



ANNUAL REPORT

2022

**Amity Science, Technology & Innovation
Foundation
(ASTIF)**

&

**Amity Directorate of Science &
Innovation (ADSI, AUUP)**

**A Journey towards
Research Excellence**

Message from Founder President



“I breathe Innovation; I dream innovation and ensure that our outcome-based research and innovation ecosystem enable us to achieve ever rising benchmarks of success”

Amity Education group has come a long way during the last few decades to become the “Topmost Research & Innovation Driven” University and it gives me immense pleasure to see the group spreading its wings to achieve newer heights every single day.

I feel proud of all my universities which are touching new horizons of research and innovation with the hardwork and dedication of my Vice- Chancellors, HODs, HOIs, Faculty Members, Scientists and Researchers and every member of the team who are contributing their best in making my dream a reality with their commitment and outcome-based approach.

Amity Science, Technology & Innovation Foundation (ASTIF) was established in the year 2008 followed by Amity Directorate of Science & Innovation (ADSI) in 2014 with a vision of constantly working to facilitate, promote, support and augment outcome-based approach to nurture the research and innovation initiatives undertaken in the Amity universities. With great pride and happiness, I would revisit with satisfaction the milestones achieved by my faculty members and researchers in the last one year which have been brought out in the 7th Annual report prepared by ASTIF/ ADSI.

I have noted with pride that India has reached 40th rank in the global innovation index (GII) from 81st position, and buoyed by this achievement, I have announced Amity Mission GII-25 on Innovation Day dated September 28, 2022 which seeks to aim at enhancing the GII with the dedicated efforts of each and every Amitian so that together Amity Education Group as a whole can immensely contribute to our country achieving a GII ranking of 25.

We must all work harder than ever this year to reach the goals we have set for ourselves at an individual, institutional, and university level. We must also work to make our knowledge, technology, and products accessible to the public by transferring technologies to the industry so that they can be used to address societal and industrial demands contributing towards the National Mission of “Aatma Nirbhar Bharat”

I proudly would like to congratulate all Amitians for creating and implementing strategies with an endeavor for extraordinary & augmented research outcome. I am confident that with your constant efforts, determination and synergy from other organisations, Amity will surely reach the position of one of the best in the world sooner than expected.

Dr. Ashok K. Chauhan
Founder President
Ritnand Balved Education Foundation

Preface

It is my proud privilege to put forth the Seventh Annual Report of Amity Science, Technology & Innovation Foundation (ASTIF) & Amity Directorate of Science & Innovation (ADSI) giving a glimpse of major milestones achieved by Amity University in the field of research and innovation during the year 2022 (Jan- Dec). Our deepest gratitude and thanks to Honorable Founder President, Dr. Ashok K. Chauhan for his exemplary leadership coupled with great vision, constant motivation, guidance, support and blessings without which we would not have been able to achieve all these milestones.



I would also like to take this opportunity to thank Dr. Atul Chauhan, President of the RBEF, Dr. Aseem Chauhan, Addl. President of the RBEF, and the entire AKC family for supporting Amitians in their mission to make Amity the best university in the world via research and innovation. The entire ASTIF and ADSI team is sincerely appreciative of the support and blessings received from every AKC Family member.

My sincere gratitude and appreciation to all Vice-Chancellors and Pro Vice-Chancellors for leading their respective campuses in carrying out the mission and dream of the Honorable Founder President. Their admirable leadership and tireless efforts in the areas through constant monitoring, motivation, and sustained efforts have resulted in exponential growth to improve the research and innovation outcomes; I would also like to acknowledge the sustained efforts made by all deans, heads of institutions, research coordinators, faculty members, and researchers. I would like to thank ASTIF & ADSI team for working together to support all Amitians in their research pursuits.

Our Faculty members and Researchers were able to receive 95 Projects sanctioned during the year amounting to **Rs 42.21** Crores bringing the total number of ongoing projects to **240** in the year 2022. In addition, **6202** Publications in journals of repute have been published in this year. **218** Patents have been filed during the year taking the total filings from Amity to 1844, **181** Patents have been granted including **68** during 2022 itself.

ASTIF in consultation with all Universities has set a target for the year 2023 of 8000+ Research Publications in Scopus and web of sciences indexed journals, 200 + funded research projects, 300+ patent filing, commercialization of at least 20+ technologies/ products developed by researchers. We will strive to reach the targets.

My best wishes for success in all the future endeavors of Amity group.

Dr. W. Selvamurthy

President, ASTIF & Director General, ADSI

TABLE OF CONTENTS

	Page No.
MESSAGE FROM FOUNDER PRESIDENT.....	2
PREFACE.....	3
PREAMBLE.....	5 - 6
HUMAN RESOURCES.....	7 - 8
CHARTERS OF ASTIF & ADSI.....	9 - 10
ACHIEVEMENTS AT GLANCE.....	11 - 12
CHAPTER 1 : PROJECTS.....	13 - 24
CHAPTER 2 : PUBLICATIONS.....	25 - 28
CHAPTER 3 : PATENTS & COPYRIGHTS.....	29 - 31
CHAPTER 4 : TECHNOLOGY TRANSFER.....	32 - 76
CHAPTER 5 : AWARDS & FELLOWSHIPS.....	34 - 35
CHAPTER 6 : COLLABORATION.....	36 - 37
CHAPTER 7 : RESEARCH ECOSYSTEM.....	38 - 42
CHAPTER 8 : RESEARCH HIGHLIGHTS.....	43 - 68

PREAMBLE

Amity Science, Technology & Innovation Foundation (ASTIF) is the umbrella body of the Amity Education Group for promoting and facilitating research and innovation in science, technology and innovation in all Amity Universities. It was founded by Dr. Ashok K. Chauhan, Hon'ble Founder President in the year 2008 with a vision of making Amity a Centre of Excellence in all Domains of Science & Technology at National and International level through an integrated research and academic endeavors to contribute to the National mission of India emerging as a Knowledge Superpower. Dr. W. Selvamurthy has been its President for a decade now.

The primary objective is to create appropriate research ecosystem, enabling processes to nurture research culture and to undertake quality research in the frontier areas of Science & Technology leading to high-impact publications, patents, technology development and commercialization. To meet this objective, state of the Art research infrastructures have been created, both through National and International funds as well as through Amity resources to augment research. Centers of Excellence have been established in niche areas of Science & Technology. In addition, more than 17 research clusters in areas of great national and international importance are effectively functioning to act as force multiplier in Amity Group. ASTIF undertakes a wide spectrum of important activities, such as Talent search, providing Amity Research Fellowship for meritorious scholars, building collaborations, supporting accreditation, and ranking activities thereby creating an enabling ecosystem for research and innovation to blossom at Amity.

Further, Amity Directorate of Science & Innovation was established at Amity University Uttar Pradesh Noida and Amity Directorate of Research & Innovation in all campuses to achieve the mission of placing Amity amongst the topmost global Universities in the field of Science & Technology. The Directorate facilitates and supports faculty members for achieving the targets in terms of Projects, Patents, Publications, Product development, Collaboration etc.



**Founder President, Ritnand Balved Education Foundation
(The Foundation of Amity Institutions and the Sponsoring
Body of Amity Universities) & Chairman, ASTIF**



**Dr. W. Selvamurthy
President, ASTIF & Director General, ADSI**



**Prof. (Dr.) Ajit Varma
Vice President, ASTIF**



**Prof. (Dr.) B.C. Das
Vice President, ASTIF**



**Prof. (Dr.) S.L. Kothari
Vice President, ASTIF**



**Prof. (Dr.) V.K. Jain
Vice President, ASTIF**



**Lt. Gen. S.K. Gadeock
Vice President, ASTIF**



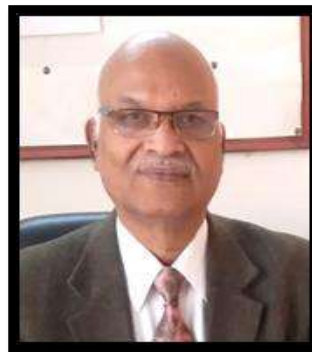
**Prof. M.S. Prasad
Vice President, ASTIF**

In order to achieve the objectives set for ASTIF & ADSI the following Human Resources have been provided.

HUMAN RESOURCES



Dr. Gopal Bhushan
Dy. Director General,
ADSI



Mr. S. N. Singh
OSD to President, ASTIF &
Director, ADSI



Dr. Goodwill Khokhar
Asst. Director
ASTIF & ADSI



Ms. Sneha Nair
Asst. Director
ASTIF



Dr. Vaibhav S. Bhugra,
Scientific Staff Officer
ASTIF



Mr. Benny Thomas
Executive Assistant
ASTIF



Ms. Jiji Binu
Dy. Manager
ADSI



Mr. Sanjai K.V.
Sr. Executive Secretary
ADSI



Mr. Devendra Kumar
Research Officer
ADSI



IPR Team



Dr. Smita Sahu
Director IPR
ASTIF & ADSI



Mr. Harish
Assistant Manager



Mr. Sonu Raghvan
Patent Associate



Mr. Aniket V. Shahare
Patent Associate



Ms. Kiran Kotnala
Technical Assistant

SUPPORT STAFF



Mr. Shailendra Tiwari



Mr. Vinod Kumar Chauhan



Mr. Gaurav Kumar



Mr. Hira Lal Kumar

CHARTERS OF ASTIF & ADSI

Amity Science, Technology & Innovation Foundation (ASTIF): The various charters and activities of ASTIF are:

1. Develop appropriate research ecosystem for promotion of cutting-edge research in emerging fields of national and international importance.
2. Set targets for Projects, Patents, Publications, Technology Transfer, Consultancy, Extension, Ph.D. programme and enable the Amity group to achieve them.
3. IPR Protection: Filing of Patents and ensuring their grant through coordination and follow-up with the office of the Controller General of Patents. In addition, Copyrights are also registered.
4. Encourage Development of technologies and products leading to Commercialization through Transfer of Technology to the Industry.
5. Organize lectures/ oration from eminent scientists from India and abroad.
6. Conduct workshops and training programmes for writing quality Project proposals, Publications, IPR augmentation.
7. Offer financial support for selective scientific projects and offer fellowships to meritorious research scholars.
8. To identify and nurture scientific talents through research cluster formation, interaction meetings and providing synergy.
9. Dissemination of scientific achievements, research excellence and innovations to promote visibility of Amity Group through media.
10. Developing research policies/ concept notes relating to areas connected with promotion of quality research and innovation.
11. Development and updation of ASTIF Website and formulation S & T Brochures, promotional Film highlighting research accomplishments.
12. Facilitating National & International research Collaborations and promoting synergy of brains.
13. Identification and submission of quality applications/ proposals under various National/International Awards & Fellowship schemes.
14. Promoting Global Research Hub, initiatives in niche areas such as Global Research Network on Novel Viruses, Neurospine etc.
15. Conducting review meetings of all Amity Universities/Institutions in India & abroad to assess the Health and Performance management of the Organization.
16. Providing assistance to all AU Campuses addressing specific issues, if any, related to HR, Projects, Certifications like NGO Darpan registration etc.

Amity Directorate of Science & Innovation (ADSI) has also been established in 2014 to address all issues related to research and innovation at AUUP-Noida, Greater Noida, Lucknow & Dubai. 26 institutions under Science & Technology domain in AUUP have been brought under this Directorate for overseeing their performance. The main charters of this Directorate are:

1. To facilitate and catalyse research activities in AUUP and its constituent campuses.
2. Set quantitative and qualitative targets in terms of research, publication & patents etc.
3. Periodic review and monitoring research endeavours including those of Ph.D. scholars.
4. Review and augment research facilities in the S&T Institutes as per the emerging needs.
5. Formulate Annual Research plan and monitor its progress in AUUP aligning to Broad Based Goals.
6. Motivate faculty members to attain their best in terms of competence, commitment, and self-motivation.
7. Promote transdisciplinary research with the participation of various relevant research Institutes.
8. Administrative & Financial Management of Funded Projects of AUUP.
9. Accreditation and rankings related activities of AUUP pertaining to Research, innovation, and extension activities.
10. To resolve any administrative or HR issues and address the grievance of Faculty and Scientists as and when referred to the Directorate.
11. Support Amity Institute of Defence Technology (AIDT) for defence technology programme including industries/schools and DRDO/ISRO interaction/special invites/talks and arranging internship.
12. Preparation of reports/notes/concept papers on emerging areas of interest to Amity.
13. Support to Amity Institute of Defence & Strategic Studies (AIDSS) as and when consulted.
14. Support ASTIF in all its endeavours including review meetings, hosting of guests and coordination of their visit to Amity/workshop/conferences/guest lectures.
15. Any other activity as and when assigned by the apex management.

GLIMPSE OF ACHIEVEMENTS 2022

Amity has created an appropriate Research eco-system through creation of World class infrastructure bench marked against best Universities around the World, State of the art Research facilities engaging quality Human Resource which have led to following achievements during the year 2022.

1. Awards and Achievement

- Indian Intellectual Property Office under the Department of Promotion of Industry and Internal Trade (DPIIT), Ministry of Commerce and Industry, Government of India has conferred Amity University as the winner of prestigious **National Intellectual Property Award for the year 2020 in the category of “Top Academic Institution for Patent and Commercialization”**
- **Amity University with its strong IP Portfolio** has been declared as the winner for the **8th Confederation of Indian Industry (CII) ‘Industrial Intellectual Property Awards 2022’ ‘Special Appreciation Awards’ in the category of ‘Academic Institutions’**
- **Quetsel India** has also conferred **IP Excellence Award 2022 to Amity University** in recognition for valuable contribution as an Innovation driven organization
- 90 awards and 22+ fellowships bestowed on the faculty members and researchers of Amity during the year 2022. Some of the noteworthy awards include Prof Birbal Sahni Medal Award, D P Burma, Haryana Yuva Vigyan Ratan award by DST and fellowships such as ESDA Fellowship Award, SERB-SIRE, HORIZON European Commission, European Molecular Biology Organization, Erasmus+ International staff training Mobility Program, DAAD Fellowship.

2. Projects:

- A total of **95 sponsored Projects** have been sanctioned with a funding of **Rs. 42.21 crores.**
- **The total number of ongoing projects is 240** with a sanction amount of **Rs. 84.86 crores.**
- Amity University, Rajasthan (Jaipur) was awarded the prestigious and the much-coveted grant of ₹8.5 crore INR from Department of Science and Technology (DST), Government of India under **The Promotion of University Research and Scientific Excellence (PURSE).**
- Amity University worked as Hub with 20+ partner institutions for conducting the training under **DST Synergistic Training program Utilizing the Scientific and Technological Infrastructure (STUTI)** programme.

- **DBT BUILDER LAB** has been established at Amity University Haryana under DBT - Boost to University Interdisciplinary Life Science Departments for Education and Research (BUILDER) Programme

3. Publications:

- A total of **6206** Publication have been done out of which 4212 are Scopus indexed.
- **396** Publications have an **Impact Factor** ranging from **6 to 202.731**.
- **h-index** of the University is **111**
- **Twenty-four** Amity University faculty members figure in **top 2%** of Global Researchers from India, in the list compiled by Stanford University, USA.

4. Patents/Copyrights:

- A total of 1844 patents have been filed out of which 219 were filed during 2022 itself.
- A total of 181 patents have been granted out of which 68 were granted during 2022
- 128 copyrights have been filed out of which 53 have been registered

5. Technologies Transferred: HNB9 formulation (Fungal Biofertilizer) and 7 MTA signed.

6. Research enrichment initiatives

- The research endeavors have been strengthened further through 57 research centers and Centres of Excellence in niche areas established across Amity Universe.
- 17 Thematic Clusters are functional with the focus on the interdisciplinary research and innovations in Science & Technology to promote research in areas of global focus as well as to promote transdisciplinary and multidisciplinary research.
- 102 MoUs i.e; 84 National and 28 International have been signed in 2022.
- 21 Ramalingaswami re-entry, Ramanujan, DST-INSPIRE, SERB-SRS, Wellcome Trust Fellows are presently working at Amity.
- Amity University has bestowed 12 Honorary Doctorates and 25 Honorary Professorships in the year 2022.
- The group has organized more than 1050 webinars/ Lectures of global relevance during the year for keeping its faculty members and researchers updated with recent technological advancement in their field of research. In addition to this, 293 Conferences, Seminars, workshops and FDPs were organized using online mode.

Chapter – 1

PROJECTS

● FUNDED PROJECTS

- 1.1. Amity believes in the philosophy that funded research projects play a pivotal role in building a strong research culture amongst the scientists and researchers as well as in generation and dissemination of knowledge for the benefit of society. Accordingly, it motivates and supports its scientists and researchers to apply for funded projects by National and International organizations as these are aligned to national priority.

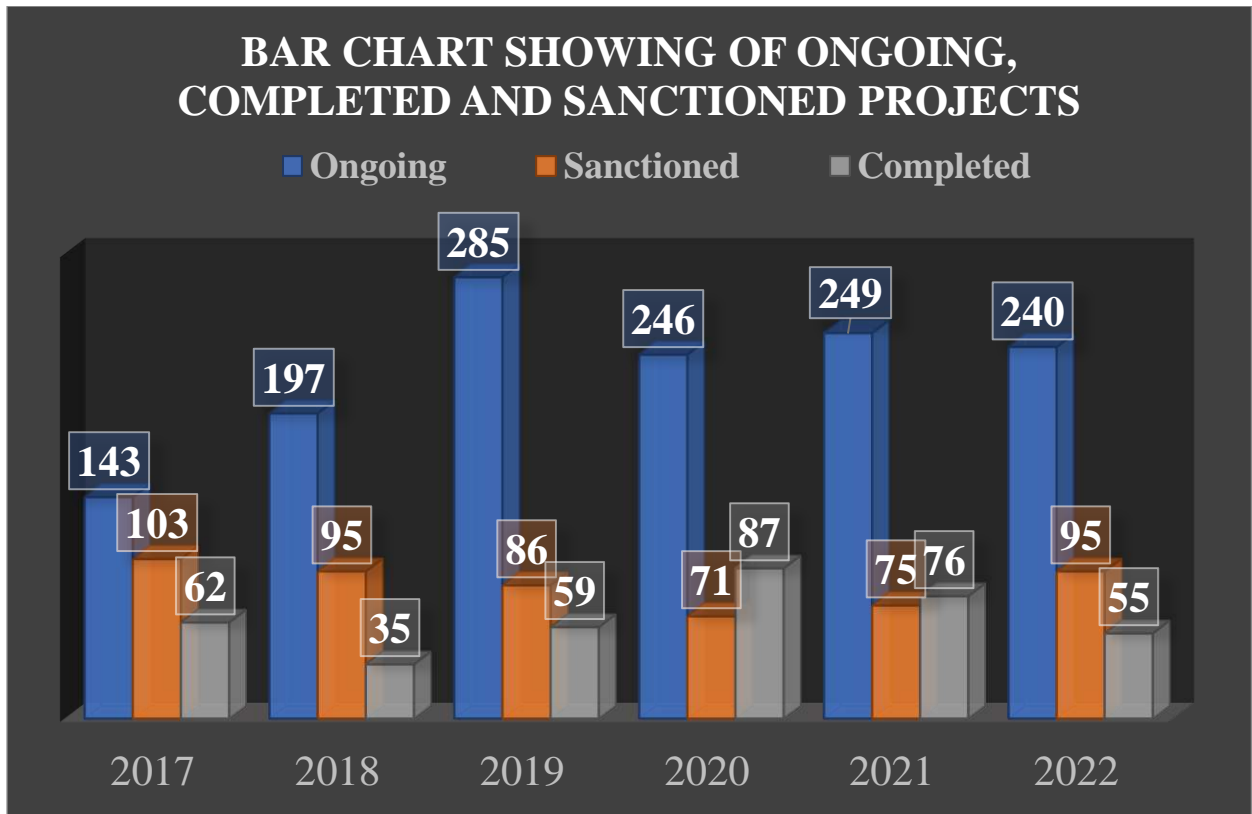
- 1.2. The University has also created an ecosystem through the establishment of Amity Foundation for Science, Technology & Innovation Alliances (AFSTIA) and Amity Centre for Developmental Cooperation and Alliances (I & II) exclusively to accelerate the number of submissions of quality proposals through timely identifying the funding opportunities, locating the relevant faculty, monitoring formulation of quality proposals as well as their technical implementation after approval. These departments have played an important role in the submission of **795 project proposals to various funding agencies in the year 2022.**

- 1.3. Amity Directorate of Science & Innovation (ADSI) facilitates Administrative & Financial Management of sanctioned research projects through an in-house developed software on “Research Project Management System”.

- 1.4. **A total of 95 projects were sanctioned** during the year 2022 amounting to **₹ 42 Crores 21 Lakhs.**

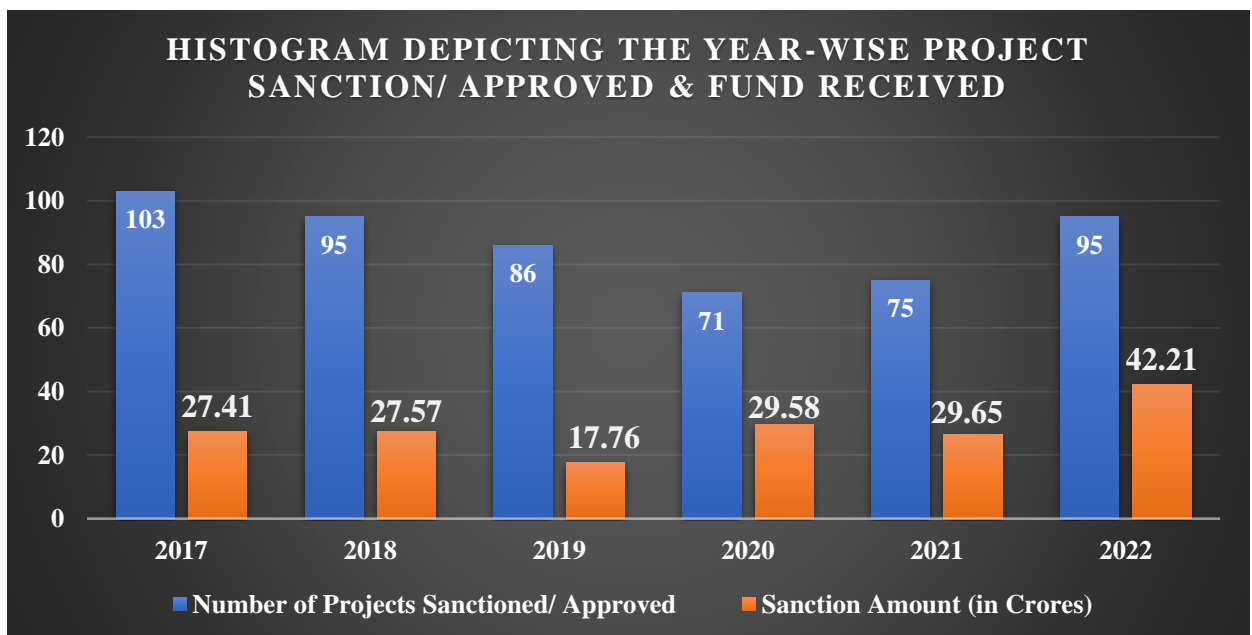
- 1.5. The summary of sanctioned, ongoing , completed research projects funded by National & International funding agencies last 6 Years is given below:-

Comparative Figures of all Amity campuses						
Year	2017	2018	2019	2020	2021	2022
Total No. of Projects ongoing	143	197	285	246	249	240
Total No. of projects sanctioned/approved	103	95	86	71	75	95
Total No. of projects completed	62	35	59	87	76	55

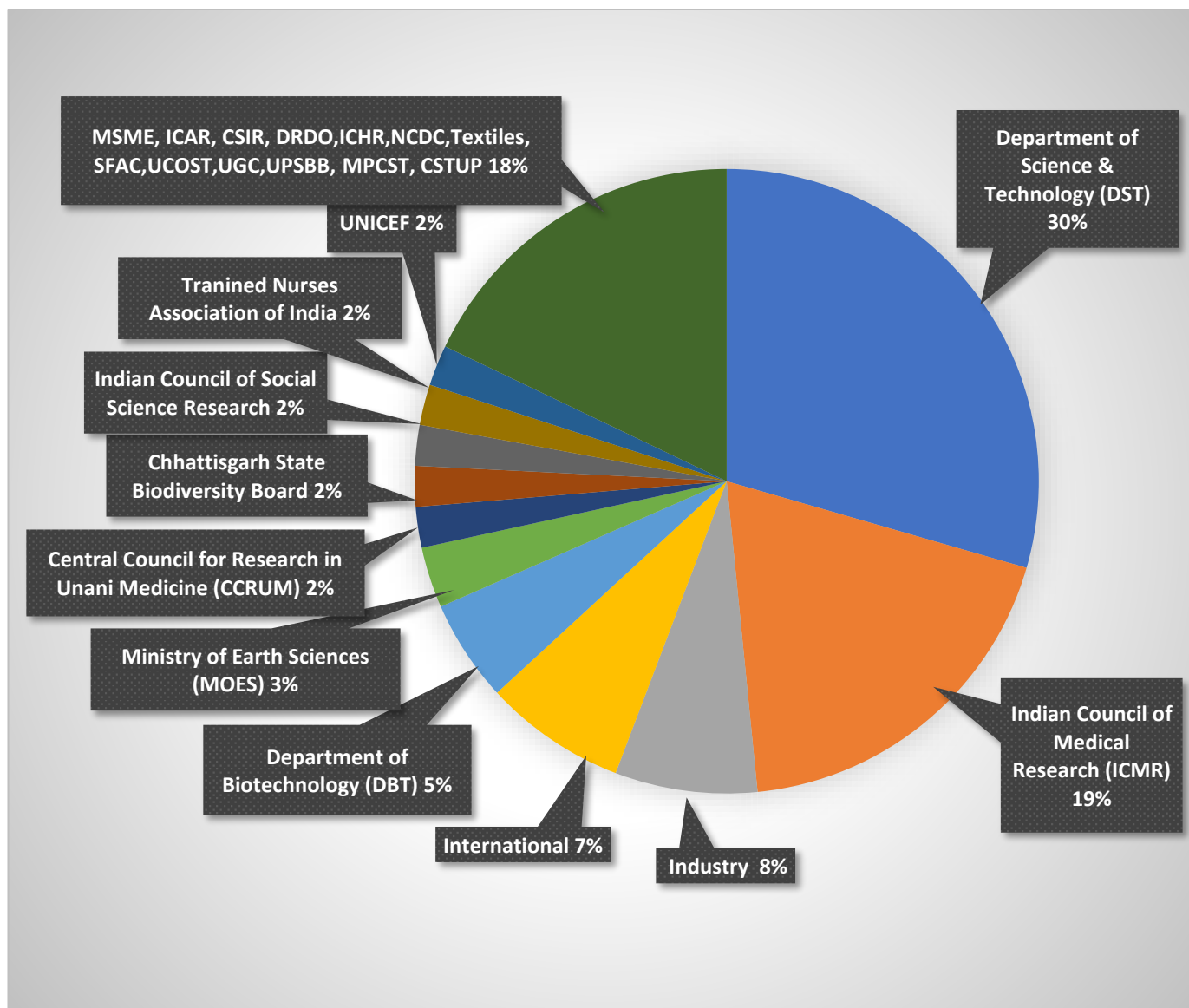


1.6 Funds received for Sanctioned/ Approved projects

	2017	2018	2019	2020	2021	2022
Total No. of projects sanctioned/ approved	103	95	86	71	75	95
Amount in Rupees (Crores)	27.41	27.57	17.76	29.58	29.65	42.21



1.7 Funding agency wise project sanctioned in 2022:








GRAPHICAL REPRESENTATION OF THE FUNDS RECEIVED FROM VARIOUS FUNDING AGENCIES

1.8 The funds received for undertaking **Consultancy, Training and Skill Development programme** for the year 2022 is ₹ 3 Crore 35 Lakhs.






1.9 Amity group has undertaken training programme for prestigious organizations such as National Internet Exchange of India, The Nainital Bank Ltd, Chhattisgarh Grameen Aajeevika Samwardhan Samiti, Ministry of external Affairs, AU Small Finance Bank Ltd, Indian Oil Corporation Ltd, Mercedes-Benz India Private Limited, Tata group, Indian Oil Corporation Ltd, West Bengal State Livelihood Mission, Embassy of USA (SAFE WATER NETWORK INDIA)

GLIMPSE OF HIGH VALUE RESEARCH PROJECTS

SANCTIONED IN – 2022

S. No.	Project Details	Principal Investigator
1.	<p><u>Project Title:</u> Promotion of University Research and Scientific Excellence (PURSE 2021)</p> <p><u>Funding Agency:</u> Department of Science & Technology</p> <p><u>Sanctioned Amount:</u> ₹ 850 Lakhs</p> <p><u>Sanctioned date:</u> 31-Jan-2022</p> <p><u>Duration:</u> 4 years</p>	 <p>Prof (Dr.) S.L. Kothari Prof (Dr.) G.K. Aseri</p>  <p>Prof (Dr.) Vinay Sharma</p>  <p>Prof (Dr.) Jagdish Prasad Prof (Dr.) Pankaj Kumar Amity University Rajasthan</p>
2.	<p><u>Project Title:</u> Synergistic Training program Utilizing the Scientific and Technological Infrastructure (STUTI)</p> <p><u>Funding Agency:</u> Department of Science & Technology</p> <p><u>Sanctioned Amount:</u> ₹ 225 Lakhs</p> <p><u>Sanctioned date:</u> 19-Dec-2022</p> <p><u>Duration:</u> 5 Year</p>	 <p>Dr. Nitin Batra Amity Institute of Training & Development Amity University Uttar Pradesh</p>
3.	<p><u>Project Title:</u> Development of Novel Materials For Prophylactic, Diagnostic And Therapeutic Applications</p> <p><u>Funding Agency:</u> DST-FIST-2022</p> <p><u>Sanctioned Amount:</u> ₹ 200 Lakhs</p> <p><u>Sanctioned date:</u> 19-Dec-2022</p> <p><u>Duration:</u> 5 Year</p>	 <p>Prof. Seema R Pathak, Faculty of Science Engineering and Technology Amity University Haryana</p>









<p>4. <u>Project Title:</u> Cluster Based Business Organizations (CBBO) for promotion of Farmer Producer Organizations was approved under Central Sector Scheme for Formation and Promotion of 10,000 FPOs during 2022-23</p> <p><u>Funding Agency:</u> Small Farmers' Agri-Business Consortium (SFAC)</p> <p><u>Sanctioned Amount:</u> ₹ 125 Lakhs</p> <p><u>Sanctioned date:</u> 14-Aug-2022</p> <p><u>Duration:</u> 1 year</p>	  <p>Dr. Nutan Kaushik Dr. R.S. Antil Amity Food & Agriculture Foundation Amity University Uttar Pradesh Noida</p>
<p>5. <u>Project Title:</u> Kinetics of Macromolecular Conformational Transition</p> <p><u>Funding Agency:</u> Science & Engineering Research Board (SERB)</p> <p><u>Sanctioned Amount:</u> ₹ 119 Lakhs</p> <p><u>Sanctioned date:</u> 9-Feb-2022</p> <p><u>Duration:</u> 5 years</p>	 <p>Dr Suman Majumder Amity Institute of Applied Science Amity University Uttar Pradesh Noida</p>
<p>6. <u>Project Title:</u> A synthetic microbial platform for the production of 1,4-butanediol</p> <p><u>Funding Agency:</u> Science & Engineering Research Board (SERB - CRG)</p> <p><u>Sanctioned Amount:</u> ₹ 78 Lakhs</p> <p><u>Sanctioned date:</u> 9-Feb-2022</p> <p><u>Duration:</u> 5 years</p>	 <p>Dr. Anmoldeep Randhawa Amity School of Biological Sciences Amity University Punjab</p>
<p>7. <u>Project Title:</u> Formation and Promotion of Farmer Producer Organizations (FPOs) under the Central Sector Scheme for Formation & Promotion of 10,000 FPOs</p> <p><u>Funding Agency:</u> National Cooperative Development Corporation (NCDC)</p> <p><u>Sanctioned Amount:</u> ₹ 75 Lakhs</p> <p><u>Sanctioned date:</u> 6-Dec-2022</p> <p><u>Duration:</u> 5 years</p>	 <p>Dr. Nutan Kaushik Amity Food & Agriculture Foundation Amity University Uttar Pradesh Noida</p>







<p>8.</p>	<p><u>Project Title:</u> Sustainable use of unconventional fibers of Indian Himalayas for Agro Textiles <u>Funding Agency:</u> Ministry of Textiles <u>Sanctioned Amount:</u> ₹ 70 Lakhs <u>Sanctioned date:</u> 20-Sep-2022 <u>Duration:</u> 3 Year</p>	 <p>Prof. Atul Thakur Prof. Preeti Thakur Amity Centre for Nanotechnology & Amity School of Applied Sciences Amity University Haryana</p>
<p>9.</p>	<p><u>Project Title:</u> Structure-Function analysis of a non-canonical primase domain of the vertebrate Mcm10 <u>Funding Agency:</u> SERB-CRG <u>Sanctioned Amount:</u> ₹ 63.74 Lakhs <u>Sanctioned date:</u> 30-May-22 <u>Duration:</u> 3 years</p>	 <p>Dr Jagmohan Singh, Amity School of Biological Sciences Amity University Punjab</p>
<p>10.</p>	<p><u>Project Title:</u> Technical Assistance to Mission Directorate JJM, PHED Chhattisgarh on strengthening monitoring capacities on JJM in 14 districts of Chhattisgarh <u>Funding Agency:</u> UNICEF <u>Sanctioned Amount:</u> ₹ 59.82 Lakhs <u>Sanctioned date:</u> 07-Jun-22 <u>Duration:</u> 07 Months</p>	 <p>Prof. Surendra N. Prof. Satyendra Rahamatkar Patnaik Amity University Chhattisgarh</p>
<p>11.</p>	<p><u>Project Title:</u> Pre-clinical and Immunotherapeutic assessment of classical Unani Formulation in Cervical Carcinoma <u>Funding Agency:</u> Central Council for Research in Unani Medicine <u>Sanctioned Amount:</u> ₹ 58.68 Lakhs <u>Sanctioned date:</u> 02-Nov-22 <u>Duration:</u> 3 years</p>	 <p>Dr Kumud Bala Amity Institute of Biotechnology Amity University Uttar Pradesh Noida</p>



<p>12. <u>Project Title:</u> To investigate physiological alterations in cortical signalling during retinal degeneration: implications for vision restoration</p> <p><u>Funding Agency:</u> Science & Engineering Research Board</p> <p><u>Sanctioned Amount:</u> ₹ 57.15 Lakhs</p> <p><u>Sanctioned date:</u> 21-Feb-22</p> <p><u>Duration:</u> 3 years</p>	 <p>Dr Anwesha Bhattacharyya Amity Institute of Neurosciences & Neurology Amity University Uttar Pradesh Noida</p>
<p>14. <u>Project Title:</u> Mass spectrometry-based identification and characterization of mycolic acid lipid biomarkers and their application for development of a lateral flow POC device for tuberculosis diagnosis.</p> <p><u>Funding Agency:</u> Indian Council for Medical Research</p> <p><u>Sanctioned Amount:</u> ₹57 Lakhs</p> <p><u>Sanctioned date:</u> 29-Mar-22</p> <p><u>Duration:</u> 3 Years</p>	  <p>Dr. Zeeshan Fatima Dr. Saif Hameed Amity Institute of Biotechnology Amity University Haryana</p>
<p>15. <u>Project Title:</u> Identifying and Establishing Bioactive Lipids as Non-invasive Biomarkers for Nonalcoholic Fatty Liver Disease (NAFLD) Progression.</p> <p><u>Funding Agency:</u> Indian Council for Medical Research</p> <p><u>Sanctioned Amount:</u> ₹ 29-Mar-22</p> <p><u>Sanctioned date:</u> 51 Lakhs</p> <p><u>Duration:</u> 3 Year</p>	 <p>Dr. Ujjaini Dasgupta Amity Institute of Integrative Sciences and Health Amity University Haryana</p>
<p>16. <u>Project Title:</u> The Genetic Screen of Chromatin “Readers” and “Erasers” proteins in DNA Damage Response pathway</p> <p><u>Funding Agency:</u> Department of Biotechnology (DBT)</p> <p><u>Sanctioned Amount:</u> ₹ 50.62 Lakhs</p> <p><u>Sanctioned date:</u> 30-Jan-22</p> <p><u>Duration:</u> 5 years</p>	 <p>Dr Rajesh Kumar Yadav Amity Institute of Molecular Medicine & Stem Cell Research Amity University Uttar Pradesh Noida</p>

17.	<p><u>Project Title:</u> Development of Nanomaterials for High Density Application</p> <p><u>Funding Agency:</u> Global Affairs Office. Yuan Ze University</p> <p><u>Sanctioned Amount:</u> ₹ 50 Lakhs</p> <p><u>Sanctioned date:</u> 21-Mar-22</p> <p><u>Duration:</u> 3 Years</p>	 <p>Prof. Atul Thakur Prof. Preeti Thakur Amity Centre for Nanotechnology & Amity School of Applied Sciences Amity University Haryana</p>
18.	<p><u>Project Title:</u> APT detection in 5G Networks</p> <p><u>Funding Agency:</u> UKI-FNI, UK</p> <p><u>Sanctioned Amount:</u> 49,995 £ (4968153 INR)</p> <p><u>Sanctioned date:</u> 21- Nov-22</p> <p><u>Duration:</u> 8 Months</p>	 <p>Dr. Satheesh Abimannan Amity School of Engineering and Technology, Amity University Maharashtra</p>
19.	<p><u>Project Title:</u> A smartphone assisted Point of Care (POC) electrochemical device for detection of SARS-COV-2 (COVID-19)</p> <p><u>Funding Agency:</u> Indian Council of Medical Research (ICMR)</p> <p><u>Sanctioned Amount:</u> ₹ 48.00 Lakhs</p> <p><u>Sanctioned date:</u> 12 -Jan-22</p> <p><u>Duration:</u> 3 years</p>	 <p>Dr. Chansi Prof. Tinku Basu</p>  <p>Dr. Ashish Mani Amity Center for Nanomedicine & Amity School of Engineering & Technology Amity University Uttar Pradesh Noida</p>

<p>20.</p>	<p><u>Project Title:</u> Identification of early diagnostic biomarker for GBM using differential alternative splicing and deep learning.</p> <p><u>Funding Agency:</u> Indian Council of Medical Research (ICMR)</p> <p><u>Sanctioned Amount:</u> ₹ 47 Lakhs</p> <p><u>Sanctioned date:</u> 30 -Mar-22</p> <p><u>Duration:</u> 3 Year</p>	<div style="display: flex; justify-content: space-around;">   </div> <p align="center"> Dr. Ravi Datta Sharma Dr. Amresh Prakash Amity Institute of Biotechnology Amity University Haryana </p>
<p>21.</p>	<p><u>Project Title:</u> Deciphering the oncogenic role of SOX2I Antisense RNA l lncRNA and its potential as a therapeutic, target for pancreatic ductal adenocarcinoma as a therapeutic, target for pancreatic, ductal adenocarcinoma'</p> <p><u>Funding Agency:</u> Indian Council of Medical Research (ICMR)</p> <p><u>Sanctioned Amount:</u> ₹ 47.00 Lakhs</p> <p><u>Sanctioned date:</u> 12 -Jan-22</p> <p><u>Duration:</u> 3 years</p>	<div style="display: flex; justify-content: space-around;">   </div> <p align="center"> Prof. (Dr) Manoj Garg Prof. Subhrajit Biswas Amity Institute of Molecular Medicine & Stem Cell Research Amity University Uttar Pradesh Noida </p>


1.9 A total of **168 Fellows** under various projects and fellowships have enrolled in Amity Universe during the year.

1.10 DST Synergistic Training program Utilizing the Scientific and Technological Infrastructure (STUTI) : Amity University served as Hub with 20+ partner institutions for conducting the training programme which saw 8000+ registrations out of which 660 participants attended the programme.




Nationwide awareness has been created through the email campaigns and social media presence


Campaigns and Social Media Presence




**2,00,000 +
Emails Sent**



**30,000 +
Website Users**



**8000 +
Registrations**



**1600 +
Followers**



1.15 DBT BUILDER LAB has been established at Amity University Haryana under DBT - Boost to University Interdisciplinary Life Science Departments for Education and Research (BUILDER) Programme

The objective of the programme is to provide for the infrastructural developments of Teaching Laboratories to enable students to perform hands-on experiments. The total funding is of ₹ 161 Lakhs with 50% contribution from the University.

GLIMPSE OF FACILITY DEVELOPED:



GLIMPSE OF RAMALINGASWAMI, RAMANUJAN & DST-INSPIRE FELLOWS 2022

A number of researchers who have been awarded prestigious fellowships such as Ramalingaswami re-entry fellowship, Ramanujan fellowship, DST-INSPIRE etc have been associated with amity in the past few years. The total number of such fellows working in Amity university campuses is as mentioned below:-

Type of Fellowship	Total
Ramalingaswami Fellow	17
DST Inspire Faculty Fellow	7
Ramanujan Fellow	3
SERB SRS Fellow	1
DBT Wellcome Trust Fellow	1
Women Scientist (ICMR, DST)	2
Total	31

Out of the above mentioned, 21 Fellows are Active while the remaining 10 Fellows have completed their tenure and have been absorbed in various Faculty positions within Amity.

GLIMPSE OF FELLOWS



Ramalingaswami re-entry/ Ramanujan Fellows



Dr. Jayasha Shandilya
Gene Regulation, Cell Cycle, Epigenetics, Cancer



Dr. Adhiraj Roy
Molecular oncology, Signal transduction, Protein kinases



Dr Saikat Dutta
Functional Materials, Therapeutic Materials, Energy storage



Dr. Pallavi Agarwal
Cancer Biology, Molecular Therapeutics, Skin fibrotic diseases



Dr. Ramesh Thimmappa
Triterpenes, Biosynthetic Pathways, Structural Bioinformatics and Structural Biology, Chemical Biology



Dr. Subrata Pore
Chemical Biology, Medicinal Chemistry, Cancer Biology, Neurourology



Dr. VeerendraKumar
Single Particle CryoEM, X-ray Crystallography, Protein expression, purification



Dr. Amit RanjanMaity
Nanomedicine, Biomaterials, Drug Delivery



GLIMPSE OF FELLOWS



Ramalingaswami re-entry/ Ramanujan Fellows



Dr. Soumitra Sau
Pathogenic Yeast
Models



Dr Raja Bhattacharya
Neuromodulation
Neurotransmission



Dr. Abhishek Guldhe
Biofuels, Algal
Biotechnology, Enzyme
catalysis, Biodiesel



Dr. Manoranjan Nayak
Biotechnology, Microalgal
Biorefinery for Biodiesel &
Biorenewables



**Dr. Manoranjan
Nayak**
Biochemistry &
Molecular Biology



**Dr. Ankan Dutta
Chowdhury**
Applied Chemistry,
Biosensor, Nanomaterials



**Dr. Suman
Majumdar**
Statistical Mechanics, Polymer
Dynamics, Spin Systems,
Computer Simulations



**Dr. Anwesha
Bhattacharyya**
Neurobiology

Wellcome Trust Fellow



Dr. Shinjinee Dasgupta
Amyloid Biology and
Cancer Research

SERB - SRS Fellow



Dr. Arif Sheikh
Nanotechnology

DST – INSPIRE FELLOW



Dr. Ashish Srivastava
Virology

DST-WOS(B)



Dr. Kirti Saxena
Nanotechnology, Biosensors

ICMR-WOS (A)



Dr. Shaheen Hussain
Bio nanotechnology, Tissue engineering,
Nanomedicine

Chapter – 2

PUBLICATIONS

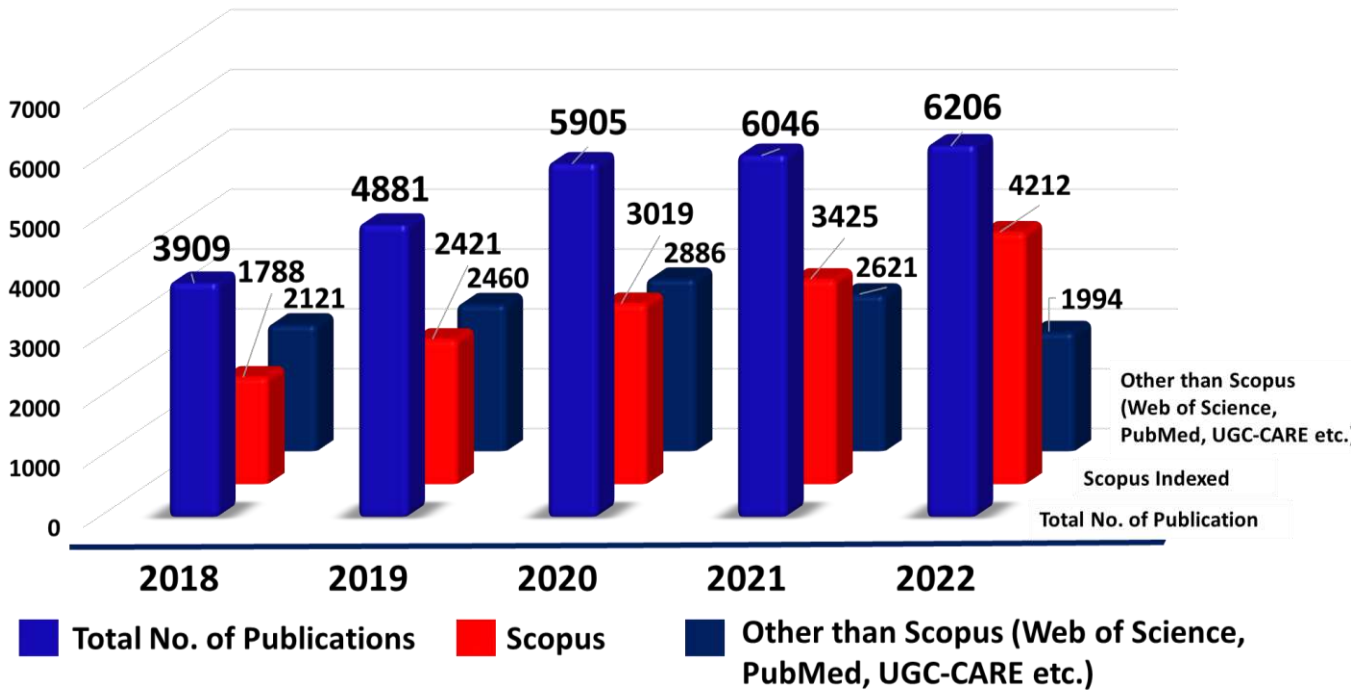
2.1 Publication, a mirror image of knowledge generation based on research and its dissemination to the scientific fraternity for societal benefit has been at the core of scientists and researchers who pursue research activities tirelessly, and publish their work in reputed, peer-reviewed refereed journals indexed in Scopus and web of sciences.

2.2 Enhancing the publications both qualitatively and quantitatively through strengthened research in order to contribute to strengthen the National position has been the objective of Amity.

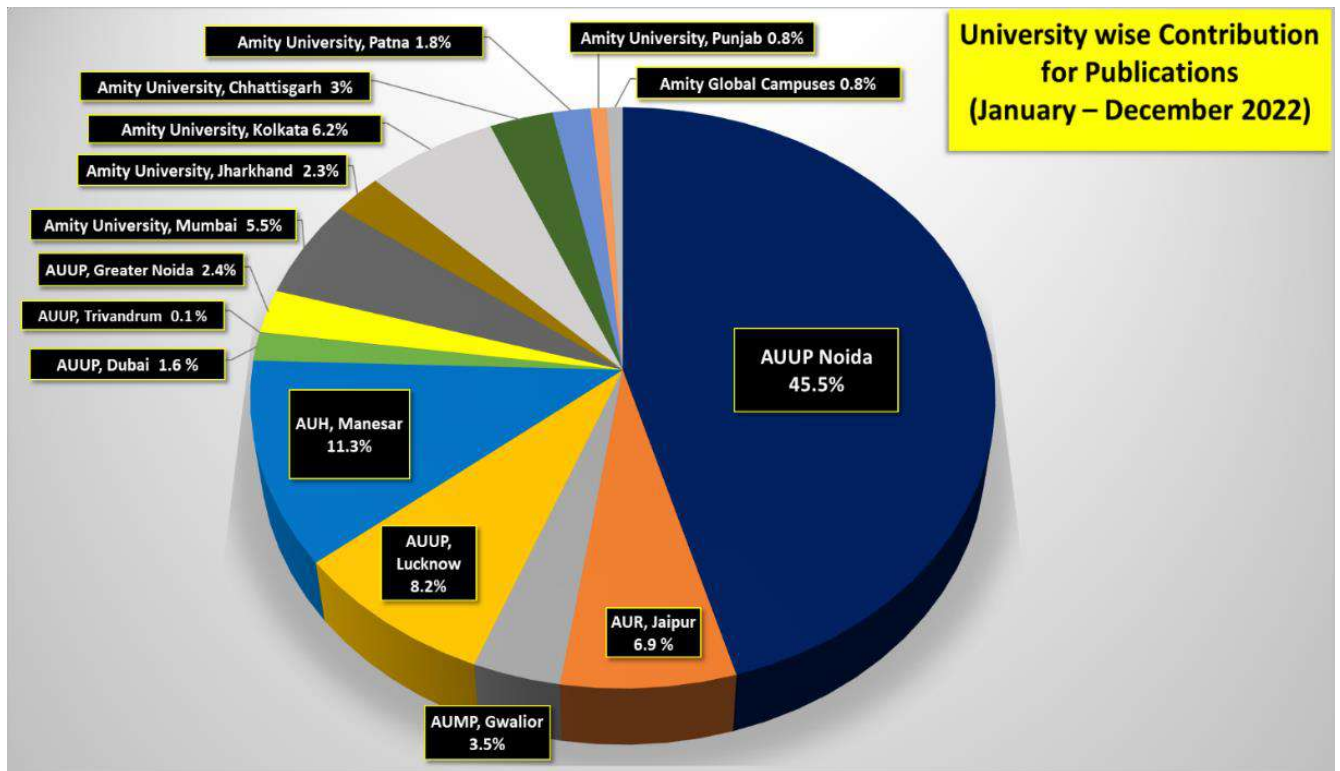
2.3 This year a total of **6206** publications have been made, out of which over **396** are having an impact factor ranging from **6.0** to **202.731**.

2.4 A Glimpse of data shared herein gives the summary of the number of **Research Papers/ Books/ Book Chapters/ Papers in conference proceedings** during the last 5 Years indicating the growth pattern in the **Publication domain**.

Year	2018	2019	2020	2021	2022
Total No. of Publication	3909	4881	5905	6046	6206
Scopus Indexed	1788	2421	3019	3425	4212
Other than Scopus (Web of Science, PubMed, UGC-CARE etc.)	2121	2460	2886	2621	1994

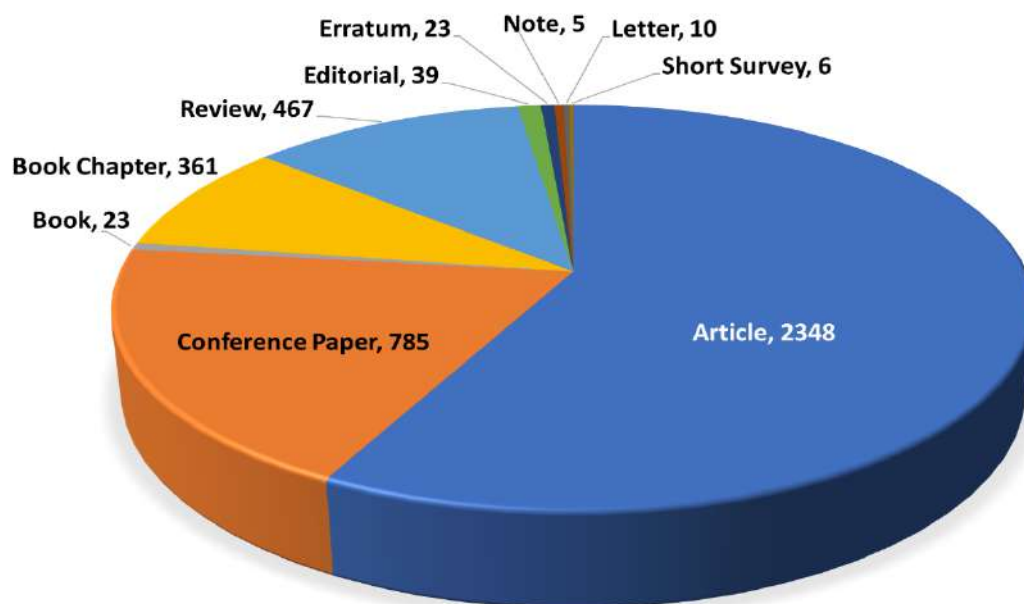


Representation of Contribution towards Mega Mission Publications from each University for the year 2022



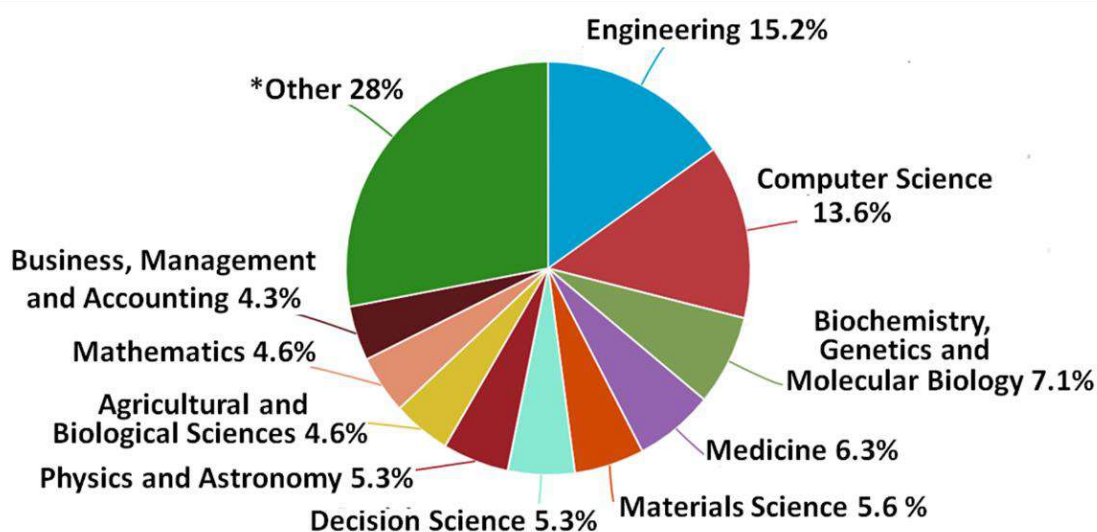
2.5 Analysis of Scopus indexed Publications for the year 2022

- The percentage of the publications document wise such as Articles, Conference papers etc. is given below:



- The percentage of publications based on their subject is as given below:

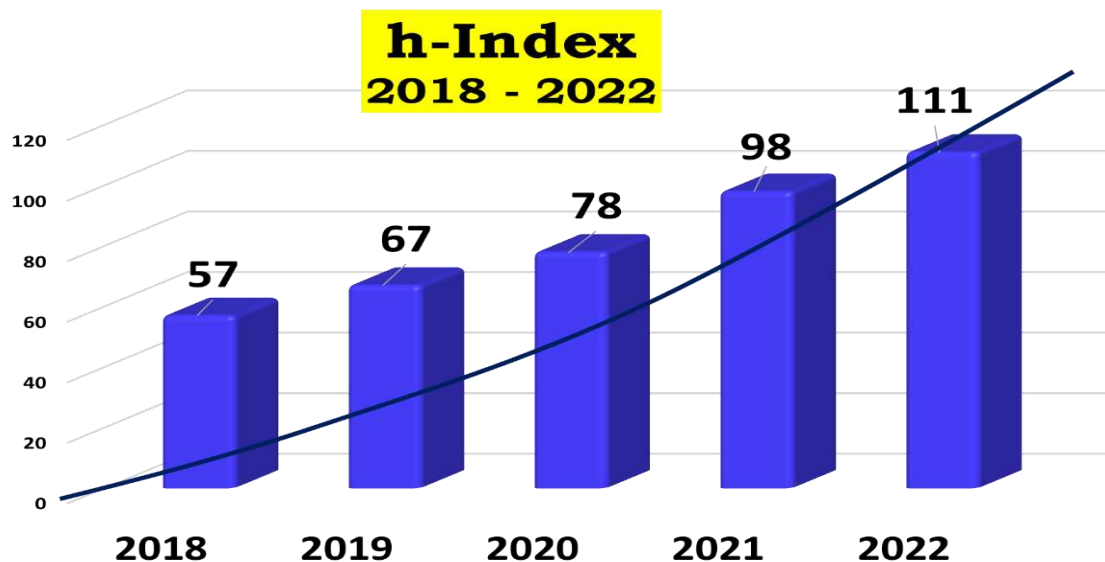
Scopus Indexed Publications by Subject Area



***Others 28%** (Chemistry, Environmental Science, Chemical Engineering, Pharmacology, Toxicology and Pharmaceutics, Social Sciences, Energy, Immunology and Microbiology, Economics, Econometrics and Finance, Earth and Planetary Sciences, Neuroscience, Multidisciplinary, Psychology, Health Professions, Arts and Humanities, Nursing, Veterinary, Dentistry)

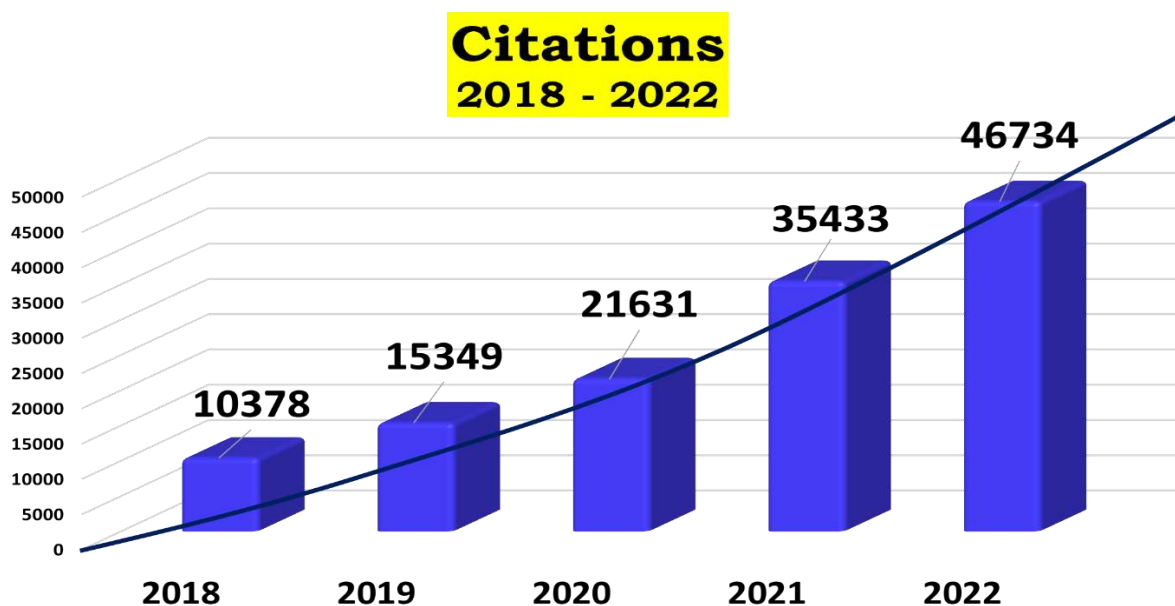
- **h-index of Amity University for the last 5 years:**

Year	2018	2019	2020	2021	2022
h-index	57	67	78	98	111



2.6 The citations of research publications by Amity faculty members/researchers as per Scopus for the last 5 years is depicted below:-

Year	2018	2019	2020	2021	2022
Citations	10378	15349	21631	35433	46734



Chapter – 3

PATENTS & COPYRIGHTS FILED

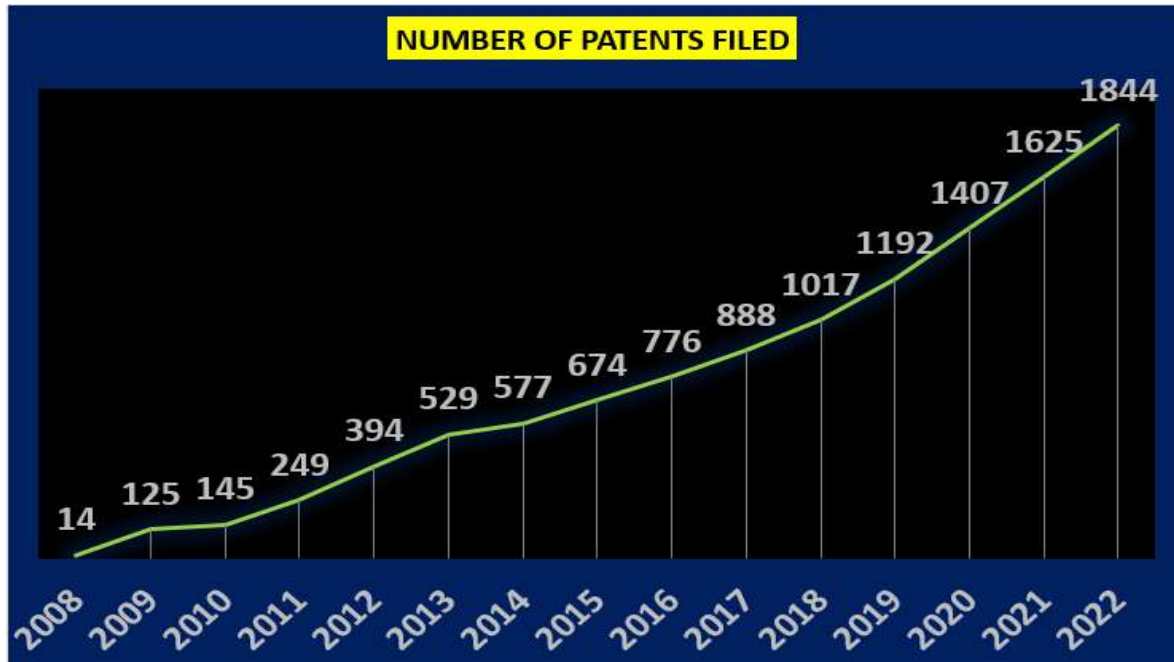
- 3.1** Amity has been credited to be one of the largest patent filing Institutions at National level with a **total of 1844 patents** till 31 December, 2022 of which **219 were filed in 2022** itself. Out of this total filed patents, **181** have been **granted** so far out of which **68** were granted during **this year itself**. In addition, **128 copyrights** were also **filed** out of which **53** have been **registered**.
- 3.2** Indian Intellectual Property Office under the Department of Promotion of Industry and Internal Trade (DPIIT), Ministry of Commerce and Industry, Government of India has conferred **Amity University as the winner of prestigious National Intellectual Property Award for the year 2020** in the category of **“Top Academic Institution for Patent and Commercialization”**:



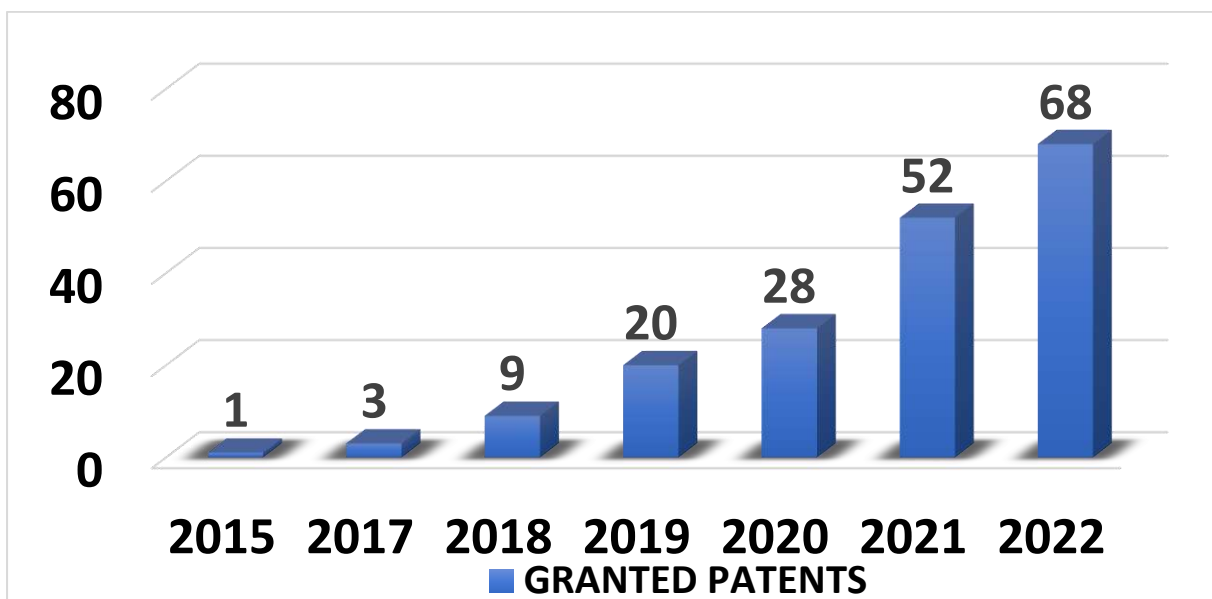
- 3.3** Further to this, **in the year 2022, Amity University with its strong IP Portfolio** has been declared as **the winner for the 8th Confederation of Indian Industry (CII) ‘Industrial Intellectual Property Awards 2022’ ‘Special Appreciation Awards’** in the category of **‘Academic Institutions’** considered as the champion in IP generation and protection to fuel our business and economic growth, **in the 8th International Conference on IPR, ‘Building Global IP Partnerships’,** wherein **World Intellectual Property Organization (WIPO), Japan Patent Office (JPO), Japan External Trade organization (JETRO),** were the Institutional Partners as organized by the CII on November 18, 2022.

3.4 Quetsel India has also conferred **IP Excellence Award 2022** to **Amity University** in recognition for valuable contribution as an Innovation driven organization.

3.5 Graphical representation of Patents filed till date by Amity:-

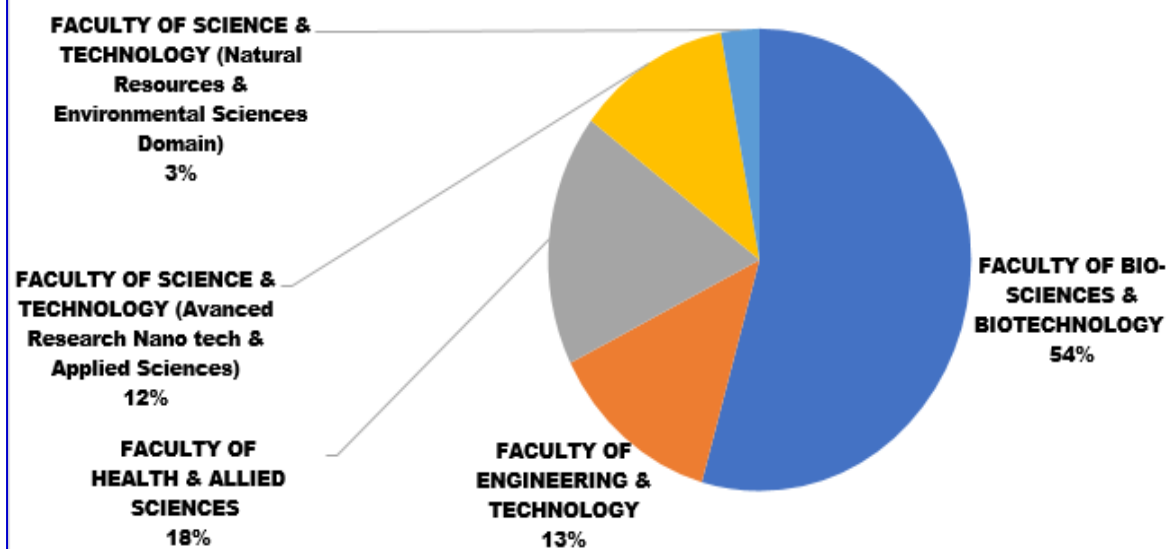


3.6 PATENTS GRANTED: A total of 181 patents have been granted till 31st December 2022 out of which 68 have been granted in the year 2022.





DOMAIN WISE GRANTED PATENTS IN 2022



3.8 AMITY COPYRIGHT FILINGS

Copyrights Details	Total	2022
Copyrights Filed	267	122
Copyrights Registered	136	53

Chapter – 4

TECHNOLOGIES TRANSFERRED

Being conscious of bridging the gap between research output of the University and its application in industries. Amity has created the Directorate of Innovation and Technology Transfer (DITT) which functions as the Industry Interface of Amity University. The DITT has a clear mandate to provide an effective interface with the Industry to promote, develop, nurture and commercialize innovative technologies of Amity Universe for mutual benefit. It is operating on the basis converting “KNOW-HOW” to “SHOW-HOW” and to “DO-HOW”.

DITT : An Industry Interface Unit of Amity University

Facilitating increasing the Technology Readiness Level
Technology Evaluation
Marketing of intellectual property
Bring Industry and Inventors together
Deal Negotiation and finalization
Providing Post transfer support and monitoring



4.1 Amity has transferred 33 technologies to the industry so far out of which the following **Technology has been** transferred to the industries for commercialization in 2022.

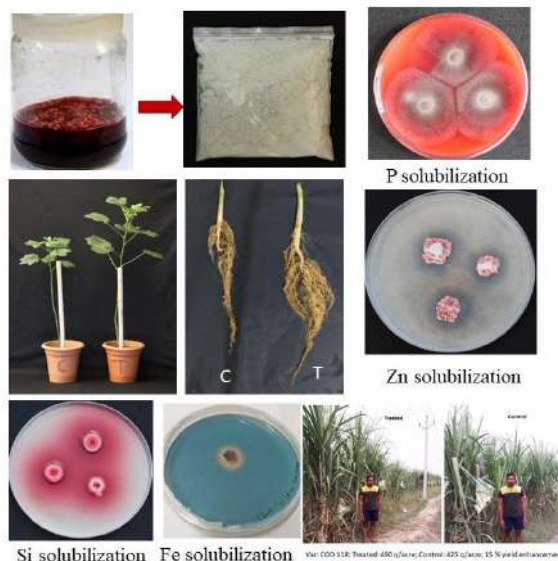
● **HNB9 Formulation to Vedic Vigyan**



HNB9

A Novel Phosphate Solubilizing Fungal Biofertilizer Developed

- *Talaromyces albobiverticillius* (formerly known as *T. purpureogenus*) HNB9 is an axenically cultivated, novel root colonizing patented phosphate solubilizing fungal strain
- Colonization of plant roots by fungus results in pronounced growth enhancement and crop yield
- The fungus has exhibited various plant growth promoting (PGP) activities like phosphate, zinc, silica, iron solubilization and auxin production etc.



4.2 The transfer of some of technologies have been initiated by signing NDA-MTA Agreement:

S. No.	Name of the technology/product	Name of the Industry
1	A plant-based drinking straw	ABPP Papers
2	Healthcare Technologies	Triviron Healthcare Pvt. Ltd.
3	Natural Small Molecules as Potential Bio-Pesticide against Rice Blast Fungus, <i>Magnaporthe oryzae</i>	Sahasra Crop Science Pvt. Ltd.
4	Novel Protease Enzymes	Balaji Enzymes & Chemicals Pvt. Limited
5	Eco-Lution	Indian pollution control association
6	Herbal Energy Drink	Humble & Honest Services
7	Ready to cook protein enriched vegetable Soup	Humble & Honest Services

Chapter – 5

AWARDS & FELLOWSHIPS

5.1 Awards and fellowships are an important component of recognition to faculty/student as it is reflective of third-party endorsement about the achievements apart from being beneficial for their career advancement.

5.2 Amity therefore encourages its faculty/researchers and students to participate at National & International forums for research and Innovation as well as Academics for prestigious awards, fellowships, scholarships.

5.3 In recognition of excellence and outstanding accomplishment in research and Academics, the brilliant and dynamic faculty members of Amity Education Group have been bestowed with 90 awards and 22 fellowships/Scholarships during the year 2022.

5.4 Some of the awards received by our faculty includes:-

- Dr. Balvinder Shukla, Vice-Chancellor Amity University Uttar Pradesh: Vice Chancellor of the Year Award 2022 by Universal Mentors Association
- Dr. Balvinder Shukla, Vice-Chancellor Amity University Uttar Pradesh: Excellent Contribution to Education Sector by CMAI Association of India
- Prof. R. K Kohli, Vice- Chancellor, Amity University Punjab: Prof Birbal Sahni Medal Award by The Indian Botanical Society
- Prof. Rajendra Prasad, Dean Faculty of Science Engineering and Technology, Director AIB, AIISH, Amity University Haryana: D P Burma Award for outstanding lifetime contribution in the field of Biological Sciences.
- Dr. Kalpana Chaswal, Amity Institute of Pharmacy, Noida: Haryana Yuva Vigyan Ratan award by DST
- Dr. Shinjinee Dasgupta, Amity Institute of Molecular Medicine & Stem Cell Research, Noida: Dr. Virendra Balkrishna Kamat Award by IACR
- Dr. Sanjeev Bansal, Amity Business School, Noida: Distinguished Scientist Award by INSO
- Prof. Tanu Jindal, Amity Institute of Environmental Toxicology Safety and Management: Women Achiever Award 2022, Environment and Social Development Association (ESDA)

- Dr. Manish Dwivedi, Amity Institute of Biotechnology, Lucknow: Young Biotechnologist Award by The Himalayan Scientific Society
- 5.5** The faculty have also received prestigious fellowships such as ESDA Fellowship Award, SERB-SIRE, HORIZON European Commission, European Molecular Biology Organization, Erasmus+ International staff training Mobility Program, DAAD Fellowship.
- 5.6** **Twenty-four** Amity University faculty members figure in **top 2%** of Global Researchers from India, in the list compiled by Stanford University, USA.
- 5.7** In addition to the faculty our students have also received 31 Awards & 12 Fellowships relating to research. This includes ESCV Travel Award, EMBO Fellowship, DST Inspire Fellowship, Smart Hackathon etc.

Chapter – 6

COLLABORATION

6.1 MEMORANDUM OF UNDERSTANDING (MOU)

- MoU provide the starting point for building collaboration and plays a vital role in bridging the gap between Industries, Academic & Government agencies for increasing the academic and research capabilities of both organizations.
- Amity University encourages and facilitates collaboration amongst National and International research-oriented organizations.
- The scope of all such collaborative endeavors encompasses collaborative research projects, joint publications, IPR generation, product/ technology development, joint Ph.D, student exchange/ dissertation/projects, award of Honorary / Adjunct Professorships, supporting international visits of the faculty, International conference/Seminars/Workshops etc.
- Amity has signed 102 MoUs i.e; 84 National and 28 International in 2022.
- Some of the National MoUs include Indian Institute of Technology Guwahati, Indian Institute of Technology Hyderabad, Centre for Joint Warfare Studies, Indian National Bar Association, Arid Forest Research Institute, National Maritime Foundation of India, Tourism and Hospitality Skill Council, India Meteorological Department, National Institute of Sowa Rigpa, Elcom Innovation Pvt Ltd, Centre for Land Warfare Studies, CII - Indian Green Building Council, Trivitron Healthcare Private Limited, UP-STATE BIODIVERSITY BOARD, Tata Power, Apollo Hospital, ICAR- Indian Institute of Agricultural Biotechnology, Jiwaji University.
- Some of the International MoUs include Universiti Malaysia Perlis (UniMAP), Malaysia, De Montfort University, UK; University of London, UK; University of Kent, UK; Lawrence Technological University, Michigan; University of Miskolc, Hungary; Royal Melbourne Institute of Technology (RMIT), Melbourne, Australia; Turan University, Kazakhstan.



MoU Signing ceremony with the Indian Navy

6.2 CONFERENCE/WEBINARS/ VISITS

- Amity among various other initiatives for facilitation of cross fertilization of ideas and thoughts, regularly organizes visits/ lectures for igniting the research acumen of its brilliant and dynamic faculty members/ researchers.
- The group has organized more than 1050 webinars/ Lectures of global relevance during the year during the lockdown period for keeping its faculty members and researchers updated with recent technological advancement in their field of research.
- In addition to this, 293 Conferences, Seminars, workshops and FDPs were organized using online mode.

6.3 HONORARY DOCTORATES/PROFESSORS

Amity University awards Honorary Doctorates to recognize and appreciate those whose life and work exemplify professional, intellectual, or artistic achievement. These distinguished persons have made significant contributions to society and Nation.

Amity University has so far bestowed 185 Honorary Doctorate degrees to distinguished persons who have made a mark at National and International level for their outstanding research & academic contributions and leadership out of which 12 were awarded in 2022.

In addition, the University has also awarded 25 Honorary Professorships to renowned Scientists, Industrialists, Technocrats in the year 2022 taking the total figure of Honorary Professors to 330.

Chapter – 7

RESEARCH ECOSYSTEM

7.1 RESEARCH CENTERS & CENTERS OF EXCELLENCE

I) Amity University has also established research centers & Centers of Excellence in niche areas to provide impetus to research activities in certain niche areas. The campus-wise list of such centers is shared below: -

a) Amity University Uttar Pradesh Noida

- Amity Food & Agriculture Foundation (AFAF)
- Amity Center for Translational Research (ACTR)
- Center of Excellence for Artificial Intelligence
- Amity Institute of Genome Engineering (AIGE)
- Amity Centre for Bio Control and Plant Disease Management (ACBPDM)
- Amity Institute of Herbal Research and Studies (AIHRS)
- Amity Centre for Agricultural Extension Services (ACAES)
- Amity Centre for Soil Sciences (ACSS)
- Amity Centre for Carbohydrate Research (ACCR)
- Amity Centre for Spintronic Materials (ACSM)
- Amity Centre for Astronomy and Astrophysics (ACAA)
- Amity Centre for Electrochemical Energy Research
- Amity Institute of Oceanography & Atmospheric Sciences (AIOAS)
- Amity Institute of Water Technology and Management (AIWTM)
- Amity Centre for Antarctic Research and Studies (ACARS)
- Amity Centre for Environmental Health and Sciences
- Amity Mega Centre for Natural and Man-Made Calamities
- Amity Centre for Interdisciplinary Research (ACIDR)
- Amity Centre for Yoga Education, Therapy and Research (ACYTER)
- Amity Centre for Cancer Epidemiology and Cancer Research (ACCECR)
- Amity Centre for Nano Medicine (ACNM)
- Amity Society for Nuclear Security
- Amity CIMA Centre of Excellence
- Centre for VUCA Studies (CVS)
- Reiki Foundation Center for the Science of Happiness
- Centre of Excellence for Sustainable Development
- Centre for Media Studies
- Centre for Cyber Forensics and Information Security
- Centre for Excellence in Photonics and Optoelectronics

b) Amity University Haryana

- Centre for BRICS Studies
- Amity Centre for Innovation In Education
- Yunus Social Business Centre (AUH-YSBC)
- AUH-E-Cell & IIC
- Centre for Financial Analytics
- Amity Centre for Linguistics Studies
- Nobel Laureate Kailash Satyarthi Centre for Child Rights & Development
- Amity Centre for Stem Cell
- Amity Centre of Excellence in Bio-Energy
- Amity Centre for Robotics and Artificial Intelligence
- Amity Centre for Bio-Energy and Bio-Fuels
- Amity Centre for NanoScience & NanoTechnology (ACNT)
- Amity Centre for Ocean Atmospheric Science and Technology (ACOAST)
- Amity Centre for Air Pollution Control (ACAPC)
- Amity Centre of Excellence in Indic and Sanskrit Studies
- Amity Herbal Centre for Medicinal Plants and Traditional Knowledge (AYUSH-Amity Herbal Garden and Medicinal Plants Distribution Centre)
- Kiran Majumdar Shah Centre of Affordable Innovation

c) Amity University Rajasthan

- Amity Center for Positivism & Happiness
- Amity Centre for Ocean, Atmospheric Science & Technology (ACOAST)
- Yunus Social Business Centre (YSBC)
- Amity Center for Water Studies and Research (ACWSR)
- Amity Center for Nanobiotechnology and Nanomedicine (ACNN)

d) Amity University Madhya Pradesh

- Amity Centre of Excellence for Environmental Conservation and Biodiversity of Madhya Pradesh
- Amity Centre for Detection of Fake News and Disinformation
- Amity Centre of Excellence for Chemical, Biological, Radiological and Nuclear (CBRN) Mitigation
- Amity Centre of Excellence for Nanobiotechnology and Alternative Medicine
- Amity Centre of Excellence for Smart City-Gwalior

e) Amity University Chhattisgarh

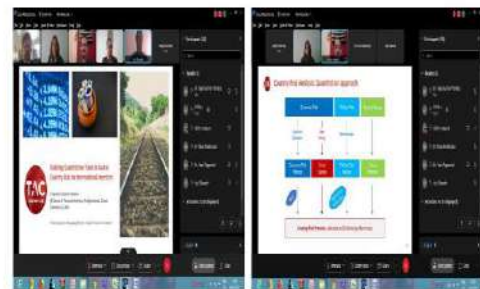
- Centre of Excellence on Tribal Studies / Development
- Centre of Excellence in Ayurvedic Medicine & Research
- Centre of Excellence on Robotic Process Automation (RPA) Technologies
(In Association with Automation Anywhere, Inc. USA, UiPath)"
- Amity Centre of Excellence for Laws Relating to Intellectual Property Rights (IPR)
- Centre of Excellence on Gender Studies

f) Amity University Mumbai

- Centre for Computational Biology and Translational Research (CCBTR)
- Amity Centre of Excellence in Astrobiology
- Centre for Proteomics & Drug Discovery (CPDD)
- Centre for Nanoscience & Nanotechnology



The Expert talk session initiated by Amity Haryana ABS Centre for Financial Analytics on 17th February, 2022 with Mr. Debanjan Chakraborty, VP, Digital Advisory, Edelman.

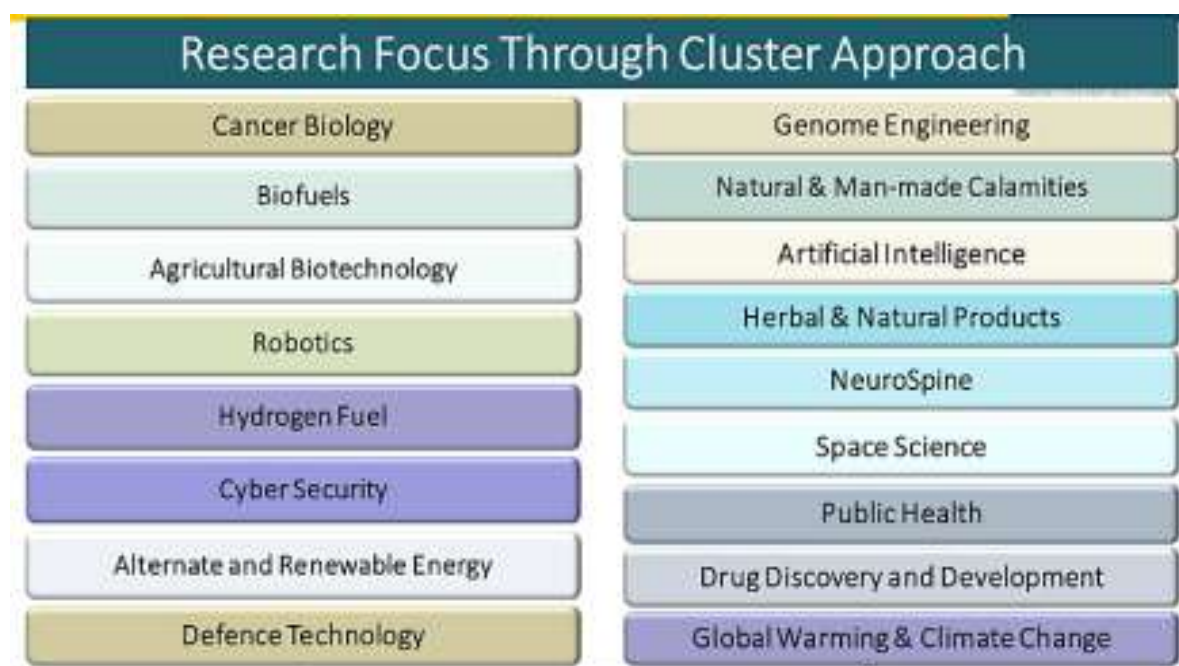


The Expert talk session initiated by Amity Haryana ABS Centre for Financial Analytics on 24th February, 2022 with Mr. Vrien Massot, MD, TAC Economics India.



7.2 Research Clusters

- Research Clusters in areas of great national and global importance have been established and are effectively functioning to act as force multiplier for synergy in Amity Group.
- Presently, 17 Thematic Clusters are functional with the focus on the interdisciplinary research and innovations in Science & Technology. These clusters are formed to bring together our brilliant faculty members, researchers, scholars, and students who share common research interests.



7.3 Pathbreaking Scientific Achievements Deliberation

Incredible efforts of Amity Faculty members, Scientists, Researchers and Technocrats who have contributed immensely in gaining global recognition in research have led to tremendous achievement by Amity University in specific research areas.

In order to give a focused understanding to these notable contributions, a forum has been established to recognize the efforts of the Scientists and also to understand the unique research work Amity Scientists have done, its impact globally and future prospects of the research.

The deliberations are attended by all relevant Faculty members, Ph.D scholars and students of Amity Universe.

7.4 Extension Activities

In its efforts to bring the knowledge generated at various labs at Amity, we have been undertaking various extension activities in the campus as well as in nearby villages.

The University also promotes regular engagement of students with the neighborhood community for their sensitization & holistic development through various activities such as blood donation, health Camps, farmers' training, environmental awareness, teaching the underprivileged, working with NGOs, etc. wherein students participate voluntarily. Various awareness programs, workshops, roadshows are conducted on cleanliness, digital literacy, environment, health & hygiene, women empowerment, gender sensitization, animal care, elderly health, disability, women empowerment. The impact of such exposure has led to sensitizing students towards social, legal issues & availability of social remedies for matters like domestic violence, dowry, child abuse, old, refugees and displaced persons. They have further become aware about conservation of water, environment preservation, careful driving on highways, concern for elderly and their special needs which has impacted them in holistic development of personality as they appreciate the complexities existing in society and need for empathy, positive approach, teamwork & balanced approach towards various issues. This has also led to the development of skills such as social, problem solving, communications, analytical & perceptual. Farmer & rural women training at KVKs for storage of agricultural produce at farm sites to minimize post-harvest losses, production of value-added products has led to economic advancement through increased income.

The University has undertaken 280+ such activities in the year 2022.





Chapter – 8

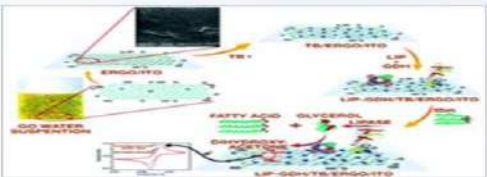
RESEARCH HIGHLIGHTS

AMITY UNIVERSITY UTTAR PRADESH NOIDA

- **Bienzymatic reusable reduced GO-based biosensors for electrochemical sensing of cholesterol and triglyceride c**

Product Features and Characteristics

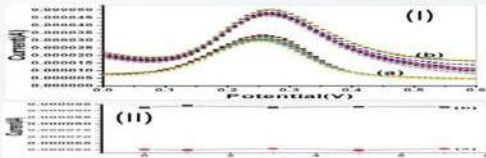
- Novel ERGO platform has been explored to fabricate a triglyceride (TG) biosensor via co-immobilizing of lipase (LIP) and glycerol dehydrogenase
- Detect tributyrin in the range of 50–400 mg dL⁻¹, high sensitivity of 29 pA mg⁻¹ dL, low response time of 12 sec, tested with serum samples
- Novel amperometric cholesterol biosensor based on bienzyme system such as cholesterol oxidase (ChOx) and horseradish peroxidase
- Offer wider linearity (35 to 500 mg/dl), higher sensitivity (4.22 μA mM⁻¹), high shelf life (8 weeks), low response time (19s)



Schematic presentation of formation of LIP-GDH/TB/ERGO/ITO electrode for Triglyceride sensing

Need and Demand

- Level of cholesterol and triglyceride in serum are important parameter in the diagnosis and prevention of heart diseases
- The risk of GAD and hyperlipidemia necessitates estimating the amount of triacylglycerols in blood
- Existing cholesterol biosensors suffer from low reliability, poor shelf life and low sensitivity and interference from other oxidisable species such as ascorbic acid (AA), uric acid (UA), and acetaminophen
- Developed sensor offers smart, simple, sensitive, rapid response and online monitoring strategy for common man usage



(i) DFV curves for reusability testing for Cholesterol biosensor (current vs. potential plot with 100 mg/dl analyte for 8 times)


(ii) Shelf life measurement for 8 weeks

Unique Selling Points (USPs) Developed sensor offers smart, simple, sensitive, rapid response and online monitoring strategy for common man usage

- **Electrochemical device for sensing of Aflatoxin B1 in Groundnut extract: Amity Center for Nanomedicine**

Product Features and Characteristics

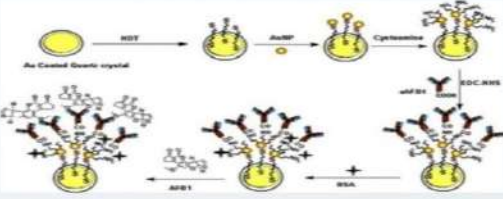
- Handheld electrochemical sensor for rapid detection of Aflatoxin B1 with a linear range of 15 to 60 ppb and a sensitivity of 7.853 count ppb⁻¹ cm⁻²
- Validated by LC-MS/MS by IARI, Accuracy level +/- 12% with LC-MS/MS
- Based on a novel self-readable smart sensing Aflatoxin B1 immunoprobe



Hand-held electrochemical device connected to self readable immunoprobe

Need and Demand

- Aflatoxin B1 is identified as group 1 carcinogenic(IARC) and also causes immune weakness, reproduction deficiency, malnutrition, and growth impairment
- Indian Council of Medical Research (ICMR)-Lucknow stated 21 per cent of groundnut in India is unfit for human consumption due to aflatoxin
- Rapid detection sensor and affordable sensor for detection of AflatoxinB1 in ground nut extract is highly needed from socio-economic point
- Argentina (\$875M), United States (\$594M), Brazil (\$320M), and Sudan are also huge exporters of groundnut, developed device projects huge demand in these countries



Schematic illustration of immunoelectrode antigen and antibody interaction

Unique Selling Points (USPs)

- Rapid detection and affordable sensor
- Total detection time 30 min including ground nut extract

- **Mobile App integrated hand-held organophosphate pesticide sensor: Amity Center for Nanomedicine**

Product Features and Characteristics

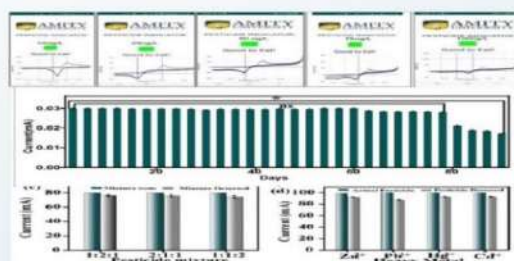
- Rapid hand-held ,mobile app interfaced Electrochemical sensor for quantitative detection of Organophosphate pesticide in vegetable extract
- Operates over a sweeping potential for detection of OP (upto 9.8 ng L⁻¹) ,mixtures of OP and spiked sample vegetable extract (deviation < 15%) over linear range (10–100 ng L⁻¹) with high sensitivity (6.39 μA ng⁻¹ Lcm²), short detection time (10 min)
- Validated with standard potentiostat, and possess remarkable stability for 3 months



OP detection Hand-held sensor with plugged in OP probe and connected to mobile phone by BLE

Need and Demand

- OP is neurotoxin and banned by Environmental Protection Agency (EPA)
- Despite of the fact, high efficacy, low cost, and easy availability, global market consumption of OP pesticide is predicted to reach 94.76 million by the end of 2027
- Existing commercially available sensors are qualitative, while OP tends to accumulate so their precise level (quantitative) detection is mandatory
- Boon for on-site detection of OP by farmers, safety regulators, supply chain retailers and even common man through a mobile app



(a) Detection of different concentration of OP pesticide (b) stability of OP probe (c)Detection of OP mixture(d) Study of interference of heavy metal ions

- **SARS-CoV-2 Antibody Sensor: Amity Center for Nanomedicine**



Mobile app integrated Handheld immunosensor for SARS-CoV-2 Antibody Detection

A novel mobile app integrated hand-held electrochemical immuno-sensor for rapid, on spot, quantitative detection of SARS-CoV 2 antibody. An in-house miniaturized potentiostat has been fabricated and integrated to an immunosensing probe connected to a smart phone via Bluetooth interface. The fabricated immunosensor can detect COVID-19 antibody within sensing range 10-100ngml⁻¹, sensitivity 0.539×10⁻⁴ mA ng⁻¹ml mm⁻², LOD 3.09

ngml⁻¹, LOQ 9.27ngml⁻¹ and linearity of 0.99575. The interference of the device in presence of the antibodies; SARS-CoV Ab, H3SKE-INFLUENZA HA1 Ab[M] (inf 1Ab), PINDA-INFLUENZA HA1 Ab [Rb] (inf2 Ab) and Dengue Ab is 8.77%, with an exception of Dengue Ab which shows an interference of 12.3%. Also encouraging result have been recorded on testing the different concentrations of SARS-CoV2 Ab spiked in serum of different blood groups B+ve and O+ve (interference <10%). The sensor is additionally equipped with features like autocalibration and patient history management. The fabricated sensor can perform on-site detection of COVID 19 using patient sample within 20-25 minutes, and display the result on a mobile screen, make it user friendly and holds a great promise for commercialization.

- **Vegetarian Hard Capsules: Amity Institute of Phytochemistry and Phytomedicine (AIP&P) & Amity Center for Carbohydrate Research (ACCR)**

Product Features and Characteristics

- Vegetarian capsules comprising of palatable polymers and completely devoid of gelatin.
- Capsule possesses multilayer forming ability, so their thickness, tensile strength, and drug release profile can be easily customized based upon the need.
- Already granted patent and ready technology for transfer at commercial scale.



DISINTEGRATION TEST

pH Time	(minutes)
1.2	10
7.4	20
9.0	30

Unique Selling Points (USPs)

- Safe & Non- Toxic
- Multimolecular polymeric film can control drug release

Effect of Temperature and Time



- **Novel Edible Film: Amity Institute of Phytochemistry and Phytomedicine (AIP&P) & Amity Center for Carbohydrate Research (ACCR)**

A thin piece of material that may be consumed and serves as a barrier to the food's ability to absorb moisture, oxygen, and solutes is known as edible film. The substance can be applied as a continuous layer between food components or as a complete food coating. Edible films have the potential to be employed with food as a gas aroma barrier and can be created as food coatings and free-standing films. In recent years, edible films and coatings have drawn a lot of attention due to their advantages over synthetic films.



- **Eco friendly mulch films from agro-waste/recycling of Plastic: Amity Institute of Phytochemistry and Phytomedicine (AIP&P) & Amity center for carbohydrate Research (ACCR)**

Plastic mulch films, especially in the Indian market, mainly consist of low-density and linear low-density polyethylene, which do not readily biodegrade. As a result, these polyethylene-based mulches must be retrieved and disposed of after usage.



- Mosquito Repellent: Amity Institute of Phytochemistry and Phytomedicine (AIP&P) & Amity Center for carbohydrate Research (ACCR)**

Mosquito-borne diseases are those spread by the bite of an infected mosquito. Diseases that are spread to people by mosquitoes include Zika virus, West Nile virus, Chikungunya virus, dengue, and malaria. Hence there is constant need for new innovations in the field of Mosquito repellents.



01 Dec 2022 Hindi Hindustan - Noida - Page No - 02

पानी और तेल का मिश्रण मच्छरों पर वार करेगा

■ अतीव धारा

नोएडा। विद्युत में छोटा, लेकिन जानलेवा 'मच्छर' बचने के साथ ज्वरदा खतरनाक होने जा रहे हैं। इसका कुछ नु है कि बाजार में उपलब्ध मांगे कोटनराक भी मच्छर पर असरदार साबित नहीं हो पा रहे हैं। ऐसे में सेक्टर-125 स्थित एमिटी विश्वविद्यालय के शोधार्थियों ने ऐसा फार्मूला तैयार किया है, जो पूरी तरह इन्वैल पक्षियों से बना है और 75 प्रतिशत तक मच्छरों को मार विराम में सक्षम है।

मोरीया रिसर्च इंस्टीट्यूट द्वारा की जाय विपेट के अनुसार पानी और विभिन्न हर्बल तेल के मिश्रण से बना फार्मूला 75 प्रतिशत तक मच्छरों को मार विराम में सक्षम है। यह मिश्रण टिट समेत अन्य कोटनराक से और प्लास्टिक की तरह मानव शरीर के लिए

बिल्कुल भी हानिकारक नहीं है। इसे करने के बाद इसका दिनभर असर रहता है। शोधार्थियों ने फार्मूले को तेल और लोशन के रूप में तैयार किया है।

एमिटी इंस्टीट्यूट ऑफ फाइटोकेमिस्ट्री और फाइटोमेडिसिन की निदेशक डॉ. हर्षा खर्कवाल ने बताया कि कोटनराक के बाद मच्छरों का प्रकोप बढ़ गया है। मच्छरों से बचाव के लिए यह करीब चार वर्ष से फार्मूला तैयार में जुटे थे। इसे बनाने में डॉ. अमित, डॉ. प्रीति, डॉ. विरुषा और डॉ. सुभाष शर्मा का भी सहयोग रहा। यह फार्मूला एंटीबैक्टीरियल और एंटीफंगल से बना है। इसे पानी के अलावा नीम, यूकेलिप्टस, लेमन ग्रास समेत अन्य छह प्रकार के तेल से मिलकर बनाया गया है। खास बात यह है कि इसमें 80 प्रतिशत पानी और मात्र 20 प्रतिशत



तेल और पानी से मिश्रण तैयार किया।

शरीर पर नुकसान नहीं

यह हर्बल पदार्थों से बनाया गया है, इसका मानव शरीर पर कोई नुकसान नहीं होगा। इसे के अलावा इसे लोशन के रूप में भी विकसित किया गया है। इसे पानी में फिलहाल की तरह कुछ नुद पानी में फिलहाल भी इस्तेमाल किया जा सकता है।

दावा: जोड़ों के दर्द से छुटकारा दिलाएगा तेल

डॉ. हर्षा खर्कवाल ने टीम के सहयोग से जंगली घास (खरफखर), बारा की जड़, बेल की छाल आदि से एक खास तेल भी तैयार किया है। यह गंधिया, जोड़ी में दर्द और सूजन से राहत दिला सकेगा। इन औषधियों को पानी में उबालने के बाद तिल के तेल में फकाकर तैयार किया गया है। तेल में शामिल औषधियों का आयुर्वेद में बारा की जड़ी का उपयोग जोड़ी के दर्द के लिए किया जाता है।

तेल शामिल है। डॉ. हर्षा के मुताबिक नीम के तेल में एंजाइमोक्लिन, मिमिन, निरिमाइन और निबोलाइट।

8-गिनेल (टेरेपेन) अर्द्ध। फिटोनेल में यूकेलिप्ट, सिट्रस और लेमन ग्रास में गेरानियल (धसिरुल), नेरल यूकेलिप्टस के तेल में सारमोन और (धसिरुल) आदि गुण पाए जाते हैं।

At Amity we have come up with a novel blend of oils along with other additives which can be formulated in different forms like cream, sprays, candles, Infusers etc.

The raw materials for extracting the oils is available in plenty and is economic in its costing. It is very efficacious as it kills around 80 % of mosquitoes. The unique blend of oils Raw material is available in plenty Quickly starts working Kills around 80 % of mosquitoes

Our formulation being a novel blend of oils can be formulated in different forms thus enhancing its commercial viability.

- Oil for Muscle Pain: Amity Institute of Phytochemistry and Phytomedicine (AIP&P) & Amity Center for Carbohydrate Research (ACCR)**

Muscle Pain Oils available in the market give temporary relief and take long time for therapy and mostly in allopathy steroids and painkillers are given whereas in Amity innovation. we have used oils which if used consistently relieves one of the pain completely. At amity we have come up with a formulation which is novel blend of oil. All the oils together have a quick

therapeutic effect. You have to take few drops of the oil and massage it for 5 minutes and it starts showing its effect by reducing inflammation and relieving one of the pains.

Novel blend of oils cost of preparation is low Oils are mostly cold pressed and few are extracted Quick action All the oils have been supported with literature.

- **Herbal Mosquito Repellent Agarbatti: Amity Institute of Herbal Research & Studies**

Technology Highlights

- ✓ Effectively repels mosquitoes.
- ✓ Contains herbal extracts & essential oils.
- ✓ Pleasant fragrance and long-lasting effect.
- ✓ Comprises base materials containing herbal ingredients that are safe and effective, pleasantly perfumed, do not irritate the skin and effectively repel mosquitoes.
- ✓ The extracts are processed with a suitable natural carrier base and can be used in the form of Agarbattis, Coils, Cones, Spray.
- ✓ The herbal mosquito repellent has no side effects and is suitable for external application.
- ✓ The effectiveness of the herbal mosquito repellent is best observed when it is subjected to sustainable burning as in case of Agarbatti, Cones etc.

Technology advantages (USPs)

- ✓ Low smoking & Cost Effective
- ✓ Can be manufactured even at small scale and cottage level
- ✓ Can be used in form of Agarbatti, Dhoopbatti, and Cones
- ✓ Suitable for rural areas
- ✓ No Power supply is required
- ✓ Natural & Ecofriendly



- **High end dietary Supplement for diabetes: Amity Institute of Phytochemistry and Phytomedicine (AIP&P) & Amity Center for carbohydrate Research (ACCR)**

Product Features and Characteristics

- Unique fiber blend, all designed to facilitate normalization of blood glucose
- Formulation comprises of novel fibers fortified with suitable vitamins, minerals, and whey proteins as a source of crucial nutrients.
- Nutritional supplement which can be reconstituted to a variety of caloric densities.
- Appropriate for patients with normal gastrointestinal function for prevention and correction of Diabetes.



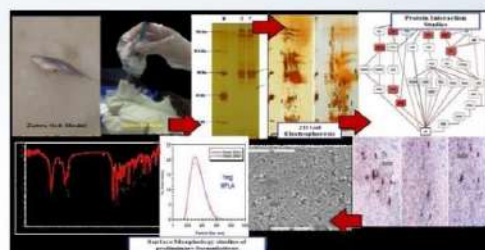
Unique Selling Points (USPs)

- No side effects
- Cost effective
- Safe to use

- **Filomicelles of combination drugs for the treatment of Brain diabetes: Amity Institute of Biotechnology**

Product Features and Characteristics

- Formulation which prevents Type 3 Diabetes having cerebral symptoms by means of a combination therapy using Metformin and Epicatechin
- The invention involves usage of Filomicelles prepared from biocompatible polymer PHA/PHB for effective drug delivery to the target receptor
- Present invention provides a method of using Metformin and Epicatechin
- The combination primarily uses Filomicelles of Metformin along with Epicatechin
- Provides the target drug delivery to brain insulin receptor to increase brain insulin sensitivity



Schematic representation of preliminary work done on Type 3 Diabetes A) model development B) Proteomic Analysis C) Protein Interaction Studies D) IHC images. E) Surface Morphology of preliminary formulations

Need and Demand

- Type 3 Diabetes should be treated as a clinical entity. As there is no drug available in the market for this pathology, the proposed drug will offer a solution for this disease.

Unique Selling Points (USPs)

- PHA/PHB is biocompatible polymer and non-toxic for human system, extracted from bacteria and is cost effective.
- Metformin and Epicatechin are synergistic drugs and the pair offers a unique combination of neuroprotection and antidiabetic properties so that a single drug can target this dual pathology.



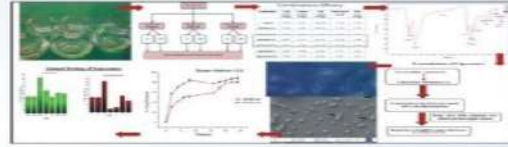
Prepared drug loaded Filomicelles



Targeted delivery through novel brain receptors for combating type 3 diabetes: Amity Institute of Biotechnology

Product Features and Characteristics

- Present invention includes the method of preparation of liposomes containing metformin and baicalein for the treatment of Type 3 Diabetes.
- Liposomes encapsulated drug combinations will target brain receptors such as Insulin receptor (INSR), Insulin degrading enzyme (IDE).
- It prevents the progression of disease.
- Targets brain receptors using the combination of metformin and baicalein.



Schematic representation of evaluation efficacy of drug combinations and liposome's formulation and characterization

Unique Selling Points (USPs)

- Improved absorption of drug and increased the biological half-life.
- Biodegradable and have the capacity to solubilize hydrophilic and hydrophobic compounds.
- Enhanced the therapeutic efficiency of drugs in comparison to conventional/ traditional methods of drug delivery system.
- Drugs transported through liposomes reached to their target sites without rapid disintegration and with lesser side effects.
- Preclinical studies for Solid Lipid Nano carriers have been performed and human validation will be carried out in future.



Liposomes containing drug combinations

Novel Synergistic Formulation for inhibition of tumor growth: Amity Institute of Biotechnology

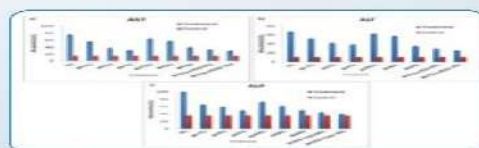
Product Features and Characteristics

- A novel synergistic formulation for tumour growth inhibition, comprising therapeutic effective amount of sorafenib hydroxyethylate with vitamin K2 and Trans chalone for tumor growth inhibition in hepatocellular carcinoma.
- Synergistic formulation sorafenib hydroxyethylate has hydroxyethyl group on the main pharmacophore ring forming a cationic derivative.
- Simple, cost effective and user-friendly.



Unique Selling Points (USPs)

- Novel therapeutic formulation that can be taken in the form of tablets, capsules as well as drops
- Pre-clinical trials already complete and clinical validations to be done



General Overview of Insulin Pumps

Novel and thermostable protease enzyme for industrial applications

Product Features and Characteristics

- Proteases have applications in several biotechnological processes, research, and many industries including pharma sector. The Protease Enzyme Purified from Ginger variety is-
- Novel
 - Significantly High activity
 - Source- Ayurvedic herb (Ginger-household spice)
 - Thermostable
 - Anticancer potential (In vitro)

- Protease enzymes account for nearly 60% of the industrial enzyme market in the world.
- According to Markets and Markets, the industrial enzymes market is projected to reach USD 8.7 billion by 2026.
- The global protease market is projected to grow at a CAGR of 5.8% during the forecast period (2022 - 2027) (Mordor Intelligence Report).
- Acc.to Market research future-Proteases Market is expected to grow at a 5.5% CAGR and reach USD 5,762.9 Million by 2030

Industrial Application Development Avenues

USP In relation to Industrial Sectors

A novel thermostable protease enzyme from plant source (household spice) with significantly high specific activity

USP In relation to Pharma sector

A novel thermostable protease enzyme from plant source (household spice) with significantly high specific activity exhibiting substantial cytotoxic effect against Human Breast Cancer Cells

Unique Selling Points (USPs)

The Novel Protease candidate have applications in several biotechnological processes, research, and industries including-

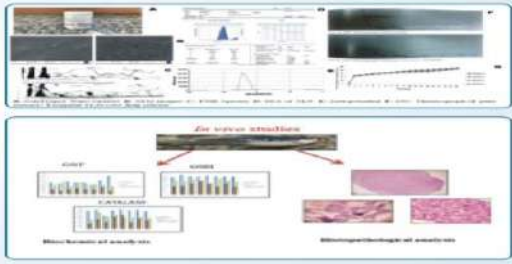
- | | | | |
|-------------------|------------------|------------|-----------------------------|
| • Food processing | • Dairy | • Bakery | • Industrial Waste Mgmt. |
| • Detergent | • Baking | • Soy | • Silver Recovery |
| • Breweries | • Beverages | • Silk | • Pharmaceutical Industries |
| • Textile | • Poultry | • Meat | |
| • Leather | • Infant Formula | • Chemical | |



- **Novel composition of Natural L-DOPA for the treatment of parkinson's disease: Amity Institute of Biotechnology**


Product Features and Characteristics

- Presently there is no cure of Parkinson's disease (PD). Also, a therapeutic effect to large doses being consistent no alternative diagnosis considered in patients who fail completely to respond.
- Improved formulation using L-DOPA with sesame oil as nano carriers for the treatment of PD.
- Helps in the sustained release of the drug from nanocarriers to treat Parkinson's disease and ensures regular supply of dopamine to the brain tissues.
- This nano-drug delivery system is able to transport the drug through brain endothelial cells and is also effective in crossing the blood brain barrier.
- Preclinical studies for Solid Lipid Nano carriers have been performed and human validation will be carried out in future.



Unique Selling Points (USPs)

- Solid lipid nanocarriers (SLN's) developed have excellent biocompatibility.
- Enhances drug stability.
- Maintain, controlled and target site drug delivery
- Easy to scale up and sterilize.
- Cost effective with no side effects.



Formulated Nanocarriers

- **DrugX Platform- Artificial Intelligence-Based drug repurposing system: Center for Computational Biology and Bioinformatics (CCBB), Amity Institute of Biotechnology**

Artificial intelligence (AI) enabled drug repurposing, has potential to shorten the time and reduce the cost compared to de novo drug discovery. Creation of heterogeneous networks: SARS CoV-2 Interactome-An expert curation strategy was combined with a text mining system to screen over 552700 relevant abstracts. We obtained 107 interactions amongst the pertinent genes, 820 interactions between genes and drug molecules, 4045 interactions between drug molecules and side-effects and 8403 interactions amongst the drug molecules. Utilizing all these interactions, we constructed 5 heterogeneous networks covering the molecular pathophysiology of the COVID-19. These networks include CoV-Human, CoV-CoV, drug-CoV, drug-drug, and drug-side-effect. We also obtained a scale-free multi-layer network of 189 nodes and 554 edges, composed of 20 SARS CoV-2 genes, 148 human genes, 7 drugs, and 14 side-effects. Further, we deployed an automated docking pipeline on several drugs and targets to identify network-based binding propensities [Rawal et al 2022].

Artificial Intelligence-based Multi-Modal Pipeline: We also developed a multi-modal pipeline named Cov-DrugX (<http://drugx.kamalrawal.in/drugx/>) to repurpose drugs for COVID-19 treatment. It incorporates several independent modules used for ranking and characterising the drugs.

- **Vaxi-DL system-web-based deep learning (DL) software: Center for Computational Biology and Bioinformatics (CCBB), Amity Institute of Biotechnology**

We have developed a web-based deep learning (DL) software that evaluates the potential of protein sequences as vaccine target antigens. The software provides four different pathogen models which enable the user to choose a specific model according to the query sequence. The four different DL pathogen models (bacteria, protozoa, fungi and virus) were trained using Positive (antigenic sequences) and negative (non-antigenic sequences) datasets.

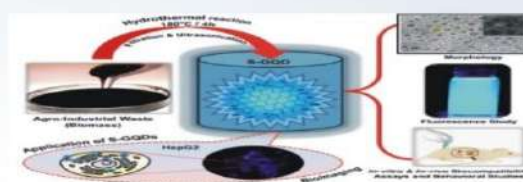
Vaxi-DL is a web-based tool for the identification of potential vaccine candidates (PVCs) in bacterial, fungal, protozoan, and viral pathogens. It is the first server that incorporates deep learning-based strategies. The system is designed to evaluate multiple biological and physicochemical features of pathogenic proteins to identify ideal PVCs.

- **Highly Fluorescent quantum dots from bio-waste for bioimaging applications: Amity Institute of Click Chemistry Research and Studies**

METHOD FOR PREPARATION OF HIGHLY FLUORESCENT BIOCOMPATIBLE SULPHUR DOPED GRAPHENE QUANTUM DOTS FROM AFFORDABLE AGRO-INDUSTRIAL BIO-WASTE CANE MOLASSES USING HYDROTHERMAL SYNTHESIS FOR BIOIMAGING APPLICATION

Product Features and Characteristics

- Present invention discloses a method for facile synthesis of graphene quantum dots (GQDs), and in particular, sulphur doped GQDs (S-GQDs)
- S-GQDs are synthesized hydrothermally through a straightforward one-pot and rapid.
- Facile synthesis using second generation agro-industrial waste (i.e. cane molasses) as a single source precursor.
- Easily scalable and eco-friendly without the need for any catalysts or organic solvents.
- Exceptional ability of S-GQDs to label, specifically, the cytoplasmic area of HepG2 cells in vitro with minimal uptake by normal DF-1 and HEK 293 cells.
- Exceptional biocompatibility, in vitro and in vivo, has a future in quick point-of-care screening and real-time bioimaging.



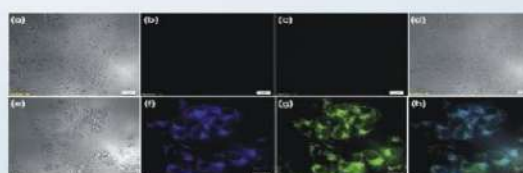
Schematic illustration of the mass synthesis of fluorescent S-GQDs from agro-industrial waste and its application in cancer cell bioimaging.



Fluorescent Graphene Quantum Dots in water

Need and Demand

- Nanosized dimensions, high surface-to-volume ratio and quantum confinement effect have made GQDs famous amongst researchers.
- Unique photoluminescent properties and biocompatibility of GQDs
- Extended range of applications from biosensing to bioimaging and drug-delivery systems.
- Environmental friendly and renewable
- In vitro studies have been performed and will be used for in-vivo testing in animal models as well as human.



Cell imaging. (a-d) DIC image of HepG2 without S-GQDs (e-g) DIC image of HepG2 using S-GQDs (h) Merged image of (e), (f) and (g)



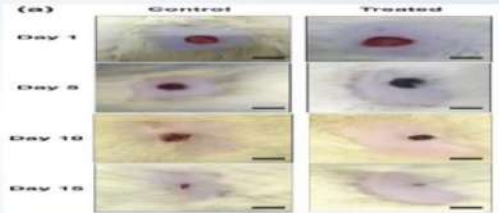
- **N- Doped carbon nano sheet based hydrogel composite for wound healing: Amity Institute of Click Chemistry research and studies**

Product Features and Characteristics


- Hydrogel nanocomposite for biomedical and/or pharmaceutical applications of non-biodegradable polymeric hydrogels containing antimicrobial two dimensional (2D) carbon nanosheets (CNS) as fillers.
- Provide pH-responsive composite composition of material in which nanosized 2D carbon sheets are uniformly dispersed in polymer matrix
- The composite may be used as carrier for therapeutic agent for long duration and as a dressing for topical wounds, cuts, etc. on human body and. Accelerates diabetic wound healing.
- Increased mechanical strength, good viscoelastic properties and could slowly release the therapeutic payload at a particular pH in a controlled fashion.
- Can control wound moisture, absorb inflammatory cytokines and dead cells from the wound and form a barrier to the microbes.
- Facilitate quicker proliferation and migration of epithelial cells, fibroblast and keratinocytes to the wound bed leading to faster wound healing.

Unique Selling Points (USPs)

- Medicament to treat diabetic wound leading to improved patient condition.
- Can decrease chances of amputation and other complications.



(e) In vivo study depicting control and hydrogel nanocomposite treated photograph of Wistar rat wounds at days 1, 5, 10, 15. Control (Panel I) Treated (Panel II). Scale bar 10 mm.




Synthesised hydrogel nanocomposite

- **Bandages for immediate pain relief and accelerated healing: Amity Institute of Pharmacy**

Product Features and Characteristics

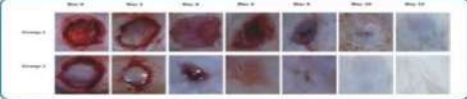
- Novel quad layer bandages for immediate relief from pain and wound healing.
- Quad layer bandage including; local anaesthetic, metal nanoparticles coated with nerve stimulants, adhesive backing and fluid absorption layer, will accelerate the process of wound healing, along with superior antibacterial action.



Novel Quad layer Bandage

Need and Demand

- Indian is among country with high number of wound injuries.
- Most of the currently marketed products only provide antiseptic and antibacterial property.
- Even after applying bandages to user, He / She suffers from pain related to injury. Our product provides immediate pain relief.



Wound Healing Activity in Animal Model

Unique Selling Points (USPs)

- Provides immediate pain relief
- Superior antibacterial action
- Accelerated wound healing process
- Cost Effective

- **Discovery of Sanal Flow Choking and Streamtube Flow Choking: - Paradigm Shifts in Central Science for Resolving Century-long Unresolved Problems in Physical, Chemical and Biological System**

Amity Institute of Aerospace Engineering proved conclusively the occurrence of the phenomenon of streamtube flow choking due to the *sonic-fluid-throat* effect in both internal and external flows at a critical total to static pressure ratio. The fundamental understanding of the causes and consequences of the boundary layer blockage persuaded flow choking (Sanal flow choking) in internal flow system and Streamtube flow choking in both internal and external flow systems received considerable attention in the global scientific community because the

concept of *sonic-fluid-throat* effect due to these flow choking phenomena helps for resolving century-long unresolved problems in physical, chemical, and biological systems. Connected findings are published in various flagship journals [(*Physics of Fluids* (2022), *Nature Scientific Reports* (2021), *Circulation Research* (2022), *Global Challenges* (2021)]. After invoking the laws of thermodynamics researchers across the country corroborated through *closed-form analytical, in vitro, in silico* and *in vivo* studies that all flowing fluids (including water and blood) are compressible and viscous, and the flow choking occurs at a critical pressure ratio in any fluid flow system irrespective of the incoming velocity. The theoretical discovery of the phenomenon of Sanal flow choking and/or Streamtube flow choking in real-world fluid flow systems encompasses disruptive technologies at the cutting edge to elucidate numerous unanswered research questions in central science and it further sheds light on exploring the causes of environmental and supernova explosions. Lead researchers from Amity University will be presenting the flow choking concept at the 2023 NASA human research investigators' workshop at Texas, U.S.A, during February 2023. It will accelerate the prestigious human space flight research project of India.

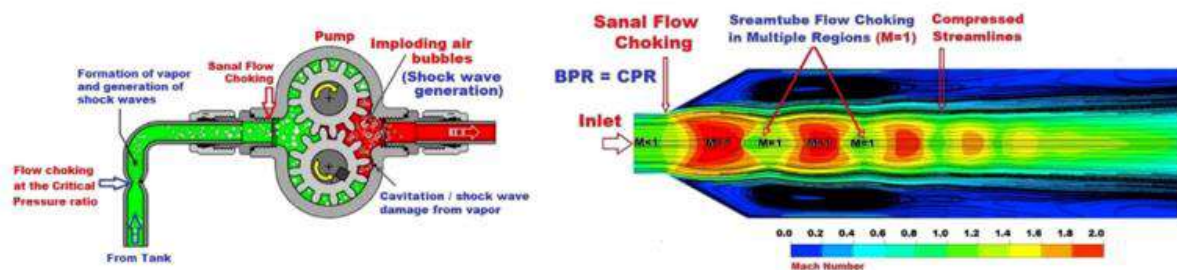


Fig.1 Demonstration of Sanal flow choking and Streamtube flow choking (*Physics of Fluids*, 34, 2022) <https://doi.org/10.1063/5.0086638>

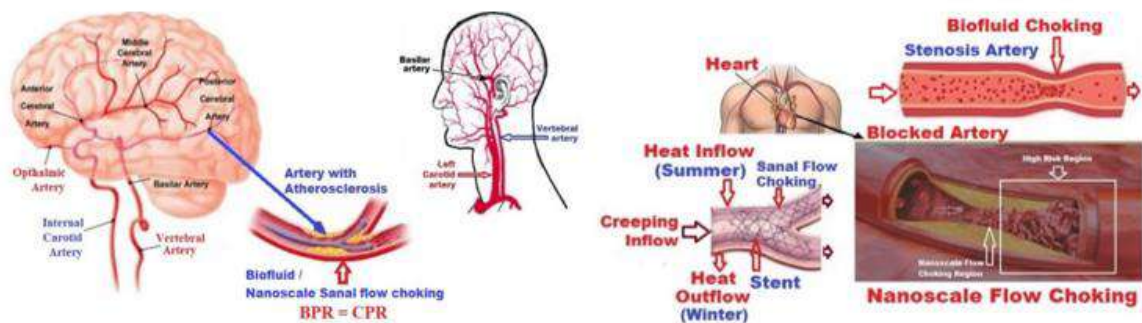


Fig.2 Demonstration of Sanal flow choking in circulatory system (*Physics of Fluids*, 34, 2022; <https://doi.org/10.1063/5.0105407>; (*Scientific Reports*, 2021; <https://www.nature.com/articles/s41598-021-94450-8>).

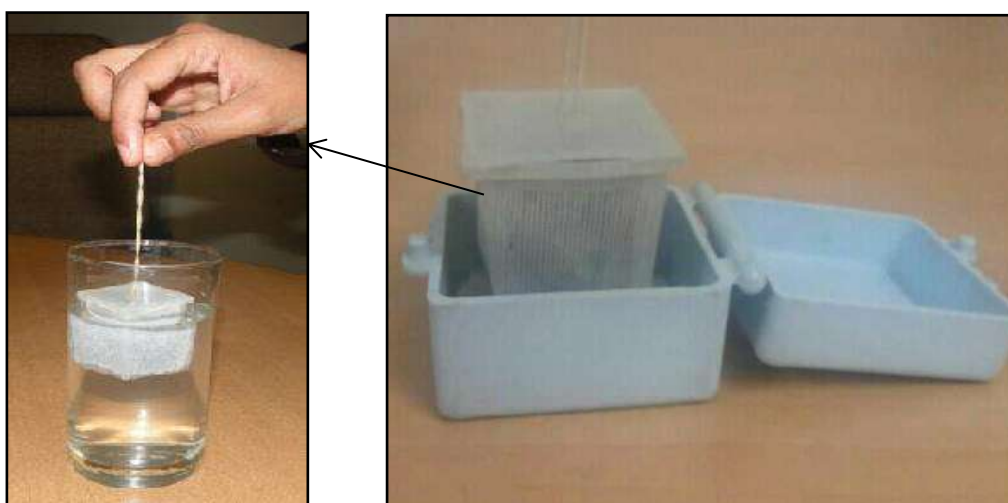
- **Milk thistle leaves for treatment of diabetes: Amity Institute of Environmental Toxicology, Safety and Management**

The focus of the present invention is to extract the active compounds from the leaves of the milk thistle plant and observe its efficiency in increasing glucose uptake and inhibiting PTP1B protein, thereby ameliorating insulin resistance. The new application will be beneficial for preparing diabetes medicament.

Phytochemicals from milk thistle were docked with PTP1B and binding energies were analysed . Optical density for PTP1B inhibition assay was measured by mixing substrate, protein, and extract. Decreasing optical density signifies PTP1B inhibition. Increase in glucose uptake by yeast cells in the presence of extract was studied. Increasing optical density signifies increase in glucose uptake by the cells

- **Pocket size Silver Nano based water purifier (Amity Institute of Advanced Research Studies (Materials & Devices), Noida)**

Scientists at Amity University have generated Nano silver particle based concrete pebble and developed a “**Pocket friendly Water Purification Device**” like a tea bag requiring to be dipped in a glass of water for 2-3 minutes, to turn it into clean drinking water. The product is likely to be priced at an unimaginably low cost as compared to other products in the segment.



Reusable water purifier using silver nano embedded porous concrete pebbles based on green technology

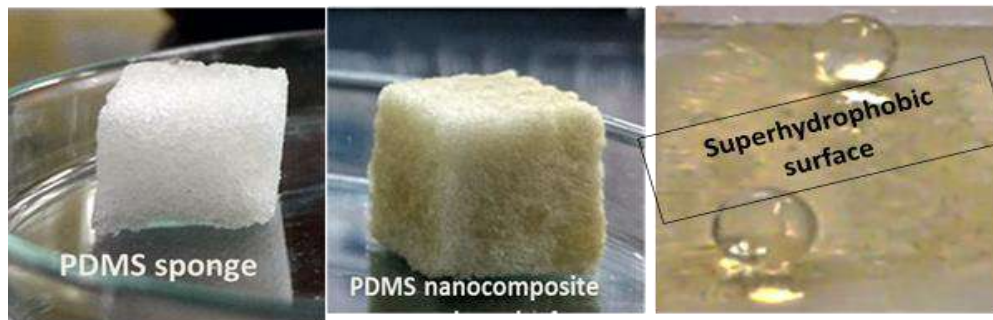
- **Self -sustained system for Generating electricity while wastewater remediation (Amity Institute of Advanced Research Studies (Materials & Devices), Noida)**



An innovative technology has been developed for Generation of electricity from industrial waste water and self-cleaning of the same water simultaneously without using any outside power or any chemical. The user has to dip two specially designed electrodes made from different materials in the dark colored industrial waste water. The system is capable of generating the electric power and cleans the water, simultaneously through an electrochemical process. The experiments have been conducted using a small quantity of waste water at Laboratory scale which resulted in generation of power of about 4 watt which was sufficient to light a LED lamp for four or even more hours as well as cleaning the water. This system is being upscaled and proves itself highly useful for use by the industries before releasing the water into the rivers.

- **Using Nano-based sponge for efficient cleaning of Industrial effluents (Amity Institute of Nanotechnology, Noida)**

A useful technology has been developed by Amity University for efficient removal of oil, organic pollutant and pathogens from industrial waste water. Smart Sponges have been developed for removal of industrial wastes from water.

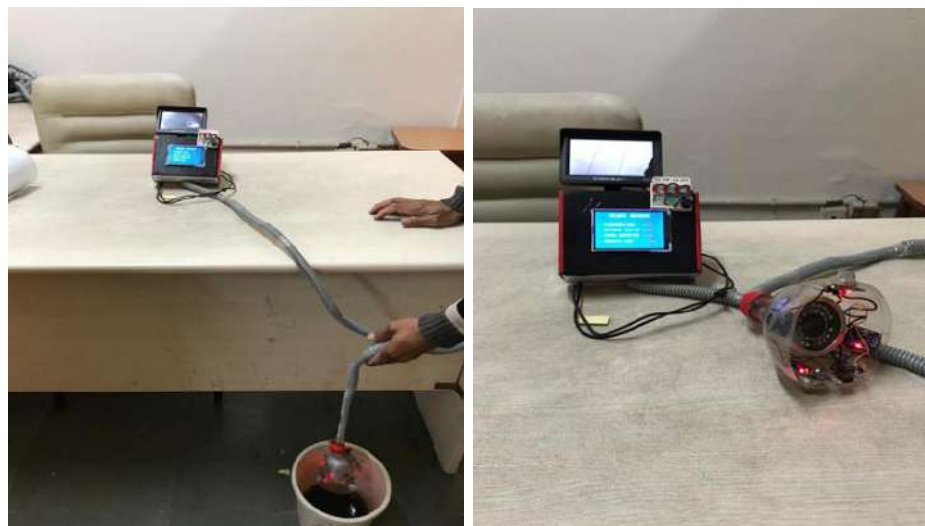


The sponge is capable of removing floating oil/hydrocarbon from water 6 to 13 times its own weight rapidly and efficiently. The product has been tested on Petrol, Diesel, Benzene, Toluene, Xylene, n-Hexane, DMF, THF, and crude oil.

The light weight, reusable and flexible sponge remains buoyant and non-leaching even after saturated with oil/hydrocarbon. The team is in process of further upgrading the product making it more industry friendly.

- **E-Nose for rapid detection of toxic gases in manholes (Amity Institute of Advance Research Studies (Materials & Devices), Noida)**

Amity has developed a low cost, easy to use portable sensor array capable of detecting poisonous gases like carbon monoxide, hydrogen sulfide, and explosive gas like methane in few minutes.



The device helps in detecting the presence of hazardous gases in sewer-pipeline to offer safe access to sewer-pipeline workers so that the human fatalities, which occur due to the toxic exposure of sewer gas components, can be avoided.

- **Point of care device for on-spot detection of Chromium in water (Amity Institute for Advanced Research and Studies (Materials & Devices), Noida)**

We have developed a colorimetric sensor for detection of chromium using nanotechnology in water and urine/serum samples of patients. The device is a small meter of a size of mobile phone. It just takes few drops of water and gives the quantity of chromium in water. It is highly useful for an “**Instant detection of chromium**” in water samples.



- **Synthesis of small *Heterocyclic Molecules* using multi-multicomponent approach, Click Chemistry, C-H activation etc. as inhibitors for various targets of malaria and cancer: Amity Institute of Biotechnology**

We reported the synthesis of β -carboline conjugates having varied substituents for *DHFR* targets based on structure activity relationship. The *in vitro* studies for these derivatives against *Plasmodium falciparum* 3D7 strain shows promising anti-plasmodium activity in micromolar scale. Additionally, *insilico* studies were also performed to validate the *invitro* results and investigating the target based-interactions where 3 major units namely hydrogen binding, complementary and auxiliary unit are found to be responsible for efficient binding.

AMITY UNIVERSITY UTTAR PRADESH, LUCKNOW CAMPUS

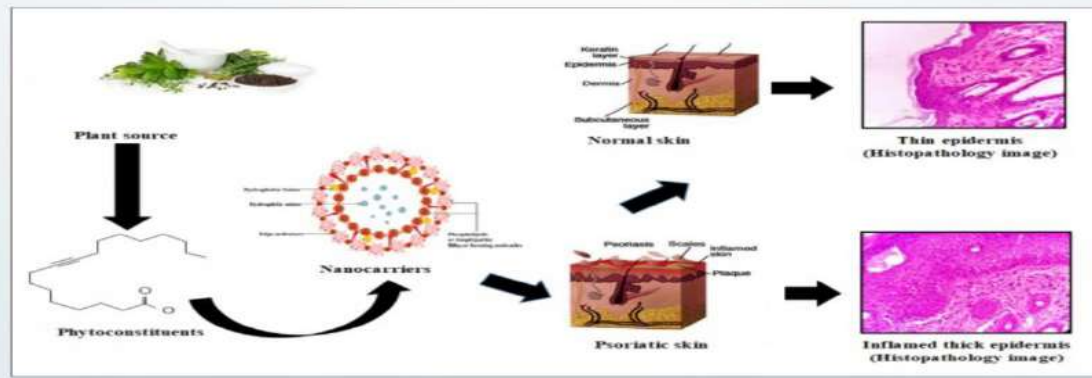
• **Herbal Remedy for Psoriasis: Amity Institute of Pharmacy**

Product Feature and Characteristics

- Herbal product for the treatment of psoriasis which is a chronic inflammatory, multi-system disease associated with considerable morbidity and co-morbidity.
- Majority of patients prefer the topical treatment for psoriasis. The biggest challenge posed by topical treatment is highly resistant stratum corneum which makes conventional creams and ointments reaching deeper layers of skin difficult. Nano formulation is capable of penetrating into deeper layers of skin.

Unique Selling Points (USPs)

- Novel nano delivery system bearing phytoconstituent
- Improved permeation into rigidized psoriatic skin
- Dermatologically tested
- Overcome the limitations associated with conventional formulation available in the market



• **QUIC: APPLICATION OF QUIC PROTOCOL FOR IoT APPLICATION**

- For decades, TCP has been the transport protocol of choice on the Internet.
- In recent years, major Internet players such as Google, Facebook and Cloud Flare have opted to use the new QUIC transport protocol.

Expectations

- Expectation of dramatically reduced connection establishment time/latency of QUIC over TCP.
- Expectation of QUIC's improved congestion control over TCP
- Expectation of Multiplexing without head of line blocking of QUIC over TCP
- Expectation of QUIC to deliver an alternative to the well-established security solutions.
- Expectation of speeding up and securing HTTP traffic
- Patented Technology for SAMSUNG R&D



AMITY UNIVERSITY HARYANA

- **RNA extraction free assay for kit development to visually diagnose COVID-19: Amity Institute of Biotechnology**

SARS-CoV-2, the causative agent for COVID-19 pandemic, continues to wreak havoc across the globe leading to unimaginable loss of human lives and plunging millions into extreme poverty. This evocative scenario of COVID-19 pandemic has presented a formidable defiance even for most sophisticated hospital settings. There is an urgency to develop simple, fast and highly accurate methods for the rapid identification and isolation of SARS-CoV-2 infected patients. In an effort to address the ongoing challenge, the present study offers a CLEVER assay (CRISPR-Cas integrated RT-LAMP Easy, Visual and Extraction-free RNA) which will allow RNA extraction-free method to visually diagnose COVID-19. RNA extraction is a major hurdle in preventing rapid and large-scale screening of samples particularly in low resource regions because of the logistics and costs involved. Herein, the visual SARS-CoV-2 detection method consists of RNA extraction-free method directly utilizing the patient nasopharyngeal and oropharyngeal samples for reverse transcription loop mediated isothermal amplification (RT-LAMP). Additionally, the assay also utilizes the integration of CRISPR-Cas based system using different guide RNAs of N and E genes along with visual detection via lateral flow readout based dip sticks with unaided eye (~100 min). Together, our CLEVER assay offers a point-of-care tool with no equipment dependency and minimum technical expertise requirement for COVID-19 diagnosis.

AMITY UNIVERSITY RAJASTHAN

- **Bajra Bites: Amity Institute of Biotechnology**

Developed protocol for the Preparation of Bajra Bites. Being highly nutritive, “Bajra Bites” can be a great replacement for the refined flour products available in the market today.



- **The Inner Cosmos: Amity Institute of Behavioural and Allied Sciences**

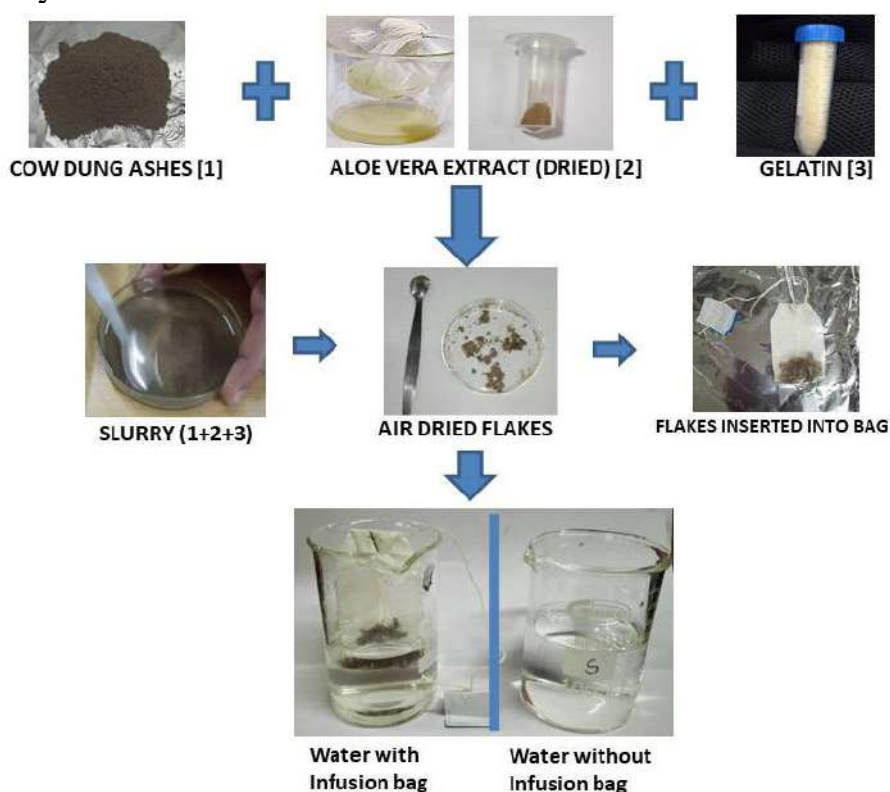
The “Inner Cosmos” is a café that will not only provide products and services related to food and hospitality but also provide counseling and services for Mental Health promotion. The café will consist of several rooms including kitchen. There will be different rooms/ centers dedicated for therapies, healing techniques and counseling. There will be provision for administration of healing therapies like art therapy, color therapy, relaxation and deep meditation, relieving of aggression etc.



AMITY UNIVERSITY MADHYA PRADESH

- A COMPOSITION FOR INFUSION BAGS TO IMPROVE THE QUALITY OF DRINKING WATER AND METHOD THEREOF: Amity institute of Biotechnology**

The present invention relates to the field of development of a composition and method thereof for infusion bags to improve the quality of drinking water. The present invention in particular, the infusion bags containing Aloe vera with cow dung ashes along with little amount of gelatin to obtain hygroscopic powder after air dry.



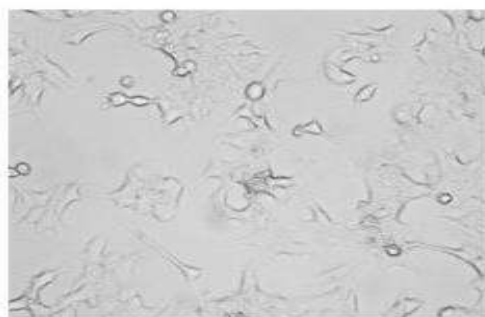
- MATRIX-COUPLED MICROALGAE FOR ENHANCED BIOSORPTION OF TOXIC NANOPARTICLES AND METHOD THEREOF: Amity Institute of Biotechnology**

The present invention relates to a matrix-coupled microalga for enhanced biosorption of toxic nanoparticles and preparation method thereof. In the present invention, the algae has been recognized as natural water purifiers. Micro algae have shown their promises due to their capability to absorb toxic metals from the environment. *Chlorella* and *Scenedesmus* are widely used green algae as compared to other species for selective uptake of toxic metals from aquatic system as they can tolerate metals like Copper, Nickel, Cadmium, Lead, Mercury, Titanium, Arsenic and Zinc.

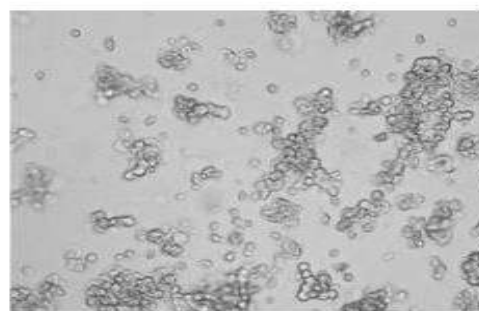
- pH Dependent Release of Targeted Anti-Cancer Metal Nanofibres Encapsulated in Goat Milk Protein, Poly Vinyl Alcohol and Phytochemicals: Amity Institute of Biotechnology**

In the above invention, the aim was to synthesise targeted anti-cancer metallic Nano fibres by an eco-friendly approach with maximum efficacy and minimal toxicity towards healthy cells. On the basis of comparative analysis, it was found that sample (1.5 ml Cp leaf extract + 7 ml PVA + 1 mM AgNO₃ + 1.5 ml Goat milk) showed maximum anti-cancer potency by causing effective toxicity on ovarian cancer without causing adverse or side effects on Normal Healthy Human cells.

• Direct Microscopic images of treated cells captured at 10x magnification were enclosed along with this report. The images are depicted in Figure 4 and 5:



a. SK-OV3 (Control)



b. SK-OV3 (Treated with Std. drug, Doxorubicin)

- DEVELOPMENT AND REPURPOSING OF CARBAPENEMS ANTIBIOTIC BASED ENCAPSULATED NANOPARTICLES AGAINST MULTI-DRUG RESISTANT BACTERIA: Amity Institute of Biotechnology**

The present invention relates to the development and repurposing of carbapenems antibiotic based encapsulated nanoparticles. The present invention in particular relates to carbapenems antibiotic based encapsulated nanoparticles against multi-drug resistant bacteria. Moreover, the present invention helps in drug repurposing to control emergence of multi-drug resistant bacteria with currently available antibiotics. Furthermore, the present invention helps to synthesize a novel, emerging, fast and safe alternative treatment option against biofilm forming multidrug resistant bacteria and also provides an insight method for stabilization of nanoparticles.

AMITY UNIVERSITY MAHARASTRA

- **Design, Fabrication and Performance Evaluation of 6 DoF Robotic Arm. (Amity School of Engineering & Technology)**

The main purpose of building this robotic arm was to create an easy to replicate design for other students to make and modify. The 6 DOF robotic arm was made using off the shelf servo motors, a combination of laser cutting 3mm MDF and 3D printing PLA. The software for controlling the robot runs on an ESP32 Wi-Fi and Bluetooth enabled microcontroller which is powered by a 12v wall adapter. The controller is a custom made app made using MIT APP INVENTOR.



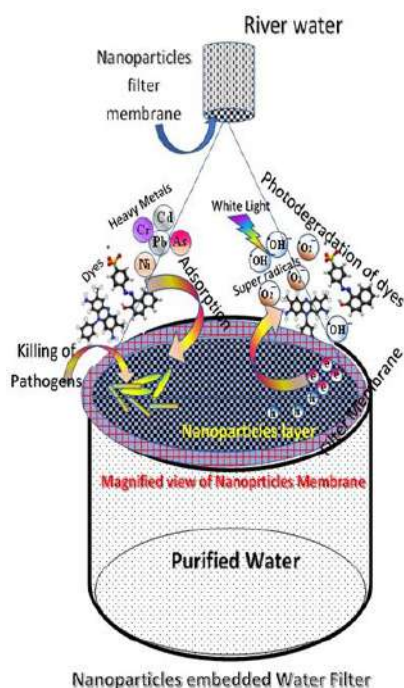
The study and research for the project included researching different types of robots, history, and various control schemes. These control schemes and designs inspired the design of the robotic arm. What makes this different from the other available designs is the extreme modularity that is provided by the laser cut design. Each item is panelized and hence can be modified or replaced as needed according to requirements. The control for each motor also uses standard PWM signals and the actuators can also be replaced. The tool also as a result is very versatile and can be replaced according to needs like drilling, cutting, welding etc.



In the current design, configuration and parts used, the arm has a maximum load capacity of 200 gm when fully extended. The cost of the entire project was also minimized and kept under ₹10,000.

AMITY UNIVERSITY WEST BENGAL

- Room Temperature Green Synthesized Doped Noble Metal Nanoparticles: Active Material for Water Filter Membrane: Department of Physics**



Successful synthesis of non-toxic metal-doped noble metal nanoparticles by using eco-friendly green synthesis method at room temperature was reported. The materials delivered good adsorption (~30% in dark) and photodegradation (100% under white light exposure) of organic toxic dyes within 90 minutes. The filter membrane prepared by synthesized doped noble metal nanoparticles can remove the suspended impurity and dissolved impurities very effectively from polluted Hooghly River water. It displays more than 3.5 times improved suspended impurity removal and 6.3 times higher efficacy dissolved impurity removal efficacy relative to bare membrane.

- A Novel Hydrophobic Visible Light Sensitive Antibacterial Organic Salt – An Efficient Antifouling Agent: Department of Chemistry**

Herein, we have developed a Novel hydrophobic visible light sensitive antibacterial Ionic Liquid which can serve as an efficient biofilm resistant coating. Besides, the coating are found to exhibit visible light induced self-sterilizing characteristics. These ILs are hence considered to possess tremendous potential for use as antifouling coating materials for biomedical devices, underwater surfaces and cultural heritages.

AMITY UNIVERSITY CHHATISGARH

- **Identification and characterization of a novel gene and enzyme responsible for the biodegradation of LDPE from *Enterobacter gergoviae* TYB1: Amity Institute of Biotechnology**

The present studies focused on the production of biosurfactant by microorganisms play an important role to enhance the degradation by changing the hydrophobic nature of LDPE into hydrophilicity. Identification and characterization of produced biosurfactant by using FTIR, GC-MS, NMR, LCMS, and UV-Spectrophotometer. This research work support to removal of polyethylene wastes from our ecosystem by the inclusion of LDPE degradation strategies in integrated waste management programme in various industries as well as municipal waste treatment.

In modern lifestyles of human society has employed more plastics and increasing pressure being placed on capacities available for polyethylene waste disposal, the need for biodegradation of polyethylene wastes has assumed increasing importance in the last few years.

- These studies will be helpful to disposal of polyethylene by the biodegradation of conventional polyethylene by isolated efficient microorganisms.
- The efficient isolates will be included into the plastic wastes managements programs. The polyethylene degrading microorganisms can be reducing the environmental pollution caused by plastic wastes.
- The genomic analysis of plastic degrading microorganism completely lacking, and no any clear evidence are present which will be beneficial for the implementation to solve this major problem.
- The removal of waste plastics from our ecosystem is becoming very overbearing environmental problems. The novelty of this proposal is concerned with the isolation and characterization of a Gene and enzyme/protein in *E. gergoviae* responsible for the degradation of LDPE.

AMITY UNIVERSITY JHARKHAND

- **Qualitative and quantitative analysis of synthesised nanoparticles and bioactive compounds from plant extracts in phytomedicine application: Amity institute of Biotechnology**

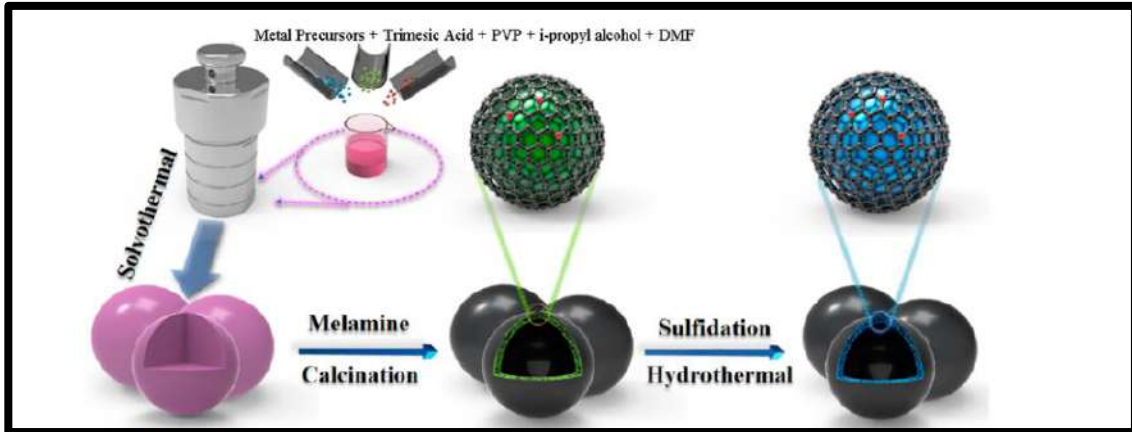
The synthetic fabrication and analysis of nanoparticles through green approach using different plant extracts of medicinal purpose has drawn the attention of researchers. The attributes such as low costing, simple methodology with less hazardous by-products production, minimal side effects, and wide range of applications interest's clinicians in field of phytomedicine. The wide range of derived bioactive compounds, antioxidants and nanoparticles synthesized from aqueous, organic and inorganic based plant extracts of medicinal plants at an optimised condition emphasizes the potential benefits of these phytoextracts for biomedical practices in human health. The futuristic investigations aim at isolation of pure phytochemicals from and study their medicinal and toxicological effects in in-vivo animal models.

- **Screening of Heteroatom Incorporated Multi-Shelled Nanospheres as Potential Electrocatalysts in Water Splitting: Amity Institute of Applied Sciences**

This project aims at the synthesis of these nanostructured materials with single, double, triple, and quadruple shelled with a controlled exterior shell. The challenges to developing new efficient strategies to fabricate high-quality multilayered complex structures with different heteroatoms, e.g., N and P, has been considered. The significance of shell number, shell spacing, and exterior shell structure has been correlated with their electrocatalytic performance for HER and OER during water electrolysis in acidic and alkaline media.

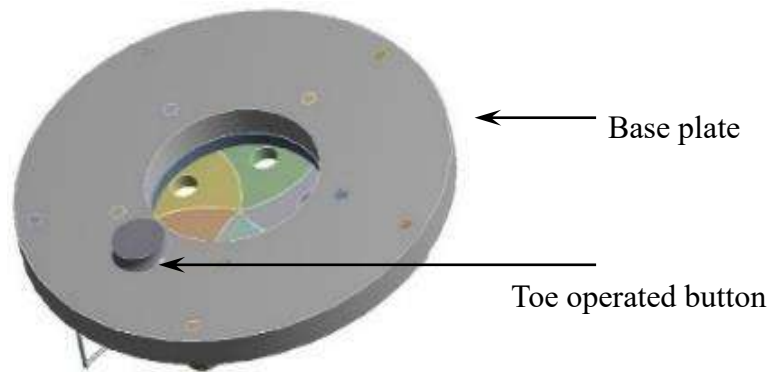
AMITY UNIVERSITY BIHAR

- **Semi-Automatic toe/heel operated water discharge system**



To overcome the problems associated with the existing ‘*water drain grating*’, a new device titled "Semi-Automatic toe/heel operated water drain grating with variable discharge" is proposed by having an adjustable area of the cut out in the ‘*water drain grating*’ and being completely toe/heel of foot operated.

- **Helping Hand**



This project aims to improve the facilities that provide care for road accidents. In today's fast-paced world, we are in a hurry to get somewhere, and as a result, many accidents occur, often resulting in instant death. If an injury occurs, crowds gather to see what happens, but no one comes to help them. As a result, we devised a solution to create software in which anyone passing by that road can take a picture or video and upload it to our site, from which we can trace that location and send immediate help from the nearest help, as well as a SOS to the nearest police station.