An invitation to our readership!

You are invited to express your views not only on matters published in this medium but also on your independent thoughts in other science-related topics. Do not allow your ideas to die out. What appears to be naive or bizarre to you may ignite others' thought process and become useful.

From
Jyoti Prakash Chaudhuri

Electrifying Story of Electricity

ELECTRICITY is one of the most fascinating achievements of human civilisation. For this kind of secondary energy the sun will soon be the primary source. The Sun Temples of ancient Egypt, Persia and India may now be updated. Our *yantra* (device) will be the solar power stations. Our *mantra* (hymn) will the vedic words *Oum jabakusumo sankasong kashyapeyam mahadyutim ..... pranatosmi divakaram* (O' the rising Sun, crimson red like a hibiscus, the son of Kashyap, powerfully radiating the light, the maker of day and night, I salute thee). The origin and development of this clean and comfortable energy is indeed electrifying — partly shocking and partly astonishing.

What benefit mankind may derive if the frog's leg twitches?

1787 AD. Luigi Galvani (1737–98), an Italian physician and Alessandro Volta (1694–1778), an Italian Physicist, could develop a chemical means to produce some impulse which induces frog's legs to react. Whenever one of the

electrodes were immersed into the electrolyte, an impulse reached the nerve fibre connected to the electrode causing a twitch of the frog leg. Volta held it for a physical action. It was perhaps the first biophysical experiment. Anyway, it caused great sensation in Europe. But newspapers from Paris and London commented : *what benefit mankind may derive if frog's legs twitch.* But this discovery of fundamental science could sustain only because of its spin-off through "galvanising", giving inferior metals the lustre and look of gold, silver or chromium.

In fact, it was the birth of electricity. Specifically, the "cell" created by Galvani and Volta, with two electrodes in an electrolytic fluid is the so called Galvanic Element, also known as primary cell. These elements are very widely used even today in the form of dry cells powering the torches we carry in our pockets, the watches at our wrists, *walkman* pouring music into our ears or mobile telephones for uninterrupted contacts. Secondary cells or accumulators (the usual car batteries) are the further developments derived from the primary cells.

Werner von Siemens and the Wonderlamp

Hundred years later. 1867. In Berlin, Werner Siemens (1816-92) improved the dynamo machine so that electric lamps (Goebel's *Gluehbirne* : carbon fibres within a glass bulb protected from air or oxygen) could be lighted. But their production cost was very high and performance very low, so that for each lamp one dynamo or at least an additional transformer was necessary. Frantically looking for a sponsor, he came to the court of King Ludwig II of Bavaria in Munich, who was madly spending for his fairy tale-like palaces and castles. Siemens could sell his technique to him. In this way Schloss Linderhof in the Bavarian Alps was electrified and electric dynamos could survive. A Venus Grotto was designed to demonstrate water pump, light effects and various other applications of electricity. Castle Linderhof became famous as *Technikschloss.* Werner Siemens was raised to nobility and became Warner von Siemens.

Peaceful use of atomic energy and not to speak of the bombs

Another 100 years. 1967. Hunger for energy, especially for electricity, was great all over the world. Germany and India were almost completing electrification of their railway nets. Prices of oil and coal were soaring high. Alternative sources for energy were necessary. Adventures in the space pioneered by the Russians and accelerated by the US national efforts developed new techniques from old discoveries : *solar energy* (Photovoltaic), *wind mill generators, fuel cells*, etc, each with great promise, each delivering clean electric current without burning any primary source of energy like oil, gas or coal. Photovoltaic Modules and fuel cells are furthermore attractive, because they produce electricity without any movement or dynamics. That means they do not have any parts suffering wear and tear, and they run

without vibration or noise. Vehicles for the Apollo Missions, Mir, Skylab and the Space Shuttles were supported by such silent servants like fuel cells supplying clean energy and clear drinking water.

William Robert Grove (1811–96), a British lawyer, invented the fuel cell in 1838, which is essentially a galvanic element with platinum electrodes between hydrogen and oxygen or air, producing electricity and water. During the energy crisis in the late 60s, we read in chemical and technical lexicons that the fuel cells may be run competitively with any of the existing technologies of generating electricity. Yet most of the countries opted for atomic energy. Everywhere politicians proclaimed *peaceful uses of atoms* — for healing, diagnosing, radioactive detections and energy production from such a small amount of uranium, whereby every country in east or west wanted to have a sure, cheap and constant source to harvest plutonium for the atom bomb. Therefore, fuel cells and photovoltaics were severely neglected.

Alternative energy is costly!

Even today, the major argument against photovoltaics and fuel cells is the cost. What is the cost of management of radioactive waste of the atomic power plants? Who will pay to clean the radioactively contaminated areas? Every other power plant — based on oil, gas, coal, or even hydroelectric — have to be insured against risk they may harbour. Even every car owner or driver is required to insure themselves against the damages that a vehicle may cause. But the risk of an atomic power plant is hitherto formidable, so that none of the insurance companies are ready to cover them.

The critics sing in chore — photovoltaics and fuel cells are costly. We read in the school lexicons published in 1959–60 : The electrification of railway tracks may bring manifold improvements like speed, safety, etc, but it is very costly, work-intensive, and difficult to implement. Yet within ten years, both India and Germany have almost completed the electrification of railway tracks. Large-scale production and accompanying work in research and development will make the new sources of electric energy like photovoltaics and fuel cells affordable very soon.

Space flight and photovoltaics

Ludwig Bölkow (1912–), a celebrated engineer and the father of German aviation and space flight, maintains that the utilisation of sun ray is the only form of power production with real future. In a country like Germany, the solar modules on the roofs and facades of the houses and buildings may provide up to 30% of the energy, while in the solar belt many countries may get superfluous energy by harnessing the sun[1], which may be exported via high volt cables or in a otherwise conserved form, eg, like liquid hydrogen obtained through electrolysis of water. India is exceptionally blessed in this regard, because when in winter months room heating and hot water are high in demand, there is almost a full guarantee for sunshine, while in the summer months when ventilators and airconditioners run nonstop at top gear, again there is guaranteed sunshine for a longer period

of the day. So we may electrify every village without pollution, noise and vibration. If our hunger for energy is satisfied by tapping the sun and supplemented with different kinds of fuel cells, we may save woods and trees making our planet all the more greener and we may save ourselves from climatic catastrophes.

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[1]An area of 640, 000 sq. km of photovoltaic modules in Sahara can cover the global need of electricity. For example, the total area of Afghanistan is 652000 sq km.

From
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Impact of Impact Factors and Citation Index Analysis in Research

Recent articles[1-2] in Current Science reveal **some interesting features** of impact factors (IF) for **assessment of quality** research publications and **mapping of research** in India. It is well **established**[3] **that during** the last decade Indian science **journals are losing** ground in the Science Citation **Index (SCI)**, prepared by the Institute of Scientific Information, Pennsylvania (USA).

Only *Current Science* has improved its IF over the years.

Vohra *et al*[1], have determined that IF may be inversely proportional to the degree of specialisation in areas of cognitive function and epilepsy research. It is also surprising that review journals carry highest IF, the reason being publication of choicest articles contributed by established groups/experts in the field.

Indian Science Academies and some recruitment agencies ask candidates to supply the citation index analysis of their research publications. Obviously, those who publish in Indian journals are rated inferior to those who publish in high IF journals abroad. The quality of research can not be judged by IF criteria alone. The need of the hour is to improve the quality and IF of Indian journals by inviting review articles form Indian and foreign scientists.

Arunachalam and Umarani's article[2] reveals that our agricultural scientists publish 77.4% papers in non-SCI journals of zero IF. It does not mean that their researches are of poor quality. But, on the other hand, it proves that IF criteria for judging the quality of research is ridiculous. Indian researchers in agriculture publish their papers mostly in non-SCI journals . Research publications of local interest, applied nature and pertaining to specific problems of Indian origin will always be rated lower in citation index