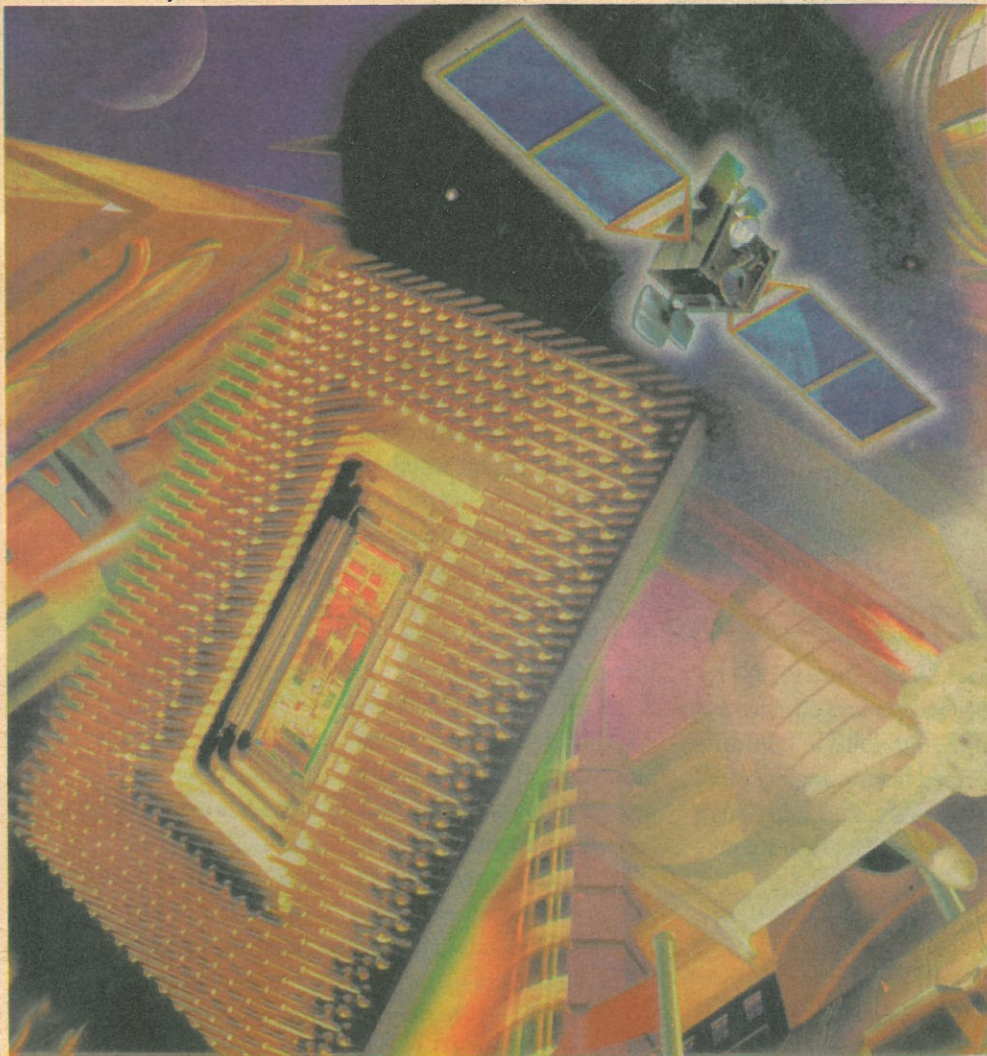


Engineer's dream

Though Nobel Prize is the highest award given to the outstanding achievement in science, it doesn't include engineering and technology in its purview. Charles Stark Draper Prize is the first international award which recognises the contribution of engineers to the welfare and freedom of humanity.

■ G.P. Vinayababu



Professor Subramanyan Chandrashekhhar in 1984 got the Nobel Prize in Physics 'for his Theoretical studies of the physical processes of importance to the structure and evolution of stars'. His research in this field of Physics was hailed as path breaking, which it was, with far reaching implications by the scientific community.

In 1989, Jack S. Kilby and Robert N. Noyce received the first 'Charles Stark Draper Prize' for their independent co-invention of the monolithic (formed from a single crystal) integrated circuit, better known as semiconductor microchip. A quick look back at the evolution of the computer technology reveals how important this development has been for

the mankind.

Of the above two cases, the first one is an outstanding contribution to the field of theoretical Physics. It undoubtedly has far reaching implications on the human understanding of his surroundings. But it takes long many years for the scientists continuing research in this field to provide a quantifiable benefit to the society, based on this.

Whereas the development in the second case for which Robert Noyce and Jack Kilby received the Draper's Prize, had immediate utility value for the entire mankind at that instance and advances in the field of IC chips continues to be relevant even today and promises to be so in future too.

The question here is not one of which contribution of the two is greater. Both are great contributions in their own way. While the first one can only be comprehended, appreciated and utilised by the scientific community, the second is of relevance today even to a common man. Identifying and encouraging such individuals who have bestowed the greatest benefit on humankind through engineering and technology is what Charles Stark

From IC to Platforming

The Charles Stark Draper Prize instituted in the year 1989 has been given away to award winners in the past. Jack S. Kilby and Robert N. Noyce received the first Charles



outstanding technologists and engineers every alternate year since then. So far eight engineers have received the award on 5 occasions till 1997. The following have been the Stark Draper Prize in 1989 for their independent co-invention of the monolithic (meaning formed from a single crystal) integrated circuit. They were also honored for their separate

work in bringing the integrated circuit into successful commercial production and application in commercial products.

Thirty years after the integrated circuit was developed by Kilby and Noyce, it is an essential component in terms ranging from consumer goods to manufacturing equipment to medical imaging devices (such as the CAT scan) to automated bank tellers. Their revolutionary engineering achievement has given birth to an entire industry and made possible a multitude of everyday products, including handheld calculators, digital watches, automatic cameras, videocassette recorders, compact discs, and facsimile machines.

John Backus was awarded the 1993 Charles Stark Draper Prize, for his development of FORTRAN - FORMula TRANslation - the first general purpose, high-level computer programming language. Such languages have made possible today's astounding computer applications -

such as animating the dinosaurs in Jurassic Park, running telephone networks, processing medical data, and training pilots on advanced flight simulators.

Today, air traffic control system, satellite, video games, and thousands of business

applications are fully integrated with computer technology. These diverse applications would not have been possible if not for the development of high-level computer languages, which made computer technology universally available.

Backus developed FORTRAN in the early 1950s to take advantage of the lightning speed of computers. A computer's "brain" is fast, but not smart. It can think only in numbers, and even then only in the 1s and 0s of binary "machine language". Before FORTRAN, telling a computer what to do involved talking to it in its own language by breaking problems down into seemingly endless strings of digits. Depending on the type of problem, it could take longer to program the computer than to do the problem manually.

High-level languages, paradoxically, are actually easier and more user-friendly than their name implies. High-level meaning a step away from, or above, the machine's binary language. They use a combination of words and math symbols for commands, rather than obscure binary code. This makes FORTRAN easy to learn and use. Each step of the computer program can be described in readable syntax rather than in specialized mathematical notation. FORTRAN also allows the same program to run on various machines, in effect fusing the

Draper Award recipients

Year	Recipients	Contribution
1989	Jack Kilby and Robert Noyce	for monolithic integrated circuit
1991	Sir Frank Whittle and Haus J.P. Vonohain	for the Jet Engine
1993	John Backus	for the invention of Fortran Computer Language.
1995	John Pierce and Honold Rosen	for the invention of communication satellites.
1997	Vladimir Haensel	for the invention of 'Platforming'.

individual computer dialects into one understandable and universal language.

Vladimir Haensel, inventor of "Platforming" - a revolutionary chemical engineering process essential in producing clean fuel for transportation and in supplying materials for the modern plastic industry was awarded the Charles Stark Draper Prize for the year 1997.

Haensel was selected as the 1997 Draper Prize laureate for developing Platforming - short

for Platinum Reforming - which use a platinum based catalyst to efficiently convert petroleum into high-performance fuels. The trademarked process also generates large quantities of "aromatic hydrocarbons", which are the raw materials used in the manufacturing of plastics.

Because of Platforming, today's fuel for cars, trucks, and practically all other forms of ground transportation is vastly more efficient, environmentally

friendly and easier and cheaper to produce than anyone thought.

In the basic Platforming patents, Haensel proposed using platinum as a catalyst for the refining process, an idea that experts thought unrealistic for technical reasons, and because platinum was an continues to be expensive and can be obtained in significant quantities only in Russia and South Africa. Many thought the expense and difficulty in obtaining platinum would make

it unprofitable for the refining process.

Platforming produces fewer emission in the refining process, and because it generates significant amounts of hydrogen, it removes much of the sulphur and other contaminants from home heating oil, diesel fuel, and industrial fuel oil.

The process also produces vast amounts of aromatic hydrocarbons, the raw materials used in the manufacturing of plastics. □

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Draper Prize is all about.

For long, it was felt that there needs to be an award which recognises the outstanding contribution of achievers in technology and engineering. Ultimately, engineers and technologists are the ones who put the theoretical principles put forth by scientists into practical use. But the Nobel Prize, which is one of the best known awards given to the achievement in experimental science, doesn't recognise the role of technology in making the fruits of science reach out to people.

This gap was bridged up by the institution of Charles Stark Draper Prize by the National Academy of Engineering in the US in 1989. The prize was established by NAE at the request of Charles Stark Laboratory Inc. to honour the memory of Charles Stark Draper and to increase the public understanding of engineering and technology to the welfare and freedom of humanity.

This prize, awarded to the greatest achievers in the development of new technologies, has been named quite appropriately after Charles Stark Draper, the father of inertial navigation.

Draper evolved the theory, invented and developed the technology and led the effort that brought 'inertial navigation' to operational usage in aircraft, space vehicles and submarines. His technology has been used in efforts like Apollo moon landing, guidance systems for strategic missiles and

modern aircraft guidance systems. There could not have been a better person than this great engineer to commemorate the award.

Dr. Draper was a master of gyroscope which he used extensively in developing gunsights during the World War II. He earned the title 'Mr. Gyro' because of the precision and effectiveness with which he used gyroscope to control and guide gun, bomb and rocket systems. His later research resulted in the development of inertial navigation systems for the manned and unmanned vehicles, which perform successfully in unfavorable weather and does not rely on information from external sources.

Technological Achievements

The technological achievements which have been identified for Draper Prize are all truly revolutionary. They have transformed the way we live forever. Take for example the invention of integrated circuits.

It is undoubtedly the single greatest development of the century that has ushered in an era of high performance computing. And, probably, it is impossible to imagine today's world without jet engines. Jet engines gave a new definition to transportation and made world a smaller place to live in. One step ahead, John Pierce and Honold Roseris developed communication satellites. These satellites have provided celestial assistance to the well

Other awards from NAE

* The Founders Award was established in 1965 by the Academy to honor outstanding contributions by an engineer both to his profession and to society. The gold medal is imprinted with a replica of the NAE seal, a stylized Roman aqueduct representing the bridge between science and society.

* The Arthur M. Bueche Award Arthur M. Bueche Award was an innovator in applying research results to the needs of the society. After his death in 1981, General Electric Company, in which he was serving as a senior vice president for corporate technology till then established a special fund to support the award in his name in 1982. Many of his colleagues also augmented the award. The Arthur M. Bueche award is being given every year since then to scientists and technologists for the fulfillment of the following principal criteria.

- Demonstrates statesmanship in the field of technology;
- Active engagement in the determination of science and technology public policy;
- Active participation on behalf of technology; and;
- Active contributions to industry-government-university relationships.

History of the Prize

The "father of inertial navigation," Charles Stark Draper evolved the theory, invented and developed the technology, and led the effort that brought inertial navigation to operational usage in aircraft, space vehicles, and submarines. Founder of Draper Laboratory in Cambridge, Massachusetts, and Institute Professor at the Massachusetts Institute of Technology (MIT), he stands as a pioneer among aircraft engineers. Such monumental efforts as the Apollo moon landing and the guidance systems for strategic missiles bear the stamp of his genius. Modern aircraft the world over travel global air routes with pinpoint accuracy using inertial guidance systems derived from his original inventions.

As a member of the MIT faculty and head of the Department of Aeronautics and Astronautics, Draper developed an extensive program in instrumentation and control. His team of students and technicians at MIT expanded to become the MIT Instrumentation Laboratory, and in 1973 that lab became a separate, nonprofit research and development laboratory The Charles Stark Draper Laboratory, Inc.

The Charles Stark Draper Prize was established by the National Academy of Engineering at the request of the Charles Stark Draper Laboratory, Inc. to honour the memory of Charles Stark Draper and to increase public understanding of the contributions of engineering and technology to the welfare and freedom of humanity. Endowment for the Draper Prize is provided by the Charles Stark Draper Laboratory, Inc. □

being of the earthlings. How can these achievements be ignored? NAE's objective of serving the betterment of life on earth through engineering ensured that these achievements aren't ignored.

NAE's goal being to honour those who have contributed to the advancement of engineering and to improve public understanding of engineering and

Dr. Charles Stark Draper

Dr. Charles Stark Draper was born in Windsor, Mo., US on Oct. 2, 1901. Dr. Draper began his college work in arts and sciences at the University of Missouri in 1917. In 1919, he entered Stanford University, Calif., and graduated in 1922 with a B.A. in Psychology. He entered MIT the same



year, earning an (S.B.) Bachelor of Science in Electrochemical Engineering in 1926 and an (S.M.) Master of Science in 1928 and an

(Sc.D.) Doctor of Science in Physics in 1938.

Founder of Draper Laboratory in Cambridge, Mass. And Institute Professor Emeritus at the Massachusetts Institute of Technology, "Doc" Draper advanced from the position of Assistant Professor in the Department of Aeronautics and Astronautics at MIT in 1935 to the post of Institute Professor in 1966. He served as Consulting Engineer to many aeronautical companies and instrument manufacturers. He held a number of patents for measuring and control equipment.

Dr. Draper stood among the pioneer members of the first group of aircraft engineers. Such monumental efforts as the Apollo landing on the moon and development of the guidance systems for all strategic missiles in the U.S. inventory, both land - and sea - based, bear the stamp of his genius. In the US Dr. Draper's work has created a multibillion-dollar industry.

First sponsored by the Sperry

Gyroscope Co., Dr. Draper's engineering work led to the development of the Mark 14 gunsight during World War II. He continued work with gun pointing and firing control developments until the late 1950s, which earned him the title "Mr. Gyro" because of the persistence and effectiveness with which he applied the gyroscope to guidance and control instruments and to gun, bomb, and rocket pointing and firing control instruments and systems.

His later research resulted in the development of a complete inertial navigation system for manned and unmanned vehicles, which performs successfully in unfavourable weather and does not rely on information from external sources.

Inertial guidance systems use gyroscopes (rotating devices that react to changes in direction) and accelerometers (instruments that detect changes in velocity over time) to keep a steady course. The information obtained from the gyroscopes and the accelerometers is fed into a computer, which calculates the degree of drift from the intended course and recommends appropriate corrections. Completely automatic inertial navigational system can sense tiny deviations from the intended course and quickly correct them, resulting in very precise navigation anywhere in the world. Before Draper developed his inertial guidance systems, navigators depended on more laborious methods, such as celestial navigation and radio navigation.

Dr. Draper died in July 1987. In tribute and in his memory, Draper Laboratory endowed the Charles Stark Draper Prize, an international engineering award administered by the National Academy of Engineering. □

technology, it administered the \$ 450,000 Charles Stark Draper Prize to increase public understanding of the contributions of engineers and how technology contributes to the welfare and freedom of humanity. Apart from the Charles Stark Draper Prize, NAE also awards the NAE founders award to honour outstanding contribution by an engineer both to his profession and to the society. Another award, the Arthur Bueche Award, honours the technologists who demonstrate statesmanship in the field of technology and contributes to industry - university relationships.

The Draper Prize is a proper step in recognising the importance of the engineering and technology. But Nobel Prize still finds the top slot in majority of the people's minds. Prof. Narasimha, Director of NIAS's views are relevant here.

"I think Nobel Prize has distorted our perception of the contributions made to the society. Engineering & Technology have suffered in particular due to this. Some of the technological developments which have transformed the way we live have been ignored by the Nobel foundation".

The Charles Stark Draper Prize may not be any where near the popularity or the prize money of Nobel Prize. But it is an important step in recognising the role of engineers and technologists in the betterment of humanity. □

Nominations

The National Academy of Engineering Calls for nominations for the prestigious Charles Stark Draper Prize at the end of the calendar year previous to the prize awarding year ie. nominations are called in November 1998 for the award in 1999. The prize, awarded for a specific achievement or for a work extending over a period of years, may be bestowed to one person or to a group of individuals who contribute to the same achievement. The work must demonstrate 'reduction to practice' - a proven innovation that contributes to human welfare and freedom. Individuals from all nations are eligible for the prize. Nomination forms can be obtained from the NAE office and should be postmarked by the February 21st of the awarding year. The award recipient(s) will be selected by a committee appointed by NAE and chaired by one of the leading professors from universities in the United States. The committee which selects the recipients comprises of senior professors from the US academia. □

Third world bias

Be it in the recognition of scientific research or awarding the Nobel Prize, third world countries have always suffered.

Third world countries account for less than 2 percent of scientific research in the world. This might sound bit like an understatement. But as a matter of fact it is true. Not that the research efforts put in by third world scientists is only 2% of the entire research done in the world. But that which comes into public scrutiny is only that. What does that mean?

It means that the research findings of third world scientists which find place in the so called international journals is abysmally low. There seems to be a clear favouritism towards English speaking western nations, as brought forth in the recently held meeting in Prague of hundreds of editors of medical journals around the world.

A 20-year old review of papers published in four major American research journals shows that the research from the US has the best chance of being published in these journals. Next preference is given to other English speaking countries. While the research from non-speaking western

countries is given the third preference, and that from third world countries is least represented.

Alun Anderson, editor of New Scientist agrees there is a prejudice. "overly enthusiastic reviews are given to work from friends, friends of friends and people whose work is already familiar from conferences. More negative reviews go to researchers with unfamiliar names from far off lands". Concealing identity of the authors of the research papers hasn't yielded better reviews either, as the familiarity of the subject is what counts ultimately. Says Anderson "Once the exceptionally good papers have been accepted and the exceptionally bad rejected, then a great mess in the middle is left. It is at this stage that a paper from Harvard can seem a sounder bet to a harassed editor than one from Hyderabad".

Third world countries have their own scientific journals in which the scientists publish their research findings. But the best known databases, that are referred to by students for further research, such as Medicine and Science Citation Index, list articles from around 3000 journals and

only 2% of these are from the developing world.

A 20-year review of paper published in the four major American medical research journals - The New England journal of Medicine, the Journal of the American Medical Association, the Archives of Internal Medicine and the Animals of Internal Medicine - shows that research from the US has the best chance of being published in those journals. Next comes work from other English-speaking countries. Non-English developed countries are poorly represented, and research from the Third World barely gets a glance.

Many scientists are now planning for a world journal that is truly international. Such a publication would highlight important research about TB or malaria which would be of relevance to not only doctors in Indonesia but New York as well. Another important development which scientists believe would reduce the gap between the western and eastern world is Internet. The sooner the western world realises the importance of research in third world countries the better it is for the humanity. □