ROHINI
COLLEGE OF ENGINEERING & TECHNOLOGY

Approved by AICTE and Affiliated to Anna University, (An ISO Certified Institution)

MECHTRON'17

[2016-2017]

Annual Technical Magazine ISSUE I

DEPARTMENT OF
MECHANICAL ENGINEERING

This magazine is designed by the Department of Mechanical Engineering for developing and cultivating the students in literary and study habits.

ROHINI COLLEGE OF ENGINEERING AND TECHNOLOGY

Approved by AICTE and affiliated to Anna University,(An ISO Certified Institution) Anjugrammam main Road , Palkulam 629401,Kanyakumari District

MECHTRON 2K17

(2016-2017)

ANNUAL TECHNICAL MAGAZINE
DEPARTMENT OF MECHANICAL ENGINEERING

MECHTRON 2K17
2016-2017

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Message from Chairman

I am proud to announce the release of 'MACHTRON'2K162K162k16 magazine's First issue. The magazine signifies the writer's penmanship and also allows them to share their ideas .I acknowledge the efforts of students and staff of Mechanical department who have taken the initiative to promote the writing and publishing skills of the students. This helps the students to share and express their ideas in an articulate manner.

Students and staff achievements have also been presented which will be a

Motivational factor for the other students to achieve the standard of excellence .Glad to say that we have achieved our aim of turning this into reality. I would like to congratulate all the students, teachers, alumni and everyone involved in bringing out its 3rd edition.

Wishing everyone loads of success and bright future.

Shri.K.NEELA MARTHANDAN

Chairman

Rohini Groups

Message by Head of Institution

Dear All,

Service to Human being is Service to God. Creating better human beings' is our motto and we can do that when we are able to mould our students to be good human beings with values which are embedded for life. Now our special emphasis is on Outcome Based Education and Experiential Learning. The main focus of our college is to empower students with sound knowledge, wisdom, experience and training both at the academic level of Engineering and in the highly competitive global industrial market.

The Mechanical Engineering Department digital magazine is a platform for sharing educational information, activities and events related to the MECH Department of our college. Introducing the third issue, I hope that the digital magazine will provide useful and relevant information. I wish the best for all our students, and the members of the department of Mechanical Engineering who reiterate their aims at providing the best in academic and extra-curricular fields. Once again, I wish all our students and faculty a successful and rewarding career.

Best Wishes,
Dr.R.RAJESH, M.E., Ph.D.
Principal
Rohini College of Engineering & Technology

Palkulam, Kanyakumari.

Message by Head of Department

I am pleased to know that our students are successful in bringing their third issue of magazine 'MACHTRON'2K162K16 for this academic year 2019-20.

'MACHTRON'2K162K16, the departmental magazine has the prime objective of providing aspiring engineers a wide platform to show case their technical knowledge and to pen down innovative ideas.

This magazine is intended to bring out the hidden literary talents in the students and teachers to inculcate strong technical skills among them. I congratulate and thank all the students and faculty coordinators who have made untiring efforts to bring out this magazine. I wish them all the very best for releasing more such magazines in future.

DR.S.INDRAN M.E., Ph.D.
Head Of Department
Rohini College of Engineering & Technology

Message from Faculty In-charge

It gives me immense pleasure to present the third issue of 'MACHTRON'2K162K16 Magazine of the Department of Mechanical Engineering. It is the talent and outcome of our students which is reflected through this. This is one of the best platforms for our students to present multifaceted personalities and innovative ideas.

I take this opportunity to thank our respected Principal Dr.R. Rajesh, HOD, Dr.S.Indran and all the faculty members for their incessant inspiration and kind support.

I believe that this edition, will prove to be a success .I express my heartfelt gratitude to the editorial committee for their relentless efforts, the young writers for their valuable articles and all those who have been a part of 'MACHTRON'2K16

Mr.Manoj J.K

Asst.Professor
Department of Mechanical Engineering

About the Department

The Department of Mechanical Engineering started in the year 2012 with an initial intake of 60 students to the B.E Program and increased to an intake of 120 students from 2013 and 180 students from 2014. The Department offers ME - Thermal Engineering programme from 2015 with an intake of 24 students. The Department is a recognized research centre by Anna University Chennai from the year 2019. The department accomplish outcome Based Education which help the students to learn, develop and serve to the society. The Department has experienced and dedicated faculty with a wide range of specialization namely Thermal Engineering, Engineering Design, Manufacturing Engineering, Energy Engineering, CAD/CAM, Industrial Engineering and Mechatronics.

The faculty members have published more than 100 papers in National/International journals/Conference and had written books, filed patterns during the last 3 years and received many awards. The students were motivated by providing lot of opportunities like technical presentation in Symposium, conferences for skill development.. The department has well established laboratory facilities to conduct research work on different specialized areas like Material Science, Renewable Energy, and Thermal Science. The students of the department have received external research funding from Tamil Nadu State council for Science and technology in recent years. The students of the departments have joined in reputed industries through placements and some of them are turned to be an entrepreneur. The department has a good network of alumni.

FROM THE DESK OF EDITOR'S

It gives us great pleasure to bring you issue of 'MACHTRON'2K16, the MECHANICAL department technical magazine of Rohini College of Engineering and Technology, Kanyakumari.

The objective of the magazine is to mainly focus on Achievement of the students from the MECHANICAL department in the Co-curricular and Extra-Curricular Activities

The name and fame of an institute depends on the caliber and achievements of the students and teachers. The role of a teacher is to be a facilitator in nurturing the skills and talents of students. This magazine is a platform to exhibit the literary skills and innovative ideas of teachers and students Ronix 2k19 presents the skills and innovative thinking of students and contributions of teachers.

We are also thankful to our Management and Principal for their support and encouragement.. Last but not the least we are thankful to all the authors who have sent their articles. We truly hope that the pages that follow will make an interesting read.

Mr.Rajkumar

Mr.Kailainathan

ABOUT COLLEGE

Rohini College of Engineering and Technology- a temple of learning, is an ISO certified institution was founded by the great Industrialist and Philanthropist, Shri. K.Neela Marthandan. The main objective of our college is to advance the knowledge base of the engineering professions and to influence the future directions of engineering education and practice.

RCET - Best Engineering College in Nagercoil, Kanyakumari District. We believe not only in educating the students, but also in grooming characters, with moral and ethical values to build the nation. Since the beginning, the college has been providing world-class facilities & infrastructure in education and learning. The emphasis is on transformational leadership rather than directional leadership. We aim to establish new trends, introduce innovative training methodologies, and thus guide students towards the road to success.

VISION

To be an academic institute of continuous excellence towards education and research in rural regime and provide service to nation in terms of nurturing potentially higher social, ethical and engineering companion graduands

MISSION

- To foster and promote technically competent graduands by imparting the state of art engineering education in rural regime.
- To enunciate research assisted scientific learning by dissemination of knowledge towards science, agriculture, industry and national security

Department Vision: Mechanical Engineering

To inculcate competence in the field of Mechanical Engineering in students by providing quality education and learning opportunities to enable them to become ethically strong engineers for the development of society.

Department Mission: Mechanical Engineering

M1. To provide fundamentals and technical skills in Mechanical Engineering through effective teaching–learning methodologies.

M2. To provide an ambience for research through collaborations with industry and academia.

M3. To inculcate students with leadership quality and employability skills with ethical values.

STAFF ARTICLES

WHY IS CONTINUING PROFESSIONAL DEVELOPMENT KEY FOR SUCCESS?

By Chanjith Charles

Employers want communications professionals who continue to develop key skills

`Recruiters are actively seeking to place internal communications professionals who are developing good business judgment and skills. These are among the top 10 most important skills and competencies employers want in their new comms staff, according to feedback in interviews with 10 global leaders in employee communication Also, only about 7% of respondents - level communication professionals "need to improve their business skills and apply business acumen, including financial literacy, to their everyday job

Better skills – higher employee retention

Continuing professional development (CPD) involves so much more than simply staying 'on the ball' professionally; it is also a vital means of employee retention. LinkedIn's 2019 Workforce Learning Report showed that 94% of employees said they would stay at a company longer if it invested in further employee learning. The interest in continual education is particularly strong among millennials and Gen Zers. Around a fourth of the former and 27% of the latter said that the number one reason they would leave a job is the feeling that there were no opportunities to grow and learn.

Why is further learning key for people working in communications?

For those working in communications, social media, and public relations, staying at the top of their game involves keeping up to date on the latest technological developments. The latter include but are not limited to artificial intelligence, virtual reality, and SEO software. Social media managers need not only worry about beautiful imagery and engaging content, but also about key SEO tools that enable them to conduct keyword searches, website audits, competitor analysis, back link monitoring, and the like. Software is continually being updated, and often, correct utilization

isn't a matter of instinct. Rather, it requires training and, therefore, an investment of time and money.

Differences in earnings

Further study can make a big impact on your earnings. With a Master's degree in Communications, you can look forward to earning a median salary of $99,532 per year though top firms may pay even more. If you are already working, you may worry about not having enough time to study. These days, however, there are various options that can save you significant time and money. Some graduate and postgraduate degree programs are intensive; others can be studied part-time. The fastest way to get a bachelor's degree is to opt for an accelerated distance course that is focused on subjects such as marketing, communications, or computer science. These will all count as credits if you wish to complete a Master's further down the line.

Broadening your career opportunities

If you decide to pursue a postgraduate degree in communications, you will have a wider range of career paths to choose from. The tools and skills you learn will serve you well in a host of professions, including those of event planner, reporter, advertising executive, and communications manager. If in the past you were producing social media content or specializing in graphic design, a Master's degree will show you have the key requirements you need to manage a team, oversee all communications between departments in a large company, and even set up an internal media hub.

Further learning opportunities are highly valued by younger generations of employees. Many would leave a company quickly, or simply not apply for a job at a company whose reputation for staff training and development is poor. In the past, completing a Master's degree while studying was almost impossible owing to the need to attend courses in person. Today, however, online tools and accelerated programs have made it easier to get where you want to, faster.

Bring the joy of learning to your job

An interesting short item on "bringing the joy of learning to your job" was published recently as the *Harvard Business Review's* "Management Tip of the Day." Adapted from the 27 March 2020 HBR article, The Simple Joy of Learning, by Marc Zao-Sanders and Catalina Schvenger, the item offers several suggestions for people to consistently enjoy learning in their professional life:

We all know that thrilling feeling of learning something new — a new recipe, a new word in a foreign language, a new chord on the guitar. And yet, so many of us go through our workdays on

autopilot without setting aside time to learn something new. How can you introduce the joy of learning into your professional life? Start by taking control of what you read to better yourself and your career. Pay attention to what genuinely interests you, rather than relying on a website's algorithm for recommendations. Have an open mind about what "counts" as learning — you can find unexpected opportunities in movies, conversations with friends, speeches, or social media feeds.

Design of birds -inspired fans offers wide-ranging applications

By Stanly Selvakumar.M

A highly sophisticated folding mechanism employed by a group of insects for at least 280 million years is set to become available for a wide range of applications, thanks to a design method developed and tested through multidisciplinary research by engineers and palaeobiologists.

According to an article published in the *Proceedings of the National Academy of Sciences* today, researchers have recreated the complex, highly compact folding mechanisms found in the wings of earwigs with an origami-inspired geometrical method, which has potential applications across different fields of engineering.

The hind wings of earwigs fold automatically under small leathery forewings when the animal is not in flight, employing a specialised folding pattern that reduces surface area ten to 15 times or more depending on the species. This is the most compact wing folding found in insects and gives earwigs unparalleled ground mobility for a flying insect. With the wings protected and their abdomens fully flexible, earwigs are able to wriggle into the soil and other narrow spaces, as well as use their characteristic rear pincers.

Despite the outstanding potential for engineering of the earwig wing and its unique properties, a method for designing their complex folding patterns had not been resolved, hindering practical applications.

"The method to design our earwig-inspired fan is based on the flat-foldability in the origami model, a mathematical theorem that explains how crease patterns may be folded to form a flat

figure," explains lead author Dr Kazuya Saito, an engineer from Kyushu University's Faculty of Design who specializes in bioinspired deployable structures. "Our earwig fan can be designed using classic drawing techniques, but we have also developed and released software that can automatise the process depending on the application requirements."

The geometrical requirements for the new design method were informed by tomographic imaging in folded earwig hind wings. Researchers predict that their earwig-inspired fan will see multiple applications for folding structures, of variable sizes and materials, into highly compact shapes that can be efficiently transported and deployed. These may include daily-use articles such as fans or umbrellas, as well as multiple structures for use in architecture,mechanical engineering, and the aerospace industry, such as drone wings, antennae reflectors, or energy-absorbing panels.

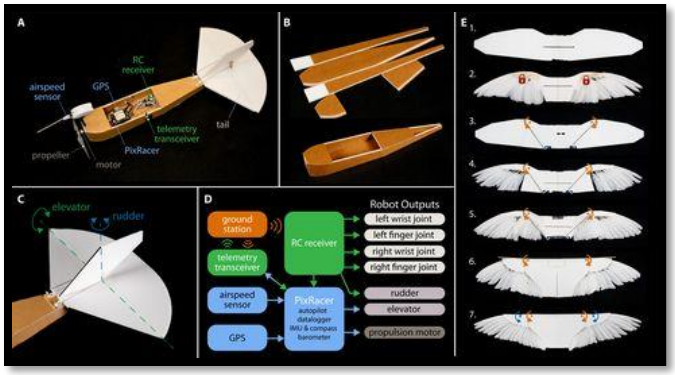
On the other hand, the research provides new insights into evolutionary biology, as the new design method can also recreate the wing-folding mechanism of 280 million-year-old earwig relatives. "The wings of modern earwigs show little variation across their approximately2,000 living species, with shape and folding patterns remaining remarkably stable through evolution because of their specialised function," says Dr Ricardo Pérez-de la Fuente, an insect palaeobiologist from Oxford University Museum of Natural History and co-author of the work. "However, a group of long-extinct insects -- the protelytropterans -- possessed fan-like wings similar to those of earwigs, but different enough to test the consistency of the new design method. Our work shows how palaeontology can be of interest for practical applications."

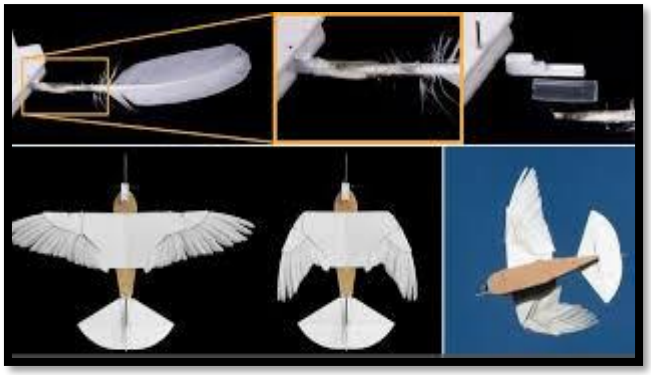
The new method defines the geometrical constraints for the fan-like wings of both earwigs and their deep-time protelytropteran relatives to remain functional. This allowed the researchers to project extinct, hypothetical intermediate forms between the two groups, shedding light on possible evolutionary pathways that could have led to the sophisticated wings of modern earwigs.

"Nature has consistently been an everlasting source of inspiration," says Prof Zhong You, from Oxford University's Department of Engineering Science and co-author of the work. "Bioinspired technologies keep offering some of the most efficient and sustainable ways to meet many of the challenges of the future."

Tail Design

Wing Design





Deep drone acrobatics

By David R

Since the dawn of flight, pilots have used acrobatic maneuvers to test the limits of their airplanes. The same goes for flying drones: Professional pilots often gage the limits of their drones and measure their level of mastery by flying such maneuvers in competitions

Greater efficiency, full speed

Working together with microprocessor company Intel, a team of researchers at the University of Zurich has now developed a quadrotor helicopter, or quadcopter, that can learn to fly acrobatic maneuvers. While a power loop or a barrel role might not be needed in conventional drone operations, a drone capable of performing such maneuvers is likely to be much more efficient. It can be pushed to its physical limits, make full use of its agility and speed, and cover more distance within its battery life.

The researchers have developed a navigation algorithm that enables drones to autonomously perform various maneuvers -- using nothing more than onboard sensor measurements. To demonstrate the efficiency of their algorithm, the researchers flew maneuvers such as a power loop, a barrel roll or a matty flip, during which the drone is subject to very high thrust and extreme angular acceleration. "This navigation is another step towards integrating autonomous drones in our daily lives," says Davide Scaramuzza, robotics professor and head of the robotics and perception group at the University of Zurich.

Trained in simulation

At the core of the novel algorithm lies an artificial neural network that combines input from the onboard camera and sensors and translates this information directly into control commands. The neural network is trained exclusively through simulated acrobatic maneuvers. This has several advantages: Maneuvers can easily be simulated through reference trajectories and do not require expensive demonstrations by a human pilot. Training can scale to a large number of diverse maneuvers and does not pose any physical risk to the quadcopter.

Only a few hours of simulation training are enough and the quadcopter is ready for use, without requiring additional fine-tuning using real data. The algorithm uses abstraction of the sensory input from the simulations and transfers it to the physical world. "Our algorithm learns how to perform acrobatic maneuvers that are challenging even for the best human pilots," says Scaramuzza.

Fast drones for fast missions

However, the researchers acknowledge that human pilots are still better than autonomous drones. "Human pilots can quickly process unexpected situations and changes in the surroundings, and are faster to adjust," says Scaramuzza. Nevertheless, the robotics professor is convinced that drones used for search and rescue missions or for delivery services will benefit from being able to cover long distances quickly and efficiently.

Turning carbon dioxide into liquid fuel

By Navin Jass

Catalysts speed up chemical reactions and form the backbone of many industrial processes. For example, they are essential in transforming heavy oil into gasoline or jet fuel. Today, catalysts are involved in over 80 percent of all manufactured products.

A research team, led by the U.S. Department of Energy's (DOE) Argonne National Laboratory in collaboration with Northern Illinois University, has discovered a new electrocatalyst that converts carbon dioxide (CO_2) and water into ethanol with very high energy efficiency, high selectivity for the desired final product and low cost. Ethanol is a particularly desirable commodity because it is an ingredient in nearly all U.S. gasoline and is widely used as an intermediate product in the chemical, pharmaceutical and cosmetics industries.

"The process resulting from our catalyst would contribute to the circular carbon economy, which entails the reuse of carbon dioxide," said Di-Jia Liu, senior chemist in Argonne's Chemical Sciences and Engineering division and a UChicago CASE scientist in the Pritzker School of Molecular Engineering, University of Chicago. This process would do so by electrochemically converting the CO_2 emitted from industrial processes, such as fossil fuel power plants or alcohol fermentation plants, into valuable commodities at reasonable cost.

The team's catalyst consists of atomically dispersed copper on a carbon-powder support. By an electrochemical reaction, this catalyst breaks down CO_2 and water molecules and selectively reassembles the broken molecules into ethanol under an external electric field. The electrocatalytic selectivity, or "Faradaic efficiency," of the process is over 90 percent, much higher than any other reported process. What is more, the catalyst operates stably over extended operation at low voltage.

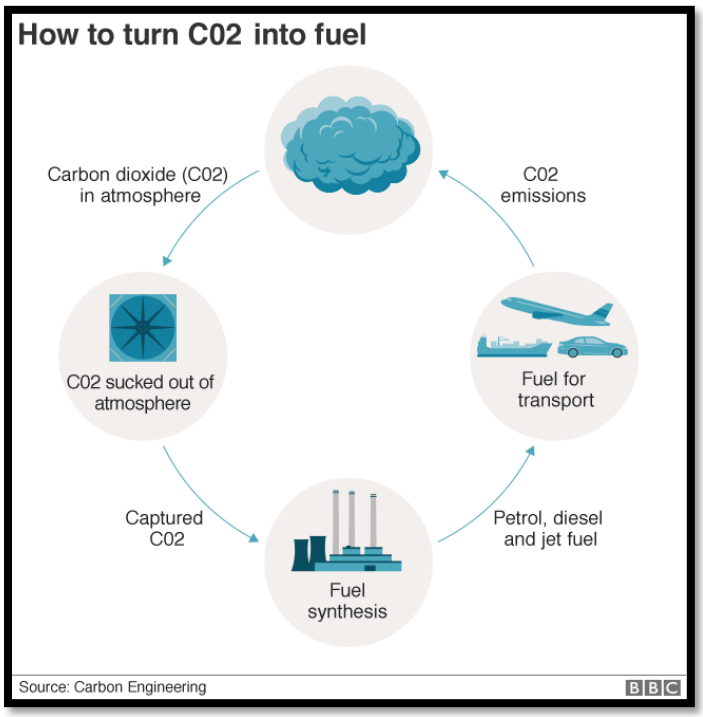
"With this research, we've discovered a new catalytic mechanism for converting carbon dioxide and water into ethanol," said Tao Xu, a professor in physical chemistry and nanotechnology from Northern Illinois University. "The mechanism should also provide a foundation for development of highly efficient electrocatalysts for carbon dioxide conversion to a vast array of value-added chemicals."

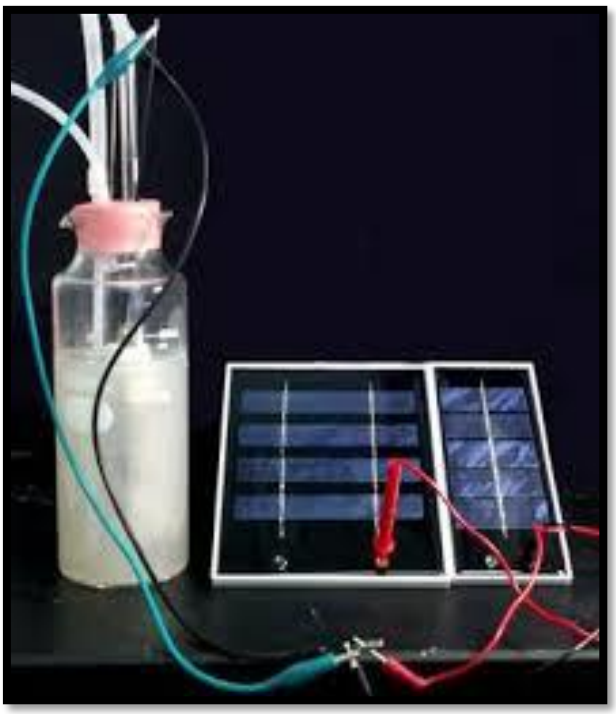
Because CO_2 is a stable molecule, transforming it into a different molecule is normally energy intensive and costly. However, according to Liu, "We could couple the electrochemical process of CO_2-to-ethanol conversion using our catalyst to the electric grid and take advantage of the low-cost electricity available from renewable sources like solar and wind during off-peak hours." Because the process runs at low temperature and pressure, it can start and stop rapidly in response to the intermittent supply of the renewable electricity.

The team's research benefited from two DOE Office of Science User Facilities at Argonne -- the Advanced Photon Source (APS) and Center for Nanoscale Materials (CNM) -- as well as Argonne's Laboratory Computing Resource Center (LCRC). "Thanks to the high photon flux of the X-ray beams at the APS, we have captured the structural changes of the catalyst during

the electrochemical reaction," said Tao Li, an assistant professor in the Department of Chemistry and Biochemistry at Northern Illinois University and an assistant scientist in Argonne's X-ray Science division. These data along with high-resolution electron microscopy at CNM and computational modeling using the LCRC revealed a reversible transformation from atomically dispersed copper to clusters of three copper atoms each on application of a low voltage. The CO_2-to-ethanol catalysis occurs on these tiny copper clusters. This finding is shedding light on ways to further improve the catalyst through rational design.

"We have prepared several new catalysts using this approach and found that they are all highly efficient in converting CO_2 to other hydrocarbons," said Liu. "We plan to continue this research in collaboration with industry to advance this promising technology."





Cooling of Earth caused by eruptions, not meteors

By David Joseph

Ancient sediment found in a central Texas cave appears to solve the mystery of why the Earth cooled suddenly about 13,000 years ago, according to a research study co-authored by a Texas A&M University professor.

Michael Waters, director of The Center for The Study of the First Americans and Distinguished Professor at Texas A&M University, and colleagues from Baylor University and the University of Houston have had their work published in *Science Advances*.

Some researchers believed the event -- which cooled the Earth by about 3 degrees Centigrade, a huge amount -- was caused by an extraterrestrial impact with the Earth, such as a meteor collision. But Waters and the team found that the evidence left in layers of sediment in Hall's Cave were almost certainly the result of volcanic eruptions. Waters said that Hall's Cave, located in the Texas hill country, has a sediment record extending over 20,000 years and he first began researching the cave in 2017.

"It is an exceptional record that offers a unique opportunity for interdisciplinary cooperation to investigate a number of important research questions," he said. "One big question was, did an extraterrestrial impact occur near the end of the last ice age, about 13,000 years ago as the ice sheets covering Canada were melting, and cause an abrupt cooling that thrust the northern hemisphere back into the ice age for an extra 1,200 years?"

Waters and the team found that within the cave are layers of sediment, first identified by Thomas Stafford (Stafford Research Laboratories, Colorado), that dated to the time of the proposed impact that could answer the question and perhaps even identify the trigger that started the ancient cold snap. The event also likely helped cause the extinction of large mammals such as mammoth, horse and camel that once roamed North America.

"This work shows that the geochemical signature associated with the cooling event is not unique but occurred four times between 9,000 and 15,000 years ago," said Alan Brandon, professor of geosciences at University of Houston and head of the research team. "Thus, the trigger for this cooling event didn't come from space. Prior geochemical evidence for a large meteor exploding in the atmosphere instead reflects a period of major volcanic eruptions.

I was skeptical," Brandon said. "We took every avenue we could to come up with an alternative explanation, or even avoid, this conclusion. A volcanic eruption had been considered one possible explanation but was generally dismissed because there was no associated geochemical fingerprint."

After a volcano erupts, the global spread of aerosols reflects incoming solar radiation away from Earth and may lead to global cooling post eruption for one to five years, depending on the size and timescales of the eruption, the team said. "The Younger Dryas, which occurred about 13,000 years ago, disrupted distinct warming at the end of the last ice age," said co-author Steven Forman, professor of geosciences at Baylor.

The Earth's climate may have been at a tipping point at the end of Younger Dryas, possibly from the ice sheet discharge into the North Atlantic Ocean, enhanced snow cover and powerful volcanic eruptions that may have in combination led to intense Northern Hemisphere cooling, Forman said."This period of rapid cooling coincides with the extinction of a number of species, including camels and horses, and the appearance of the Clovis archaeological tradition," said Waters.

Brandon and fellow University of Houston scientist Nan Sun completed the isotopic analysis of sediments collected from Hall's Cave. They found that elements such as iridium, ruthenium, platinum, palladium and rhenium were not present in the correct proportions, meaning that a meteor or asteroid could not have caused the event.

"The isotope analysis and the relative proportion of the elements matched those that were found in previous volcanic gases," said Sun, lead author of the report.Volcanic eruptions cause their most severe cooling near the source, usually in the year of the eruption, with substantially less cooling in the years after the eruption, the team said.

The Younger Dryas cooling lasted about 1,200 years, "so a sole volcanic eruptive cause is an important initiating factor, but other Earth system changes, such as cooling of the oceans and more snow cover were needed to sustain this colder period, "Forman said. Waters added that the bottom line is that "the chemical anomalies found in sediments dating to the beginning of the Younger Dryas are the result of volcanism and not an extraterrestrial impact."

Volcanic Eruption

Early Mars was covered in ice sheets, not flowing rivers, researchers say

By Jonny Varghese

A large number of the valley networks scarring Mars's surface were carved by water melting beneath glacial ice, not by free-flowing rivers as previously thought, according to new UBC research published today in *Nature Geoscience*. The findings effectively throw cold water on the dominant "warm and wet ancient Mars" hypothesis, which postulates that rivers, rainfall and oceans once existed on the red planet.

To reach this conclusion, lead author Anna Grau Galofre, former PhD student in the department of earth, ocean and atmospheric sciences, developed and used new techniques to examine thousands of Martian valleys. She and her co-authors also compared the Martian valleys to the subglacial channels in the Canadian Arctic Archipelago and uncovered striking similarities.

"For the last 40 years, since Mars's valleys were first discovered, the assumption was that rivers once flowed on Mars, eroding and originating all of these valleys," says Grau Galofre. "But there are hundreds of valleys on Mars, and they look very different from each other. If you look at Earth from a satellite you see a lot of valleys: some of them made by rivers, some made by glaciers, some made by other processes, and each type has a distinctive shape. Mars is similar, in that valleys look very different from each other, suggesting that many processes were at play to carve them."

The similarity between many Martian valleys and the sub glacial channels on Devon Island in the Canadian Arctic motivated the authors to conduct their comparative study. "Devon Island is one of the best analogues we have for Mars here on Earth -- it is a cold, dry, polar desert, and the glaciation is largely cold-based," says co-author Gordon Osinski, professor in Western University's department of earth sciences and Institute for Earth and Space Exploration.

In total, the researchers analyzed more than 10,000 Martian valleys, using a novel algorithm to infer their underlying erosion processes. "These results are the first evidence for extensive subglacial erosion driven by channelized meltwater drainage beneath an ancient ice sheet on Mars," says co-author Mark Jellinek, professor in UBC's department of earth, ocean and atmospheric sciences. "The findings demonstrate that only a fraction of valley networks match patterns typical of surface water erosion, which is in marked contrast to the conventional view. Using the geomorphology of Mars' surface to rigorously reconstruct the character and evolution of the planet in a statistically meaningful way is, frankly, revolutionary."

Grau Galofre's theory also helps explain how the valleys would have formed 3.8 billion years ago on a planet that is further away from the sun than Earth, during a time when the sun was less intense. "Climate modelling predicts that Mars' ancient climate was much cooler during the time of valley network formation," says Grau Galofre, currently a SESE Exploration Post-doctoral Fellow at Arizona State University. "We tried to put everything together and bring up a hypothesis that hadn't really been considered: that channels and valleys networks can form under ice sheets, as part of the drainage system that forms naturally under an ice sheet when there's water accumulated at the base."

These environments would also support better survival conditions for possible ancient life on Mars. A sheet of ice would lend more protection and stability of underlying water, as well as providing shelter from solar radiation in the absence of a magnetic field -- something Mars once had, but which disappeared billions of years ago.While Grau Galofre's research was focused on Mars, the analytical tools she developed for this work can be applied to uncover more about the early history of our own planet. Jellinek says he intends to use these new algorithms to analyze and explore erosion features left over from very early Earth history.

"Currently we can reconstruct rigorously the history of global glaciation on Earth going back about a million to five million years," says Jellinek. "Anna's work will enable us to explore the advance and retreat of ice sheets back to at least 35 million years ago -- to the beginnings of Antarctica, or earlier -- back in time well before the age of our oldest ice cores. These are very elegant analytical tools."

Students Articles

Experimental study of strain fields during shearing of medium and high-strength steel sheet

By Mahesh Kumar.N 963314114038 IV Mech-B

Background

There is a shortage of experimentally determined strains during sheet metal shearing. These kinds of data are a requisite to validate shearing models and to simulate the shearing process.

Methods

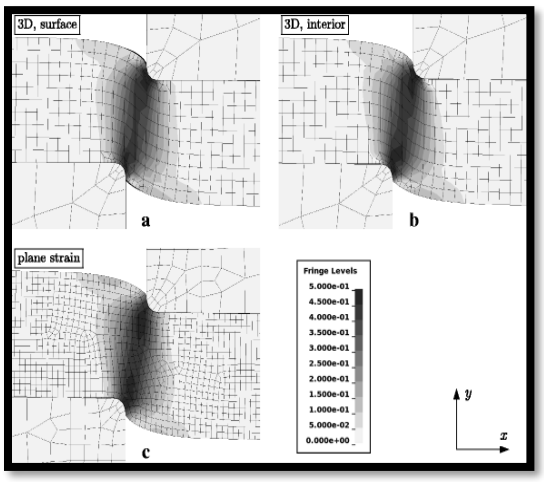
In this work, strain fields were continuously measured during shearing of a medium and a high strength steel sheet, using digital image correlation. Preliminary studies based on finite element simulations, suggested that the effective surface strains are a good approximation of the bulk strains below the surface. The experiments were performed in a symmetric set-up with large stiffness and stable tool clearances, using various combinations of tool clearance and clamping configuration. Due to large deformations, strains were measured from images captured in a series of steps from shearing start to final fracture. Both the Cauchy and Hencky strain measures were considered, but the difference between these were found negligible with the number of increments used (about 20 to 50). Force-displacement curves were also determined for the various experimental conditions.

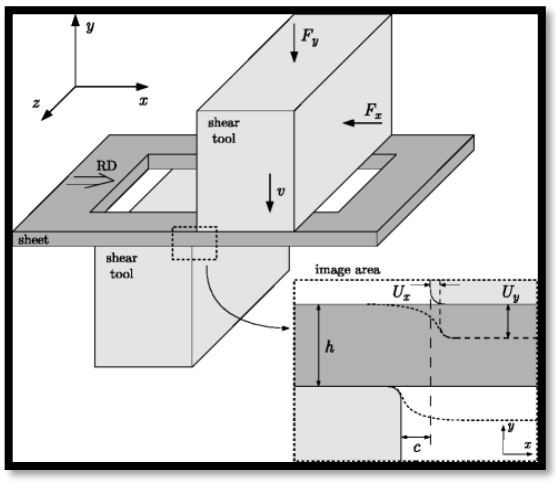
Results

The measured strain fields displayed a thin band of large strain between the tool edges. Shearing with two clamps resulted in a symmetric strain band whereas there was an extended area with large strains around the tool at the unclamped side when shearing with one clamp. Furthermore, one or two cracks were visible on most of the samples close to the tool edges well before final fracture.

Conclusions

The fracture strain was larger for the medium strength material compared with the high-strength material and increased with increasing clearance.





Aircraft Interior Design Just Got More Challenging

Airlines constantly face the necessity to increase capacity in economy class. More people on board is not only better for the airline's business but also better for the environment, as fully packed airplanes mean less airplanes in the air. But in the midst of a pandemic, packing passengers together raises new challenges for engineers designing and analyzing aircraft interiors.

We meet two such engineers at ESI. Christian Marca, Product Manager from Marseille, France and Trevor Edwards, Vibro Acoustics Global Business Development from the UK who are steeped in cabin comfort and vibro-acoustics.

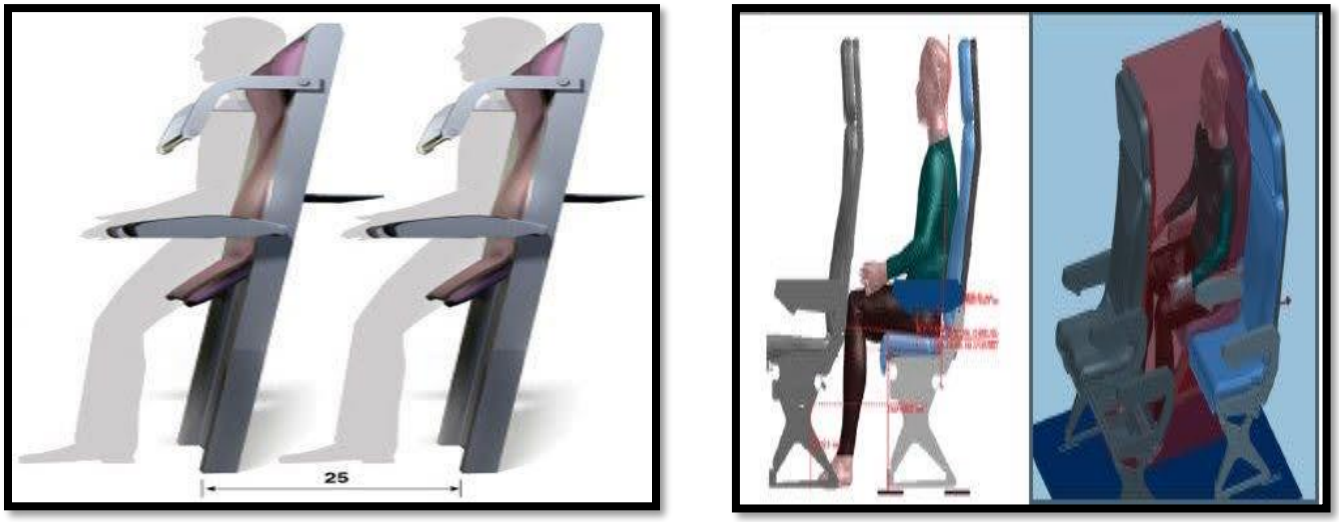
Noise

If you have heard a military plane take off or fly overhead, you know how loud a jet engine can get. The noise will have you bleeding from the ears, well in excess of 100 dB. By contrast, a commercial airplane may not even wake up the baby, whether that baby is sleeping inside the plane on a bulkhead bassinet or the family naïve enough to have bought a house in the flight path of a major airport. Commercial airplane engines are muffled, their interiors stuffed with noise-absorbing materials. The noise management is so effective that the loudest noise could be the rattle of the overhead storage space compartments.

Doing more than wonder are hotshot engineers who specialize in aircraft acoustics and the structural integrity of cabin fixtures. Trevor's job is to consider excitations from jet engines and wind noise. He struggles to boil down a career in vibro-acoustics into a short interview—but does so marvelously. Trevor breaks down the noise sources in a commercial jet aircraft into three types.

The Structural Simulations

Enjoying the rigid but light seats are airline accountants, who translate each ounce saved into fuel savings and each extra seat into revenue. You've thought that every time your knees have scraped the seat in front of you. You're sure they would have you standing, if they could.



Standing "seats." (Picture by Graham Robert, The New York Times.)

The accountants have already thought of this. The average seat-to-seat distance has shrunk by three inches since 1978, according to the New York Times. Airbus has also revealed a stand-up concept "seat."

Perhaps the biggest challenge is invisible: the air in your precious little personal space. That air might be shared by one and all on the same flight, blown about by air vents overhead and underneath, part of the ECS (environmental control system). The ECS is also a source of noise. Hydraulic pumps and electronics also emit noise.

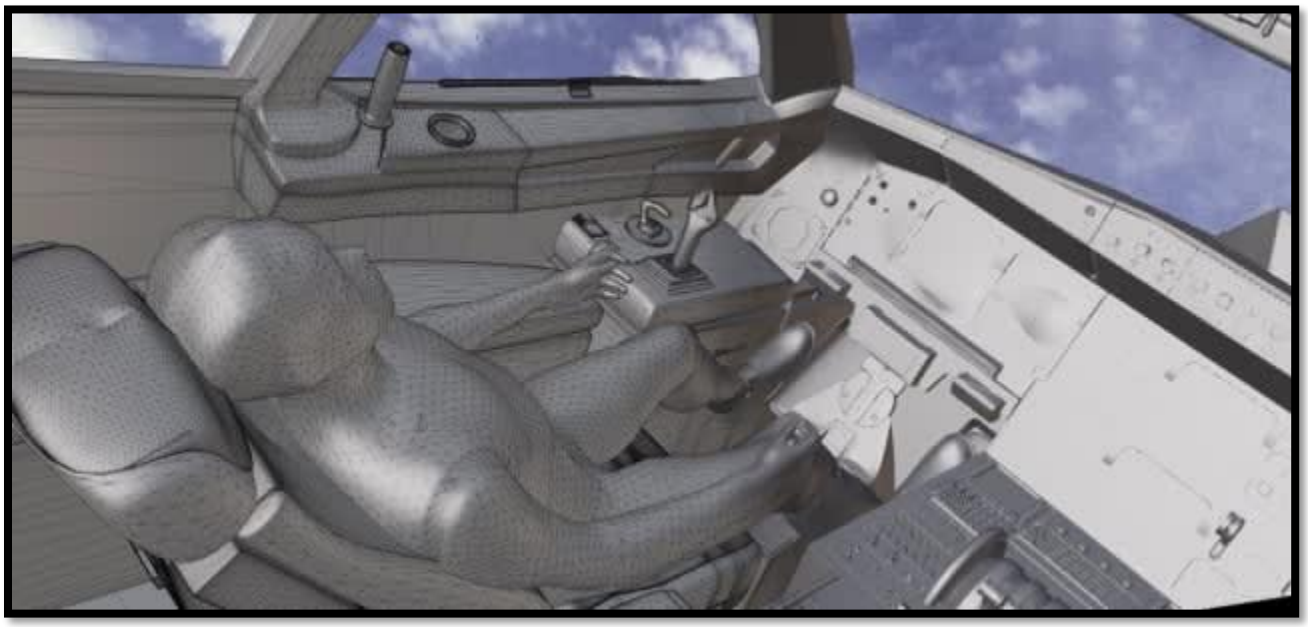
While climate control is limited in coach class, first class and business class passengers have a bit more control of their environment.

A Class Struggle

As we shuffle through the first-class cabin on our way to the back of the plane, we can't help but sigh. First class can be a study in lavishness, whereas economy class is a study in packing efficiency. Thick, padded seats with speakers for maximum entertainment pleasure and lie-flat seats are

cocoons of comfort. ESI software can model the electromechanical system composed of structure, wires, motors, and entertainment systems with speakers.

To help simulate the environment is ESI's VA One, a multi-physics sound simulation specialized for aeronautical application. It includes:

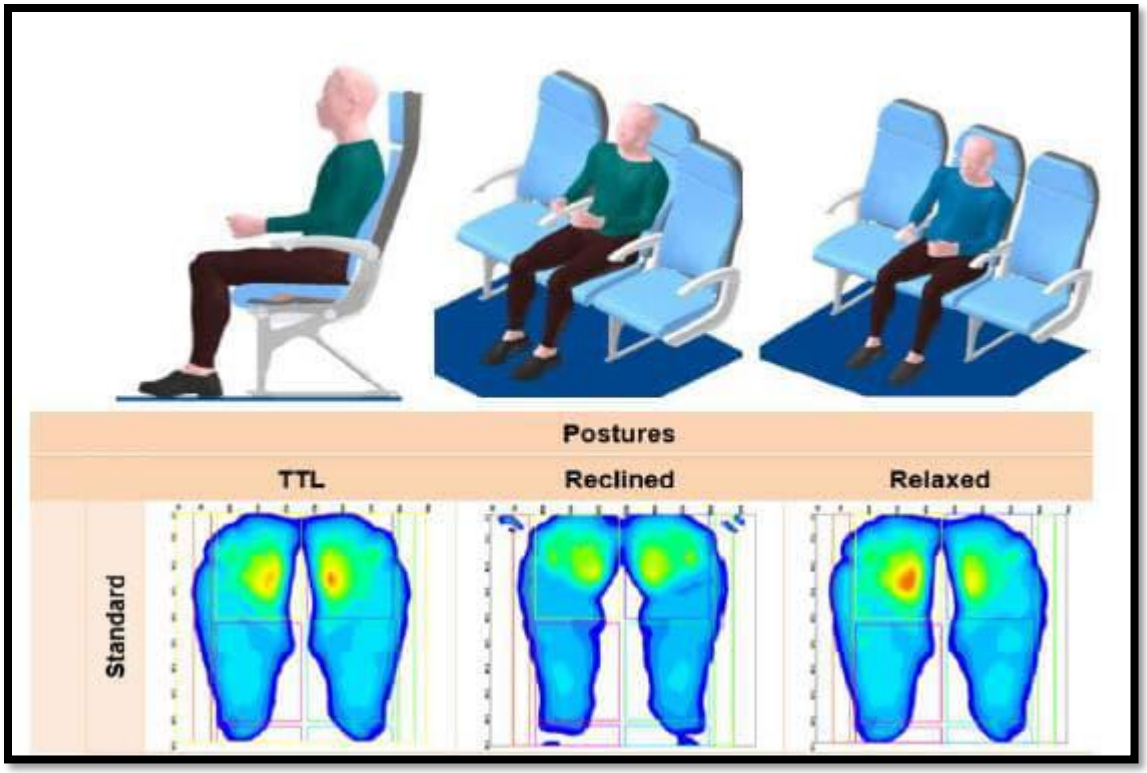


A comfortable pilot is a safe pilot. Digital model of pilot. (Picture courtesy of ESI.)

What's wrong with Testing with Humans?

The current development process to create an aircraft interior has its advantages and limitations. The advantage is obvious: nothing simulates one human with as much fidelity as another. But humans being so expensive, come in all shapes and sizes and are of all ages – from the babies in child carriers to the elderly in wheelchairs. Getting the proper selection during a live comfort test is a casting nightmare. It's so much easier to dial up the girth of a digital passenger, or increase their height, or limit their mobility.

"ESI's Interior application provides models of various morphology," says Christian. We supply a database of virtual human specimens. They are frozen in common positions, such as seated with hands extending towards controllers for pilot simulation, but they can be moved to different postures and positions. They can be used to see the pressure hot spots on seats, for example."
"Having a virtual model makes for complete repeatability," adds Christian.



ESI software promises more comfort with aircraft interior design software that localizes the environment to individual seats, giving even economy class passengers smarter climate and light control that depends on detection of a passenger, by controlling the air vents and overhead lighting.

ASTRONOMERS IDENTIFY THE BEST SPOT ON THE PLANET FOR A TELESCOPE

An international team of astronomers has identified what may be the best spot on Earth to stick a telescope. According to the study, a high plateau in eastern Antarctica would have an exceptionally clear view of the stars, even outperforming other locations on the polar continent.

Telescopes on the ground have to contend with all sorts of issues. Turbulence in the atmosphere can warp the image quality, the sky can be washed out by light pollution from nearby cities, and an increasing crowd of satellites is making it hard to see anything at all. That's why so many telescopes, such as Hubble and Spitzer, image the cosmos from orbit. But now a new study has identified what is reportedly the best spot on Earth for a ground-based telescope. Dome A, or Dome Argus, is an ice dome on the Antarctic Plateau, located about 1,200 km (750 mi) inland on the east

side of the frozen continent. It sits at an altitude of over 4,000 m (13,000 ft), and is recognized as one of the coldest places on the planet, which together means the atmosphere is very thin.

"A telescope located at Dome A could out-perform a similar telescope located at any other astronomical site on the planet," says Paul Hickson, a co-author of the new study. "The combination of high altitude, low temperature, long periods of continuous darkness, and an exceptionally stable atmosphere, makes Dome A a very attractive location for optical and infrared astronomy. A telescope located there would have sharper images and could detect fainter objects."

Astronomers measure atmospheric turbulence with a "seeing" number in arcseconds, and the lower the number, the better. Some of the best astronomical sites in the world, like observatories in Chile and Hawaii, have seeing numbers between 0.6 and 0.8 arcseconds. But Dome A boasts seeing as low as 0.13 arcseconds at night.

That means it also outperforms other promising Antarctic locations, such as Dome C, with a seeing range of 0.23 to 0.36 arcseconds, and Ridge A, with seeing of around 0.2 arcseconds.

The team took these measurements using an instrument called a differential image motion monitor, at a height of 8 m (26.2 ft). This turned out to be comparable to a height of 20 m (65.6 ft) at Dome C, highlighting Dome A as the better location.

The researchers also say that frost proved a hinderance to the experiment, but by finding ways around that problem, seeing could be improved by a further 10 to 12 percent.

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