professor Sarah Masters.

1.6 New Postgraduate Degree Holders

Dr. T. Jaseetharan completed his Doctoral Degree on 23rd July 2020 at the Postgraduate Institute of Science, University of Peradeniya, Sri Lanka. He pursued the research investigation on "*Synthesis and characterization of Cadmium sulphide and Lead sulphide semiconductor quantum dots and their applications in solar cells and Infrared detectors*" for his Ph.D. thesis under the supervision of Prof. M.A.K.L. Dissanayake, (National Institute of Fundamental Studies, Sri Lanka) and Prof. G.K.R. Senadeera, (The Open University of Sri Lanka). Part of the Ph.D. research work was carried out at the Department of Physics, Chalmers University of Technology, Sweden under the supervision of Prof. Bengt-Erik Mellander, (Chalmers University of Technology, Sweden) Dr. Maurizio Furlani (University of Gothenburg, Sweden), and Dr. Ingvar Albinsson, (University of Gothenburg, Sweden). As a young scientist, he published three peer-reviewed scientific papers on his Ph.D. research investigation.

Mrs. Yogeswary Raviraj, faculty member attached to the Department of Mathematical Sciences, has completed her M.Phil. Degree on 14th November 2019 at the Postgraduate Institute of Science, University of Peradeniya Sri Lanka. She conducted a research investigation on "*real time traffic control optimum phases at road isolated intersections and arerial networks*" under the supervision of Prof. W.B. Daundasekera. She has published four scientific papers on her novel discoveries in well-known scientific journals, in addition to a couple of abstract publications in "PGIS RESCON" and "ASRS".

2. PROMOTIONS AND STAFF ACHIEVEMENTS

2.1 Promotions

Mrs. Yogeswary Raviraj, an experienced faculty member at the Department of Mathematical Sciences, has been promoted to Senior Lecturer Grade-II in Mathematics since 2019. She recently completed her M.Phil. in Mathematics at Post Graduate Institute of Science (PGIS), University of Peradeniya. Considering her excellent record both in teaching and research in the field of Mathematics, the university has elevated her academic rank in FAS.

Mr. A.L. Hanees, attached to the Department of Mathematical Sciences, has been promoted as a Senior Lecturer Grade-I in Computer Science with effect from May 2017. Mr. Hanees, one of FAS's graduates, successfully completed B.Sc. (Hons) in Computer Science with second class upper division in 2002 prior to earning his M.Tech. by Research at Bharathidasan University, India in 2011. Currently, he is serving as the Head of the Department of Mathematical Sciences, FAS.

2.2 Staff Achievements

Senate Honours Award

Dr. T. Jaseetharan, Probationary Lecturer, attached to the Department of Physical Sciences, won the two Senate Honours Awards for high impact publication. It was awarded by the Vice-Chancellor at the 207th of Senate meeting for publishing research articles on "High Efficient, PbS:Hg quantum dot sensitized, plasmonic solar cells with TiO2 triple-layer photoanode" and "*Efficiency enhancement in PbS/CdS quantum dot-sensitized solar cells by plasmonic Ag nanoparticles* " in one of the highly reputed journal for solid-state materials, *Journal of Solid State Electrochemistry*.

Prof. A. Jahufer, one of the veteran faculty members attached to the Department of Mathematical Sciences, was appreciated with senate award for his high impact publication at the 208th meeting of the Senate, South Eastern University of Sri Lanka. Especially, the research work published on "*Moderating effects of academic position and Computer Literacy Skills on E – Learning Portal Usage: SEM Application on Theory Planned Behavior*" (*Journal on Interdisciplinary Studies in Humanities*, 2020) was highlighted and well-regarded.

Dr. U.L. Zainudeen, Senior Lecturer, attached to the Department of Physical Sciences, published two high-impact research investigations in 2020. His investigation on Electrochemical double-layer capacitors (EDLCs) was published in Advances in Materials Research under the title of "*Solid state electrochemical double layer capacitors with natural graphite and activated charcoal composite electrodes*". In the same year, another research study on solar cell material was published with the title of "*Investigation of Inorganic electron-hole transport material for high efficiency, stable and low-cost perovskite solar cell*" in another well-reputed journal, *Journal of Materials Science*. While bearing the responsibility of the Dean of the faculty, his contribution to the advancement of science was greatly appreciated by the SEUSL senate bestowing senate honours award in 2020.

Dr. K. Komathiraj, Senior Lecturer in Mathematics, received a senate honours award for the research study conducted on "*Generalized Durgapal – Fuloria relativistic stellar models*" and published in *Journal of Astrophysics and Astronomy*. The awards were granted by the Vice-Chancellor at the 201st meeting of the Senate. Being a senior member of the Department of Mathematics, his appetite for high-impact research investigation while bearing responsibilities in different committees was well regarded by the senate of the SEUSL .

Dr. M.I.S. Safeena, Senior Lecturer in Biology at the Department of Biological Sciences, received four Senate Honours Awards for high-impact publications. All four awards were granted by the Vice-Chancellor at the 205th meeting of the Senate held in 2020 at the Board room of South Eastern University of Sri Lanka. In terms of research, She is interested in bio-fertilizers and the application of novel biotechnological strategies in the management of Microbiome such as phytonematodes. The *"Nanobiotechnology – driven management of phytonematode's in management of phytonematodes"* and *"Metagenomics insights into interaction between plant nematodes and endophytic microbiome in management of phytonematodes"* published in *Recent Advances and Future Challenges* are some of the highlighted papers registered for her name. As one of the senior faculty members, her achievements in the research field while holding many responsibilities in various committees are exemplary for young researchers and admired both at the faculty and the university level.

Mr. M.C. Alibuhtto, a Senior Lecturer in Statistics attached to the Department of Mathematical Sciences, was awarded a senate honour for high impact publication. It was awarded by the Vice-Chancellor at the 207th of Senate meeting for publishing a research paper on *"Distance based k-means clustering algorithm for determining number of clusters for high dimensional data"* in one of the high impact journals, *Journal of decision science letters.*

Dr. A.M. Razmy, a Senior Lecturer in Statistics, attached to the Department of Mathematical Sciences, published his collaborative research on *"University students' nomophobia prevalence, sociodemographic factors and relationship with academic performance* at a University in Oman" in the *International Journal of Africa Nursing Sciences.* The other co-authors are M. Qutishat, E.R. Lazarus, and P. Samson. This publication won the Senate Honours Awards for high-impact publication and it was awarded at the 205th of Senate of the South Eastern University of Sri Lanka.

3. STUDENT ACHIEVEMENTS AND ACTIVITIES

3.1 Blood Donation Campaign

As a community service project, FAS students organize the blood donation campaign each year. The recent campaign took place on 2nd of January 2020 at the FAS common hall with the help of Sammanthurai Base Hospital. More than 100 FAS students and staff members belong to different religions and cultures, generously donated blood to make this event successful. The FAS appreciates the student for organizing such valued community events under extremely difficult conditions and hopes their service will prevail to the benefit of society.

3.2 Students for the Exploration and Development of Space (SEDS)

The SEDS is an independent student organization functioning within 16 state universities in Sri Lanka. The "**SEDS Agni**" is the SEDS chapter of South Eastern University, established in 2020 under the patronage of Dr. T.B.N.S. Madugalle, lecturer in Earth Science. Both applied sciences and the engineering faculty students are working together for **SEDS Agni** and thus far, they have organized and participated in various space-related workshops and competitions throughout the year 2020. Interestingly, most of them are international competitions which great exposure and experience to our students. A FAS student, Miss. Hasini Dayananda participated in the Indian Rover Design Challenge (IRDC)-2020 organized by the Mars society South Asia. Miss. Hasini, was a member of the Sri Lankan team who secured 13th place competing against 31 teams from different countries all over the world. She also took part in the International Mars Hackathon (IMH)-2020 along with two other FAS students, Dasuni Hewawasam and Aravinda Dhanapala.

This was also organized by the Mars society South Asia and Sri Lankan team with three FAS represents showed the outstanding performance securing 4th place among 24 teams. The Global Space Balloon Challenge (GSBC) was another important competition that took place in 2020, organized by the Stanford University, USA. Three FAS students, Bhathiya Senevirathne, Michelle Fernando, and Subodha Rathnayake, participated in the GSBC-2020 as members of the Sri Lankan team along with students from other 15 SL universities. A weather balloon was launched from Dambulla with a payload attached to it consisting of cameras and sensors to collect atmospheric data. The payload was recovered after a one-hour journey with a maximum altitude of 32km.

Thus, current FAS students registered a great history in the **SEDS Agni** chapter and have built a great platform for students who are interested in space sciences and the space industry. Thanks to their dedication and hard work, the year 2020 became the year of achievements for FAS students. On behalf of FAS, we congratulate and wish the best of luck to the **SEDS Agni** team.

4. RESEARCH, CONFERENCES AND DEVELOPMENT PROJECTS

4.1 Research

Annual Science Research Symposium 2020 (ASRS 2020)

FAS organized its 9th Annual Science Research Sessions (ASRS) via Zoom on 25th November 2020, on the theme of, "Integrated Applied Sciences and Smart Technologies for Sustainable Developments".

Although the virtual ASRS was a new concept, thanks to the commitment and dedication of the ASRS 2020 team, the event was held with great success. This symposium provided a great opportunity for young scientists to share their ongoing research investigations with others. The Vice-Chancellor, Prof. M.M.M. Najim was the Chief Guest and the Dean, Faculty of Applied Sciences, Dr. U.L. Zainudeen was the Guest of Honour for the event. Senior Professor. Purushottam Chakraborty, Saha Institute of Nuclear Physics, Kolkatta, India, delivered the Keynote address on "*Molecular ion SIMS': An innovative Chemical approach for composition analysis of quantum structures*"

In this session, 38 abstracts were published under seven different themes of Sciences. Of these, more than 22 papers were from undergraduates of FAS, SEUSL, and were co-authored by FAS academicians.

The Journal of Science

The Journal of Science (JSC), an open-access journal, is initiated by the faculty members of FAS in 2019, published two issues of volume 1 in 2020. Researchers all over the world are encouraged to share their novel discoveries via JSC free of charge. Further details, including guidelines for manuscript preparation and submission, can be obtained by visiting (JSC) official website **www.seu.ac.lk/jsc.**

4.2 Development Projects

Accelerating Higher Education Expansion and Development (AHEAD) Project

RENOVATED LECTURE THEATER AT THE FAS PREMISES UNDER ACTIVITY 2 OF AHEAD PROJECT

The FAS is one of the recipients of the Accelerating Higher Education Expansion and Development (AHEAD) grant under the World Bank project. Through this project, FAS received 120 million rupees to launch the proposed FAS development plan which includes five main activities.

Some revolutionary modernizations on teaching and evaluation methods are taking place under Activity 1. The activity coordinator took responsibility of this huge task and organized many events to training FAS academic and non-academic staff on outcome based teaching and evaluation methods. The workshop organized for FAS staff at Trincomalee on "*Innovative Learner Centered Teaching (LCT), Learning and Assessment Methods*" was very valuable and provided a great platform for FAS staff to share their experience with each other and to make our teaching technique more learner centered. As recourse persons, Prf. Gominda Ponnamperuma and Prof. S.M.P.W.K. Sethunga helped our staff to turn their teaching methods more effective in achieving intended outcomes. Parallelly, various workshops were organized to improve the skill and knowledge of non-academic staff as well. Especially, the workshop conducted by Prof. M. Sithambaresan on "laboratory safety" was a timely requirement to make FAS laboratories a safe place for both students and staff.

Activity 2 is mainly focusing on the improvement of the learning environment in the faculty. Ongoing renovations of lecture halls, enhancing laboratory facilities, etc. are taking place under Activity 2. As result, FAS is expecting numerous new instruments and accessories to the laboratories in near future. The upgraded learning facilities will certainly improve FAS's ability to train students for the national and international job market.

GROUP PHOTOGRAPH OF LCT WORKSHOP PARTICIPANTS WITH RESOURCE PERSONS AT MANAGEMENT DEVELOPMENT TRAINING UNIT (MDTU), TRINCOMALEE

Induction of five interdisciplinary/interfaculty courses to the FAS curriculum is one of the main goals planning to achieve under activity 3. An interfaculty course, Human Resources Management (HRM), is already included in the FAS curriculum under activity 3 and has high demand among the students. In addition, Principles of Land Surveying, Geotechnical Engineering, Practical Computational Chemistry, and Medical Laboratory Techniques are other four high-impact courses developed under activity 3. Upon receiving the recommendation of the FAS faculty board and approval from the SEUSL senate, the AHEAD team planning to introduces these courses to the FAS curriculum in the near future. Further, targeting vast job opportunities in the field of computer networking, the FAS AHEAD team also working on the development of Network Demonstration Laboratory. Thus, FAS will be able to prepare our students for national and international job demands in the computer networking field.

Activity 4 has been proposed to enhance the employability of the FAS graduates as one of most challenging activities. Under this activity, the AHEAD team has organized several workshops to widen the awareness of the current job market and to improve the soft skills of first and third-year undergraduates of the FAS. In addition, the team also working on the establishment of Student Information System (SIS) Setup with the assistance of Morish Green (Pvt) Ltd., and improvement of the Science Research Centre (SRC) of the Faculty by purchasing sophisticated analytical instruments for research purpose. Through these activities, the AHEAD team expect to equip the FAS graduates with high demanding skills and knowledge by enhancing the research opportunity for them.

The FAS greatly appreciate the hard work and scarifies made by Dr. Haroon and the team to achieve the targets of the FAS AHEAD proposal under the extremely difficult condition in the country.

5. Science Alert

5.1 MICROORGANISMS FOR AVIATION SAFETY

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Bird strikes can cause damage to operating aircraft posing severe threats to aviation safety, even lead to loss of human life. Depending on the country, the frequency of bird strikes may range from 2.8 to 8.2 per 10 000 aircraft movements costing about USD 1 – 2 billion annually. Further, it has caused 618 aircraft damaged beyond repair and 534 human fatalities since the beginning of aviation.

The food sources such as grasses, other plants, insects, rodents, etc. attract birds in large numbers towards the airfields increasing the risk of bird strikes. The usual ways to keep birds away from airfields are to scare away birds using balloons, dogs, gas guns, lasers, and lights which have been proven to be not very effective.

Recently, it has been demonstrated that microorganisms are potential solution to this problem. An endophytic fungus that is living inside a grass plant, deter birds by producing alkaloids **Ergovaline** and **Loline**. The **Ergovaline** makes the plant or its parts disgusting for the birds and **loline** makes it disgusting to the invertebrates. Thus, the grasses treated with these endophytes fungus help to keep away plant feeding and invertebrate feeding birds from airfields. This has been demonstrated in two New Zeeland airports using a bird deterrent endophyte commercialized by a New Zeeland horticultural company under the registered trademark of **Avanex®**. This technology is under testing in many European airfields and military bases including Copenhagen Airport, Denmark, collaborating with **DLF**, a global seed company.

Within short periods, this technology getting global recognition as one of the most efficient and humane ways to reduce bird numbers in the field and also considered as the most effective long-term solution to many wildlife problems.

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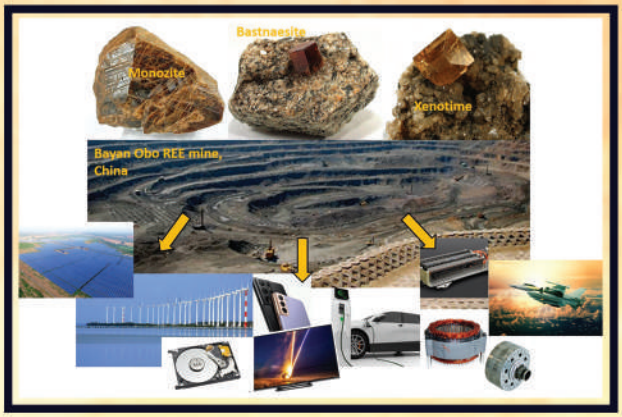
5.2 RARE EARTH ELEMENTS AS STRATEGIC MINERAL RESOURCES



Rare earth elements (REEs) comprising elements from lanthanum (La) to lutetium (Lu) along with scandium (Sc) and yttrium (Y) have been identified as essential natural mineral resources. Despite their name, REEs are not rare on Earth. On average, concentrations of REEs in the Earth's crust vary from 130 to 240 ppm and are more abundant than gold, silver, and platinum.

Naturally, REEs are formed through the primary and secondary geological process and associated with all types of rocks including igneous, metamorphic as well as sedimentary rocks. However, most economically viable deposits of REEs are limited as much as fossil fuels and commonly occur in carbonatites, alkaline rocks, granitic pegmatites, sedimentary residual and placer deposits, as well as in marine phosphorites. Hitherto, about 200 minerals are known to contain REEs, but only a few minerals show commercially extractable concentrations of REEs. These minerals are Bastnaesite, Monazite, Loparite, Xenotime, Fergusonite, Apatite, and iron adsorption clay minerals (e.g., Kaolinite).

The first REEs were discovered in the late 18th century in mineral Gadolinite (Ytterbite) at a quarry site in Sweden. Since then, REEs are commonly used for glass polishing, crude oil refining, and flints for lighters. With rapid technological advances, scientists have discovered the superior magnetic, luminescent, electrochemical, and thermal properties of REEs enabling them as raw materials for modern high-tech industries such as computer hard drives, rechargeable batteries, autocatalytic converters, super magnets, smartphones, flat-screen televisions, electronic displays, medical imaging, etc. Also, mostly Neodymium (Nd) and Dysprosium (Dy) are used in electric vehicles replacing fossil fuels. Therefore, at present REEs are referred to as "seeds of technology" or "vitamins of modern industry". Similarly, their application in energy-efficient instruments so-called "green technology" is expanding as REEs allow such instruments to be more efficient and smaller. In addition, larger quantities of REEs are used in defense (jet fighter engines, missile guidance systems, antimissile defense, radar, and sonar) and green energy (solar panel, wind turbines) industries. Therefore, the world demand for REEs is increasing at exponentially.

According to the latest estimates, the global REEs reserves are about 120 million metric tons. Large reserves of REEs are found in China (44 Mmt), Brazil (22 Mmt), Vietnam (22 Mmt), India (6.9 Mmt), Australia (3.3 Mmt), Greenland (1.5 Mmt), and the USA (1.4 Mmt). However, owing to the geochemical characteristics of REEs, they are highly dispersed in the Earth's Crust. Therefore, most of the world's REE reserves are low grade, which is difficult to mine and process profitably. To date, more than 850 REE deposits have been identified throughout the world and the largest REE mine is located at Bayan Obo (REE-Nb-Fe deposit associated with carbonatites) in inner Mongolia, China.

In the early 1990s both China and the USA equally shared the REE market. However, the largest mine, Mountain Pass in California of the USA was defunct. Consequently, China has become the worlds' leading REE manufacturer with more than 95% of global supply and has established a dominant position in the entire REE supply chain. At present, China is restricting exports of REEs as raw materials and making policies to increase the market share of high-end REE products. As a result, in the future, there would be REE shortages and increased market prices. Or else, the rest of the world ought to research for REE resources to replace the supply from China. But, there would be many challenges since mostly the opening of new REE mines takes decades, as well as the extraction and separation processes of REEs, are associated with various environmental downsides. Many types of research are being carried out to seek possibilities of long-term sustainable use of REEs by designing new materials (e.g core-shell nanoparticles, thin films) that use very few amounts of REEs and to investigate various methods to recycle REEs in e-waste. These scientific advances will ensure that REEs are readily available, affordable, and adequate to meet the needs of industrial applications.

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NEWSLETTER

FACULTY OF APPLIED SCIENCES, SEUSL

Do you desire to publish significant news related to your faculty, Department or Division of the FAS in the Newsletter 2021?

Kindly inform us before
20th of September 2021.

Please make sure to limit the news items to 200 words of maximum and the number of photographs to three.

When you are submitting photographs to be published in FAS newsletter, we strongly advised you to obtained authorization from those who have been photographed, in order to have their photograph taken and be published in FAS newsletter.

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