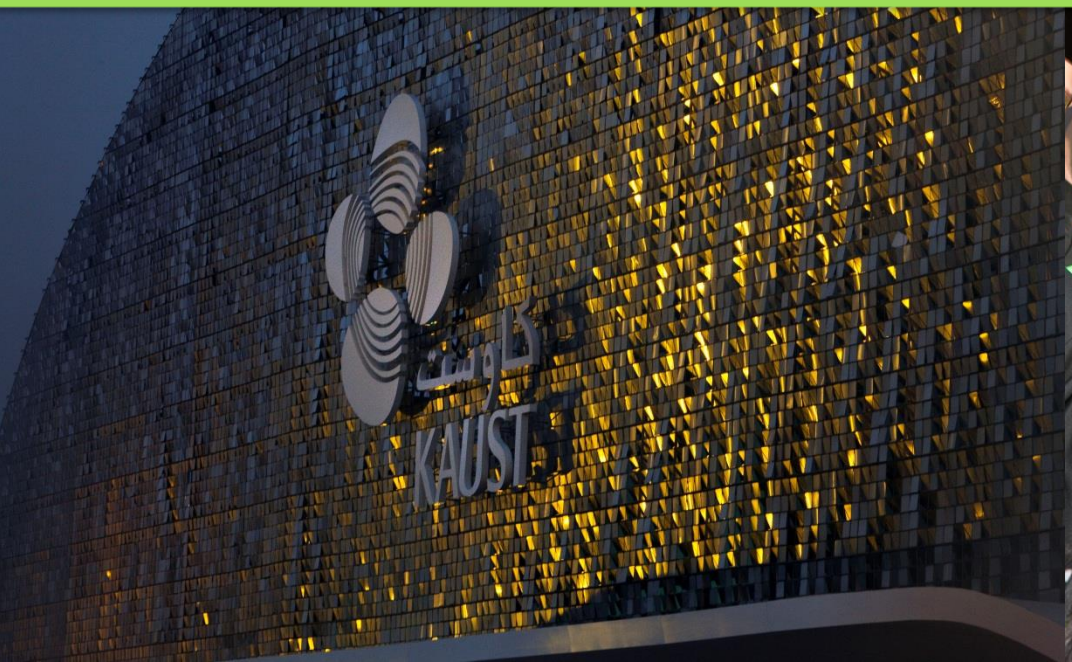
KAUST

King Abdullah University of Science and Technology

Physical Sciences and Engineering Division

جامعة الملك عبدالله للعلوم والتقنية

King Abdullah University of Science and Technology



KAUST Academic Divisions and Degree Programs

BESE – Biological & Environmental Sciences & Engineering

- Bioscience
- Environmental Science and Engineering
- Marine Science

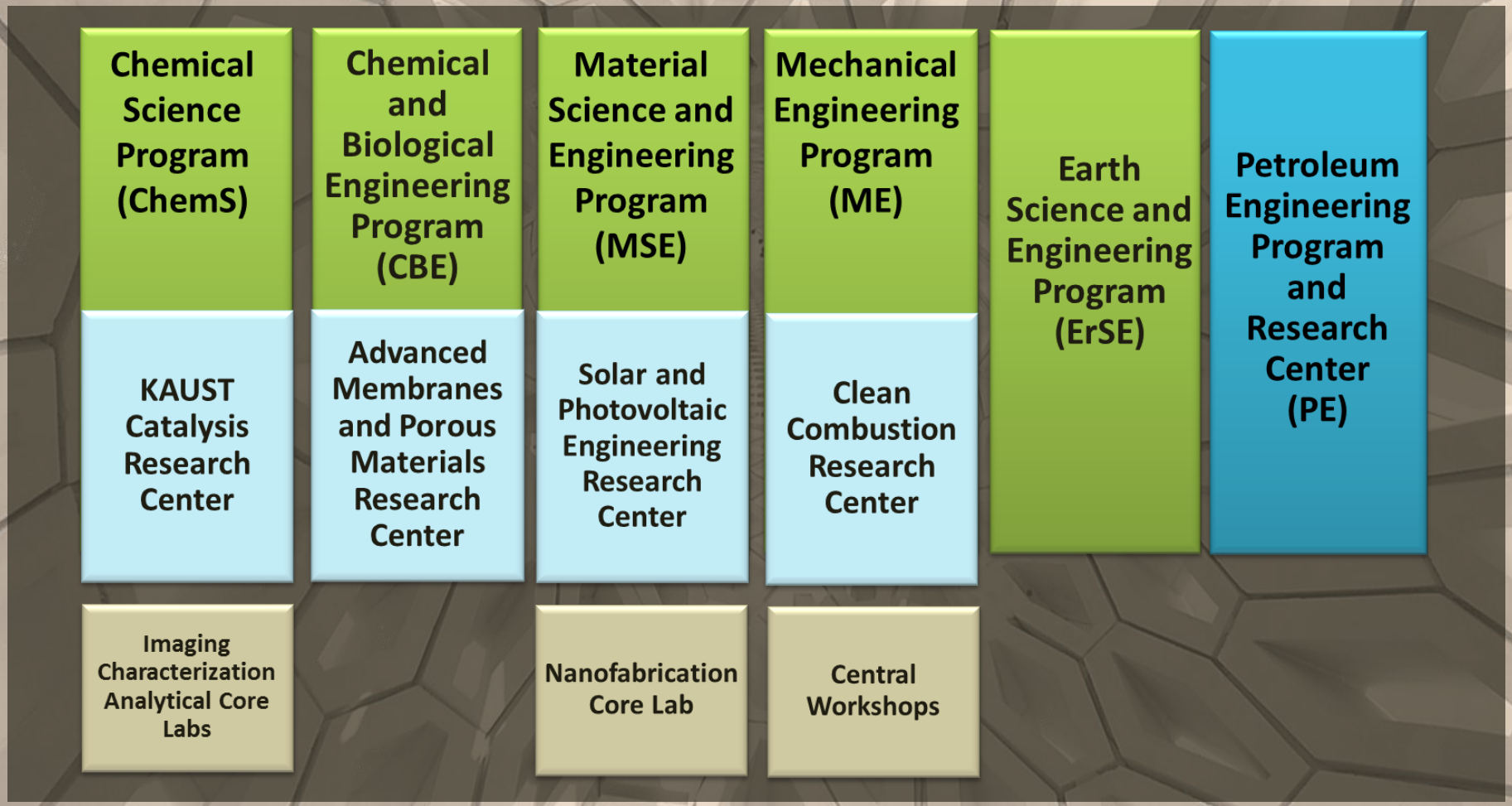
PSE – Physical Sciences & Engineering Division

- Chemical and Biological Engineering
- Chemical Science
- Earth Science and Engineering
- Material Science and Engineering
- Mechanical Engineering

CEMSE – Computer, Electrical & Mathematical Sciences & Engineering Division

- Applied Mathematics and Computational Science
- Computer Science
- Electrical Engineering

PSE Programs, Associated Research Centers and Core Labs



Earth Science and Engineering Program

Address the most important environmental and resource exploration/recovery issues in the Kingdom…

Saudi Arabia is experiencing a booming economy, and a large industrial and population growth, with rapid developments in oil-recovery and petro-chemical industries. These industries have significant impact on surface and subsurface, marine, and atmospheric environmental systems. The country's ambitious plans on energy production, oil recovery, urbanization, and industrialization, as well as its extreme climate, require comprehensive and quantitative assessment of natural and human-induced hazards to ensure environmental safety and sustainable long-term economic development.

Since KAUST's foundation, earth and environmental sciences have been recognized as a key research thrust at KAUST. In the Earth Science and Engineering (ErSE) program at KAUST, faculty and their students engage in interdisciplinary research to understand and model geophysical processes due to the complex and changing nature of our planet. The program is rich with opportunities, building on modern computational and advanced data-analysis methods to study geophysical problems associated with oil exploration and reservoir modeling, atmospheric processes, ocean circulation, and natural hazards related to earthquake processes and crustal deformation.

Mechanical Engineering Program

Exceptional research and practice in a rapidly evolving, multi-disciplinary technological scenario…

Mechanical Engineering is the oldest and widest of all engineering disciplines. Research within the Mechanical Engineering Program at KAUST is focused on energy and spans several areas: composite materials, computational mechanics, combustion, turbulence, bio-physics, plasma physics and fluid mechanics.

Laboratories in various areas of expertise include an integrated environment dedicated to state-of-the-art modeling, simulation and inverse approaches for composite materials, state-of-the-art instrumentation for experiments in fluid mechanics, advanced equipment and facilities for combustion diagnostics, experimental capabilities for reactive flow modeling, and a total internal refraction fluorescence microscope.

The ME program course curriculum is modern and rigorous and provides a solid foundation in each area. Our graduates are well trained to be productive members of modern society and specifically suited for research careers in academia, industry and government laboratories.

Chemical Science Program

Strong emphasis on research with a clear focus on current challenges related to catalysis and materials…

The Chemical Science Program (ChemS) is an interdisciplinary degree program that distinguishes itself by a strong emphasis on research with a clear focus on contemporary challenges related to catalysis and materials.

The ChemS program combines the expertise of three research centers: Catalysis, Advanced Membranes & Porous Materials, and Solar & Renewable Energy.

Research interests of ChemS faculty include design and preparation of:

(i) new catalysts for a variety of chemical reactions including metathesis and water splitting;

(ii) porous materials for energy intensive gas separations, carbon dioxide capture and natural gas upgrading;

(iii) stimuli responsive materials for sensing and controlled release;

(iv) novel polymeric materials for catalytic and energy applications;

(v) ultrafast laser spectroscopy and modern computational chemistry tools.

Chemical and Biological Engineering Program

Provide real-world solutions to global challenges by leveraging basic discoveries in chemical and biological sciences…

The Chemical and Biological Engineering Program (CBE) offers students opportunities to develop real-world solutions to global challenges by leveraging basic discoveries in chemical and biological sciences. Research in the Chemical and Biological Engineering Program focuses on the development of new processes for gas and liquid separations, water desalination, and the development of new materials for reducing greenhouse gases and remediating chemical and biological threats.

Material Science and Engineering Program

Tackling the major challenges facing the world in terms of sustainability and alternative energy…

The Material Science and Engineering Program at KAUST offers a broad range of expertise in material design and synthesis, computational materials science, device fabrication, and nanoscale characterization of the structure and properties of materials.

The program places special focus on energy efficient devices and applications (e.g. energy harvesting and storage, electronic and magnetic materials).

Our long-term goal is to develop better materials to meet the challenges the world faces to ensure a bright and sustainable future for all.

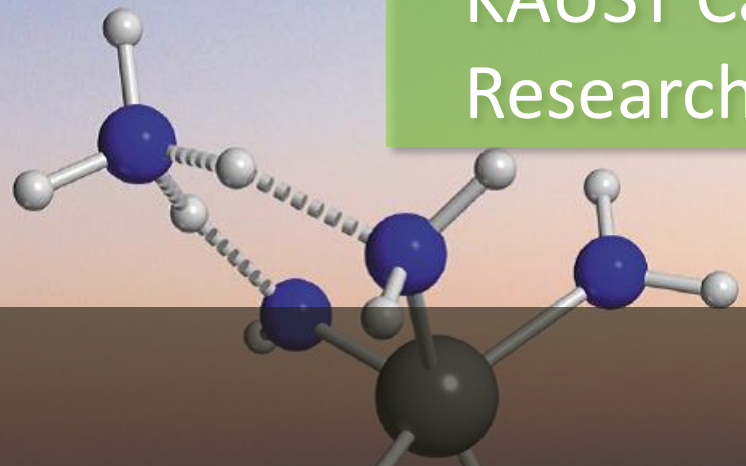
SPERC
Solar and Photovoltaic Engineering Research Center

Seeking solutions to the global challenges that arise from the transition to renewable energies…

The world's energy demands will continue to grow. While fossil fuel sources have provided most of the world's energy in the past, it is clear that renewable energy sources must form a much larger part of our energy resources in the future to protect the environment and mitigate the world's climate issues.

The vision of the Center is to carry out fundamental and application-oriented multidisciplinary research on renewable technologies, educate young researchers in the field of renewable energies and to work closely with Saudi Arabian and international industry to establish economic growth.

KAUST Catalysis Research Center



With world class personnel and facilities, KCC and its industrial and academic partners are helping to lay the foundations for a sustainable future…

The KAUST Catalysis Center's 'Catalysis by Design' approach brings together a unique combination of world leading specialists to address the 21st Century's challenges. Projects range from catalytic generation of novel energy vectors, e.g. hydrogen from water and solar light as well as development of methods for selective conversion of the Kingdom's fossil feedstock to applications of CO_2 as renewable resource, generation of novel polymers with programed unique properties and creating novel biocatalysts for a more selective and sustainable production.

Advanced Membranes and Porous Materials Research Center (AMPM)

World-leading development of novel, cutting-edge technologies to provide efficient and sustainable separation processes…

The research of the AMPM Center concentrates on the development of novel membranes, functional and porous materials and world-leading, cutting-edge separation technologies that can provide commercial solutions to enduring challenges related to energy security in the natural gas and petrochemical sectors, environmental sustainability, and more energy-efficient water production and treatment technologies.

Clean Combustion Research Center

Fundamental combustion science with goal-oriented and industrially relevant technologies…

Research Environment Forecast:

Hydrocarbon (HC) fuel will dominate in the next several decades while gradually shifting to low-grade fuels.

Major portion of petroleum utilization is for transportation.

Pollution issues drive combustion to extreme conditions.

Global warming and climate change are a concern.

Research Directions:

Fuel formulation and diversity.

Efficiency/Emission.

High pressure and extreme combustion.

Chemical kinetic mechanism development and validation.

Computational predictive tool development.

Innovative combustion ideas.

Advanced Nanofabrication, Imaging and Characterization

The Advanced Nanofabrication, Imaging and Characterization Core Facilities are dedicated to providing the instrumentation, technical expertise, and team-teaching environment to stimulate collaborative research in nanoscale technology.

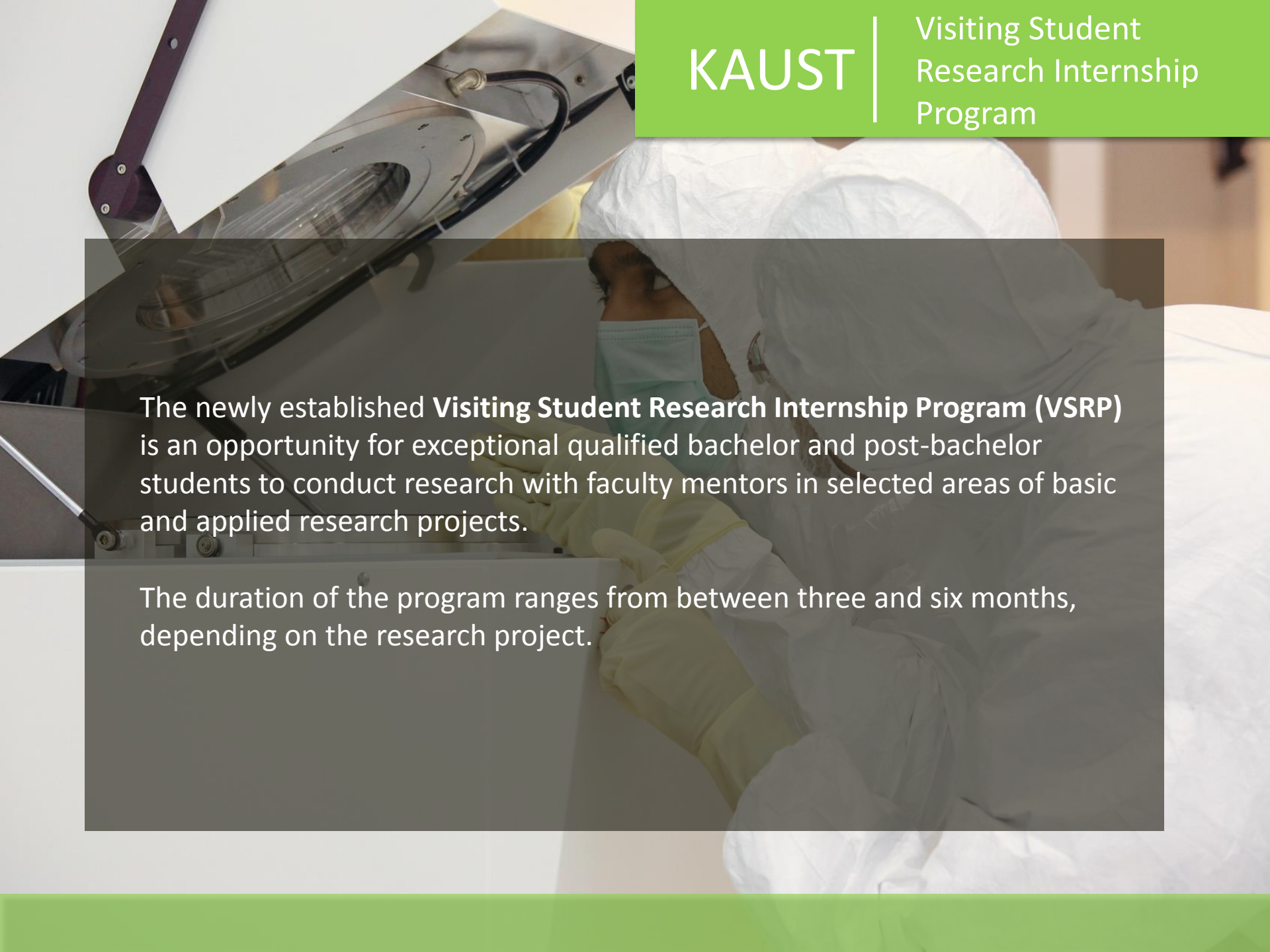
The facility is a multidisciplinary laboratory that supports research across many different departments within KAUST. The laboratory supports not only materials and device research in physics, electrical engineering, mechanical engineering and chemistry, but it also facilitates research interaction and collaboration between the physical, chemical, biological and medical disciplines.

The staff members are very competent both academically and technically and come from 14 different countries/areas.

Analytical Core Lab

ACL's mission is to provide highest quality analytical services to KAUST research community utilizing state-of-the-art analytical instruments; to participate in collaborative research with KAUST faculty members and to support KAUST educational mission.

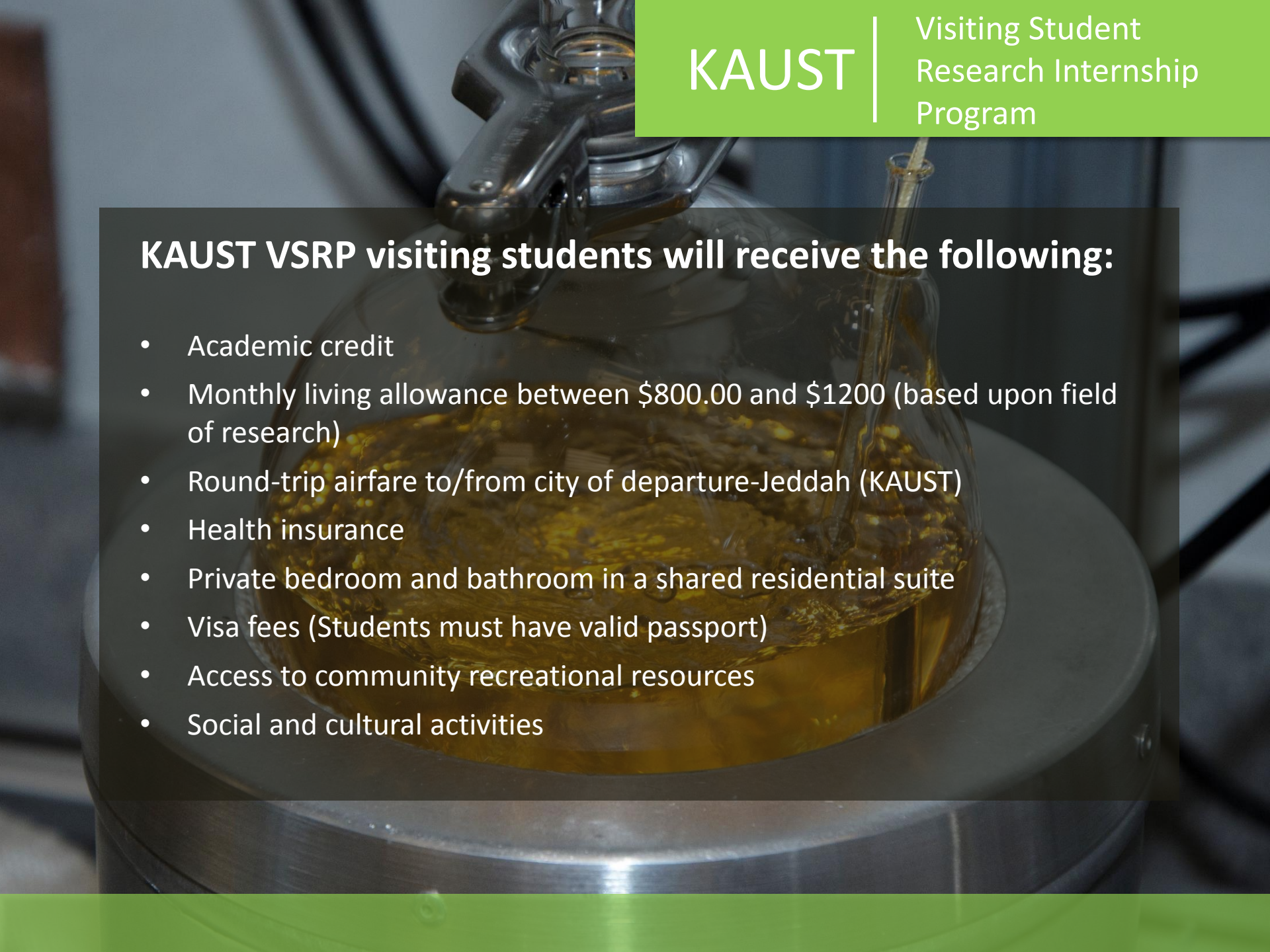
The Analytical Core Lab has specialized laboratories for spectroscopy, chromatography and mass spectrometry, trace metals analysis, wet chemistry, and surface analysis. The state-of-the-art instrumentations and operations of ACL are controlled by a LabWare LIMS system. The Lab offers analytical services in the fields of environmental science (air, water, marine organisms, sea water, nutrients, pollutants, etc.), industrial hygiene, geochemistry, bio/pharmaceutical, material science, health and safety, polymer and catalysis.



KAUST | Visiting Student Research Internship Program

The newly established **Visiting Student Research Internship Program (VSRP)** is an opportunity for exceptional qualified bachelor and post-bachelor students to conduct research with faculty mentors in selected areas of basic and applied research projects.

The duration of the program ranges from between three and six months, depending on the research project.



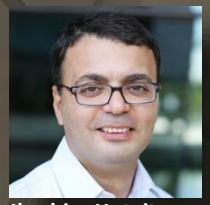
KAUST | Visiting Student Research Internship Program

KAUST VSRP visiting students will receive the following:

- Academic credit
- Monthly living allowance between $800.00 and $1200 (based upon field of research)
- Round-trip airfare to/from city of departure-Jeddah (KAUST)
- Health insurance
- Private bedroom and bathroom in a shared residential suite
- Visa fees (Students must have valid passport)
- Access to community recreational resources
- Social and cultural activities

KAUST | Visiting Student Research Internship Program

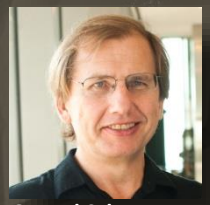
PSE Projects available in the Earth Science and Engineering Program:



Ibrahim Hoteit

Qualifying and reducing uncertainties in earth fluid models.

Enhancing weather downscaling and forecasting



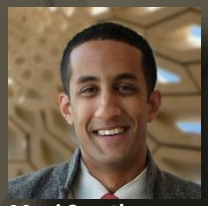
Gerard Schuster

Cooperative Research in Least-Squares Migration

Victor Calo

Cosserat's media differ from Cauchy's media of classical continuum mechanics by admitting infinitesimal deformations besides the infinitesimal translations

PSE Projects available in the Chemical and Biological Engineering Program:

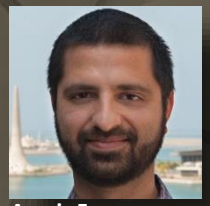


Mani Sarathy

Combustion chemistry of future fuels.

KAUST | Visiting Student Research Internship Program

PSE Projects available in the Mechanical Engineering Program:



Aamir Farooq

Chemical kinetics of novel biofuels.

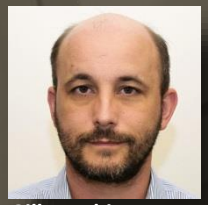
Biomedical sensor development .

Fabrizio Bisetti

Experimental characterization of condensation aerosols in canonical flows.

Experimental and numerical investigation of the pathways to soot formation.

Large-eddy simulation (LES) of laboratory-scale turbulent jet flames at high pressure and high Reynolds number.



Gilles Lubineau

Adhesion phenomena across interfaces with spatially heterogeneous adhesive properties

Mohammad Younis

Designing MEMS inertia sensors for the detection of elderly falling

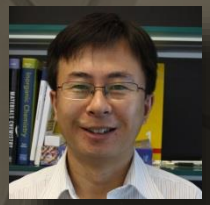
Hong Im

Modeling of spray dynamics using openFOAM

Direct numerical simulation of turbulent combustion in high pressures

KAUST | Visiting Student Research Internship Program

PSE Projects available in the Chemical Science Program:



Yu Han

Asymmetric Monometallic Nano-dimers with Novel Optical Properties

Kuo-Wei (Andy) Huang

Role of non-classical hydrogen bonding in organocatalysis .

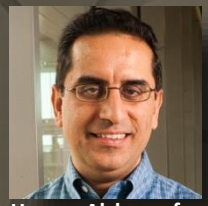
Synthesis of Novel Pincer complexes .

Kazuhiro Takanabe

Catalysis of Energy Conversion

KAUST | Visiting Student Research Internship Program

PSE Projects available in the Materials Science and Engineering Program:



Husam Alshareef

Thin Film Alloys for Na-ion Battery applications

Udo Schwingenschlogl

Novel Phenomena at perovskite interfaces and superlattices .

First principles modeling of hybrid organic-inorganic perovskites.

Computer Aided modeling of Zeolitic Imidazolate frameworks as packings of Building Units

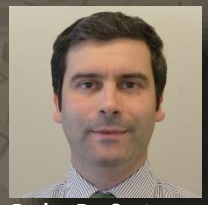
Aurelien Manchon

Theoretical modeling of the interaction between surface plasmons and antiferromagnetic magnons .

Theoretical exploration of weak localization of spin-orbit torques

Iman Roqan

Optical properties of AlGaN/AlInN multi-layer nanorods



Pedro Da Costa

Grafting of Polyoxometalates in Carbon Nanostructures

KAUST | Laboratory for Carbon Nanostructures

Pedro Da Costa
Principal Investigator

Shashikant Patole
Senior Post-Doctoral Fellow

Shahid Rasul
Post-Doctoral Fellow

Amira Aalazmi
ChemS PhD Student

Ahmed Abdelkader
MSE PhD Student

Nitin Batra
MSE MS Student

Andre Monteiro
PhD Student (Univ. Aveiro)

I. GROWTH

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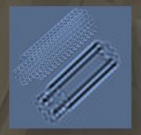

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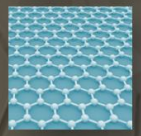
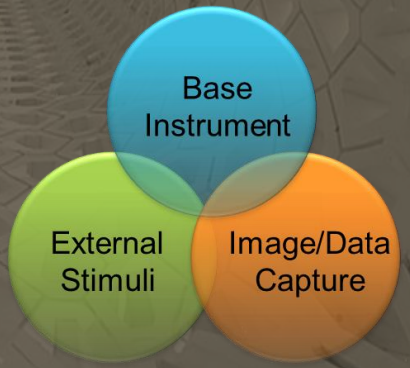


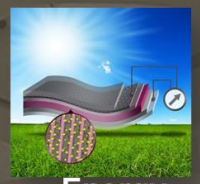
2 D

3 D

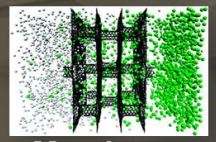
II. *In situ* ANALYSIS



III. APPLICATIONS



Energy



Membranes

Electronics

PMFJ Costa and PJ Ferreira, *In situ TEM of CNT* (book chapter, in press)
SP Patole *et al.*, Carbon (submitted)
AO Monteiro *et al.*, Carbon (2014), DOI: 10.1016/j.carbon.2014.08.011
AO Monteiro *et al.*, J. Mater. Sc. (2013), DOI :10.1007/s10853-013-7745-3
PMFJ Costa *et al.*, Nat. Comms. (2011), DOI: 10.1038/ncomms1429

KAUST | Laboratory for Carbon Nanostructures

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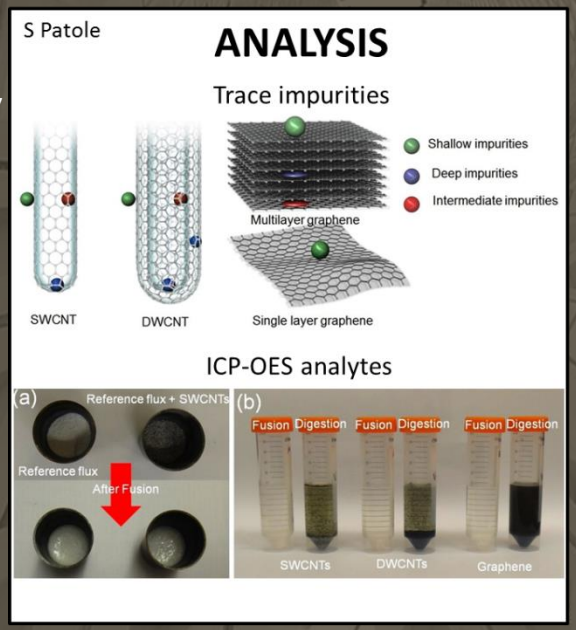
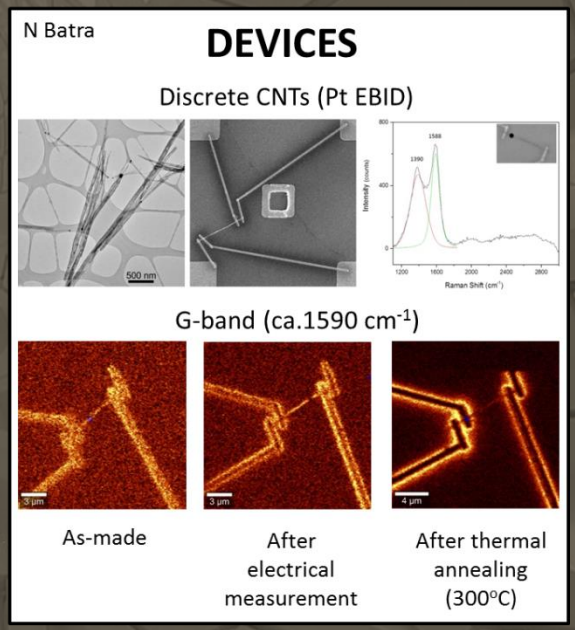
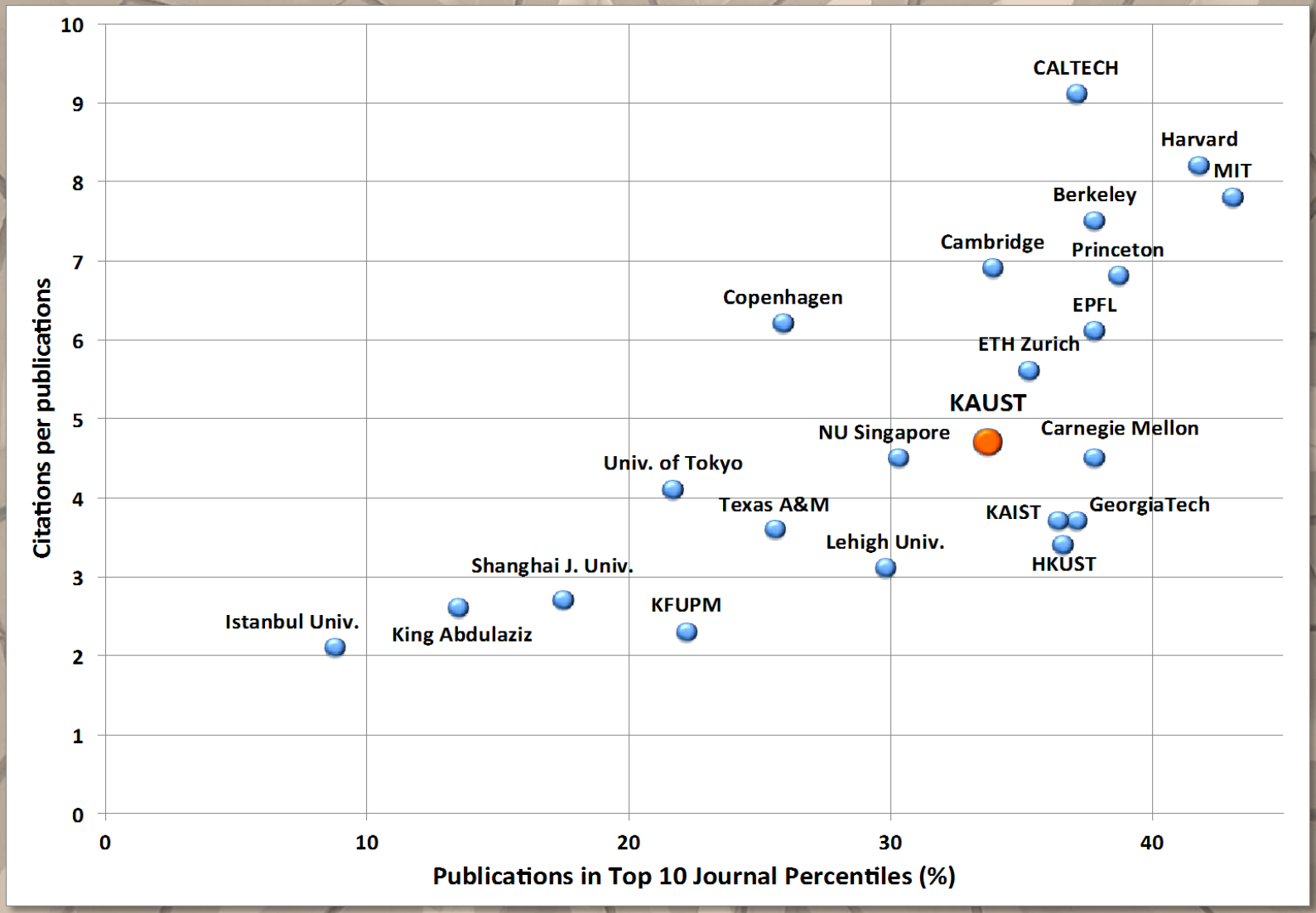




Obrigado.
Questions?

www.kaust.edu.sa

KAUST | Benchmarking



KAUST | Visiting Student Research Internship Program

PSE projects are available across multiple research areas:

http://vsrp.kaust.edu.sa/Pages/Internships.aspx