

SCIENTIFIC THOUGHTS OF DR. A.P.J. ABDUL KALAM AND ITS RELEVANCE IN 21ST CENTURY: AN EXPLORATORY STUDY

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Abstract: This paper has tried to explore the scientific thoughts of Dr. APJ Abdul Kalam for 21st century. The findings of the study are: Kalam's scientific thoughts have great relevance for 21st century. Dr. A.P.J. Abdul Kalam's belief in the power of technology to resolve society's problems and his views of these problems as a result of inefficient distribution of resources is modernistic. He also sees science and technology as ideology free areas and emphasizes the cultivation of scientific temper and entrepreneurial drive in students. Dr. A.P.J. Abdul Kalam insists that if we aspire to achieve great things in life, we need Scientific Magnanimity to focus the young achievers. Great mind and great heart go together. Science is a Lifetime mission and is Borderless. Science is about converting challenges into opportunities and Scientific Magnanimity. This Scientific Magnanimity will motivate the scientific community and nurture team spirit among all scientists. He further adds that science and technology and its convergence should lead to the development of the nation with equitable and inclusive growth resulting happy, prosperous and peaceful society with the citizens adopting the civilization heritage and value systems in their actions thus create enlightened citizens. Thus, it is evident that Kalam's scientific thoughts have great relevance for 21st century in India and abroad.

IndexTerms: Concept of Science, Paradigm for Science, Intelligent Bioscience, Creative Scientific Leaders, Scientific Magnanimity, Unification of Science and Spirituality, Creation of Science Cadre

I. INTRODUCTION

Many personalities took birth in our mother land of India and motivate our youths and children. Dr. APJ Abdul Kalam is one of them. He played many roles from seven decades as a scientist, as a President, as an author and as a teacher. In honor of the scientist and former president, the southeast Indian state government of Tamil Nadu created a "Dr. A.P.J. Abdul Kalam Award," which recognizes exceptional individuals who promote the sciences, students and humanities. The government has also established Kalam's birthday (October 15) as "Youth Renaissance Day." Kalam liked to meet students and shared his experiences and motivated them to become something for nation. He is one of the great personalities who dominated the last moment of his life to students and youths (Trivedi, 2017 & Dash, 2018). Kalam was a great scientist of the World. He invented many things which gave glory to India. He wanted to arise a love in children for science. Because he believed that nation could develop through science and technology (Trivedi, 2017 & Dash, 2018). The extraordinary charismatic personality of Dr. Kalam has sensitized every individual in our nation. His reach to the people was beyond the bar of caste, color and creed. An ordinary man, who came from a humble family of Rameswaram, Tamil Nadu, India, reached to the highest national rank by being the 11th President in Indian Republic. He has been a very sincere worker of his field and was a continuous source of inspiration for all generation of people. Among the awards which he deservedly earned in his lifetime, few of them include Padambhushan (1981), Padma Vibushan (1990), Bharat Ratna (1997) King Charles Medal-II (2007) and many more. However, the greatest award was the respect he commanded among common man and specially youth for whom he is an unyielding source of inspiration. His speeches and his perspective towards "Science and its Utilization for People" are a worth beyond words (Tanwar & Kumar, 2015). Thus, it is essential to study the scientific thoughts of Dr. A.P.J. Abdul Kalam for the present 21st century.

II. SIGNIFICANCE OF THE STUDY

1. It might help in understanding the concept of science for 21st century.
2. It might help in exploring the basic features of science for 21st century.
3. It might help in understanding the pre-independence phase of Indian science and technology.
4. It might help in understanding the post-independence phase of Indian science and technology.
5. It might help in exploring the new paradigm for science and the challenges for the scientific community.
6. It might help in understanding Kalam's ideas about Nano- technology and concept of intelligent bioscience.
7. It might help in exploring the role of creative scientific leaders for 21st century.
8. It might help in understanding the scientific magnanimity for 21st century.
9. It might help in understanding the unification of science and spirituality for 21st century.
10. It might help in understanding the importance of creation of science cadre and the strategies for development of

scientific interest in youth for 21st century.

11. It might help in understanding the societal transformation through science and technology for 21st century.

III. OBJECTIVES OF THE STUDY

1. To study the concept of science for 21st century.
2. To explore the basic features of science for 21st century.
3. To study the pre-independence phase of Indian science and technology.
4. To study the post-independence phase of Indian science and technology.
5. To study the new paradigm for science and the challenges for the scientific community.
6. To study Kalam's ideas about Nano- technology and concept of intelligent bioscience.
7. To study the role of creative scientific leaders for 21st century.
8. To study the scientific magnanimity for 21st century.
9. To study the unification of science and spirituality for 21st century.
10. To study the importance of creation of science cadre and the strategies for development of scientific interest in youth for 21st century.
11. To study societal transformation through science and technology for 21st century.

IV. RESEARCH QUESTIONS

1. What is the concept of science for 21st century?
2. What are the basic features of science for 21st century?
3. What is the pre-independence phase of Indian science and technology?
4. What is the post-independence phase of Indian science and technology?
5. What is the new paradigm for science and the challenges for the scientific community?
6. What are Kalam's ideas about Nano- technology and concept of intelligent bioscience?
7. What are the roles of creative scientific leaders for 21st century?
8. What is the concept of scientific magnanimity for 21st century?
9. What is the unification of science and spirituality for 21st century?
10. Why is it important to create science cadre and what are the strategies for development of scientific interest in youth for 21st century?
11. What is societal transformation through science and technology for 21st century?

V. RESEARCH METHODOLOGY

In view of the nature of the study, exploratory method was used in order to accomplish the present research work. The nature of the present study is qualitative as it studies the scientific thoughts of Dr. A.P.J. Abdul Kalam for 21st century.

5.1 Sources of Data

The present study is based on the scientific thoughts of Dr. A.P.J. Abdul Kalam for 21st century. So, it is decided to collect the information from different sources. The researchers made extensive use of relevant literature to get the required information. Both primary and secondary sources of data were used. Data were collected from journals, magazines, newspapers, books, online portals, newspaper articles (reporting events), photographs, autobiographies, personal narratives, manuscripts and other sources of data.

5.2 Tools and Techniques Used for Collection of Data

As the present study was based on the scientific thoughts of Dr. A.P.J. Abdul Kalam for 21st century, thus content analysis was used as a technique to analyze his educational philosophy and its relevance to the 21st century. According to the content analysis method, the researchers utilized the following steps in the analysis of the data. a) Thought Analysis: The researchers read all the materials and recorded the scientific thoughts of Dr. A.P.J. Abdul Kalam for 21st century in the form of idea units. b) Concept Analysis: After categorizing the idea units into idea groups, the researchers tried to analyze the scientific thoughts of Dr.

A.P.J. Abdul Kalam for 21st century. c) Linguistic Analysis: While analyzing the thoughts and concepts, the research also analyzed the words and language used by A.P.J. Abdul Kalam because each person expresses the thoughts and concepts through words (Chauhan, 2017).

5.3 Delimitations of the Study

5.3.1. The study has been delimited to the scientific thoughts of Dr. A.P.J. Abdul Kalam.

5.3.2. The study has been delimited to analyze the relevance of scientific thoughts of Dr. A.P.J. Abdul Kalam for 21st century.

5.4 Variables of the Study

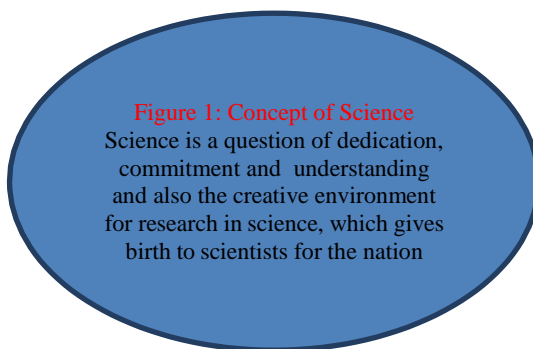
The study sought mainly to study the scientific thoughts of Dr. A.P.J. Abdul Kalam for 21st century.

VI. RESULTS AND DISCUSSION

Scientific Thoughts of Dr. A.P.J. Abdul Kalam: Dr. A.P.J. Abdul Kalam is a famous scientist and is well known as the father of indigenous missile program. His scientific thoughts are very important and inspiring. He has given a new definition to science. He is a dedicated scientist and it was the result of his dedication and strong will that by the 90s Dr. A.P.J. Abdul Kalam emerged as a czar of Indian science and technology and was awarded the BHARAT RATNA. Dr. A.P.J. Abdul Kalam dreams of making India a technological superpower and he is still capable of acting on it. Scientific thoughts of Dr. A.P.J. Abdul Kalam is of great relevance in the 21st century. The results of the present study have been presented as follows:

6.1 Concept of Science

About science, Dr. A.P.J. Abdul Kalam says that science is a lifetime mission. Advances in science and technology improve people's living conditions and help us understand the world around us. Science is inherently open-ended and exploratory. Science is a passion, a never-ending voyage in promises and possibilities.



6.2 Basic Features of Science

According to Dr. A.P.J. Abdul Kalam, following are the basic features of science.

Figure 2: Basic Features of Science	
✚	Science gives the human beings better eyes because science can remove the mental blinkers.
✚	Science seeks truth that enriches human life.
✚	It gives our brain a challenge to solve many scientific problems that are yet to be solved.
✚	Science always gives lifetime missions to the scientists, and then only success comes.
✚	Science is the major link for human being to understand one self, the environment, the planet earth, atmosphere, oceans and outer space.
✚	Science has enabled understanding of many mysteries that could have remained unknown otherwise.
✚	Science always provides challenging problems.
✚	All the astronomical discoveries have come out of science.
✚	About human body, science has revealed that the human body is made up of millions and millions of atoms. Science has revealed that the difference between one human being and another as determined by the sequencing of the atoms.

Dr. A.P.J. Abdul Kalam's belief in the power of technology to resolve society's problems and his views of these problems as a result of inefficient distribution of resources is modernistic. He also sees science and technology as ideology free areas and emphasizes the cultivation of scientific temper and entrepreneurial drive.

6.3 The Pre-Independence Phase of Indian Science and Technology

Dr. A.P.J. Abdul Kalam believes that any country revolves itself initially around a few earnest knowledge giants and in India, science and technology took a two-phase progress with high scientific momentum created in 1930s, by the great scientists of international repute. They gave the country the confidence. Among these are Srinivasa Ramanujan, Sir CV Raman, JC Bose, SN Bose, MeghnadSaha and Chandrasekhar Subramaniam who are remembered and respected for their pioneer works.



The scientific foundation laid by these scientists triggered the later generations and inspired many later generation scientists. Dr. A.P.J. Abdul Kalam considers this phase as the glorious phase of Indian science. He observes that the unique similarity among all these scientists was that they had dedicated their entire life for the cause of scientific research and the spirit of inquiry for the fields that they had chosen amidst all the hurdles and problems in their life.

6.4 The Post-Independence Phase of Indian Science and Technology

Dr. A.P.J. Abdul Kalam observes that in the post independent era, India drew the road map leading to national development using science and technology particularly in the field of defence, space and atomic energy. In the history of independent India, there may be many, but he is very close to three great Indian personalities who are founders of three great institutions.

Figure 4: Great Scientists of Post-Independence Phase	
Great Scientists of Post-Independence Phase	DS Kothari Homi Jehangir Bhabha Prof. Vikram Sarabhai

He has worked in two of the institutions directly and one in partnership. They are : DS Kothari who was an outstanding Physicist and an Astrophysicist and is considered as the architect of defence science in India, Homi Jehangir Bhabha who started

Tata Institute of Fundamental Research and contributed much in the area of nuclear science and technology and Prof. Vikram Sarabhai who unfurled the space mission for India in 1970 that we should build Satellite Launch Vehicle capability, to put our

communication satellites in the geo-synchronous orbit and remote sensing satellites in the polar orbit. He also envisaged that launch vehicles built in India should be launched from Indian soil. This one visionary thought led to intensive research and development in multiple fields of science and space technology. Dr. A.P.J. Abdul Kalam was a part of Prof. Vikram Sarabhai's vision. Along with his team, he participated in India's first satellite launch vehicle programme to put the satellite in the orbit. Today, India with her 20,000 scientific, technological and support staff in multiple space research centres, supported by about 300 industries and academic institutions, has the capability to build any type of satellite launch vehicle to place remote sensing, communication and meteorology satellites in different orbits and space application has become part of our daily life. Dr. A.P. J. Abdul Kalam stresses that the work of our ancient scholars and scientists should be thoroughly examined and where possible integrated with modern science as they provide the basis to modern science.

6.5 New Paradigm for Science

Dr. A.P.J. Abdul Kalam hopes that in the coming years, we will not only discover the space, we will have an industrial complex on the moon and new material from under sea world. Many challenges are going to be thrown on the sea, under the sea and above the sea. Dr. A.P.J. Abdul Kalam has identified following great challenges for the scientific community of today:

Figure 5: Challenges for the Scientific Community

- Evolution of clean atmosphere replacing the fossil fuel by the cost effective renewable energy system.
- Life science scientists will have great challenge of exploring human body, particularly gene characterization through the proteomics project for developing gene-based drugs
- There will be a big challenge for the agricultural scientists to double the food production and through science and technological discovery.
- In the area of communication, a big revolution is setting in high-bandwidth mobile wireless is in the offing. This will result in the mobile phone becoming a convergent system for the multi-media applications for meeting the needs of communication in the office, home and on the move. This will demand many technological innovations for our scientific community.
- Rural Development through PURA (Science and Technology as the Focus).
- Evolution of unified field theory, which may be the ultimate of physics revealing how the universe is born and how we are born.
- The scientific community of today and tomorrow has to evolve an alternate habitat for the mankind.
- Evolution of earth, moon, mars complex to bring back to the earth new material is needed and the solar power and particularly energy material like helium-3 is needed.

6.6 Dr. A.P.J. Abdul Kalam's Ideas about Nano- Technology

Dr. A.P.J. Abdul Kalam says that a nation that is alert should be sensitive to the changes that take place to the technological fabric of the world and prepare itself for the arrival of newer changes in the horizon. As India has acquired the technologies of steel, agriculture, space, missiles and IT, we have a place between third to fifth nations in figure of merit. In information technology we have a possibility of becoming the third knowledge power. He believes that nanotechnology would give an opportunity to India to become one of the important technological nations in the world. Nanotechnology is the field of the future that will replace microelectronics and many fields with tremendous application potential in the areas of medicine, electronics and material science.

Figure 6: Intelligent Bioscience

When Nano technology and ICT meet, integrated silicon electronics, photonics are born and it can be said that material convergence will happen. With material convergence and biotechnology linked, a new science called Intelligent Bioscience will be born which would lead to a disease free, happy and more intelligent human habitat with longevity and high human capabilities and nanotechnology will take a center place in the convergence of technologies.

Dr. A.P.J. Abdul Kalam advises that industrial groups should work on commercialization of Nano-science and Nanotechnology-based products along with basic research in the university environment. The main focus should be speedy commercialization to fit into the global market. Nanotechnology has wider applications in structure, electronics, and healthcare and space systems. Potential applications are virtually endless. Progress in nanotechnology is spurred by collaboration among researchers in material science, mechanical engineering, computer science, molecular biology, physics, electrical engineering, chemistry, medicine and aerospace engineering. This is one of the important emerging areas, which brings synergy in research and development by combining the strengths of the multiple domain knowledge leading to the creation of knowledge society. Our educational institutions and universities should have a special purpose missions based on their core competence. Dr. A.P.J. Abdul Kalam suggests that our research focus in the Nano-material should be towards cheaper rural housing, surfaces, coatings, use of concrete with heat and light exclusion. The areas where Nano technology can contribute are Energy Independence, Safe Drinking Water, Healthcare, Aero Space, and ICT development. Dr. A.P.J. Abdul Kalam believes that Nano science and technology is must for fast national development. He says that Nano science is the greatest building block for healthcare, structural material, in electronics, automation etc. and will become the platform for new cutting-edge technologies to grow for better living of the mankind. Certainly, the convergence of technologies will provide us tremendous opportunity for contributing towards national development. Dr. A.P.J. Abdul Kalam hopes that Nano-technology initiatives in India will mature into marketable products for worldwide applications as many Industries are keen to take the technologies from academic institutions and commercialize. He says that industries should take the lead and become a partner in the Nano science and technology ventures to capture the

international market. Dr. A.P.J. Abdul Kalam is sure that the next ten years will see Nano technology playing the most dominant role in the global business environment. And It is true. He says that it is essential to have a focused mission in partnership with international industry and academia for faster design, development and production of products for world market. Dr. A.P.J. Abdul Kalam has observed that In India, modest beginnings have been made. But only a few institutions are contributing towards this

pioneering research. A lot more needs to be done and we have to formulate an action plan by pooling all the available national resources. He says that we should enhance our capabilities, identifying the gaps and steps required to make India a significant player in Nanoscience and Nanotechnology. He suggests that both Government and Private sectors should join hands and form a „Nano-Tech Enterprise“. Dr. A.P.J. Abdul Kalam says that India needs to tackle the issues of science and technology, product development and societal aspects in an integrated way to succeed in manufacturing of Nano products and their deployment. Judging the past experience of the country in driving technology missions like in Aerospace, Agri-culture, Atomic energy and IT, he is confident that, if the mission is started with a clear-cut vision, the country will reap the benefits of Nanoscience and technology.

6.7 Creative Scientific Leaders

Dr. A.P.J. Abdul Kalam believes that one of the very important ingredients for success of the vision of transforming India into a developed nation by 2020 is the evolution of creative leaders in every sphere of life including the scientific establishments.

Figure 7: Creative Scientific Leaders

There is a big connection between developed India, economic prosperity, competitiveness, science, technology, innovation, production, all of which are linked to the creative leaders. The higher the proportion of creative leaders in a nation, the higher the potential of success of visions like developed India.

These creative leaders will emerge for eliminating poverty and diseases and establish a peaceful nation and thereby the world through vast application of science and technology. Dr. A.P.J. Abdul Kalam says that inventions and discoveries always emanate from creative minds that have been constantly working and imaging the outcome in the mind. With imaging and constant effort, all the forces of the universe work for that inspired mind, thereby leading to inventions or discoveries. Higher the number of creative minds in an organization, the best results of innovation in space science and technology will emerge.

6.8 Scientific Magnanimity

Dr. A.P.J. Abdul Kalam insists that if we aspire to achieve great things in life, we need Scientific Magnanimity to focus the young achievers. Great mind and great heart go together. Science is a Lifetime mission and is Borderless. Science is about converting challenges into opportunities and Scientific Magnanimity. This Scientific Magnanimity will motivate the scientific community and nurture team spirit among all scientists.

6.9 Unification of Science and Spirituality

Dr. A.P.J. Abdul Kalam is fully aware that for the benefit of science and technology to mankind, the unification of science and spirituality is essential as both science and spirituality seek the Almighty's blessings for human prosperity in mind and body.

6.10 Creation of Science Cadre

Dr. A.P.J. Abdul Kalam says that Science is a lifetime mission. This feature of science makes youth to become passionate towards it. He says that it is essential to attract the best young minds towards science, scientific missions and scientific career. For this purpose creation of a science cadre is must. Dr. A.P.J. Abdul Kalam recalls that during his interaction with the students of biotechnology from the University of Calcutta a student asked him the following question: A majority of the bright students at the high school level aspire to become a doctor, engineer or a manager. How can these rich minds be motivated towards taking up research as a first-grade career option?

Dr. A.P.J. Abdul Kalam says that after listening to the question he felt the need to do something that could help in attracting the youth towards science. He had many discussions with the students and the parents also. After the discussions he found that the parents spend almost all their earnings in order to educate their children, since they see education as the best way of promising an assured career. They even go to the extent of sacrificing their personal luxuries and get loans to educate the children. The only mission they have in their eyes is to see well-settled sons and daughters with guaranteed profession. They are confident that this will happen if their children pursue a degree in engineering, management, medicine or civil services. They do not see the pursuit of pure sciences and research guaranteeing this. Dr. A.P.J. Abdul Kalam considers this way of thinking as an important area of concern attention of the scientific community as a whole. In his view, it is essential for the nation to assure a career for those who wish to pursue science as a mission. This will attract many students with the full support of the parents. He suggests that we should work for the creation of a science cadre, with clear mission goals, well-defined growth path and attractive salaries. Starting a number of Indian Institutes of Science Education and Research is definitely a good effort towards attracting youth towards science as a career. Scientific cadre can also be considered along with this. Dr. A.P.J. Abdul Kalam suggests that for attracting the best talent in research, innovation and teaching, the scientific institutions should come up with the new scheme of selecting about 100 researchers from various parts of the country who could be nurtured for 2 to 3 years, under the guidance of world renowned scientist from India and abroad. Research problems may be oriented to the current and future needs of our national development. Dr. A.P.J. Abdul Kalam that we need to give value to science to build scientific cadre. This environment is very important for nurturing science and research. For the development of scientific interest in youth he suggests the following ways:

Figure 7: Strategies for Development of Scientific Interest in Youth

- It is essential to identify few brilliant minds in the institutions and provide them with the right type of scientific environment to pursue fundamental research of their choice.
- A large number of innovative researchers should be facilitated to carry out "Directed Research", particularly towards alleviation of human suffering and promoting robust health.
- Technological institutions should nurture small startup companies with novel ideas to create global giants leading to the internationally competitive innovative industry in India.
- Technological institutions should create a flexible cross-disciplinary structure in the campus, breaking down the Berlin walls that traditionally exist between different departments.
- The faculty members of the technological institutions should be encouraged to start collaborative research with world top engineering institutions.

6.11 Societal Transformation through Science and Technology

Dr. A.P.J. Abdul Kalam says that technology is the non-linear tool available to humanity, which can affect fundamental changes in the ground rules of economic competitiveness. Science is linked to technology through applications. Technology is linked to economy and environment through manufacture. Economy and environment are linked to technology and it promotes prosperity to the society. Dr. A.P.J. Abdul Kalam says that scientific and technological advancements have contributed much in societal developments.

Figure 8: Societal Transformation through Science and Technology

He says that such development of technologies and their convergence with science have significant influence on the society in terms of knowledge, health care, governance and economic development. To maximize the synergy between the various components of education, healthcare, e-governance, rural development, we need to establish connectivity among them. This connectivity will certainly bring seamless access and information flow among the various domains leading to maximization of GDP and productivity.

Dr. A.P.J. Abdul Kalam wants that science and technology and its convergence should lead to the development of the nation with equitable and inclusive growth resulting happy, prosperous and peaceful society with the citizens adopting the civilization heritage and value systems in their actions thus create enlightened citizens.

VII. MAIN FINDINGS

7.1 Concept of Science

Science is a question of dedication, commitment and understanding and also the creative environment for research in science, which gives birth to scientists for the nation.

7.2 Basic Features of Science

- ✚ Science gives the human beings better eyes because science can remove the mental blinkers.
- ✚ Science seeks truth that enriches human life.
- ✚ It gives our brain a challenge to solve many scientific problems that are yet to be solved.
- ✚ Science always gives lifetime missions to the scientists, and then only success comes.
- ✚ Science is the major link for human being to understand one self, the environment, the planet earth, atmosphere, oceans and outer space.
- ✚ Science has enabled understanding of many mysteries that could have remained unknown otherwise.
- ✚ Science always provides challenging problems.
- ✚ All the astronomical discoveries have come out of science.
- ✚ About human body, science has revealed that the human body is made up of millions and millions of atoms. Science has revealed that the difference between one human being and another as determined by the sequencing of the atoms.

7.3 The Pre-Independence Phase of Indian Science and Technology

Great scientists of pre-independence phase are: SrinivasaRamanujan, CVRaman, JC Bose, SN Bose, Meghnad Saha and Chandrasekhar Subramaniam.

7.4 The Post-Independence Phase of Indian Science and Technology

Great scientists of post-independence phase are: DS Kothari, Homi Jehangir Bhabha and Prof. Vikram Sarabhai.

7.5 New Paradigm for Science

The challenges for the scientific community of today are:

- ✚ Evolution of clean atmosphere replacing the fossil fuel by the cost effective renewable energy system.
- ✚ Life science scientists will have great challenge of exploring human body, particularly gene characterization through the proteomics project for developing gene-based drugs
- ✚ There will be a big challenge for the agricultural scientists to double the food production and through science and technological discovery.
- ✚ In the area of communication, a big revolution is setting in high-bandwidth mobile wireless is in the offing. This will result in the mobile phone becoming a convergent system for the multi-media applications for meeting the needs of communication in the office, home and on the move. This will demand many technological innovations for our scientific community.
- ✚ Rural Development through PURA (Science and Technology as the Focus).
- ✚ Evolution of unified field theory, which may be the ultimate of physics revealing how the universe is born and how we are born.
- ✚ The scientific community of today and tomorrow has to evolve an alternate habitat for the mankind.
- ✚ Evolution of earth, moon, mars complex to bring back to the earth new material is needed and the solar power and particularly energy material like helium-3 is needed.

7.6 Dr. A.P.J. Abdul Kalam's Ideas about Nano- Technology

Nanotechnology would give an opportunity to India to become one of the important technological nations in the world. Nanotechnology is the field of the future that will replace microelectronics and many fields with tremendous application potential

in the areas of medicine, electronics and material science. When Nano technology and ICT meet, integrated silicon electronics, photonics are born and it can be said that material convergence will happen. With material convergence and biotechnology linked, a new science called Intelligent Bioscience will be born which would lead to a disease free, happy and more intelligent human habitat with longevity and high human capabilities and nanotechnology will take a center place in the convergence of technologies.

7.7 Creative Scientific Leaders

There is a big connection between developed India, economic prosperity, competitiveness, science, technology, innovation, production, all of which are linked to the creative leaders. The higher the proportion of creative leaders in a nation, the higher the potential of success of visions like developed India.

7.8 Scientific Magnanimity

Dr. A.P.J. Abdul Kalam insists that if we aspire to achieve great things in life, we need Scientific Magnanimity to focus the young achievers. Great mind and great heart go together. Science is a Lifetime mission and is Borderless. Science is about converting challenges into opportunities and Scientific Magnanimity. This Scientific Magnanimity will motivate the scientific community and nurture team spirit among all scientists.

7.9 Unification of Science and Spirituality

Dr. A.P.J. Abdul Kalam is fully aware that for the benefit of science and technology to mankind, the unification of science and spirituality is essential as both science and spirituality seek the Almighty's blessings for human prosperity in mind and body.

7.10 Creation of Science Cadre

Dr. A.P.J. Abdul Kalam suggests that for attracting the best talent in research, innovation and teaching, the scientific institutions should come up with the new scheme of selecting about 100 researchers from various parts of the country who could be nurtured for 2 to 3 years, under the guidance of world renowned scientist from India and abroad. Research problems may be oriented to the current and future needs of our national development. Dr. A.P.J. Abdul Kalam that we need to give value to science to build scientific cadre. This environment is very important for nurturing science and research. The strategies for development of scientific interest in youth are:

- ✚ It is essential to identify few brilliant minds in the institutions and provide them with the right type of scientific environment to pursue fundamental research of their choice.
- ✚ A large number of innovative researchers should be facilitated to carry out "Directed Research", particularly towards alleviation of human suffering and promoting robust health.
- ✚ Technological institutions should nurture small startup companies with novel ideas to create global giants leading to the internationally competitive innovative industry in India.
- ✚ Technological institutions should create a flexible cross-disciplinary structure in the campus, breaking down the Berlin walls that traditionally exist between different departments.
- ✚ The faculty members of the technological institutions should be encouraged to start collaborative research with world top engineering institutions.

7.11 Societal Transformation through Science and Technology

Dr. Kalam says that such development of technologies and their convergence with science have significant influence on the society in terms of knowledge, health care, governance and economic development. To maximize the synergy between the various components of education, healthcare, e-governance, rural development, we need to establish connectivity among them. This connectivity will certainly bring seamless access and information flow among the various domains leading to maximization of GDP and productivity.

VIII. CONCLUSION

Young children have the intellectual capacity to learn science. Our social and technological context is constantly evolving. The primary purpose of 21st century is to investigate the impact of scientific advances on society (past and present), and the limitations placed by society on the work of scientists (Phillipson, 2018). Therefore Kalam's scientific thoughts have great relevance for 21st century. Dr. A.P.J. Abdul Kalam's belief in the power of technology to resolve society's problems and his views of these problems as a result of inefficient distribution of resources is modernistic. He also sees science and technology as ideology free areas and emphasizes the cultivation of scientific temper and entrepreneurial drive in students. Dr. A.P.J. Abdul Kalam insists that if we aspire to achieve great things in life, we need Scientific Magnanimity to focus the young achievers. Great mind and great heart go together. Science is a Lifetime mission and is Borderless. Science is about converting challenges into opportunities and Scientific Magnanimity. This Scientific Magnanimity will motivate the scientific community and nurture team spirit among all scientists. He further adds that science and technology and its convergence should lead to the development of the nation with equitable and inclusive growth resulting happy, prosperous and peaceful society with the citizens adopting the civilization heritage and value systems in their actions thus create enlightened citizens. From the ideas presented above, it is evident that Kalam's scientific thoughts have great relevance for 21st century in India and abroad.

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