Laureates of the 29th Khwarizmi International Award
Abstract:
Due to recent advances in medical science and biotechnology, as well as increasing attention to the hygiene and health of human beings, the need for measuring small quantities of pharmaceuticals, biomarkers and environmental species have been dramatically increased. In this research work, different metal nanoparticles, nanocomposites, organic modifiers, polymers, DNA, antibodies and nanomaterials were used to develop and modify a variety of sensors based on carbon materials and ionic liquids. The electrochemical sensors, compared to the expensive and complicated analytical methods, have been the subject of increasing attention, and their application has grown specifically in environmental, medical, agricultural and industrial laboratories. Introduction of new electrochemical sensors is important for improving the response of the sensors for particular species and enhancing their efficiency. Electrochemical sensors based on modification of the electrode surface have the ability to accomplish different objectives. In this project, we have evaluated the performance of these sensors for various applications including sequence detection, defects, mutations and hybridization in DNA, detection of cancer markers and tumor cells, antigen-antibody interactions, investigation of the effect of drugs on biological processes, determination of drugs in real samples such as blood, urine, and measurement of various pollutants. These electrochemical sensors generally provide appropriate analytical response characteristics and some of them have a great potential for application in pharmaceutical, medical and environmental researches. Development of technical knowledge and expertise in this field enables the production and commercialization of some of these sensors with a reasonable cost. This will play a significant role in the rapid prevention, detection and treatment of the diseases, with the aim of promoting health, increasing life expectancy and reducing costs and moral damage to the society.

First Laureate
Fundamental Research

- **Research Work Title:** Development of knowledge of electrochemically modified sensors, immunosensors and aptasensor
- **Researcher:** Prof. Mohammad Mazloom Ardakani
- **Scientific Affiliation:** Yazd University
Abstract:

Aran-Bidgol salt lake is a hypersaline and easonal playa with a unique structure. Owing to the importance of this ecosystem and the fact that microorganisms account for more than half of the live biomass on earth the prokaryotic diversity of the Aran-Bidgol hypersaline lake has been studied.

Studies of this environment are the pioneer studies of the domain Archaea in the country. Culture independent method has also been used to study the microbial ecology and community structure of the Aran-Bidgol Lake. Because of the extreme environment of the lake the microorganisms have a key role in keeping the equilibrium of the environment and the fingerprint of microbial community of the Aran-Bidgol Lake has been determined.

The ability of pure isolate has been studied for hydrolytic enzyme production and screening for enzymes including amylase, protease, lipase, pullulanase, xylanase, cellulase, chitinase, inulinase, and nuclease resulted in total number of 128, 17, 142, 64, 3, 8, 2, 38, and 144 positive strains for each enzyme respectively. These enzymes have a important role in biotechnology and introducing native enzyme producing isolates could have the potential biotechnological importance.

According to the results of this study the prokaryotic diversity of the Aran-Bidgol Lake is higher than other hypersaline lakes around the world. Bacteria are a abundant, diverse and metabolically active group in this environment. Culture dependent and culture independent methods are showing a different view of the prokaryotic diversity in this lake and it is recommended to use both methods in order to get a better view of the prokaryotic diversity of the lake.
Abstract:

Valuable natural and synthetic compounds can be prepared either in laboratory or extracted from nature. In this project new methods for the synthesis of organic compounds or extraction and semi-synthesis of valuable natural products are reported. Also, the biological activity of the products has been investigated.

Heterocyclic compounds are among the most valuable synthetic chemicals in the world. In the present project, new methods for the synthesis of different types of heterocyclic compounds via multi-component reactions, asymmetric synthesis and click chemistry have been reported. In some reactions, new catalysts with higher efficiency and more environmental compatibility were introduced.

Application of lead compounds and preparation of a library of their derivatives is an important method for the discovery of new potential drugs. In this project several valuable lead compounds such as β-lactam antibiotics, alkaloids and terpenoids have been used for the synthesis of new analogues.

Anti-microbial, anti-cancer, anti-oxidant, analgesic, anti-diabetic and anti-inflammatory activities of the prepared compounds have been investigated and in some cases, promising results were obtained.
First Laureate
Applied Research

- **Research Work Title:** Research, design and development of knowledge & production technology of Iranian Gas Turbine 25MW
- **Executive Organization:** Oil Turbo Compressor Engineering Co.
- **Representative:** Saeid Mohtadi (B.SC.)
- **Collaborators:** Middle East Industrial Gas Turbine, Middle East Turbo Compressor Tech. Co., Yazd Ghadir Industrial Turbines Co., National Iranian Gas Company (NIGC)

**Abstract:**

OTC IGT-25 heavy duty gas turbine is designed and built to satisfy the need for heavy-duty equipment able to meet the requirements for low life-cycle cost, i.e. low first cost, low fuel costs and low costs for operation and maintenance.

The IGT25- was initially designed as a mechanical drive in compressor and pumping applications, and was later adapted for power generation because of its robust design and its operating economy.

The turbine is delivered with a Dry Low Emission (DLE) combustion system as standard. A gas turbine with this system offers an additional advantage in maintaining low specific fuel consumption in all applications. The uncomplicated DLE-system does not add to the already low service costs for the IGT25-. The combination of using less fuel and generating fewer emissions makes the IGT25- arguably the most environmentally friendly gas turbine in its power range. Industrial gas turbines from OTC holding offer long lifetime on oil platforms, in hot deserts, in arctic cold and in aggressive industrial environments. In other words, wherever the operating conditions are particularly tough. The IGT25- has had a long history of successful operation in such environments and has already achieved some six million operating hours, with field experience constantly being fed back into the design for continuous improvement. OTC holding offers flexible maintenance solutions, enabling significant contribution to the plant operational profit arising from the optimization of preventive Maintenance planning.
Abstract:

Gas fuels have lower cost and impact on the environment when compared to liquid fuels, which leads to its higher appreciation in industries and other applications. However, the difference in gas fuels combustion properties may result in a decrease in power output and efficiency.

This project, based on years of empirical and numerical investigation, utilizes the available resources and manufacturing potential to provide an appropriate methodology in modeling and simulating burners and furnaces with a better performance.

In this work, we individually analyzed and modeled all parts of a water tube boiler. In particular, we focused on combustion parts and burners due to their importance and complexity. In addition to developing an empirical simulator, the furnace has been modeled precisely using Computational Fluid Dynamics tools. The resulting models for the individual parts are used to develop a comprehensive numerical simulator. Based on feasible changes in the burner and boiler structure, the computational simulator is used to determine the applicable method that achieves a higher power and efficiency.

Applicable modifications that are economical are applied in the unit, giving results confirmed to be successful. This solution is considered as a combination of OFA and Fuel Biasing approach.

This solution, compared to other suggested solutions coming from foreign contractors, shows substantial economic efficiency.
Abstract:

Skydiving simulator is a vertical wind tunnel with flow velocities in the range of 200 to 250 km/h. In this wind tunnel, skydivers can experience the floating conditions during the free fall. Using the wind tunnel it is possible to train the first stage of skydiving to the trainees. This stage lasts for 30 seconds, starting from the instant the skydivers leave the airplane or the helicopter till the moment the skydiver opens his/her parachute. The training process is quite difficult and the trainers have a difficult task in the sky for training the skydiving trainees.

The vertical wind tunnel consists of main parts such as nozzle, protective net, flight chamber, diffusers and fans. The flow velocity in the tunnel can be adjusted by controlling the rotational speed of the fan. The scientific foundation of this project is fluid mechanics and aerodynamics. Different phases of this project of national importance are: feasibility study, including a detail examination of various vertical wind tunnels worldwide, conceptual study using semi-empirical relations for the design of the wind tunnel and determination of its geometry and shape, preliminary design, where the project’s unknowns were experimentally investigated using scaled down wind tunnel models, detailed design, where detailed engineering drawings of the wind tunnel were prepared and the fabrication techniques were determined, procurement and fabrication of the components and parts, testing and calibration of the wind tunnel, commissioning of the completed wind tunnel.

The construction of this wind tunnel has resulted in multiple advantages, namely acquisition of technology know how pertaining to design and construction of large vertical wind tunnels.
Abstract:
Germanium single crystals with 99.999 percent purity and good quality for optical usage in the range of 12 – 2 micro meters successfully were grown. Analyses that performed for quality determination of grown crystals indicates that they are single crystals, surface density of dislocations is sufficient for optical applications, transmission percent for IR waves usage in the range of 12 – 2 micro meters is good and their ability of cutting and polishing is also sufficient.
Newcastle disease (ND) and infectious bronchitis are important diseases in poultry industry which cause significant economic losses in most part of the world. Therefore production of vaccines with more efficiency and fewer side effects are needed. Due to imports of the bivalent ND (La Sota)+IB (H - 120) live vaccine against these two important diseases of poultry industry and considering that these vaccines has drawn the attention of poultry owners because of their advantages such as removal of vaccine stress, less mortality, time and cost and removal of other adverse factors, production of this vaccine has important economic aspect in the country. In this study, the vaccine was made in accordance with international standards. The viral seeds of La-Sota strain of Newcastle and H - 120 strain of infectious bronchitis virus were propagated in SPF embryonated eggs separately. After the sterility and titer of harvested viruses were controlled, formulation and optimization of the amount of each two viruses in vaccine were performed based on their titer to meet the requested minimum dose. The vaccine was validated with respect to safety, potency and efficacy according to quality control tests. It was concluded that the vaccine can induce sufficient immune response in SPF and commercial chickens and can be useful in the control of Newcastle and Infectious bronchitis diseases. The bivalent ND (La Sota)+IB (H - 120) live vaccine was certified by Veterinary Organization, received product license for mass production and is currently produced on an industrial scale.
Abstract:
As one of the most important national mother industries, petroleum industry has recently achieved rapid growth which is mainly due to the fact that Iran has abundant supply of raw materials whose annual value added is growing in an ever-increasing rate. One of the critical units in petrochemical industry is the manufacturing unit of polyethylene terephthalate (PET) in which various types of catalysts are used. Catalysts used in this unit are very sensitive and have complex technical specifications. The presence of trace amounts of contaminants in the catalysts is one of the most important characteristics.
Our research is grounded in the novel scientific sources and numerous experiments by which we leverage our deep technical knowledge in the design and development of the manufacturing process to obtain catalysts with desired characteristics and minimum contaminants while considering domestic facilities and equipment in industrial scale. The proposed process is capable of extension to the production of diverse catalysts and analogous chemicals with high purity.
The most innovative approach to this project is underlying the different steps of the process including the design and construction of the reactors and the conditions under which the reactions were performed, design and construction of the evaporators, crystallizers, and dryers as well as the process conditions of each of them.
Abstract:
As we may be aware, in Iran, oil and gas wells are at a point of exceeding their useful life. The precious gas has to unavoidably be burned. In order to prevent environmental pollution resulting from the burning and the waste of these valuable gas sources, the most convenient procedure is to connect two wells together and extract more oil to protect the precious gas resources. One of the main problems of this project is the lack of tubes with a diameter of near 4 inches, with two layers, the inner layer in stainless steel and the outer in carbon steel. The inner one is resistant against sour gas and the outer one resistant against chlorine and high pressure. After research and studies over different procedures, including cladding by welding with stainless steel wires for inner sides of carbon steel pipes, we found out that it would need a lot of time to produce these kind of pipes and it may have high probability of flaws, in consequence this procedure has not been considered.
Abstract:
The product, based on NGN architecture, has been designed and produced for the first time in Iran. In addition to the physical circuits, the key performance of this technology lies in the software system inside the equipment, in other words, it is an hybrid soft switch supporting circuit-based technology. Among the main advantages of Ava Soft Switch are the integration of communications for organizations with geographically distributed branches, virtual fax, voice mail, call center features, automatic response, providing E1 lines and various capacities (several hundred ports to several million ports).

Commercialization Features
Ava Communication Industries Co., as a provider of a wide range of telecommunications solutions, is considered praiseworthy because of the following factors:

• Teamworking which created the initial core of the company and perseverance with clear division of tasks and responsibilities, from the beginning, teamwork has been a key to its success. Scientific integrated management to achieve long-term goals, creating employment opportunities and use of systematic services to meet customer satisfaction, transparency in financial statements, decentralization and distribution of other departments around the country are among the other notable features of Ava Communication Industries Co. in management, documentation and planning.

• Successful mass production and stabilizing the company in a knowledge based economy with private investment without state financial assistance, a long-term vision and business plan, recipient of various domestic and foreign certificates for approval samples and standards, a development strategy documentation fully covering opportunities and risks affecting commercialization and export success policies, a growing trend in production, sales and profits which indicates the sustainability and predominence of Ava Communication Industries, in the market.

• Enjoying an efficient and active research and development center, meeting the needs of the customers, improving and reforming the operation conditions, covering a large part of the target market, creating a strong brand positioning with competitors, quality improvement through software and hardware and producing new products to enter the international market, and outsourcing the needs for importing similar foreign products are among the features of the company in a knowledge based economy.

The KIA Laureate
Outstanding Achievement in National Production

- Achievement: Commercialization of the next-generation hybrid telephone switch capable of communicating with IP network
- Representative: Anooshiravan Merat
- Executive Organization: Ava Communication Industries Co.
- Collaborators: Payam Shabanian, Davood Adib
Abstract:
Engineered materials that integrate advances in polymer chemistry, nanotechnology, and biological sciences have the potential to create powerful medical therapies. Prof. Khademhosseini has engineered tissue regenerative therapies using water-containing polymer networks, called hydrogels that can regulate cell behavior. Specifically, he has developed photocrosslinkable hybrid hydrogels that combine natural biomolecules with nanoparticles to regulate the chemical, biological, mechanical and electrical properties of gels. These functional scaffolds induce the differentiation of stem cells to desired cell types and direct the formation of vascularized heart or bone tissues. He has pioneered concepts of making conductive hydrogels by integrating nanomaterials including carbon nanotubes, graphene, and reduced graphene oxide into materials. To create tissue complexity, he has also developed directed assembly techniques to compile small tissue modules into larger constructs. It is anticipated that such approaches will lead to the development of next-generation regenerative therapeutics and biomedical devices.

Biography:
Mr. Ali Khademhosseini is a Professor of Medicine and Health Sciences and Technology at Harvard-MIT’s Division of Health Sciences and Technology and the Harvard Medical School. His research is based on developing micro and nano-scale technologies to control cellular behavior with particular emphasis in developing microscale biomaterials and engineering systems for tissue engineering and drug delivery. He is an author on 450 journal articles, 50 book chapters/editorials, over 250 abstracts, and 20 patent/disclosure applications. He has received numerous awards including the TR35 by the Technology Review Magazine, the Coulter Foundation Early Career, NSF Career, the Presidential Early Career Award for Scientists and Engineers.
Abstract:
Our vision is that “agricultural waste” is a “resource”, but our knowledge has not been developed enough to convert it to product, so we don’t use it and it remains waste that we want to get rid of it. If we look as molecules and atoms of any wastes, we should be able to find out many methods and many valuable products to use the wastes and products. In this research, we have developed methods to convert sugars, starch, cellulose and hemicellulose present in agricultural wastes, industrial wastes and municipal wastes into several products including biofuels such as ethanol and biogas and also animal feed and biopolymers using bacteria and filamentous fungi. This knowledge is now transferring to several companies in Sweden, Germany, Iran, etc.

Biography:
Prof. Mohammad Taherzadeh received his BSc and MSc in chemical engineering and PhD in bioscience, he then developed his area in the border of these sciences and applied research. He worked at several universities including Isfahan University of Technology in Iran and Lund University and Chalmers University of Technology in Sweden until 2004 that he works as full professor at University of Borås in Sweden. He worked also part time as the chairman of biotechnology chemical engineering committee at Swedish Research Council during 2015-2012. He has developed industrial biotechnology, contributed to several companies in Iran and Sweden, published more than 200 books, book chapters and papers in scientific journals and was active in transferring knowledge and technology to different countries in the field of waste management and and resource recovery.
The nature of construction has remained intensely manual throughout recorded history. Unlike in manufacturing, the growth of automation in construction has been slow. A promising new automation approach is the Contour Crafting (CC) technology which has been invented by Professor Khoshnevis and has been under R&D in the last two decades, Contour Crafting aims at automated on-site construction of whole buildings as well as subcomponents. Using this process, a single building or a colony of buildings may be constructed automatically with all plumbing and electrical utilities imbedded in each; yet each building could have a different design which can include complex curved features. The technology also has astounding environmental and energy impacts. The entry level implication is especially profound for emergency shelter construction and low income housing. Professor Khoshnevis is working closely with NASA to explore possible applications of CC in building on other planets. This new mode of construction will be one of the very few feasible approaches for building using in-situ material on planets such as Moon and Mars, which are being targeted for human colonization before the end of the century. CC has received international attention and could soon revolutionize the construction industry.

Biography:
Mr. Behrokh Khoshnevis is a Dean’s Professor of engineering at University of Southern California and is a Fellow of the National Academy of Inventors and a member of the EU Academy of Sciences. Through his passion driven inventive research activities, he has made many useful inventions and innovations in different domains including robotics, haptics, biomedical, oil and gas, renewable energy, fabrication, construction and space systems. His automated construction inventions, Contour Crafting, is destined to cause a revolution in terrestrial construction and is regarded as the most promising approach for planetary construction of human outposts. A prestigious NASA organization awarded Contour Crafting the Grand Prize of the Create the Future Design Contest among +1000 globally competing technologies. Prof. Khoshnevis has over 160 technical publications, and holds many international patents. He has developed products that help people worldwide. He is a NASA Innovative Advanced Concept Fellow, a Fellow of the Institute of Industrial Engineering, and a Fellow of the Society for Computer Simulation.
Abstract:
This research work led to discoveries of two 1.85-1.95 billion years old Himalaya-type continent-continent collisional belts (named Trans-North China Orogen and Khondalite Belt) in North China. On the basis of these discoveries, Prof. Guochun Zhao recognized that similar-aged continental collisional belts exist in nearly all other old continents in the world. This led him to have proposed that these collisional belts recorded global-scale collisional events that led to the assembly of an old supercontinent. In 2002 and 2004, Prof. Zhao and his colleagues presented comprehensive overviews on the assembly, outgrowth and breakup of this supercontinent in two classic papers published in Earth-Science Reviews (volume 59, pages 162-125; volume 67, pages 127-91). Later, this supercontinent was named “Columbia” or “Nuna”, whose existence has been supported by more and more geological and paleomagnetic data. So far, this supercontinent has been widely accepted by earth scientists and become a hotspot in earth sciences.

Biography:
Prof. Guochun Zhao earned BSc and MSc degrees from Changchun University of Earth Sciences in 1985 and 1988, respectively, and a PhD degree from Curtin University in 2000. Since 2000, he has been working as postdoctoral fellow/associate professor/full-time professor at the University of Hong Kong. His major scientific findings include discoveries of two 1.85-1.95 Ga Himalaya-type collisional belts in North China and first recognition of global-scale 1.8-2.0 Ga collisional events leading to the assembly of ~1.8 Ga supercontinent. He has published ~200 papers that have been cited for ~20000 times. He is the Editor-in-Chief of Precambrian Research, and the principal investigator of project “Paleoproterozoic amalgamation of North China and the assembly of the Columbia supercontinent” that won The State Natural Science Award in 2014. Also in 2014, he was elected to be the Fellow of GSA and the President of the International Association of Gondwana Research.
Abstract:
Prof. Ohshima has established a theory of interfacial electric phenomena of soft particles, which is often called “Ohshima’s soft particle theory”. Soft particles are hard particles covered with an ion-penetrable surface layer of polyelectrolytes and serve as a model for biological cells. The electric properties of soft particles are quite different from those of hard particles without surface structures. This theory successfully explains various electric phenomena of soft particles, which cannot be explained by the traditional theories for hard particles. Electrophoresis of biological cells, in particular, is now widely analyzed on the basis of this theory to obtain the charge density and electrophoretic softness of soft particles. His two books (Theory of Colloid and Interfacial Electric Phenomena, Elsevier, 2006 and Biophysical Chemistry of Biointerfaces, Wiley, 2010) provide a detailed review of the soft particle theory.

Biography:
Mr. Hiroyuki Ohshima is Professor of Pharmaceutical Sciences at the Tokyo University of Science, Japan. He received his BS, Ms, and PhD degrees in physics from the University of Tokyo, Japan. He is the author or co-author of 10 books and more than 300 book chapters and journal publications relating to colloid and interface sciences as well as biophysical chemistry. He was an Editor of Colloids and Surfaces B: Biointerfaces from 1994 to 2012. He is also a Regional Editor for Asia of the journal Colloid and Polymer Science.
Abstract:
We explore the ultimate limits of miniaturization – the smallest switches and motors in the world. While our inspiration comes from Nature, using rigid synthetic molecules, so that we can go from quantum mechanics to mechanical engineering, in experiment, theory, and simulation. Using molecular design, tailored syntheses, intermolecular interactions, and selective chemistry to direct molecules into desired positions to create nanostructures, to connect functional molecules to the outside world, and to serve as test structures for measuring single or bundled molecules. We have developed the ability to place individual molecules into controlled environments and microscopes that simultaneously image structure, function, and spectra with submolecular resolution, tens and hundreds of thousands of times on the functional molecules and assemblies. In this way, we selectively and objectively test hypothesized mechanisms, enabling and disabling function and control using predictive and testable means.

Biography:
Prof. Paul S. Weiss received his S.B. and S.M. degrees in chemistry from MIT and his Ph.D. in chemistry from the University of California at Berkeley. He was a post-doctoral member at Bell Laboratories and a Visiting Scientist at IBM Almaden Research Center. In 2009, he became Director of the California NanoSystems Institute, Professor of Chemistry and Biochemistry at UCLA, and Fred Kavli Chair in NanoSystems Sciences. Before coming to UCLA, he was a Distinguished Professor of Chemistry and Physics at the Pennsylvania State University. His work focuses on the atomic-scale chemical, physical, optical, mechanical and electronic properties of surfaces and supramolecular assemblies. He and his students have developed new techniques to expand the applicability and chemical specificity of scanning probe microscopies. He has published over 200 papers and patents, and has given over 400 invited and plenary lectures.
Abstract:
The research interests of Professor Breit evolve around the topics of organic synthesis and catalysis. Professor Breit has pioneered the use of supramolecular concepts in homogeneous catalysis as well as the development of novel atom economic C/C and C/heteroatom bond forming reactions. The new catalysts and methods have been applied for the synthesis of a wide range of medicinally important target molecules as well as natural products.

Biography:
Professor Bernhard Breit is a graduate of the University of Kaiserslautern (Diploma and Dr. rer. nat.). After postdoctoral studies at Stanford University he joined the faculty at the University of Marburg for a habilitation (1998). In 1999 he accepted a position as a professor of organic chemistry at the University of Heidelberg. In 2001 he moved to his current position as a full professor of organic chemistry to the Albert-Ludwigs Universität in Freiburg. His research interests focus on the exploration and development of methods and strategies for a sustainable organic synthesis. He is author of more than 190 publications, and has been a visiting professor at Harvard University, Stanford University and the University of Strasbourg. Professor Breit’s research has been recognized by several awards, including the Dozenten Award of the Fonds of the Chemical Industry (1999), the Heinz Maier-Leibnitz Award of the DFG (1999), Krupp Award (2000), Novartis European Young Investigator Award (2003), JSPS Fellow (2007 & 2000), Senior Fellow of the Freiburg Institute for Advanced Studies (2008).
Abstract:
N fertilizer is essential for improving crop yield, but at the same time, also impose severe energy and environmental problems. To alleviate these problems, nitrogen utilization efficiency of crops need to be improved. Prof. Tsay’s pioneering works of nitrate transport and signaling could provide novel strategy to improve nitrogen utilization efficiency. She had cloned the first nitrate transporter gene CHL1 in higher plants. This opened the door to study nitrate transport mechanism at the molecular level. And, then, by studying CHL1 and its homologues, she made several breakthroughs and provide new concepts in nitrate transport and signaling. She found out that transporter responsible for uptake also function as a sensor, and elucidated how transceptor (transporter with receptor function) senses the concentration changes, and elicits different levels of responses. This study could serve as a prototype for others to study different nutrient sensing.

Biography:
Prof. Tsay got her bachelor degree in 1983, and master degree in 1985 at department of botany in National Taiwan University, Taiwan. And, then she received her PhD degree in 1990 at department of biology in Carnegie Mellon University, Pittsburgh, Pennsylvania. She worked as a post-doctoral fellow in University of California, San Diego from 1990 to 1993. During that period, she cloned the first nitrate transporter gene CHL1. She joined institute of Molecular biology, Academia Sinica, Taipei, Taiwan in 1994 to establish her own research group. Since then, she made several breakthroughs in nitrate transport and signaling, and published outstanding research papers and review articles in prestige journals like Cell, Nature, EMBO J., Plant Cell etc. Some of her studies could be developed into new strategy to improve nitrogen utilization of crops.
Abstract:
It is over a hundred years since discovery that 'the ague' (malaria) is caused by infection with a protozoan parasite transmitted between humans by mosquitoes. Malaria has been a scourge of humanity since antiquity. Over three hundred million people develop malaria each year with the loss of over 600,000 lives. There has been a strengthening of will to combat malaria and this coincided with an enhanced ability to genetically analyze the parasite, mosquito and human genomes. This provided information to utilize new approaches to understand pathogenesis and identify drug and vaccine candidates. Malaria has been a companion of humans throughout history and attempts to control it has been defeated by the parasite and mosquitoes ability to adapt. It is hoped the increased commitment to malaria, with full exploitation of scientific advances associated with our increased knowledge of the malaria genome, will bring this old enemy under control.

Biography:
Professor Alan Cowman is Head, Division of Infection and Immunity, the Walter and Eliza Hall Institute of Medical Research. He is a Fellow of the Australian Academy of Sciences and the Royal Society (United Kingdom) and has received a number of awards including the Glaxo Award for Advanced Research in Infectious Diseases, Gottschalk Medal for Medical Science and Biology from the Australian Academy of Sciences, Boehringer-Mannheim Medal, Glaxo-Wellcome Australia Medal and the Howard Taylor Ricketts Medal. He has also received the Victoria Prize from the Victorian Government and the Mahathir Science Prize from the Mahathir Science Award Foundation (Malaysia). He has over 300 research publications. His work is aimed at understanding the function of proteins in Plasmodium falciparum, the causative agent of the most severe form of malaria in humans and to use this information for the development of vaccines and drug targets against this parasitic disease.
Abstract:
In collaboration with Iranian pediatric centers, our lab is engaged in studying rare human variants of the immune system to provide novel insights into mechanisms governing inflammation and leukemogenesis. We propose to analyze children suffering from congenital neutropenia and to determine underlying genetic defects. In a complementary approach, we plan to use a genome-wide RNA-interference screen in an attempt to unravel critical factors controlling endoplasmatic reticulum stress in myeloid cells, a fundamental aspect of increased cellular death during myeloid cell differentiation in severe congenital neutropenia. Finally, we will mechanistically explore a novel genetic factor causing congenital neutropenia in human patients by studying a new murine model system. Overall, our studies will continue to build scientific and clinical bridges between Germany and various Iranian centers of excellence by unraveling as yet unknown pathways governing the differentiation and function of the innate immune system, a prerequisite for the development of personalized therapies. These studies will contribute to our global care-for-rare alliance, aiming to support the mission that no child should die of its rare disease, regardless of national and ethnic and financial considerations.

Biography:
Professor Christoph Klein, MD PhD, is Director of the Dr. von Hauner Children’s Hospital at the Ludwig-Maximilians-Universität München, where he oversees an extensive clinical and research portfolio devoted to preventing, diagnosing, and treating children with rare and common diseases. After completing subspecialty training in pediatric immunology (Hôpital Necker Enfants Malades, Paris) and pediatric hematology/oncology (Boston Children’s Hospital, Harvard Medical School), he held faculty appointments at Harvard Medical School and Hannover Medical School before being nominated chair-man of the Department of Pediatrics at LMU. Christoph Klein and his team have made seminal contributions to the understanding of how blood and immune cells develop and control immunity and tolerance as well as to the development of novel cell- and gene-based therapies. He is a member of many scientific societies and recipient of numerous prestigious national and international awards. He is the founding spokesman of the German research networks on rare diseases as well as co-founder and principal architect of the international Care-for-Rare Foundation.
Abstract:
The research deals with the development of a process and catalysts for upgrading of heavy petroleum. A new technology (HIDRO-IMP®) has been developed whereby the amount of impurities is considerably reduced by catalytic hydrotreating. API gravity of the feed is substantially enhanced while the yields of gasoline and diesel are increased. These changes in oil composition and quality make refining of the produced upgraded oil much easier and cheaper. Semi-commercial results demonstrated that a 13°API heavy crude oil can be upgraded up to 23°API, sulfur reduces from 5.2 to 1.7 wt%, metals from 535 to 219 ppm, asphaltenes from 21.8 to 9.8 wt%, among other important reductions in nitrogen and viscosity. The main advantages of this technology against other commercially available technologies are reduced investment costs, moderate reaction severity, and better economics. HIDRO-IMP® process has been continuously optimized so that it is ready for commercial application.

Biography:
Prof. Jorge Ancheyta has worked for the Mexican Institute of Petroleum since 1989 and his present position is Manager of Products for the Transformation of Crude Oil. He has also worked as professor of Chemical Engineering at the National Polytechnic Institute of Mexico since 1992. He has been supervisor of more than one hundred theses and of a number of postdoctoral and sabbatical year professors.
Prof. Ancheyta has been working in the development and application of petroleum refining catalysts, kinetic and reactor models, and process technologies mainly in catalytic cracking, catalytic reforming, middle distillate hydrotreating and heavy oils upgrading. He is author of a number of patents, books and more than 200 scientific papers, and has been recognized with various national and international awards.
Abstract:
Professor Suresh Bhargava has an outstanding track record of taking his research excellence to industrial relevance, working with large Australian industry partners to develop mercury sensing and abatement technology solutions. Over the last 10 years, he has developed a patented sensor technology for measuring mercury levels within alumina refinery processes and effluent streams in partnership with Alcoa and BHP Billiton Worsley Alumina, as well as established significant expertise in handling and analyzing complex real world samples (<1 ppb Hg) to understand the fate/speciation of mercury within industrial processes in collaboration with ExxonMobil and Alcoa Australia. The sensor utilizes quartz crystal microbalance technology patterned with patented gold nanostructures and performs with the sensitivity, selectivity, dynamic range and recovery required for monitoring mercury within alumina refinery processes. The technology has now been licensed for commercialization to MinSensor Pty.Ltd. This is a significant, innovative breakthrough in air pollution control.

Biography:
Suresh Bhargava obtained his PhD from University of Exeter, United Kingdom in 1982. He was conferred DSc (Honoris Causa) at Rajasthan University by President of India, in 2009. He is an elected fellow of six learned academies around the world including Australian Academy of Technological Sciences and Engineering. Suresh is a world-renowned interdisciplinary scientist and is recognized for delivering research excellence that underpins significant industrial applications. As a passionate advocate in the application of technological science and engineering to innovation; he provides consultancy and advisory services to many government and industrial bodies around the world including BHP Billiton, Alcoa World Alumina, Rio Tinto and Mobil Exxon. During his distinguished career; Suresh was awarded many prestigious awards including 2015 CHEMECA medal (The most prestigious award in chemical engineering profession in Australia and New Zealand). He has also strived over the years to create solid and sustainable global research partnerships to improve and advance Science and Technology.