Ocean Science and Technology – Newer Opportunities for Engineers

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The Oceans

The world's oceans cover 70 percent of the earth's surface and represent the greatest unexplored frontier remaining on earth. We are increasingly becoming aware of the importance of the oceans to the future of our civilization. The oceans present vast untapped resources including offshore oil and gas, minerals and renewable ocean energy. They are increasingly important in facilitating cost effective transportation of people and goods thus enabling economic growth through global trade. Ocean fisheries continue to be a major source of food for growing populations with future growth focused on coastal aquaculture. Coastal and ocean areas also present challenges for, and solutions to, national defence and security. They are also source of recreation and enjoyment. It is an essential source for freshwater and food. The ocean provides ecosystem services estimated to range in the trillions of dollars and creates millions of jobs.

Oceans contribute to poverty eradication, sustained economic growth, food security and creation of sustainable livelihoods and decent work. There is a strong inter-linkage between UN Sustainable Development Goals SDG 14.. However, there is an unprecedented need to continue to build capacities on ocean technology and ocean Observations to support for example the global oceans-based economy, which is estimated at between USD 3-6 trillion/year.

A timely and precise forecast is the essence of successful ocean observation program, which involves cyclone predictions and tracking based on the meteorological and sea surface parameters including air pressure, air temperature, wind speed and direction, sea water temperature and conductivity. Large scale spatio-temporal analysis requires oceanographic parameters such as subsea temperature, conductivity and solar irradiance for effective modelling of ocean dynamics and monsoon predictions.

Enabling Technology

There is a need to increase research output, innovation and technology development opportunities, which in turn lead to economic activity, wealth and better environmental stewardship for all participants. Fundamental new or enabling technologies generally arise from innovation. Innovation is known to be more likely when people look at a problem from a new perspective or adapt ideas from another field. International research collaboration can facilitate the innovation process by fostering interaction among people from divergent backgrounds and having different perspectives.

Blue Economy

The Blue Economy captured the attention due to its growing global interest and potential as the top priority for generating employment, food security, poverty alleviation and ensuring sustainability in business and economic models It is necessary for India to tap the enormous potential of the Ocean based Blue Economy, which will propel the nation into a higher growth trajectory. The development of Blue Economy can serve as a growth catalyst in realizing the vision to become a $10 trillion economy by 2032. Additionally, the Indian Ocean Region is of strategic importance to India's economic growth as the most of the country's oil, and gas is imported through the sea. Further, this dependency is expected to rise by 2025 exponentially. The Sagar Mala project, launched by the Ministry of Shipping, is the strategic initiative for port-led development through the extensive use of IT enabled services for modernization of ports. It tackles the issue of underutilized ports by focusing on port modernization, efficient evacuation, and coastal economic development. The government has allocated over Rs. 3 lakh crore to fund 199 projects under the Sagar Mala project to be implemented in the next three years. The blue economy-related investment areas identified are:

1. Coastal Transport
2. Ecotourism/Sustainable Tourism
3. Energy

4. Enterprise and Livelihood Development
5. Fisheries and Food Security
6. Habitat Protection, Restoration and Management
7. Natural and Man-made Hazard Prevention and Management
8. Pollution Reduction and Waste Management
9. Water Use and Supply Management
10. Marine biodiversity and Bio prospects

Deep Ocean

In the early 20th Century, explorers raced to the South Pole, their sponsors keen to benefit from future exploitation of these unknown areas. India launched our flag in Central Indian Ocean at 5000 metres depth and continued to collect valuable data. Russia used a submersible to plant a flag at the North Pole Only 5% of the deep-sea floor, which covers about 60% of the Earth's surface, has been properly explored. Light penetrates only the top layers, and the vast, deep oceans are pitch-black, with temperatures just a few degrees above freezing point. But countries and companies are turning their eyes towards its minerals, potentially worth billions of pounds. There have been significant advances in the technology required to discover, map and mine them - with underwater robotic equipment built to operate at great depths. Deep Ocean has active and extinct underwater Volcanoes- hydrothermal vents. Deep-sea mining could now happen within next 10 years. It has been made a possibility by population growth, economic growth and concerns over the supply and security of minerals on land. These include the rare earth elements used in a range of new technologies such as memory chips, LEDs and batteries for electric vehicles. It is thought the mountains of the Pacific alone could contain about 22 times more tellurium - which is used in solar panels - than the known land-based reserves combined. At present there is no exploitation of deep-sea mineral resources, only exploration. The rules for exploitation are yet to be agreed, but contractors will have to demonstrate they have assessed the environmental impact of mining and that plans are in place to manage the effects. Mining could have consequences for many forms of life in the ocean. Scientist search for new drugs and other products in ocean.

Ocean Policy

Opportunities would be more on ocean policy and every country has to expand their resource map in the ocean as land resources are depleting and may not cater to the need of future. World population is projected to be cross 8 billion soon. A tremendous change occurred with the industrial revolution: whereas it had taken all of human history until around 1800 for world population to reach one billion**,** the second billion was achieved in only 130 years (1930), the third billion in less than 30 years (1959), the fourth billion in 15 years (1974), and the fifth billion in only 13 years (1987) and now crossing 7.5 billion 50 percent are living close to the coast. There the resources are found within 200 nautical miles (370km) of shore, it is up to individual countries to reach agreement about who owns them. In the deeper international waters, it becomes more difficult. Here, the UN body International Seabed Authority (ISA) is responsible for awarding licenses for mining. The oceans already provide humanity with many resources, but the deep oceans have long been overlooked because of their inaccessibility.

Marine Litter

One among the new issues being discussed among the international community is growing dumping of plastics in the ocean. Marine Litter is a global menace Tons of plastic find a way to reach ocean/ beach and as their molecular bonding is so strong they will remain forever. UN Environment launched an unprecedented global campaign to eliminate major sources of marine litter: micro plastics in cosmetics and the excessive, wasteful usage of single-use plastic by the year 2022. Engineers have to look for newer tools to dispose these plastics and to invent alternate to plastics. In Deep Ocean at 2000 m depth ROVs have shown video graph of plastic drums, components lying on the sea bed

Here I am representing about young entrepreneur which will motivate young students reading this article:

Boyan Slat

The coming years will potentially see a lot of changes, as our understanding and technology improves. Lot of opportunities do exist and solution for the some newer problems need to come from young talented engineers One among them to note is the recent invention of Marine plastics sucker by Boyan Slat (27 July 1994) is a Dutch inventor and entrepreneur who creates technologies to solve societal problems. He is the founder and CEO of The Ocean Cleanup, a group that develops advanced systems to rid world’s oceans of plastic. Instead of going after the plastic, Boyan devised a system though which, driven by the ocean currents, the plastic would concentrate itself, reducing the theoretical cleanup time from millennia to mere years. In February 2013 he dropped out of his Aerospace Engineering study at TU Delft to start The Ocean Cleanup. The first cleanup prototype was deployed in June 2016, and The Ocean Cleanup now prepares to launch the first full-scale operational system into the Great Pacific Garbage Patch by early 2018.Boyan Slat is youngest ever receipt of the UN’s highest environment accolade; Champion of the Earth. In 2015, HM king Herald of Norway awarded the maritime Industry s young entrepreneur award and Frobes included in their 30 under 30 edition in 2016, Readers digest had chosen him as the European of the year in 2017 and was named by Golden Sachs and many more

Technology and Sensor Development

Oceanographic studies require newer sensors to understand the ocean. Optical acoustic sensors are owing major improvements, next generation web based sensors to monitor changing oceans. In particular, new applications for maritime technologies in extreme environments (deep-sea, seabed, Arctic) require new material properties and functions. They need to be reliable, safe, efficient, economically feasible, and environmental friendly over their entire life cycle. The oceanographic community is seeing new and substantial advances in the development of underwater vehicles such as Ocean Glider/AUV/ARGO Floats as shown in figure 1. The potential of multiple, concurrent AUV/UUV/Ocean Glider deployments promises the ocean research community with increased data accuracy, the elimination of spatial and temporal aliasing, and more efficient and cost-effective means of data dissemination and to develop new and more sophisticated sensor systems, to expand our understanding of the ocean's processes. Other newer avenues we need to work on Ocean Energy, Marine Biotechnology, marine microbes, marine spatial planning like land planning, development highly corrosion resistant material which can with stand marine harsh environmental conditions.

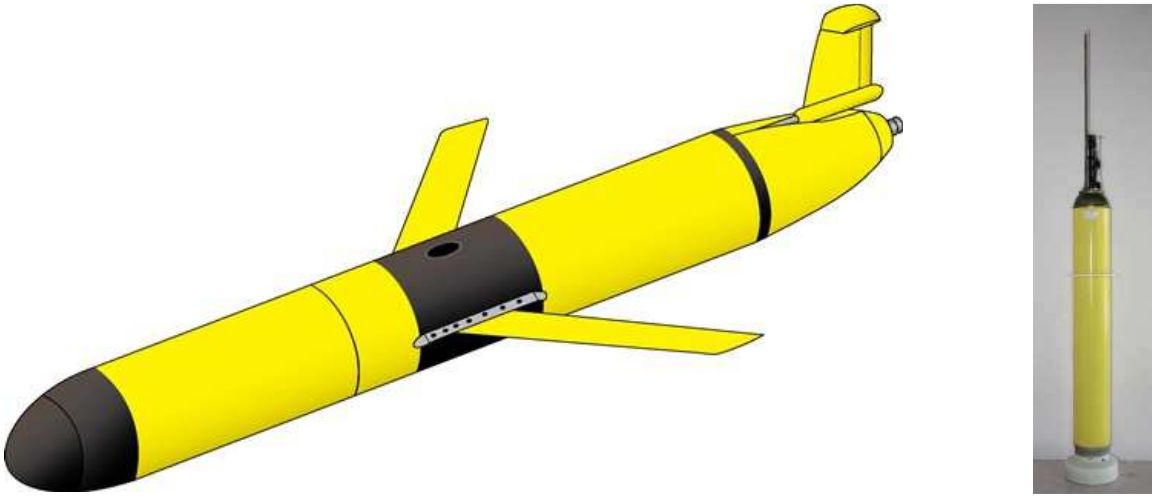

Fig 1 Ocean Glider & ARGO Floats

A case study on how NIOT has introduced best capacity building exercise for students

Student AUV competition

The National Institute of Ocean Technology (NIOT), under the Ministry of Earth Sciences, along with IEEE OES and Marine Technology Society conducts a national level competition for students pursuing engineering degree to visualize and design an autonomous underwater vehicle. The conceptual basis for Student Autonomous underwater Vehicle (SAVe) is a highly mobile autonomous underwater vehicle (AUV) to be built based on engineering principles. This innovative initiative was launched in 2011 and so far, NIOT received 17473 website hits, 257 registrations were made and 127 teams had submitted their Preliminary Design Reports (PDR) and 60 teams made oral presentation of Conceptual Design Reports (CDR) to improve their presentation and handle question and answers skills; 28 teams participated in final competition and demonstrated their working and engineered AUVs at swimming pool. Most of the teams used 4-5 thrusters configurations to have 6 DOF controlled by mostly Inertial Measurement Unit (IMU) interfaced with control unit (CPU) and powered by commercial LiPo battery packs. Till now, 3 teams have participated in International competition held at AUVSI foundation San Diego, USA and totally 8 prototypes of AUVs were developed by engineering students in India since year 2011.The outcome of this competition is to involve young engineering students on the new frontiers of ocean technology and kindle their innovative thinking in this unexplored area of ocean environment and observation.

The most common configuration of the student AUVs is that the linear dimensions of the AUVs were less than 1.5 m in length and weight is less than 35 kg. The AUV design is a modular hydrodynamic hull structure and made up of acrylic material; mounted on Aluminium metallic frames. They use maximum of 4 numbers of thrusters (for 6 degrees of freedom) to optimize the AUVs operation for considerable maneuverability with good energy efficiency and high endurance. Almost all the student AUVs gets power supply from Lithium-Polymer (Li-Po) batteries with either 18.5 V or 11.1 V DC input to provide supply for the 19.1 V DC Thrusters and 12 V Mother Board. One of the most common features of the teams is Arduino microcontroller for controlling the thrusters interfaced with CPU. CPU configurations and capabilities of the teams processor speedvaried from 1.6GHz to 2.1GHz supported by 1GB or 2GB RAM. In fact, almost all the teams have learned to use good quality web cameras for the underwater vision and image processing by placing them in sealed chambers. All

the AUVs used face O-rings for the hulls for good sealing effect as well as for faster assembly and disassembly. Water resistant connectors were used to connect the AUV to supportive systems.

The competition received overwhelming response from different institutions in which IEEE has come forward to extend financial support.

1. AUV

AUV is a self-propelled unmanned submersible vehicle with its own onboard intelligence system to make decisions is dependent on stored energy of the battery to execute its mission. They generally execute their motion by drift, cruise, or glide through the ocean [1]. The history of AUVs research can be dated back to early 1960's where the first successful development could be attributed to Dimitri Rebikoff's SEA SPOOK. Later, Stan Murphy, Bob Francois and later Terry Ewart of the Applied Physics Laboratory of the University of Washington began development of what may have been first "true" AUV in the late 1950's. Their work led to the development and operation of "The Self Propelled Underwater Research Vehicle(s)" (SPURV). They were soon followed by others such as SKAT at the Shirshov Institute of Oceanology (Russia); OSR-V (Japan); EAVE West, RUMIC, UFSS (U.S. Navy); EAVE EAST (University of New Hampshire, U.S.); and EPAULARD (France) [2]. During the 1990s AUVs testbeds turn into operational systems. In Indian scenario, a significant step in developing a prototype small AUV called Maya was achieved at the National Institute of Oceanography, Goa, India in May 2006 [3]. Another AUV named AUV-150 was developed by Central Mechanical Research Institute (CMERI), Durgapur, India and sponsored by Ministry of Earth Sciences was tested for sea trials in 2011 [4] are shown in Fig. 2. Today, hundreds of AUVs have been developed worldwide by many countries to accomplish a set of tasks according to defined goals and user emerged different types of mission tasks. An AUV's endurance depends upon speed, mission requirements, payload, and battery type and is quantified in both time and distance.

AUV MAYA (Courtesy: NIO, Goa)

AUV 150 (Courtesy: CMERI, Durgapur)

Fig 2.AUVs developed in India

As most of the AUVs have propellers, more than half of the battery power is consumed by propellers, as a result, reducing the endurance of operation. Of the surveyed AUVs, 46% operate less than 12 hours, 19% between 12-24 hours, and 17% greater than 24 hours [5].Hence, in order to enhance the range capabilities of an AUV in terms of endurance, powerful and complex systems which are capable of performing underwater (shallow and deep sea) tasks are required to be developed. In this context, The National Institute of Ocean Technology (NIOT), under the Ministry of Earth Sciences, joined with IEEE-Oceanic Engineering Society - India chapter and Ocean Society of India to provide an opportunity for students pursuing engineering degree to visualize and design an autonomous underwater vehicle. The conceptual basis for Student Autonomous underwater Vehicle (SAVe) is to build a highly mobile autonomous underwater vehicle (AUV) based on engineering principles. The aim of this competition is to attract young talented students to work on under water technology and new frontiers of ocean technology and kindle their innovative thinking in the unexplored area of ocean environment and observation. NIOT has been continuing this capacity building exercise in the field of Underwater Technology by giving technical support to the selected student teams for developing their AUVs and is sponsoring the winning team of SAVe to participate in the International ROBOTICS competition organized at San Diego USA.

Main objective for this project is to develop AUVs for specified mission scenarios underwater which can judge the physical aspects of the AUV such as the kinematics, dynamics, physical limitations, and environmental effects. Compared to autonomous aerial or ground vehicle projects, underwater domain imposes the most restriction on sensory devices and its hardware [6].

2. Competition Model

The main focus of this competition is to involve students on the new frontier areas of ocean technology and kindle their innovative thinking in this unexplored area of ocean environment and observation. NIOT will support the winning team with their technical expertise and also sponsor for the International competition being held annually in AUVSI foundation San Diego, USA. The competition is open to all Indian national students. The competition held in three levels viz. Preliminary design review, critical design review and functionality review.

In the preliminary design review, a report comprising of the concept, literature review, design methodology, 3D simulation depicting the concept, brief theoretical substantiation of the design proposed, block diagram of the concept, Project document with methodology of operation, design, 3D model and Video simulation.

In continuation to the PDR, a second level design review to evaluate the detailed description of the concept including detailed specification, circuit level design, detailed mathematical modeling, Commercial Off-The-Shelf equipment required. Expert guidance through state- of- the- art facility and industrial experience to the teams and a Mentor is allocated who shall guide the team in preparing the final prototype.

After completion of the CDR, the developed engineered prototype will be reviewed in the final competition where the students should demonstrate the capabilities of the AUV.

Students have to plan well ahead in the initial stages on the time bound deadlines for ordering the components from both National and International market, build, integrate, and test their vehicles. The major factor to be taken into account in the procurement of underwater products is that availability of off the shelf products which might take months' time to receive and could be the cause for missing deadlines. Apart from these, the students have to concentrate on their curricular activities, which is a very important factor to be dealt with win-win attitude in both studies and competition. Fig. 3 shows the student teams working during the competition at the swimming pool.

Fig 3 Student teams working during the competition at the swimming pool

Motivation to students

To motivate the engineering or technology students in the field of underwater technology often requires a very practical approach far from the classroom. Educational workshops on marine robotics fulfill this requirement considerably, as the operating medium is the water, it would provide a playful environment. Either in a pool or at sea these educational activities provide students with an exciting environment where they can learn the design, integration and operation of robots. The field of robotics needs basic background of physics and other STEM (Science, Technology, Engineering and Mathematics) [7] disciplines and these sorts of competitions provide a framework that encourages innovation against tough but credible targets and respected benchmarks, through friendly rivalry. The challenge to solve complex tasks in realistic situations forces participants to tackle the issues, often huge, of designing robots capable of working robustly in a realistic environment. Furthermore, the competition against other teams encourages young engineers to study innovative approaches to the problems that often perform better than existing solutions. There is no better way to encourage the development of young and talented people than proposing that they solve challenging tasks at sea in efficient and original ways. To achieve success, they must mature their technical skills and use notions learned academically in real physical situations. This organized session will focus both on educational and competition efforts in marine robotics. In particular, we are interested in contributions describing the competition/workshop activity history, the number of participating teams/students, the breakthrough results achieved etc. The NIOT competition is an opportunity for motivated students to work together and face challenges themselves to accomplish a unique and rewarding goal. The rewards announced and providing the lab facility to test their vehicle in underwater shall be one of the motivational factors for the team to work against the odds to accomplish their mission.


Fig 4.Indian students interacting with Mr. Daryl Davidson, Executive Director, AUVSI Foundation, USA at NIOT

Apart from these, success stories of students who later continued their career in an ocean-related industry, research institutions, or other robotics fields are valuable examples of the success of the organized competition/workshop to assess its impact from the educational and economic points of view.

These attempts create a platform to provide students in establishing newer contacts in the underwater Industry. During these events, people across the world with similar motives join together and this helps the students to improve domain knowledge. NIOT succeeded in guiding the most useful sponsorships and encouraging the industry to donate hard-to-find or expensive components. Few sponsors from Industry/component manufacturers agreed to provide students, the components at a discounted price or agreed to give components on loan at free of cost. Furthermore, one of the other motivating factors is mentorship throughout the competition. This model is one of its kinds, where the mentors from NIOT and other national institutes guide the teams to develop problem solving capabilities and get expertise in design and development.

Furthermore, the students develop problem solving capabilities in their respective fields together with managerial skills to establish the team, handle time bound situations and control the stress caused by issues that occur during the competition.

Contribution to Underwater Technology

This entire process proved well and helped in the development of 10 underwater vehicle prototypes in India. Students have come up with brilliant ideas of naming their vehicles for the competition such as Amogh, Sedna, Poseidon, Tiburon, JalNetra, Varun, Samudra, Zyra, Leviathan, Delfino and Hydra. The success of this competition is based, in part, on the fact that India has fourteen AUVs having different configurations. The winning students teams of National AUV competition in the year 2014 and 2015 as shown in fig 4.

Fig. 4 Winning teams of National AUV competition in the year 2014 and 2015

Conclusion

Now it is era new technology miniaturization of electronic appliances, communication technology, marine biotechnology, newer materials, and energy systems. With a growing global population, mounting pressure on the existing resource base and increasing access to coastal and marine environments through technological advances, accelerated development and exploitation of coasts and oceans is a certainty. The initial impetus for this competition has come from the fact that India's quest towards the unexplored areas of underwater technology. This could be possible by the continuous thriving for technological innovations and students are the best possible wealth that any country can have. Thus, today at the helm of rowing needs for energy and resources.

Education and Research in Ocean Science and Technology in India

There are efforts in our country to create well trained, educated and competent human resource to address various issues like ocean and atmospheric modelling, weather prediction, protection of water and air, development of renewable energy, hydrocarbons, disaster prediction and preparedness, watershed and flood management, coastal erosion, environment pollution assessment, resource conservation and recycling, development of clean technologies, climate change prediction and impact on socio-economic well-being, blue economy etc., Ministry of Earth Sciences is supporting such programmes by offering facility and senior scientist as Adjunct Professors for teaching and providing dissertation projects and sponsored projects to faculty to support these initiatives by various educational institutions. The National Institute of Ocean Technology under the Ministry of Earth Sciences through IIT Madras is supporting a Post graduate program in IIT Madras. In addition various colleges/ Institutes/ Universities are supported by extending ocean science and technology related projects by Ministry of Human Resource Development, Naval Research Board, Ministry of Environment Forests and Climate Research, Ministry of shipping and Ministry of Science and Technology etc., the National Institute of Oceanography Goa under council of scientific and industrial research offers Ph D programmes under the AcSIR. In addition Indian maritime University and many deemed Unvisited such as AMET University are established to cater to the need of human capacity requirements in marine sector Besides Indian Space Research Organisation ISRO, Marine and Atmospheric Sciences Department (MASD), formerly known as Coastal Processes and Marine Resources Division and Marine Sciences Division, offers training & education courses and provides R&D opportunities and user services

There are courses offered both undergraduate and post graduate level degree programmes besides doctoral research avenues. It is briefly highlighted here on opportunities for Engineering graduates do exist to pursue their interest and skills in ocean science and technology. Graduate engineers can also opt for ocean or atmospheric science modelling and research in Indian Institute of Science Bangalore, IIT Bombay IIT Kharagpur and other institutions. It will be surprised to note few world renowned successful oceanographers has graduate degree in civil or mechanical engineering

Students from various graduate engineering disciplines are admitted through regular processes such as GATE or respective entrance examination to admit for Post graduate courses in IITs in Chennai, Bhubaneshwar, Kharagpur, Mumbai etc.,

Also to pursue as part time or distance education there are specific courses available The Tamilnadu Dr.Ambedkar Law University offers one year distance education course on PG Diploma in Maritime Law. While discussing about Law It is be noted here aaout only one of its kind course offered in IITs LLB Rajiv Gandhi School of Intellectual Property Law (RGSOIPL) is the first of its kind law school to impart legal education with IP specialization within the IIT System bringing synergy among science, technology, management and law. The School offers a Six-Semester, Three-Year Full-Time residential programme leading to the Degree of Bachelor of Laws (Hons) in Intellectual Property Law approved by the Bar Council of India. Programme Curriculum of the Programme has been prepared based on the requirements of the Bar Council of India. In addition, several specialised courses in law and Intellectual Property Rights are offered. The eligibility for Admission to LL.B. (Hons) Degree in Intellectual Property Rights, First Class Bachelors Degree in Engineering / Technology / Medicine or equivalent. etc.,

There are also few newer Institutions in the process of starting courses or have started courses in earth sciences by the Indian Institute of Science Education and Research IISER adn National Institute of Science Education and Research NISER under DAE Government of India

I have listed few institution who are working on research and academic in the field ocean and earth science and technology are Centre of Advanced Study in Marine Biology & Oceanography (CASMB), Annamalai University, Tamil Nadu, Centre for Atmospheric Sciences (CAS), Indian Institute of Technology Delhi, Centre for Oceans, Rivers, Atmosphere and Land Sciences (CORAL), Indian Institute of Technology Kharagpur, Centre for Atmospheric and Oceanic Sciences (CAOS), Indian Institute of Science (IISc), Center for Earth and Space Sciences -UCESS-University of Hyderabad, Hyderabad, Centre for Ocean and Coastal Studies, University of Madras, Centre for Atmospheric and Ocean Studies, University of Allahabad, Centre for Marine Living Resources and Ecology, Ministry of Earth Sciences, Kochi, Kerala, Centre for Marine Science and Technology, Manonmaniam Sundaranar University, Rajakkamangalam, Kanyakumari Dist, TN, Central Marine Fisheries Research Institute, Kochi, Kerala, Central Institute of Fisheries Technology, Kochi, Kerala, Department of Meteorology and Oceanography, Andhra UniversityDepartment of Marine Sciences, Goa University, Goa Department of Post Graduate Studies in Marine Biology, Karnatak University Dharwad,Department of Marine Sciences, Berhampur University, Odisha Department of Marine Science, University of Calcutta, Faculty of Marine Sciences, Annamalai University, Tamil Nadu , Indian National Center for Ocean Information Services (INCOIS), Hyderabad, India. Integrated Coastal and Marine area Management Project Directorate (ICMAM PD), Pallikaranai, Chennai, Institute of Ocean Management (IOM), Anna University, Chennai, Kerala University of Fisheries and Ocean Studies (KUFOS), Marine Planktonology and Aquaculture Division, Department of Marine Science, Bharathidasan University, Tiruchirappalli, National Institute of Oceanography, Goa, National Atmospheric Research Laboratory, National Centre for Antarctic and Ocean research (NCAOR), Goa, National Centre for Sustainable Coastal Management (NCSCM), Chennai, National

Institute of Oceanography, Goa (HQ), RC's at Kochi, Mumbai and Vishagapatnam, National Institute of Ocean Technology (NIOT), Chennai, Nansen Environmental Research Centre (India), Kerala, School of Energy Environment & Natural Resources, Madurai Kamaraj University, Tamil Nadu School of Marine Sciences, Cochin university of science and technology (CUSAT), Kerala, School of Earth, Ocean and Climate Sciences, Indian Institute of Technology Bhubaneswar, School of Oceanographic Studies, Jadavpur University, Centre for Coastal Harzards and Disaster Mitigation in AMET University, Marine Biotechnology and Drugs from Sea Research Program Sathyabama University Chennai

There are 20 Institutions in India offering courses or undertaking research in the interdisciplinary areas of ocean, atmospheric and earth sciences. Courses in oceanography is given in this link http://www.nio.org/index.php?option=com_category&task=show&title=Courses%20in%20oceanography&tid=3&sid=94

From my association with these institutions, students who have interests and competency are continuing in this discipline successfully within India and abroad

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Mom gets ₹34k bill as child accidentally places Amazon order: A five-year-old girl in England accidentally placed an Amazon order for a £107 (₹9,200) diamond necklace and 12 Disney toys worth £287 (₹24,600) through voice recognition technology without her parents' knowledge. The matter came to light when the necklace was delivered, and her mother checked her order history. She contacted Amazon, following which the orders were cancelled and money refunded.

'Twisted' light proposed for wireless data transmission: Physicists based in the UK, Germany, New Zealand, and Canada have said that 'twisted' light can be used for wireless data transmission. Photons can be 'twisted' by passing them through a type of hologram giving them a twist known as optical angular momentum. Researchers claimed that the number of intertwined twists in the photons allows them to carry additional data.

AI system claims to detect bowel cancer in under a second: Japan-based scientists have developed an artificial intelligence (AI) system which they claim can detect colorectal cancer in less than a second. The diagnostic uses a 500-fold magnified view to detect abnormal tissue growth in the area. Trained using over 30,000 images, the AI assessed 306 cases in real-time, providing a 94% sensitivity, 79% specificity, and 86% accuracy, said researchers.

WhatsApp allows deleting sent messages from receivers' phones: WhatsApp has globally launched a feature that allows deleting sent messages from other chat members' phones on both Android and iOS platforms. Called 'Delete for Everyone', the feature allows users to revoke the messages within 7 minutes of sending them. Once the user deletes a message, its receivers will see the phrase 'This message was deleted' instead of the message.