Nanotechnology, A Paradigm Shift Towards Scientific Revolution, Law and Regulations: An Overview

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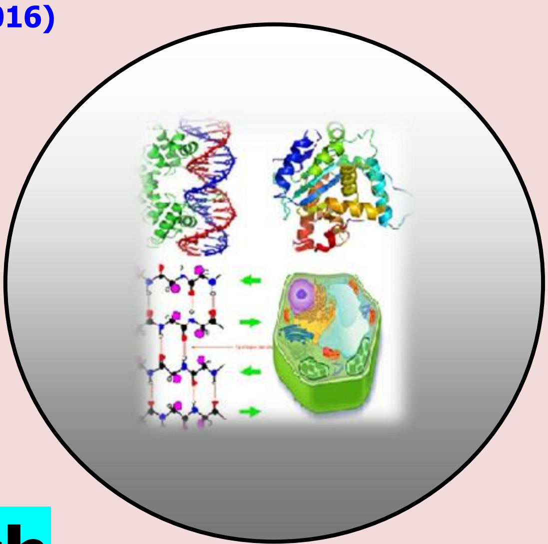

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RESEARCH PAPER

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Nanotechnology, A Paradigm Shift Towards Scientific Revolution, Law and Regulations: An Overview

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ABSTRACT

In the last few years, the term Nanotechnology has become fashionable and the subject of passionate debate as to how the subject should be handled through law and regulation. Nanotechnology is an entirely new development with the potential to bring valuable new benefits on one hand and may also engender unknown and potential very serious new hazards on the other, both for human health and for environment. Lately, Nanotechnology has been largely confined to the laboratory with both its potential benefits and its potential risks still substantially speculative rather than actual. But this is about to change, the results of the last decade or so of research are now reaching commercial and industrial level (Lorna Brazell 2012) which highlights the main issue of this article that whether India needs a law to regulate Nanotechnology because the recent results address an urgent need of some legal and regulatory provisions for the products emerging through Nanotechnology.

Regulatory instruments addressing Nanotechnology in industrial sectors from chemical to food and waste are now being adopted at an increasingly rapid rate, regulators in all of the industrialized countries are grappling with the question of how best to minimize any exposure to risks that are barely identified, and at the same time minimize any unnecessary burden on researchers and industry from divergent regulatory approaches around the globe.

Accordingly, this article sets out what is the need for separate Nanotechnological Law in India considering the legal and sociological issues that can be caused if it is left unregulated.

Keywords: Nanotechnology, Environment, Industry, Law, Commercialization, Engineering, Ipr, Privacy, Regulations and Ethics.

INTRODUCTION

Nanotechnology is the next marvel after the internet and is also referred to as the third industrial revolution. The word 'Nano' derives from Greek word 'Nanos', meaning 'dwarf'', very small man'. This word is used in a relative form to mean a scale of measurement. Because of multiple reasons, it has turned to be the wave of the future and everyone is in a race to lead in this area. The regulatory regime on Nanotechnology mostly rotates around the study of chemical legislation and safety, etc.

Nanotechnology ("Nanotech") is manipulation of matter on an atomic, molecular, and supra-molecular scale. The earliest, widespread description of Nanotechnology (Drexler, 1986, Drexler, 1992) referred to the particular technological goal of manipulating atoms and molecules for fabrication of macro-scale products bearing enhanced utility, also now referred to as molecular Nanotechnology. A wider description of Nanotechnology was formulated by the National Nanotechnology Initiative that defines Nanotechnology as the manipulation of matter with at least one dimension sized from 1 to 100 Nanometers. This definition highlights the fact that quantum mechanical effects are important at this quantum-realm scale, and so the definition shifted from a particular technological goal to a research category inclusive of all types of research and technologies that deal with the distinctive properties of matter which occur below the given size threshold. Hence it is common to see the plural form "Nanotechnologies" as well as "Nanoscale technologies" to refer to the diversity in research and applications whose common trait is size. Because of the variety of potential use (including industrial and military), governments have invested in research. Until 2012, through its National Nanotechnology Initiative, the USA has invested $3.7 billion, the European Union has invested $1.2 billion and Japan has $750 million (The Daily Star (Bangladesh, 2012).

DEFINITION

Nanotechnology as defined by size of science as surface science, organic chemistry, molecular biology, semiconductor physics, energy storage (Hubler, A. 2010) micro-fabrication, (Lyon et al., 2013) molecular engineering, etc. (Saini et al., 2010). The research and usage ranges from extensions of conventional device physics to completely new approaches based upon molecular self-assembly, (Belkin, 2015) from developing new materials with dimensions on the Nano scale to direct control of matter on the atomic scale.

Scientists debate the implications of Nanotechnology. Nanotechnology may result in many new materials and devices with a range of applications, such as in Nano medicine, Nano electronics, biomaterials energy production, and consumer products. Nanotechnology raises same issues as any new technology, including concerns about the toxicity and environmental impact of Nanomaterial, (Buzea et al., 2007) and their potential impact on global economics, speculations of doomsday. These concerns have ignited debates among advocacy groups and governments on whether special regulation of Nanotechnology is warranted.

The value of debate on Nanotechnology is undermined by a lack of consensus as to exactly what is being talked about when the term is used. The term “Nano” is a measurement of size. A Nanometer (nm) is a millionth of a millimeter — far too small to be perceived by the eye, and little larger than the individual atoms and molecules which make up all the matter. A Nanometer is normally illustrated as being about 1/150000th the width of a human hair, or 1/100,000th the thickness of a sheet of office paper. (Lorna Brazell, 2012).

‘Technology’ means the applied arts: not pure scientific theories, but the practical applications that they can be put. It means techniques and devices which have been developed over the centuries in order to manipulate the world. Therefore “Nanotechnology” is a set of techniques manipulating the matter on the Nano scale. Nanotechnology can be applied to every field of science. It is a system of knowledge which because of its size is different, technology at such a smaller level is what makes it novel. At sizes of .1-100 nm the physical, chemical and biological properties of material can differ in fundamental and often valuable ways from the properties of individual atoms and molecules or bulk matter. However, it is not the case with all Nano scale materials. Some do not change in their properties from their bulk form.

ORIGIN

Nanotechnology was first discussed in 1959 by renowned physicist Richard Feynman in his talk *There's Plenty of Room at the Bottom*. He described the possibility of synthesis via direct manipulation of atoms. The term "Nano-technology" was also used by Norio Taniguchi in 1974, though it was not widely known. Inspired by Feynman's concepts, K. Eric Drexler used the term "Nanotechnology" in his 1986 book *Engines of Creation: The Coming Era of Nanotechnology*, which proposed the idea of a Nano scale "assembler" which would be able to build a copy of itself and of other items of arbitrary complexity with atomic control. Also in 1986, Drexler co-founded The Foresight Institute (with which he is no longer affiliated) to help increase public awareness and understanding of Nanotechnology concepts and implications.

In the 1980s, two major breakthroughs sparked the growth of Nanotechnology in modern era. It was through convergence of Drexler's theoretical and public work, which developed and popularized a conceptual framework for Nanotechnology, and high-visibility experimental advances that drew additional wide-scale attention to the prospects of atomic control of matter.

First, the invention of the scanning tunneling microscope in 1981 which provided unprecedented visualization of individual atoms and bonds, and was successfully used to manipulate individual atoms in 1989. The microscope's developers Gerd Binnig and Heinrich Rohrer at IBM Zurich Research Laboratory received a Nobel Prize in Physics in 1986. (Binnig, G. and Rohrer, 1986) Binnig, Quate and Gerber also invented the analogous atomic force microscope that year.

Second, Fullerenes were discovered in 1985 by Harry Kroto, Richard Smalley, and Robert Curl, who together won the 1996 Nobel Prize in Chemistry. (Kroto et al., 1985, Adams and Baughman, 2005) C_{60} was not initially described as Nanotechnology; the term was used regarding subsequent work with related graphene tubes (called carbon Nanotubes and sometimes called Bucky tubes) which suggested potential applications for Nano scale electronics and devices.

In the early 2000s, the field garnered increased scientific, political, and commercial attention leading to controversy and progress. Controversies emerged regarding the definitions and potential implications of Nanotechnologies, exemplified by the Royal Society's report on Nanotechnology. (Nanoscience and Nanotechnologies: opportunities and uncertainties, 2011) Challenges were raised regarding the feasibility of applications envisioned by advocates of molecular Nanotechnology, which culminated in a public debate between Drexler and Smalley in 2001 and 2003. (Chemical & Engineering News, 2003)

Meanwhile, commercialization of products based on advancements in Nano-scale technologies began emerging. These products are limited to bulk applications of Nano-materials and do not involve atomic control of matter. Some examples include the Silver Nano platform for using silver Nanoparticles as an antibacterial agent, Nanoparticle-based transparent sunscreens, carbon fiber strengthening using silica Nanoparticles, and carbon Nanotubes for stain-resistant textiles. (American Elements, 2014)

Nanotechnology is expected to be one of the next drivers of innovation based business and economic development, and underlined the requirement for product based research from lab to end clients. Moreover the advent of Nanotechnology is surely bringing in clean environment.

Governments moved to promote and fund research into Nanotechnology. U.S. with the National Nanotechnology Initiative formalized a size-based definition of Nanotechnology and funded research on the Nano scale and in Europe via the European Framework Programs for Research and Technological Development.

By mid-2000s new and serious scientific attention began to flourish. Projects emerged to produce Nanotechnology roadmaps (Productive Nano systems Technology Roadmap, 2008) based on precise manipulation of matter and discuss existing and projected capabilities, goals, and applications.

ISSUES RELATING TO PATENTING NANOTECHNOLOGY IN INDIA

Intellectual property, creation of human mind, is an intangible asset that is the only inexhaustible resource. Patents are the strongest form of intellectual property protection and are essential to the growth of the Nanotechnology industry, similar to their importance for the development of the biotechnology and information technology industries. Patents will be critical in the success of the global Nanotechnology revolution. The primary limitation lies in the non-adaptability and obsoleteness of the existing patents law. It must be realized that the laws covering products and technology since the Industrial Revolution may not apply to Nanotechnology. Can you patent an atomic or molecular structure? How do you protect an atom or molecule-sized device from being illegally copied? How will patent policies evolve and affect the scope of Nanotechnology patents? These and other intellectual property questions require resolution in order to make effective and efficient use of Nanotechnology innovation. It is critical to develop intellectual property strategies that allow for fluid transfer of government-funded science to the private sector for commercialization of Nanotechnology. The need for patenting Nanotechnology emerges from the large influx of investment in R & D by the Government and private companies to accelerate the availability of commercial Nanotechnology applications. Anything less than a guaranteed cloak of protection may lead to distaste in the mouth of potential financers, hence, hampering the inflow of commercial credits towards the Nano-science research.

Challenges in patenting Nanotechnology:

Patent usually do not apply to properties of matter and other fundamental scientific discoveries. An initial challenge for patent strategists was to determine how to obtain patent coverage that is based on the discovery of inherent properties of materials. Simply submitting a smaller version of a known structure would not be potentially patentable without additional utility or novelty. The section focuses upon the applicability of these traditional bases of patenting to the Nanotechnology inventions and discoveries.

A. Patent applicability - One of the fundamental aspects of obtaining a valid and enforceable patent is that the claims must be novel and unobvious over the prior art. Identifying the pertinent prior art in an emerging technology can often be a tedious and difficult task. This is especially the case in Nanotechnology because the technology has recently emerged, is fast evolving and covers a rather wide range of scientific areas.

B. Novelty - In India, the novelty requirement ensures that only inventions that have not been known or previously used by others are patented. Novelty is evaluated against the prior art available, including national and foreign patents, publications and public demonstration or use of inventions. The aforementioned requirement is met through searching of prior art databases by the patent office. Owing to the multidisciplinary nature of Nanotechnology inventions, examiners may have a difficult time in performing adequate searches of prior art databases. Further many Nanotechnology inventions bridge different fields of applications, the ability of a single examiner or technology group may not be sufficient to determine the novelty of a particular application.

C. Utility requirement - The quid pro quo nature of the patent laws requires that an invention be operative and function for its intended purpose. Otherwise, there will be no benefit to society, no exchange for the reward of a limited monopoly. Unlike mechanical and engineering applications, which have a defined and finite purpose, chemical and biological inventions possess an evolving utility, making it more difficult to convey and define. The utility of an invention may not always be known at the time of conception or reduction to practice. Although patentees in emerging technology companies would like broad protection on their patents, claiming incredible uses of the invention may work contrary to the goal of obtaining patent protection. There is a risk that the patent may be denied on lack of utility.

Though limiting claims to ensure acceptance may help against rejection of the application, unnecessarily limiting the claims to not cover anticipated or future improvements may render a patent useless.

In Nanotechnology, the types of applications for each invention are theoretically limitless. Because of the scale impact and the interdisciplinary nature of the field, Nanotechnology inventions may be written across a wide range of applications. This implies that expertise across a wide range of fields is necessary for the drafting of Nanotechnology patent applications, similar to the team effort required in examination of the patents mentioned above. Without this, careful drafting of claim language cannot take place, which is essential in gaining the optimal patent protection for the product.

D. Obviousness - Non-obviousness is a highly complicated subject in the patent field, and is the standard of mainly patent litigation battles. It is difficult to reduce into ordinary terms, but suffice it to say that even if an invention passes the novelty test above; it still needs to be non-obvious to one of ordinary skill in the art.

Non-obviousness determinations in emerging technologies are highly determined by the scope of prior art, and again the quality of the search performed by the patent office. To a larger extent, non-obviousness requires intimate knowledge of the particular technology to get a sense of what one of ordinary skill in the art would know in order to combine knowledge or prior art references. These ties back to the knowledge of the examiners, and the expertise of the technology group at the PTO. Because Nanotechnology is a multi-disciplinary field, it is difficult to define the scope of the prior art and who one of ordinary skill in the Nanotechnology art is.

In addition, what does one of ordinary skill in the Nanotechnology art know about the field with Nanotechnology, determining what is obvious or not will present unique challenges for the patent examiners and courts.

WHY INDIA NEEDS NANOTECHNOLOGY REGULATION

India ranks third in the number of research publications in Nanotechnology, only after China and the US. This significant share in global Nanotech research is a result of sharp focus by the Department of Science and Technology (DST) to research in the field in the country. The unprecedented funding of Rs 1,000 crore for the Nano Mission was clearly dictated by the fact that India had missed the bus on the micro-electronic revolution of the 1970s and its attendant economic benefits that countries like China, Taiwan and South Korea continue to enjoy to this day.

At the same time, the success of the Nano Mission is not limited to research but also involves training the required human resource for further advancement in the field. An ASSOCHAM and Tech-Sci Research study reported in 2014: “From 2015 onwards, global Nanotechnology industry would require about two million professionals and India is expected to contribute about 25% professionals in the coming years.”

A missing element in India’s march towards becoming a Nanotechnology powerhouse is the lack of focus on risk analysis and regulation. A survey of Indian practitioners working in the area of Nano-science and Nanotechnology research showed that 95% of the practitioners recognized ethical issues in Nanotech research. Some of these concerns relate to the possibly adverse effects of Nanotechnology on the environment and humans, their use as undetectable weapon in warfare, and the incorporation of Nano-devices as performance enhancers in human beings.

One reason for lack of debate around ethical, and public-health and -safety, concerns around new technologies could be the exalted status that science and its practitioners enjoy in the country. A very successful space program and a largely indigenous nuclear program has ensured that policymakers spend much of their time feting achievements of Indian science than discussing the risks associated with new technologies or improving regulation.

It is not surprising then that products like silver-Nano washing machines or insecticides with Nanoparticles continue to be sold in the Indian market without any analysis of the risk associated with their use.

This – despite the fact that the government itself has acknowledged that Nanoparticles of sizes comparable to that of human cells can be deposited in lungs and "may cause damage by acting directly at the site of deposition by trans locating to other organs or by being absorbed through the blood."

A study by the Massachusetts Institute of Technology, Boston, on the toxicity of Nano-materials found that carbon Nanoparticles inhaled by rats "reached the olfactory bulb and also the cerebrum and cerebellum, suggesting that translocation to the brain occurred through the nasal mucosa along the olfactory nerve to the brain." This ability to translocate opens up questions about the effect different types of Nanoparticles could have on human health.

Many commonly used products have Nanoparticles; for instance, titanium dioxide Nanoparticles are widely used in sunscreens and cosmetics as sun-protection. In the US, the National Institute of Occupational Safety and Health has issued safe occupational exposure limit of 0.1 mg/m3 for Nano scale titanium dioxide. This was after reports of incidences of lung cancer in rats at doses of 10 mg/m3 and above surfaced. There is also a concern that Nano-scale titanium dioxide particles have higher photo-reactivity than coarser particles, and may generate free radicals that can damage cells.

The challenge that remains in front of policymakers is that of regulating a field where vast area of knowledge are still being investigated and are unknown. In this situation, over-regulation may end up stifling further development while under-regulation could expose the public to adverse health effects. Further, India's lack of investment in risk studies only sustains the lull in the policy establishment when it comes to Nanotech regulations.

The Energy and Resources Institute has extensively studied regulatory challenges posed by Nanotechnology and advocates that an "incremental approach holds out some promise and offers a reconciliation between the two schools- one advocating no regulation at present given the uncertainty and the other propounding a stand-alone regulation for Nanotechnology."

Kesineni Srinivas, the Member of Parliament from Vijayawada, has taken cognizance of the need for incremental regulation in Nanotechnology from the view point of public health and safety. (Vijayawada MP, 2015).

In December 2015, Srinivas introduced the Insecticides (Amendment) Bill in the Lok Sabha to grant only a provisional registration to insecticides containing Nanoparticles with a condition that "it shall be mandatory for the manufacturer or importer to report any adverse impact of the insecticide on humans and environment in a manner specified by the Registration Committee." This is an improvement over the earlier process of granting permanent registration to insecticides. However, the fate of the bill remains uncertain as only 14 private member bills have been passed in Parliament since the first Lok Sabha in 1952.

More recently, the DST released the 'Guidelines and best practices for safe handling of Nano-materials in research laboratories and industries'. The guidelines which are precautionary in nature lay out methods for safe handling and disposal of Nanoparticles by researchers and the industry. Though much delayed, it is a welcome step towards safer Nanotechnology research in India.

LEGAL ISSUES

Nanotechnology raises new legal issues in the areas of property rights and privacy. It also raises intellectual property issues like whether a Nano version of a prior invention should be patentable. For example, a very small-sized camera (Nano version) can be patented as it has already been invented before, can just the change in size be patented.

The following sections will address the issue of what forms of intellectual property protection might be available for Nanotechnology and briefly highlight some of the other legal and public policy issues that may arise.

- Intellectual Property - The inherent complexity of Nanotechnology raises some interesting intellectual property issues.

Some of the legal questions include:

- Can you patent an atomic or molecular structure?
- Is a difference in size something novel or merely obvious?
- Is it proven-to-work technology?
- Is it copyrightable?
- Is it a form of expression, or fixed in a material form?
- Could it have an artistic element or is it purely functional?
- Could it be an industrial design, a sculpture or a work of architecture?
- Is a man-made molecule a finished article?
- What if it is later discovered to exist in nature?
- Is it capable of being judged by the human eye?
- Are Nano-circuits automatic or created by humans? - Who owns Nanotech creations made by Nano machines?

In most of the cases issue of patentability of Nano-technology has been taken into consideration. The challenge on the novelty aspects is the most litigated issue, below mentioned cases are the latest on pressing issues:

Latest Judicial trends on patentability of Nanotechnology

1. T 0006/02 photodegradable cellulose tow case:

The increased photo-degradability of cellulose by the addition of Nano particle size Titanium Dioxide is novel as generic disclosure like plastic materials as laid down in the prior art does not normally does not take away the novelty of any specific example (cellulose esters) falling within the disclosures".

2. T 0915/00 (Nano-crystalline Metals) Case: "The Nano crystal Nickel material, obtained by electrode position and having crystalline size of less than 11 nm is novel over a substantially identical material disclosed in the literature, comprising micro crystalline nickel obtained by electro-deposition."

3. T 0509/92 (Dipeptide Crystals) Case:The board is of the opinion that there was no disclosure in any of the said prior art documents of aspartame type crystals having the given X-ray characteristics and moisture content for these reasons the novelty is acknowledged".

Property and trespass - Settled property and pollution laws may be challenged by the concept of Nano space, Nano device movement and detectability. Nano space is any area accessible to Nano devices. Some objects that seem macroscopically solid can be argued if seen at a Nano level. For example, the wall of a house may appear solid, but any minute crack, even invisible to naked eye, are wide open range in Nano space.

Traditionally property or pollution law analysis fences off Nano space to correspond to macroscopic object boundaries. Under traditional property law analysis, a Nano device that passes through a wall into a house is trespassing into private property. Treating Nano devices as pollution reaches essentially the same result as the polluter may escape the liability of nuisance and pollution caused because the Nano devices, especially for the average person, might be completely undetectable (Stuart et al., 1990). There are many such issues like:

- Does a Nano device interfere with owner property's right when it cannot be detected and it leaves no trace that it has ever been there?
- Has a person's right been violated if a Nano device enters and leaves the body causing no damage without his knowledge of any such device entering and leaving?

- How to protect a person if any such device is administered to a person to cause him damage and it leaves the body undetected?
- On the other side of the issue are the property rights of Nano device owners. If a person inhales a Nano device in a public place then goes home, has the person committed the offence of theft under Section 378 Penal Code, 1860?
- If Nano device is treated as private property, how will Government enforce those rights?
- What type of equipment required proving infringement of such rights?

Another issue is of ownership identification of a Nano device. Suppose if a person accidently inhales a Nano device and it leads to the death of that individual, how liability will be imposed as it cannot be affixed without identifying the person who owned or released the Nano device.

Privacy - There is an approach to make Nano space a public resource, much like airspace where the public has rights of access subject to regulation. Opening Nano space would allow Nano devices to be mobile without violating individual space. Pollution abatement devices, sewer pipe cleaners, and insect control devices could freely move wherever they needed to go. Individual would need not fear charges of trespass resulting from their mobile Nano devices. (Lawrence Letham, 2007).

Treating Nano space as airspace eliminates traditional property boundaries issues, but the airspace model give rise to another problem, laws for it can be present anywhere a person's house, office, bedroom, bathroom which may lead to serious privacy issues. Should Nano devices be allowed to report any discoveries made in Nano space to their owners? Privacy interest are likely to be violated if Nano device used to spy on a competitor leading to corporate espionage.Many confidential information can be leaked which can ultimately be a threat to the national security of the nation. So, law should be made to limit their capabilities of Nano devices so that by the nature of their design they cannot violate privacy or perform some kind of mischief under Section 425 of the Penal Code or perform any undesirable conduct in Nano space.

- Patentability - An invention must overcome two preliminary hurdles to be patentable; it must be novel and non-obvious. Once an invention is found to be novel and non-obvious, the description of the invention must also enable a person skilled in the art to build and use the invention without an unreasonable amount of experimentation. Nanotechnology presents issues when assessing novelty, obviousness, and enablement because many Nanostructures are similar to, if not exactly the same as, prior macroscopic-sized inventions. An invention may "inherently" anticipate a later invention even though the patent does not expressly disclose the later invention. In the case of the carbon tubes, if the macroscopic carbon tubes do not specify wall thickness, an examiner may argue that the macroscopic carbon tube inherently anticipates the single-walled Nanotube. Such a broad interpretation of inherency has the potential of denying a patent to any Nanostructure that is simply a scaled version of macroscopic prior art.

The second hurdle to a patent is non-obviousness, which bars a patent if a new invention is an obvious extension or obvious change from a prior invention. A hallmark of a non-obviousness invention is an invention that looks similar to prior art, but that produces unexpected results.

The single walled carbon Nanotube is non-obvious when compared to the macroscopic carbon tube because the Nanotube can carry a billion amps per square centimeter and the macroscopic carbon tube cannot (Lawrence Letham, 2007). The high current carrying capacity of the Nanotube is an unexpected result so will qualify as non-obvious.

- Social issues - The negative impacts of Nanotechnology have been considered in several areas. The increase in material difference between rich and poor countries is referred to as "Nano divide". It is anticipated that Nanotechnology manufacturing plants, such as Nano electronics factory, will cost billions of dollars, thereby limiting control of production to the rich nations, resulting in a striking difference between rich and poor. (Richard, 2011).

- Nanotechnology could result in major disturbances in the financial markets of the countries. The list of potentially malicious and destructive uses of Nanotechnology includes gathering information with undetectable sensor delivering nerve agents with Nano devices (M. Meyer, 2011) infecting people with artificial and deadly viruses, producing undetectable weapons through Nanotechnology combined with Nano electric artificial intelligence (Richard, 2001). The greatest dangers of Nanotechnology designed for harm are unforeseeable and unknown because it is difficult to predict what dangers a new technology may facilitate. Nano weapons that can be produced secretly and inexpensively and that is difficult to detect or counter could fracture allegiance to nations and will unequivocally be a threat to national security.

CONCLUSION

As information technology continues to evolve from a micro scale to Nano scale, we are beginning to see a paradigm shift in the industry from silicon to carbon-based products and increased convergence between different disciplines, such as electronics, computers, mathematics, chemistry, physics, quantum mechanics, materials science, biology and engineering. India's competitive advantage in the world marketplace is its technology and in order to ensure its continued economic prosperity, it is important that the Indian Nanotechnology industry continues to grow. In order for this to occur, developers and businesses must feel comfortable that the Nanotech inventions, works, machines, products and processes that they create or purchase have value as assets; in other words, that they are entitled to intellectual property protection. Nanotechnology has the potential of impacting segments of society, however because of the unforeseeable impact of the new technologies, it is currently impossible to say whether the affects will be positive or negative. Nanotechnology poses some challenges to current conceptualization of law. The advent of Nano devices or even simple Nano sensors opens the frontier of Nano space. The possibility of objects moving through Nano space challenges our current concepts and laws of property rights and privacy. India's existing legal framework, in particular intellectual property law, offers some protection for Nanotech creations. However, Nanotechnology is raising new challenges when one attempts to apply the conventional laws to such new technologies that were never anticipated at the time our laws were created. In order to meet these challenges and to ensure that our laws keep pace with the rapid technological evolution, our government needs to understand the legal issues that Nanotechnology creates and implement legislative changes as required. As well, businesses need to rely on legal counsel with specialized expertise in the multi-disciplinary fields of Nanotechnology law, commercial law and intellectual property law, in order to ensure that their Nanotech assets are adequately protected and commercially exploited to realize maximum value. With the dynamic society facing technological developments everyday has to amend its laws to cope up with the upcoming technologies so as to maintain social order and peace in India. If we look at an example when removable storage devices were made, they were used to copy data from computers without any consent of the owners of the data. It was an offence of theft, but an essential condition for theft was to take away the property from the possession of the owner but here the data still stayed with the owner so the need for a new law was required to define theft in context with computer software so as to prevent illegal copying of data without the consent of the owner. Similarly, law has to be framed with respect to the Nanotechnology in India so as to limit the capabilities of Nanotechnology by regulating the nature of its design, and to redefine certain offences, concepts, laws of property rights and privacy and many such areas, which if left unregulated may lead to the breakdown of the society and nation at large.

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