

SPEECH DELIVERED AT THE SURABHI NAG RESEARCH AWARD FUNCTION

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Trustees of Surabhi Nag Foundation, Dr Shona Nag, Shri Milon Nag, invited guests, ladies and gentleman,

I am delighted to be here amongst all of you today to celebrate the award being presented to Dr Sanjoy Chatterjee for his research proposal in the area of head and neck cancer, a disease which I understand, afflicts a very large population in India. My congratulations to the awardee; and my compliments to the Nag Foundation on this most laudable initiative to support scientific research in medical sciences. I strongly believe that science must receive support from people who recognize that science can deliver solutions to some of the most intractable problems facing humanity and that consumers of research should be willing to pay for research. In many parts of the world, philanthropic funding is driving the future agenda of science. In my opinion this augurs well for the future of science. In fact, in the US philanthropic funding of biomedical sciences exceeded that of the National Institutes of Health (NIH) funding for the first time in 2015-16. For better or worse, practice of science in this century is shaped more by individuals, foundations and not for profit organizations, who wish share a part of their wealth to support science for the good of the mankind. Chances are that the most effective vaccine against Malaria will not come from any major pharmaceutical company, but through research supported by Bill and Melinda Gates Foundation! Several new institutions have been created through private foundation and philanthropy in recent years. Example, Janelia Farms by Hughes Medical Foundation, Allen Institute of medical Sciences, founded by Paul Allen, one of the founders of Microsoft. Broad Institute at MIT, Wellcome Trust, Schmidt Ocean Institute, Ellison Medical Foundation and the like.

The support of research through philanthropy is really not a new idea. Much of 18th and 19th century science was funded by philanthropy. It was only in the post war period that Governments stepped in as major funders of research. However, in the past two decades philanthropy is emerging again as a major funder for long-term basic scientific research as most Governments are progressively reducing their support to science because of competing demands on state finances for diverse end segments of the economy. Today cutting edge science is performed in small entrepreneurial driven start up companies, university research supported by philanthropy and not for profit foundations, research funded by crowd sourcing of resources and by grand challenge awards and prizes. The scientific landscape is being increasingly democratized by what I call “distributed science”.

Let me conclude by one telling example of this phenomenon. Just four years ago a revolutionary discovery emerged from three groups, one at MIT, one at Max Planck Institute at Berlin and the third from the University of California at Berkeley. This is called **Clustered Regularly Interspaced Palindromic Repeats**, in short, CRISPR technology. Interestingly two of the three discoverers of this technology are women

scientists! All the three persons are in line for the most coveted award, namely, the Nobel Prize in the next few years. CRISPR is an easy and inexpensive way to find and alter virtually any piece of DNA in any species - a technique that is now popularly called Gene Editing. Gene Editing is considered as the most revolutionary discovery in biology since the discovery of Genetic Engineering in the early eighties. Genetics has undergone a revolutionary change since the discovery of CRISPR. Now scientists have an easy tool to wield unprecedented control, allowing them to delete bits of DNA, add snippets of genetic code and insert entirely new pieces of code. The first Gene Edited and FDA approved mushrooms that will not brown and potatoes that will not generate acrylamide, a carcinogen, when fried will hit the markets in 2017.

As we speak today, there is a research group at the University of Pennsylvania led by Professor Carl June which is beginning a trial of eighteen people who suffer from stubborn cancers in an exercise claimed to be the most extensive manipulation of human genome ever attempted. Carl June's wife died of Ovarian Cancer in 2001, that led him to rethink a fundamental question that has plagued human biology, why the human immune system, designed to fight disease, is so inefficient in fighting cancer? Professor June will, extract the T cells from these trial patients, modify three genes in those cells using CRISPR, and insert them back into the patients to enable their own immune system to fight the cancer. This is the first attempt to prove CRISPR's therapeutic potential. The risk of failure is high, but a success can be revolutionary, a discovery that can change the course of medical science.

The interesting aspect of this activity is who is funding this research? Using CRISPR In humans is currently mired in controversy and has raised many ethical concerns. As of now most countries will not allow use of CRISPR on human embryos and there are stiff procedures for getting approvals for any new way of altering genes in human cells. Many public funding agencies are grappling with the questions on how far they should go in supporting such research. Professor June's research has received support from an individual, Sean Parker, a former Facebook executive and a Silicon Valley entrepreneur. Mr Parker recently established the Parker Institute for Cancer Immunotherapy, a consortium of six major cancer research centres, of which June's group is one. Mr Parker feels that such revolutionary ideas is unlikely to get funding from public bodies and, thus, finds for him a unique role.

Ladies and gentleman, it is this spirit of giving that we salute today. India has a rich tradition of giving, but not many have ventured to support scientific research. We thank the Nag Foundation for this generosity. I only pray that their tribe may grow, so that that wealth generated by this generation may help reduce the miseries of generations yet unborn through pursuit of science

Thank you so much