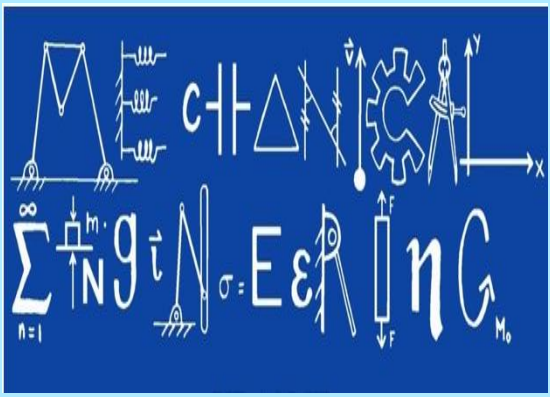
Yaantrika

Newsletter

Department of Mechanical Engineering



Volume 2 **Issue 1** **Nov 2016**

Vision and Mission of the Institute

Vision

- To be one of the premier Institutes of Engineering and Management education in the country.

Mission

- To provide Engineering and Management education that meets the needs of human resources in the country.
- To develop leadership qualities, team spirit and concern for environment in students.

Vision and Mission of the Department

Vision

- To be a premier department for education in Mechanical engineering in the state of Karnataka, that moulds students into professional Engineers.

Mission

- To provide a teaching-learning process that prepares engineers to meet the needs of industry and higher learning.
- Provide environment for self learning to meet the challenges of changing technology and inculcate team spirit and leadership qualities to succeed in professional career.
- To instill professional ethics and concern for environment for the benefit of society.

"Yaantrika" from the Department of Mechanical Engineering, is dedicated to "James Watt" a **Scottish inventor & Mechanical engineer,** ***famous for the invention of the Steam Engine.***

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B.N.M Institute of Technology

Affiliated to V.T.U. Belgaum | Approved by A.I.C.T.E., New Delhi.

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From Editor's Desk

Dear Readers,

***W*elcome to the November 2016 issue of our newsletter Yaantrika.**

The team of Yaantrika, like to give our readers, the most unusually arresting and intellectually stimulating newsletter. The newsletter endeavors to reflect the values and the quality of our Institution. The presentation of the entire newsletter shows the creative indulgence of our students. A lot of thought and care has gone into the making of the newsletter.

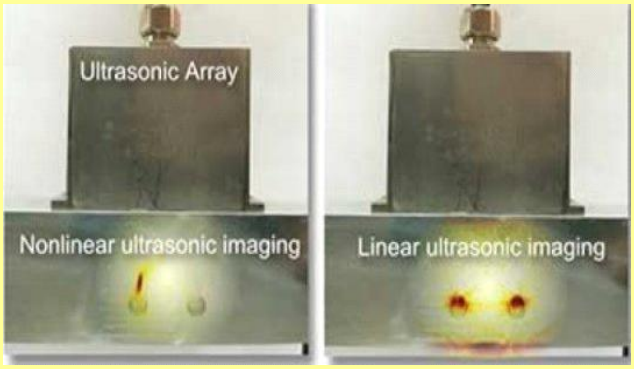
We would like to express our appreciation to all those who have contributed articles in this issue. It is this willingness to make the effort to share knowledge, concerns and special insights that have made this issue possible.

Knowledge is treasure which appreciates when we share and depreciates when accumulated. Never stop sharing knowledge and helping others

About ME Department

Department of Mechanical Engineering was started in the Year 2011-2012 with an intake of 60 students. The department offers undergraduate program in Mechanical Engineering and is headed by Dr. Mukesh Patil. All the laboratories have been established procuring state of the art equipments. The department has a team of talented well qualified and dedicated staff members, with a blend of industrial and academic experience. Faculty members have Master's and Doctorate degree qualification with specialization in Machine Design, Thermal engineering, Product Design and Maintenance Engineering.

Aircraft Safety: New Imaging Technique Could Detect Acoustically 'Invisible' Cracks



The next generation of aircraft could be thinner and lighter thanks to the development of a new imaging technique that could detect damage previously invisible to acoustic imaging systems.

The nonlinear acoustic technique developed by researchers from the University of Bristol's Ultrasonic's and Non-destructive Testing (NDT) research group is published in the current issue of Physical Review Letters together with an accompanying article in Physics.

It has long been understood that acoustic nonlinearity is sensitive to many physical properties including material microstructure and mechanical damage. The lack of effective imaging has, however, held back the use of this important method.

Currently engineers are able to produce images of the interior of components using ultrasound, but can only detect large problems such as cracks. This is like detecting only broken bones in a medical environment.

Imaging of acoustic nonlinearity is achieved by exploiting differences in the propagation of fields produced by the parallel and sequential transmission of elements in ultrasonic arrays.

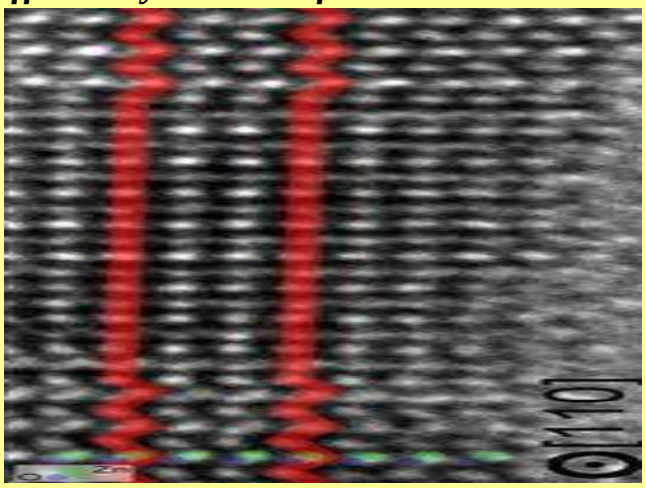
Dr Jack Potter, Research Assistant in the Department of Mechanical Engineering, who led the study, said: "Imaging acoustic nonlinearity not only provides sensitivity to smaller defects than is currently possible but may have the potential to detect damage before macroscopic material changes occur.

"This would enable intervention before cracks have even begun to form, as well as predicting the remaining life of an engineering Structure. Crucially the technique has been achieved using standard inspection equipment, which will allow for the rapid implementation of the technique in numerous applications."

Such advances in non-destructive evaluation not only increase the safety of engineering structures but can help future design, for example, allowing the next generation of aircraft to be built thinner and lighter.

Nag Pujit,III Sem 'B'

Mechanical behavior of tiny structures is affected by atomic defects



The atomic arrangements of Zinc Oxide visible under a high-resolution transmission electron microscope. Here, Zn (green) represents Zinc and O (blue) represents Oxygen. The red lines showing the defect in the periodicity of atomic arrangements. The zig zag periodicity is Zinc Oxide's original periodicity called quartzite and the straight line is the region with defect where the original zig zag periodicity is lost. The defected region plays a significant role in the study.

An international team of scientists with participation from the University of Gottingen, the Indian Institute of Science, Bangalore, Pennsylvania State University, and Wright State University has measured the mechanics of tiny crystalline ceramics. Materials are made of atoms, and if they are arranged periodically, they are called crystalline structures. If the size of these crystalline structures is 1,000 times smaller than a single human hair diameter, then they are called nano-structures such as nano-rods, nano-wires, nano-ribbons, nano-belts etc.

In some cases, special atomic arrangements enable them to convert mechanical energy into electrical energy. These materials are called piezoelectric materials. They are useful for energy harvesting as well as a variety of electro-mechanical gadgets to enhance the quality of life. Hence, it is important to have a grip on these nano-structures

and measure their mechanical responses. Until now, it was unknown that mechanical behavior of piezoelectric nano-crystals containing atomic defects is different than pure. This recent study is reported in the journal Nano Letters.

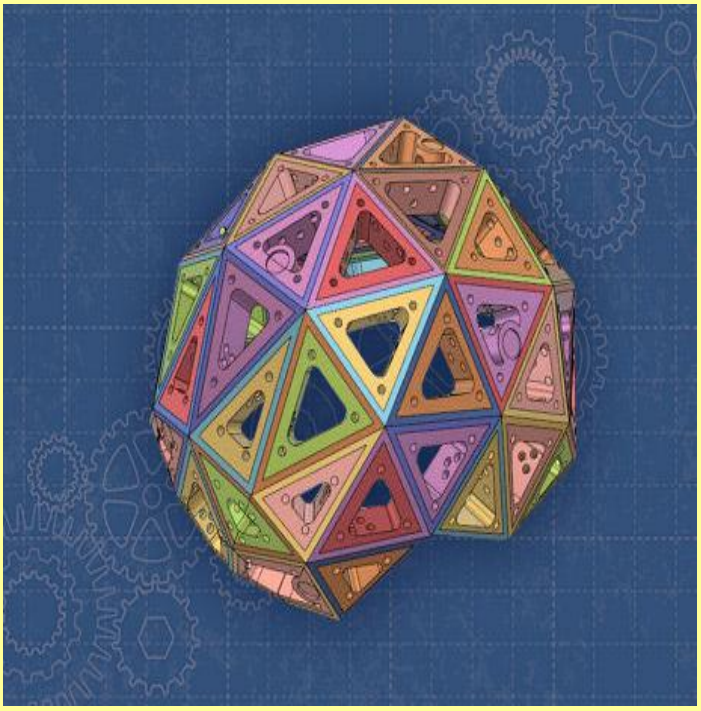
In nature, crystals are never 100 percent perfect, and they have various kinds of structural defects. One such defect type is a stacking-fault. This is considered a structural defect. In a stacking fault, a stack of periodic arrangements of atoms in crystals gets added or missing. Dr. Kasra Momeni, Director of Advanced Hierarchical Materials by Design Laboratory and faculty member of Mechanical Engineering at Louisiana Tech University, elaborates that the presence of structural defects including stacking faults can significantly alter the stress distribution. This is due to the complex interaction between stress fields from stacking faults and the ones from free boundaries of the nano-rods, which can alter the failure mechanism of nanorods with stacking faults compared to the perfect ones.

"Since energy harvesting is one of the key requirements in today's age, converting mechanical forces into a useful form of energy, i.e. electrical output, is an alternative to other energy transduction modes as well as an efficient approach. There are several crystalline ceramics which convert mechanical energy into electrical energy. We introduced a new concept that mechanics of these tiny crystalline ceramic structures are dependent on atomic defects. For example, they can collapse and their mechanical properties are not as expected. Consideration of these facts will enable us to design energy harvesting devices out of such tiny structures," explains Dr. Moumita Ghosh, leading scientist of this research from the University of Göttingen and former doctoral research scholar of the Indian Institute of Science, Bangalore.

The new finding reveals a non-intuitive know-how of defects in terms of mechanics at low dimension. Defect engineering in piezoelectric nanomaterials in future will enable us to realize various high quality and cost-effective vibration-based energy harvesting as well as electro-mechanical devices for biomedical research, diagnostics, and electronic application.

Dipak Srinivas,III Sem 'A'

Bike Helmet Design Shifts Gears

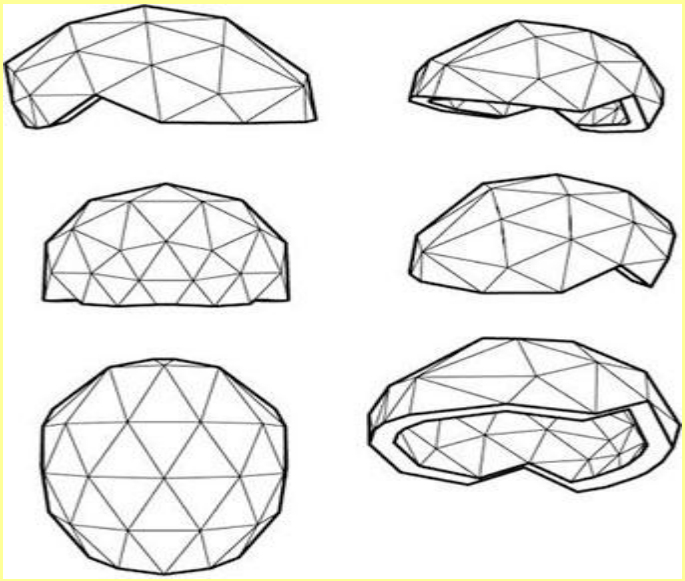


(A new bike helmet is grown from mushrooms and custom-shaped into a dome the exact shape of a user's skull)

The bike helmet has evolved over the years from an item used by serious cyclists to something you see practically everywhere. But there have been a number of complaints that have gone with this bulky safety gear. Though there may be limitations to what you can do for "helmet hair," the lugging of a cumbersome helmet throughout the day may have an answer down the road.

Philippe Videau was in his final year as an aerospace engineering student at UCLA when an internship at Autodesk, a company highly focused on software, allowed him a chance to do far more than glorified paper shuffling. With six interns assigned to see what the company's software could do, three branched off to work on a bike helmet, one that might even fit into a smaller bag, taking up a fraction of the usual required space.

The team used mycelium, a part of a mushroom, and this molding material would allow for a helmet to be molded according to a rider's head. It would also be foldable.



When not in use, the helmet folds into a strip of small segments.

"You get a kit and ultimately activate the mushroom by breaking apart a mixture and over weeks you get this foam-like material and even have to cure it in an oven to stop it from growing," he says. As far as the actual shape of the helmet, they did some testing on growing the mycelium similar to a half soccer ball shape. "It was pretty heavy because it was 3D printed with a heavier plastic but could be printed on a much lighter plastic—think about something like plastics from a MakerBot," Videau says.

The prototype was a very positive result for Videau, taking up between 40% and 50% less space, he says. "It's almost like you can crumple it up and it will be at the bottom of your backpack," he says. "If you take a helmet based on your head geometry then it will be more comfortable because often times people buy a helmet either too big or too small. The mycelium is grown in a mold and you get a 3D model out of it and make it into a mold. You can scan your head with a 3D scanner or just take your smartphone to take 30 to 40 pictures for the process of photogrammetry."
Videau also points out that mycelium isn't just good for making space in your bag but for saving landfill space as well. "Much of the material for bike helmets isn't great for the environment," he says. "This material is biodegradable."

Videau is hopeful that the helmet will keep moving forward but he already takes with him what he found to be a tremendous experience. "Biking is something so many people grow up with and it's fun to take on the challenge of a common problem," he says. "Why do you need to just continue to complain about having a bulky helmet? It's fun to actually do something about it.

Ganesh Dixit III Sem 'A'

'Robotarium' to Provide Scientists With Remote Access to Robots

Researchers in US are developing a new lab called 'Robotarium' that will house up to 100 ground and aerial swarm robots to allow scientists to conduct experiments remotely.

University researchers, as well as middle and high school students, will schedule experiments, upload their own programming code, watch the robots in real-time via streamed video feeds and receive scientific data demonstrating the results.

The "Robotarium" being developed by Georgia Institute of Technology in US is expected to house up to 100 ground and aerial swarm robots.

"Building and maintaining a world-class, multi-robot lab is too expensive for a large number of roboticists and budding roboticists. This creates a steep barrier to entry into our field," said Magnus Egerstedt, Professor in the School of Electrical and Computer Engineering (ECE).

"We need to provide more access to more people in order to continue creating robot-assisted technologies. The Robotarium will allow that," said Egerstedt.

The team has already created a mini-version of the Robotarium. Researchers from the University of California, San Diego, successfully uploaded code during a recent test session.

The Robotarium is expected to be fully operational in 2017, researchers said.

"A research instrument like the Robotarium has the potential to build stronger networks of collaborative research, making the whole significantly larger than the sum of its parts," Egerstedt said.

"The end result has the potential to show how remote access instruments can be structured in other areas beyond robotics," Egerstedt said.

"The first thing that's going to happen when you open it to the public is someone is going to try to break it," said Aaron Ames, an associate

professor in the Woodruff School of Mechanical Engineering and ECE who's involved in the project.

Ames has already developed an algorithm to prevent robots from colliding with each other.

Abhishek Y R, V Sem

Flexible, modular robo-EV

Four years ago, when Germany announced that it planned to put 1 million electric cars on the nation's autobahns and roads by 2020, government ministers turned to the public-private R&D partnership DFKI, the German Research Center for Artificial Intelligence, to develop a road platform to support e-mobility and autonomous driving experiments.

"When we saw the government's ambitious e-mobility plan," recalled Frank Kirchner, Director of the DFKI's Robotics Innovation Center and chairman of the University of Bremen's robotics department, "we said to ourselves, 'this is nothing new to us; after all, we build autonomous robots that move around on electric power. So an autonomous electric car is just a big robot to us.'" We took a chance and submitted a research proposal that we had literally scribbled down on a napkin."

The robotic center's team, which called their proposed car EO—Latin for "I go" (or "to there")—received a $1.7-million grant for a 15-month program to develop their electric smart microcar. "The EO proof-of-concept vehicle turned out to be enough to convince the funding organization to provide another half-million Euros" to build a working prototype, the EO2, which was completed in late 2014, he said.

"Since we were basically a bunch of programming and engineering nerds who spent their time typing in front of computer screens," Kirchner noted, "we had our own view point.

We wanted to design something that was totally different than the cars we saw on the road." So EO was conceived as a reconfigurable robot—a highly flexible and fully modular vehicle that featured multiple degrees of freedom.

Maximum flexibility

The researchers opted for a distributed propulsion system comprising four in-wheel electric motors at the corners. "Distributed drive, together with a drive-by-wire system, enabled us to control the vehicle and distribute energy differently than most other cars," he explained. The lack of a large engine and transmission amid the vehicle affords maximum design flexibility. EO2 can independently turn its wheels 90 degrees and so spin in place, drive diagonally, or sideways abilities that can be useful when driving and parking in congested urban areas, especially in cities of the future with many autonomous vehicles that are less constrained by standard human driving patterns.

Another key aspect of the EO2's design is modularity: "It lets us produce any component simpler and faster, more efficiently." The Robotic Center's team endowed the two-seat vehicle with the ability to reconfigure quickly and easily to carry more passengers or extra cargo, or to add range extenders simply by plugging rolling modules into the back of the car. They built a range-extender module to demonstrate the modular approach.

The concept's modularity extends to the ability to connect multiple vehicles to form road trains. Platooning on highways can save energy and boost range by sharing electric power among the linked cars and cutting wind resistance.

The team developed a foldable docking interface that fits into the body of the car and allows easy connection of the charging cable and for connecting dedicated plug-in modules that carry seats, additional storage room, or a power supply—battery pack, fuel cell, or generator set. "We had previously developed something similar—compatible plug-and-play linkups—for the space program," he said. The electromechanical docking interface features both inductive and direct electrical connections.

Yet another fact of the EO2 prototype's reconfigurability was the capability to change shape and alter its footprint both to improve highway aerodynamics and better fit the tight spaces in cities, all while the passengers remain seated comfortably inside. The vehicle can squat down to reduce wind resistance at speed and also rise up into a smaller footprint for parking. It shrinks from 2 x 1.5 m to 1.5 x 1.5 m by shifting its rear axle toward the front and sliding the body up on a set of rails. "We wanted it to navigate in the confined spaces of urban scenarios to fit into smart cities of the future," he said.

The 750-kg (1650-lb) EO2 prototype has a top speed of 40 mph (64 km/h), and can travel over 30 miles (48 km) on a single four-hour charge of its lithium-ion (LiFePO4) battery.

More Street Smarts

Finally, the design team wanted its car to have the sensors and street smarts to drive itself around town and on highways surely and safely. Its sensor suite includes stereo cameras at the front and back, a lidar laser rangefinder for 3D-scanning the environment, six time-of-flight 3D cameras for near field views, as well as internal Hall-effect and a string of potentiometer sensors for monitoring steering angle and make range measurements.

NANDISH C, V Sem

Industrial Visit

The department organised a one day industrial visit to,

- **KARNATAKA SOAPS AND DETERGENTS LIMITED** on 18th October 2016 for V Sem students
- **VISHNU FORGE INDUSTRIES LIMITED**, on 22nd October 2016 for III Sem Students.

Departmental Activities

- One Week Faculty Development Programme On" **Research Avenues in Thermal, Design and Manufacturing Engineering"** from 11th to 16th July 2016.

- A Technical Talk on **"Effect of Various Fins on Heat Transfer in LEDS"** by Dr. K N Seetaramu,Chair Professor,PES University, on 8th October, 2016.

- A technical talk on **"Career Guidance"** by Dr. H. Sundara Murthy President, Indian Foundry Organization & Managing Director, Fenfe Metallurgicals, Bengaluru on 21st October, 2016.

Students' Achievements

- Varun Ravichandran,Revanth E R,Varun Kumar D,Sandeep M of VII Sem have presented paper on **"Measurement of Residual Stress Distribution & Fatigue life Assessment of Similar & Dissimilar Butt Welded Joint"** on 30th September 2016 at 2nd International Conference of Fatigue, Durability & Fracture Mechanics ,IISC ,Bangalore.

- Pruthvishri Hegde of Vth sem was in the team secured runners up award in the Inter Collegiate Bangalore central zone Throw Ball tournament held at CMRIT from 8th -9th October-2016

Faculty Achievements

- B. S. Anil Kumar, Assoc. Professor, Mechanical Engineering Dept, has submitted his PhD thesis for his doctoral degree under VTU,Belgaum.

- Raghavendra N, Assoc. Professor Mechanical Engineering Dept of BNMIT has presented a paper on " **Development And Tribological Properties Of Particulate MMC Developed By Stir Casting Process",** at IJRET: International Journal of Research in Engineering and Technology eISSN: 2319-1163 | pISSN: 2321-7308 ,Volume: 05 Special Issue: 13

Puzzles and Teasers

1. A man is asked what his daughters look like. He answers, "They are all blondes, but two, all brunettes, but two, and all redheads, but two." How many daughters did he have?

2. What is the product of the following series:-

(x-a), (x-b), (x-c), ...(x-z) ?.

What is it that goes with an automobile and comes with it; is of no use to it, and yet the automobile cannot move without it?

4. You are in a race and you overtake the person who is in second place. What is your position now?

5. Six drinking glasses stand in a row, with the first three full of juice and the next three empty. By moving only one glass can you arrange them so empty and full glasses alternate?

6. Add a single line to the equation in order to make it true (the 'equals' sign remains unchanged).

105 + 2 + 5 = 350

7. What falls but never breaks?

Answers

1. Three. One blonde, one brunette and one redhead.

2. Zero. All factors are multiplied by the factor (x-x)

Which is zero.

3. Noise

4. Second place

5. Pour the second glass into the fifth glass

6. Add a line to the second plus sign in order to

Make it into a four

7. Night

EDITORIAL TEAM

FACULTY **Sucharita Mohanty, Assistant Professor Mechanical Engg. Department,BNMIT**

STUDENTS **Praful S, VII Sem.**
Tejus Sharma , V Sem.
Dipak Srinivas,III Sem'A', Nag Pujit, III Sem 'B'