



# **Synthetic Chemistry and Drug Discovery Lab**

**Prof. K.M. Nalin de Silva *FRSC*  
Chair of Chemistry**

**Prof. Rohini M. de Silva *FRSC*  
Head / Department of Chemistry  
University of Colombo**

## CUFSAA RESOURCE REQUEST

### 1. REQUESTER'S INFORMATION

- FULL NAME: Prof. K.M. Nalin de Silva
- DEPARTMENT: Chemistry
- TITLE: Chair Senior Professor
- PHONE: +94-714406276
- EMAIL: [kmnd@chem.cmb.ac.lk](mailto:kmnd@chem.cmb.ac.lk)

2. **RESOURCE REQUESTED:** Fully equipped synthetic chemistry and drug discovery laboratory.

### SIGNIFICANCE

3.1 Explain how the requested resource benefit students and/or the department.

The Department of Chemistry at the Faculty of Science, University of Colombo, is pleased to submit this proposal for a fully equipped synthetic laboratory. Designing and synthesizing new molecules is a fundamental aspect of chemical sciences. Synthesis of new chemical compounds has immense commercial importance since it's at the core of many industrial products such as pharmaceuticals, polymers, semiconductor materials and many others. The current facilities at the Department of Chemistry are not adequate to meet current synthetic challenges, particularly the handling of air- and moisture-sensitive material. To remedy this, we propose the development of a fully equipped synthetic laboratory with dual manifold Schlenk lines, single station glove box and solvent purification systems. We fervently believe that this new laboratory will play a central role in the R&D landscape of Sri Lanka, together with the currently existing facilities.

3.2 Would the requested resource benefit students? Yes

3.2.1. If YES, explain how.

The Department of Chemistry over the last 10 years has progressively expanded its research facilities, particularly with the development of three new laboratory facilities – Centre for Advanced Materials and Devices (CAMD), Sri Lanka Pharmaceutical Laboratory (SLPL) and the Instrument Laboratory. The SLPL was recently converted to a centre, Centre for Advanced Pharmaceutical Research and Industry Solutions (CAPRIS). Currently the Department conducts five Honors Degree programs for undergraduates and three MSc programs with two more in the pipeline. In addition, the department has proposed an external degree program which will be started in January 2024. This new external degree program, BSc in Applied Chemistry will be a game changer due to the anticipated revenue generation for self-sustainability. All these degree programs have a strong research component which has been validated by the fact that over the past five years our students have received admission to top-ranked Universities including Oxford, MIT and Cambridge. In addition, the Academic Staff of the Department of Chemistry supervise around 40 MPhil/PhD students at a given time. This has led to a strong output of publications in reputed SCI journals by the department over the past several years (Annex II). However, the lack

of modern synthetic facilities severely limits the scope of projects for our research students and also hampers our ability to provide up-to-date knowledge in undergraduate and postgraduate practical courses. With the capabilities of the proposed synthetic laboratory, both the undergraduate and the postgraduate students in the Department will benefit from a significant improvement in their research exposure and knowledge. This will also translate into high impact publications and commercially important projects.

## **CURRENT STATUS**

4.1 Explain the current status of affairs in the absence of the requested resource.

The Department of Chemistry currently has only limited capability to conduct syntheses that require handling of air- and moisture sensitive chemicals and reagents. This severely limits the ability to carry-out important and finest reaction pathways necessary for most organic, organometallic and materials syntheses.

4.2 Is there any other alternative if CUFSA could not accommodate the requested resource:

No other viable alternative exists at present. However, the department is optimistic in fund raising through the fee levying external degree program proposed. Presently the department is totally dependent on the donations from well wishers and with the present vision of the department, the total dependency of outside sources will be eliminated due to the anticipated fund raising through the external degree program and other postgraduate programs.

4.3 Explain the impact on students and/or on the department if CUFSA could not accommodate the requested resource.

With these facilities being a critical part of any modern synthesis program, inability to provide exposure to these is a disservice to the undergraduate and postgraduate students we cater to. This will hinder our students of getting exposed to the most important modern techniques available for synthetic chemistry. This has been the scenario for the last decade, however even with depleted resources our students grabbed the best universities in the world for postgraduate studies mainly due to the sound theoretical knowledge gained through our degree programs. Due to the lack of facilities the students will be affected but with generated funds the department is presently outsourcing many facilities through generated funds. In this context it is vital to have in-house facilities for state-of-the-art research projects of young talented academic staff members. If CUFSA is unable to fund the proposed project, the department is optimistic in raising funds through fee levying courses and establish this proposed laboratory during next five years.

5. **RATIONALE** – Please explain the rationale of your request.

Synthesis of new chemical compounds has immense commercial importance since it's at the core of many industrial products such as pharmaceuticals, polymers, advanced materials and many others. The current facilities at the Department of Chemistry are not adequate to meet current synthetic challenges, particularly the handling of air- and moisture-sensitive materials. To remedy this, we propose the development of a fully equipped synthetic laboratory at the Department

Chemistry. We fervently believe that this new laboratory will play a central role in the R&D landscape of Sri Lanka, together with the currently existing Centre for Advanced Materials and Devices (CAMD) and the Sri Lanka Pharmaceutical Laboratory (SLPL).

**OTHER FUNDING SOURCES** – Besides CUFSAA what are the other potential funding sources for your request?

6.1 Have you pursued other funding resources? Yes

6.2 If not why?

6.3 If yes what was the outcome? The department has included the development of this laboratory within the LKR 100 million Chemistry building renovation project submitted to the university. However, with the funding cuts that occurred because of the economic crisis, these funds are no longer available. Even this would not have covered equipment costs.

7. How soon do you need the requested resource? and why? The project would be carried out in phases. It is our fervent hope that the lab would be fully functional by 2025. The longer this type of development is postponed the further our research will fall behind compared to our international and regional peers.

8. Propose specifications such as the brand, the model, the cost and the source for purchasing.

Please see detailed proposal provided.

9. Provided CUFSAA fulfills your request, explain how you report the progress on the impact of the resource.

Once the funds are available, regular communication will take place between the Department and CUFSAA regarding the use of funds. In addition, periodic progress reports will be provided. In addition, a joint committee can be appointed to monitor and evaluate the progress of the lab and its output.

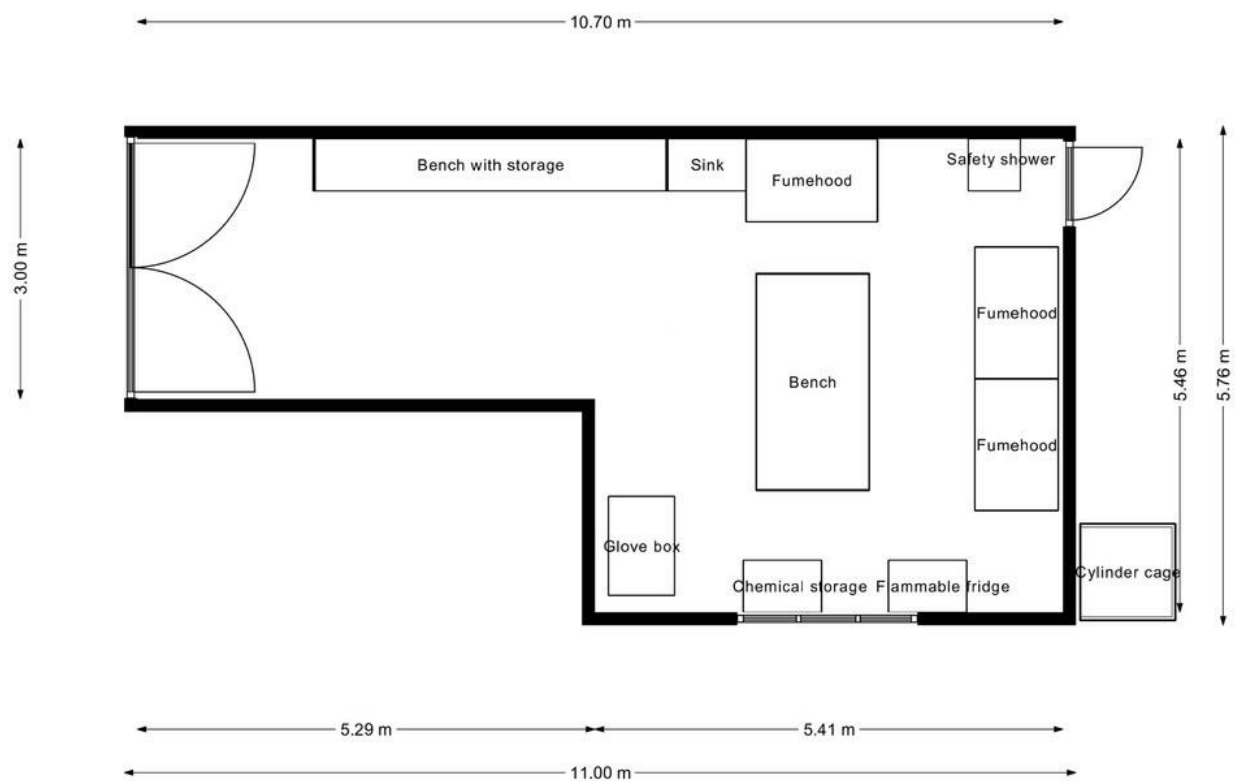
## Proposed Synthetic Laboratory at the Department of Chemistry, Faculty of Science, University

### Location

The proposed location for the laboratory is the old solvent storage room located on the ground floor at the east end of the chemistry department building. This is a sizable room for a fully equipped state of the art synthetic laboratory. The location is currently in very bad shape and needs a complete overhaul to elevate the space to an international standard laboratory. Considering these circumstances, we are in the process of planning to modernize the laboratory including the utilization of space for advanced synthetic laboratory. The following broad items will be required to uplift the laboratory to a sophisticated synthetic laboratory.

1. Renovation of the laboratory (Civil Works)
2. Laboratory Furniture (As this is an advanced synthetic lab the cleanliness is of utmost importance; hence, we are requesting the best furniture with international standard for the lab)
3. Aluminum works (Doors and Windows)
4. Air Conditioning System
5. Electrical and other items (UPS system, etc.)

### Floor plan



## CUFSAA-NA Project



Prof. Tillekerathne's visit to inspect the proposed premises for the laboratory.

### Laboratory design highlights

- **Entry points:** Main entrance – Glass double door with fingerprint gated access. Rear entrance to function as fire escape.
- **Exhaust system:** The laboratory is to be equipped with proper ventilation and exhausts ducts to which fume-hoods and gloveboxes would be connected.
- **Fume-hoods:** Three Standard 5 ft x 3 ft fume-hoods. When operational each fume-hood is to contain a fully functional Schlenk line
- **Cylinder cage with built in gas lines:** With an emphasis on safety the pressurized gas cylinders will be housed outside and a gas line system is to carry gases into the laboratory
- **Chemical resistant modular benches:** This design allows for quick reconfiguration and expansion in the future
- **Chemical storage:** Rated cabinets for flammable chemical storage cabinets and “spark-free” refrigerators

### Main Equipment and instruments

- **Dual manifold Schlenk lines with vacuum pumps:** The lines would be inside the fume-hoods and rotary-vain or direct-drive vacuum pumps will be connected for vacuum and gas lines from the cylinder cage for inert gases.
- **Single station glovebox with purification catalyst bed:** This would aid in storage and weighing of air-sensitive material prior to carrying out reactions on the Schlenk line. The glovebox atmosphere is expected to have sub ppm levels of oxygen and water.
- **Solvent purification system:** This would provide the anhydrous solvents required for air- and moisture-sensitive chemistry. This system would also enhance safety over the use of traditional sodium stills.
- **Top-loaded and analytical balances:** Standard balances for weighing chemicals
- **Hotplate stirrers with temperature controller:** These will allow for elevated temperature reactions to be carried out safely.

### Approximate Budget Estimate

Note: Cost of basic lab infrastructure including benches, fumehoods and safety showers are based on quotations obtained from Avon Pharmo Chem (Pvt) Ltd, a local manufacturer. Other equipment cost estimates are based on quotations and information provided by local and international suppliers including MBraun (India), ChemGlass and Welch.

#### A.) Phase 01: Room upgrade

Item	Estimated cost (USD)
Laboratory upgrade - Demolition and removal of items - Upgrade of electrical system - Flooring - Windows/doors/walls/security system	25000
<b>Total</b>	<b>25000</b>

***Funding for this to be secured through the budget of the proposed Chemistry building renovation project funded by the University. Additional funding may be provided by the Department Development fund.***

## B.) Phase 02: Basic lab infrastructure

Item	Estimated cost (USD)
Three fume hoods with ventilation system	15000
Chemical resistant benches (wall bench + island bench) and regular storage cabinets	15000
Cylinder cage, safety shower and gas lines	5000
Flammable storage cabinets, "spark-free" fridge	5000
Five port, dual manifold Schlenk line equipped with direct-drive or rotary-vain vacuum pump	20000
Rotary Evaporator	5000
Single station glovebox with purification catalyst bed	25000
Top loading Balance X 1 Analytical Balance X 1 Hotplate stirrer with temperature regulator X 3 Oven X 1	10000
<b>Total</b>	<b>100000</b>

*Funding for phase 02 is proposed as an initiative for CUFSAA to support the project fully or partly through generous contributions of alumni.* The Color coding based on: Red – High, orange – moderate, green – nice to have. *The equipment prices are based on the estimates provided by the suppliers. These prices may fluctuate due to exchange rate and tax variations.*

## C.) Phase 03: Equipment

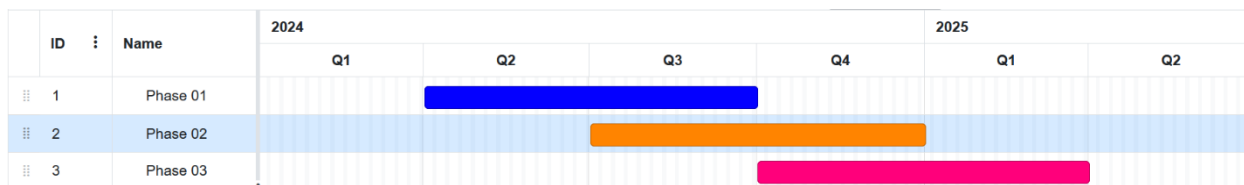
Item	Estimated cost (USD)
Solvent Purification System	30000
GC-FID system	50000
HPLC system	50000
<b>Total</b>	<b>130000</b>

*To be carried out incrementally through donations and fundraising initiatives.*



## Timeline

The timeline for the project will depend on the funding availability at each phase. However, the development phases can overlap and given below is an idealized Gantt chart envisioning this.



## Development and operating model for laboratory

The development of the laboratory would be undertaken in a similar fashion to the existing Centre for Advanced Materials and Devices (CAMD). Please see attached annex I for details. The new synthesis lab would not have dedicated bench space or fume hoods allocated to users. This lab will use a booking system that a scientist can use to request the resources they require for that period. This allows for the efficient use of limited resources (commonly used in industrial labs in North America). Hence, we believe that this facility can cater up to dozens of researchers at a given time. With many modern multidisciplinary projects only the synthesis part would be carried out in this lab. Other work such as biological/pharmacological studies, material characterization and development will be carried out at other existing facilities.

## **Annex I – Progress of the Department**

### **Centre for Advanced Materials and Devices (CAMD) Development**

The newly constructed Centre for Advanced Materials and Devices (CAMD) at the Department of Chemistry was declared open by Senior Professor Lakshman Dissanayake, the Vice chancellor of the University of Colombo on the 23<sup>rd</sup> of August 2018, in the presence of members of the staff and invited guests. The CAMD was initiated by Professors Nalin de Silva and Rohini de Silva, University of Colombo to facilitate the activities of the National Research Council Target Oriented Research Project, Advanced Materials for Water Purification. It is headed by Professor Rohini M. de Silva and Professor K.M. Nalin de Silva of the Department of Chemistry, University of Colombo. Both have secured Rs. 50 million from the National Research Council for this target-oriented project. The university spent matching funds of Rs. 12 million to convert the former NMR/GCMS room to CAMD. In addition, they have also secured Rs 20 million from the NRC, NSF, University College London, the Royal Society, UK and the Engineering and Physical Science Research Council (EPSRC) of the UK to carry out more research in diverse areas such as drug delivery, tissue engineering and cancer therapy. CAMD is equipped with a 20 kVA Generator, 20 kVA UPS, CCTV System and fingerprint access system to protect state of the art instruments such as X ray Diffractometer (XRD), Microwave Plasma Atomic Emission Spectrometer (MPAES) and other instruments. Presently this lab is mainly used by 6 PhD students 5 MSc students and 10 Undergraduate students supervised by Professors Nalin and Rohini de Silva. In addition, this lab is used by all other undergraduates of the department for materials characterization. Further the lab facilitates the use of its instruments to students from other universities, University of Moratuwa, University of Ruhuna and University of Sri Jayawardenapura. In addition to main instruments, the lab acquired the electrospinning technology through a grant from the Royal Society London due to the collaboration between Nalin and Rohini with Prof. Gareth Williams of the University College London UK.

The lab was developed from scratch using the available abandoned space in the department. These two rooms have been used as a place to store broken instruments including the 200 MHz NMR and other debris. In addition, there was an abandoned restroom adjoining these two rooms and that space was also annexed to the lab after demolishing everything. The lab was designed by Eng Mr. Sunanda Gunasekera (Chief Engineer, SLINTEC) in 2017 with an estimated budget of Rs. 12 million. Due to the received funding for the project the Vice chancellor pledged the Rs. 12 million to develop the infrastructure. The investigators convinced the Vice Chancellor of a decision to construct a lab after demolishing everything inside including the floor, brick walls, partitioning, etc. except the perimeter walls of the two rooms.

The CAMD has already produced 6 PhD students, 10 MSc students and more than 50 undergraduate research students. These projects have contributed to approximately 30 peer reviewed SCI international research papers. This shows that development of proper facilities with a good vision for research can pave the way for exponential growth in the research portfolio of the department. The present leadership of the department has strengthened many avenues to support the research of the department. The CUFSA contribution to develop this lab would be an excellent addition to the research strength of the department.

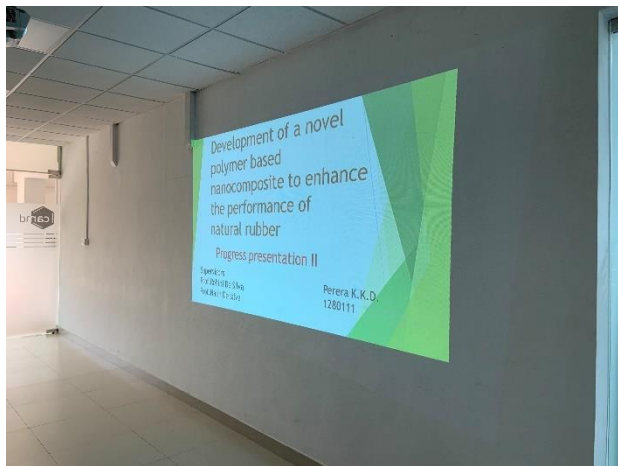
**The status of the room in 2016 is given below.**



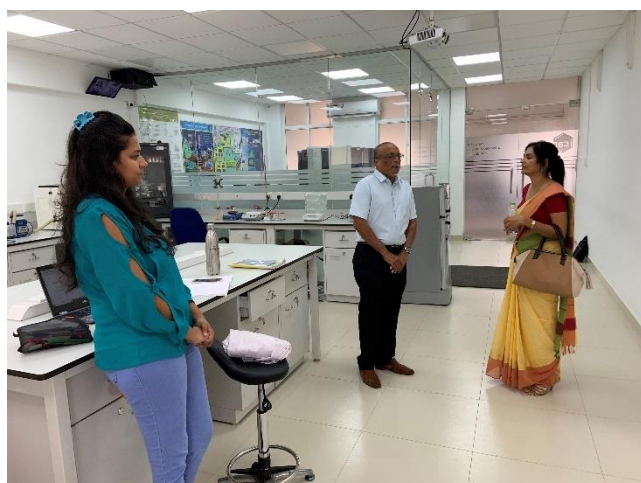


**Conversion of this space to a state-of-the-art CAMD**





Picture shows the opening day of the lab: Vice Chancellor, Prof. Nalin de Silva, Prof. Rohini de Silva, Late Prof. Ranil Dassanayake and Dr. Neranga Abeysinghe. The other person is the XRD Engineer who visited from India to install the XRD machine in the background.



Prof. Gehan Amarathunga's visit to the lab. Gehan is a Professor in Electrical Engineering at the University of Cambridge UK.

**Google Scholar Details of present senior staff and the beneficiaries of the proposed lab**

**\*Dr. Dinesh Aluthge is the coordinator of the synthetic laboratory project**

	Name	h-index	Total Citations	Beneficiaries of the proposed lab
Professor	K.M. Nalin de Silva (Chair)	33	3440	√
Professor	Rohini M. de Silva (Head)	26	1754	√
Dr.	WMC Sameera	26	2988	
Professor	Samantha Weerasinghe	18	2124	
Professor	Dhammike Dissanayake	17	2191	√
Professor	Thusitha Abeythunga	16	933	√
Professor	KRR Mahanama	15	1104	
Professor	Chamari Hettiarachchi	15	1717	
Professor	MDP de Costa	11	351	√
Professor	Aashani Tillekerathne	11	372	√
Dr.	Dinesh Aluthge*	11	714	√
Professor	Dilrukshi Wijerathne	10	273	
Dr.	Kaveesha Wijesinghe	10	338	
Professor	RD Wijesekera	9	636	



Dr.	Ireshika de Silva	9	331	√
Professor	MN Kaumal	7	206	
Dr.	Sashiprabha Vithanarchchi	7	168	√
Dr.	Duleeepa Pathiraja	7	190	
Dr.	Hasini Perera	6	74	√
Dr.	Neranga Abeysinghe	6	396	√
Dr.	Achala Liyanage	5	336	√
Dr.	Gayathri Silva	4	125	
Dr.	Sachindra Perera	4	102	√
Ms.	Umayangana Godakanda	4	154	√
Dr.	Tharindunee Jayakody	2	72	
Dr.	Prasadi de Silva	3	18	
Dr.	Tharindra Weerakoon	4	44	√

Total Citations to the present senior academic staff = 21,151

### **The general status of the Department in August 2020**

#### **Entrance and other areas**

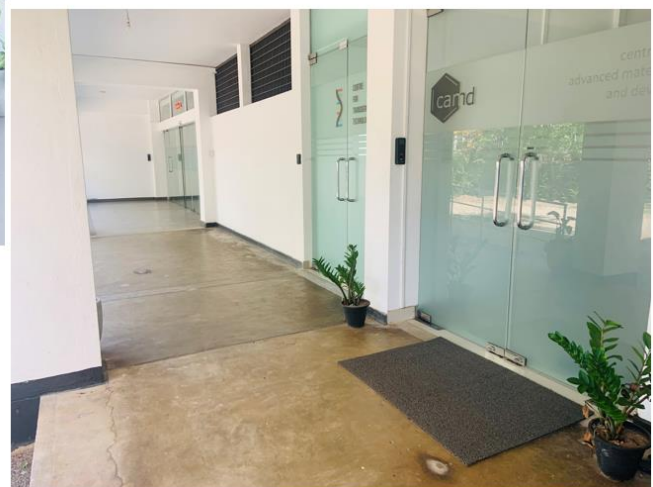




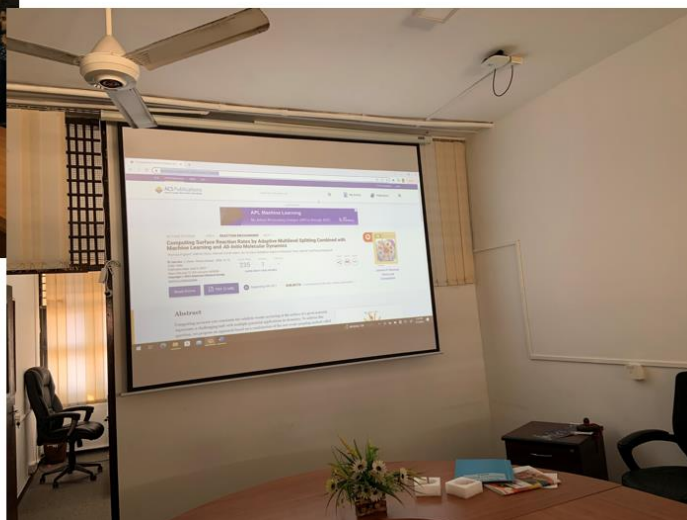




**The status of the Department in August 2023 (during the tenure of HoD, Prof. K.M. Nalin de Silva)**











## Laboratory Safety:

International safety standards were introduced and managed through a health and Safety committee. The whole department is now monitored through 23 CCTV cameras with one month backup recording.



## 5S Implementation



5 S implemented





# Chemistry Endowment Fund (CHEF) (Started in March 2022)

## Meet Our CHEF

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Officially launched on: 21 March 2022



Chemistry Endowment Fund (CHEF) – Department of Chemistry, University of Colombo



**Primary Goal:**  
To create a sustainable funding mechanism that promotes scholarly and research excellence to brighten the paths of our future scientists

**Objective:**  
To mobilize resources nationally and internationally to provide need-based support to talented students in Sri Lanka to pursue research degrees (MPhil and PhD)

**Fund Strategy:**  
To secure donations from local and international well-wishers, donors, philanthropic individuals, organizations, partners and foundations and ensure fund sustainability through capital growth

Type of Donation	Amount (Rs.)
Platinum Benefactor	5 million
Gold Benefactor	3 million
Silver Benefactor	2 million
Bronze Benefactor	1 million
Brick for the Department of Chemistry	500,000

Any other donations are welcome



Join Hands to Be the Change

**Benefits:**  
In recognition of their contributions, a wall in the lobby of the Department of Chemistry will be dedicated to display the name of all the benefactors

Please contact [chef@chem.cmb.ac.lk](mailto:chef@chem.cmb.ac.lk) for Donations





**Started with a donation of Rs. 2 million. The present balance is closer to Rs. 9 million.**



**A donation by Dr. Malsha Udayakantha (Texas A &M) (Rs. 500,000) (Former research student of Prof. Rohini and Prof. Nalin)**





**A donation by Astron Ltd (Rs. 500,000)**



**A donation by a present Demonstrator Mr. Malintha Wijeweera (Media Director of the department) (Rs. 200,000). He will be in USA, August 2023 at University of Massachusetts, Lowell for his PhD.**



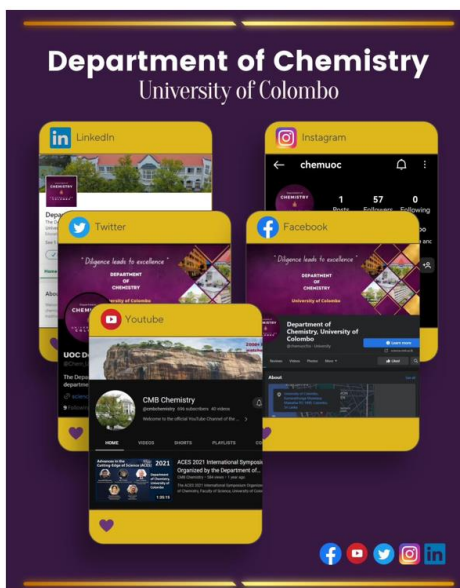
First ever fully funded PhD scholarship offered by the Chemistry Endowment Fund (CHEF). Mr. Janaka Sampath (Second from Left) has decided to do a PhD under the supervision of Prof. Nalin de Silva and Prof. Rohini de Silva and was selected through a competitive screening procedure by the CHEF committee. Janaka has a GPA of 4.1 out of 4 and this initiative managed to retain the best student to enroll for a PhD in University of Colombo.

## CHEF Committee

				
Prof. Nalin	Prof. Rohini	Dr. Dinesh	Prof. Aashani	Dr. Sameera
			<p style="color: yellow;">SAR / Faculty of Science</p> <p style="color: yellow;">SAB / Faculty of Science</p>	
Dr. Neranga	Dr. Hasini	Mr. Asanga Ranasinghe Chairman / SLSI		



## Department of Chemistry Newsletter and Social Media Presence (FB, Twitter, LinkedIn, Instagram, and YouTube)



## External Degree in Applied Chemistry (From January 2024)

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**Application Deadline 30<sup>th</sup> September 2023**

The syllabus includes fundamentals of chemistry and applied areas:

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- Industrial Chemistry
- Computational and Pharmaceutical Chemistry
- Nanotechnology
- Biotechnology

With Liberal Arts flavor including Philosophy of Science, Sociology, Economics, Management, Communication Skills, Innovation & IP Law, Entrepreneurship, Meditation and Ethics in STEM

Donations  
**CALTECH Donation**



**CALTECH donation was facilitated by Dr. Dinesh Aluthge**

**CUFSAA–NA Donation (Approximately 70 pieces of equipment)**



**Annex II – List of Publications from the Department of Chemistry University of Colombo:  
2017-2022**

2022

1. Danushika. C. Manatunga, J. Asanka Bandara Jayasinghe, Chanaka Sandaruwan, Rohini M. De Silva, K. M. Nalin De Silva: Enhancement of release and solubility of curcumin from electrospun PEO/EC/PVP tripolymer based nanofibers: a study on the effect of hydrogenated castor-oil, , ACS Omega, 2022, 7, 42, 37264–37278.
2. G.G. Gayathri Wathsala K.Kotuwegedara, Rohini M.de Silva, K.M. Nalin de Silva, Dhammike P. Dissanayake, L. Hasini Rangika Perera, Nadeesha P.W. Rathuwadu, Superhydrophobic coating to mitigate metal corrosion with electrically insulative and thermally conductive properties, , Materials Letters, 2022, 324, 132773.
3. V. Umayangana Godakanda, , Karolina Dziemidowicz, Rohini M. de Silva, K. M. Nalin de Silva and Gareth R. Williams Electrospun Fibers in Drug Delivery, , 2022, 159-181, Springer.
4. Rina Faisal, Rohini De Silva, K.M. Nalin De Silva, Density Functional Theory (DFT) simulations on fullerene/polymer blends for organic photovoltaic systems, , International Journal of Advance Research, Ideas and Innovations in Technology, 2022, 8(1), V8I1-1466
5. Wanninaika, I. P.; Toyama, H; Thachibana, S; Perumpuli; P. A. B. N; Hettiarachchi, C; Kaumal, M. N. Inhibitory effect of water soluble fraction of monascus-fermented rice on lipid accumulation in 3T3 L1 Adipocyte. *Cuurn. Appl. Sci & Technology*. 2022. In press.
6. [Book Chapter]: Sameera, W. M. C.; Sumiya, Y.; Skjelstad, B. B.; Maeda, S. (2022) Automated mechanism discovery, comprehensive computational chemistry, Elsevier. In press.  
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DOI: <https://doi.org/10.1016/j.jmb.2022.167747>
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DOI: <https://doi.org/10.1021/acsomega.2c02862>

11. Bandara, W. W.; Wijesundera, W. S. S.; Hettiarachchi, C. Rice and *Arabidopsis* BBX proteins: toward genetic engineering of abiotic stress resistant crops. *3 Biotech*, 2022, 12, 164.  
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18. Liyanaarachchi, G. V. V.; Mahanama, K. R. R.; Somasiri, H. P. P.; Punyasiri, P. A. N.; Ranatunga M. A. B.; Wijesena, K. A. K.; Weerasinghe, W. D. P. Impact of seasonal, geographical and varietal variations on amino acid profile of Sri Lankan rice varieties (*Oryza sativa L.*). *J. Food. Compost. Anal.* 2022, 109, 104494.  
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## Awards to the Chemistry Department

- Presidential Awards (Nalin, Rohini, Aashani and Ranil)
- Vice Chancellors Research Award: 2017 (Nalin), 2019 (Rohini), 2020 (Nalin)
- Senate Awards: Every Year chemistry is well represented.
- Outreach Award: Every Year chemistry is well represented.
- Faculty Awards: every Year chemistry is well represented.
- Only two members (One is retired) from the entire faculty were Represented in the top 2% of world Scientists released by Stanford University, USA.

**WORLD'S TOP  
2%  
SCIENTISTS' LIST BY STANFORD UNIVERSITY**



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கொழும்புப் பல்கலைக்கழகம்  
UNIVERSITY OF COLOMBO



Emeritus Professor  
Kamini Mendis  
Faculty of Medicine



Emeritus Professor  
W D Ratnasooriya  
Faculty of Science



Professor Senaka  
Rajapakse  
Faculty of Medicine



Professor Saroj  
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D. Karunaweera  
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de Silva  
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Professor Priyanga  
Ranasinghe  
Faculty of Medicine



Professor Ranil  
Jayawardena  
Faculty of Medicine



Dr. Umesh Jayarajah  
Faculty of Medicine