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Patently obvious: Intellectual property rights and nanotechnology

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Abstract

Rapid technological advances and commercialisation of the emerging field of nanotechnology will challenge traditional international and domestic regulatory regimes, including intellectual property rights. This article examines the role of the World Trade Organisation's Trade-Related Intellectual Property Rights Agreement as a global regulatory device for nanotechnology, and questions the applicability of the Agreement with respect to current and future nanotechnology applications. With the commercialisation of nanotechnology already occurring, exploration of the international intellectual property and nanotechnology interface is timely. Early recognition of uncertainties will enable policy makers the ability to balance the needs of commercial investors and innovation against the broader objectives and ideals promised by nanotechnology.

1. Introduction

Nanotechnology, a form of molecular engineering, has been heralded as the 'new technological revolution' [1]. This cutting edge technology is enabling industry to manipulate matter at the atomic level, thereby offering unrivalled possibilities across the fields of, for example, biotechnology, information technology, agriculture, medicine, and materials [2]. The Action Group on Erosion, Technology and Concentration (Etc Group) [3] note that future applications of nanotechnology will provide scientists the ability to 'modify matter and transform every aspect of work and life.'

Despite its emergent nature, the commercial impact of nanotechnology is already being felt. While estimates vary considerably, BCC research for instance suggest that the global market value for nanotechnology-related products was approximately $US10.5 billion in 2006 [4]. Spectacular growth in the market has been forecast over the next 5–10 years, with commentators suggesting that by 2015 the potential size of this market will lie somewhere between $US1 trillion [5] and $US2.4 trillion [6].

The economic implication of nanotechnology has ensured that research and development (R&D) has become a national priority for the industrialised world. Today over 60 countries, including the United States (US), Japan, Germany, Taiwan, China, Israel and Australia, have implemented national nanotechnology initiatives [7,8], with public sector funding estimated at $US4.6 billion in 2004 alone [6]. Government spending

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has similarly been matched by private sector investment, with companies such as IBM, NEC, Monsanto and DuPont all racing to share in the profits of next generation scientific developments [3,9].

Despite the attention focused on the scientific and commercial potential of nanotechnology, until recently there has been limited debate on the broader legal, regulatory and ethical aspects of nanotechnology [10–15]. While many of the patent law and broader intellectual property rights (IPRs) issues raised by nanotechnology at this time are not unique, the current international intellectual property framework, as governed primarily by the World Trade Organisation's (WTO) Trade-Related Intellectual Property Rights (TRIPS) Agreement, was realised at a time when nanotechnology was simply a futuristic aspiration.

This paper investigates the regulation of nanotechnology within the context of the current IPRs regime, as governed by the TRIPS Agreement. Following an examination of the phenomena of nanotechnology, this paper explores whether nanotechnology falls within the auspices of Article 27 of the TRIPS Agreement. In doing so, the paper questions the applicability of Article 27 as a regulatory device for nanotechnology, particularly in light of the apparent blurring of the discovery/invention interface. The technicalities of this debate are critical to the scope of IPRs that may be afforded to commercialisation of nanotechnology products. In reviewing this issue, this paper explores the growth in nano-patents and discusses the implications of the US PTO Class 977/Dig 1 with respect to the global harmonisation of nano-related nomenclature. Finally, this paper will argue that the lack of uniform definitions underpinning the granting of IPRs gives rise to the potential for overlapping and conflicting patents claims, and suggests that governments adopt a proactive approach to protect the commercial interests of patent holders.

2. Nanotechnology: science function or science fiction?

'Nanotechnology,' a form of molecular engineering, is an emerging form of assorted technologies including 'nanosciences' and 'nanotechnologies' that enables the manipulation of matter at the atomic level [16]. With the field of nanotechnology focused on atom-by-atom construction, nanotechnology is defined by its scale[1]—nanometer (nm) or one billionth of a meter—rather than its potential application across domains [2]. Conceptually, nanotechnology refers to the ability to control the composition of molecules and atoms, within the range of 1.00–100 nm [1], potentially enabling scientists to create specific molecular structures and devices [17]. Importantly, it is the ability to manipulate matter at the discrete and invisible level with such great precision that differentiates nanotechnology from all previous technological applications [18]. With an impending convergence of this technology across industry sectors, nanotechnology appears to 'promise nothing less than complete control over the physical structure of matter' [19].

While much of the current debate concerning the application of nanotechnology has focused on the possibilities of longer-term radical applications of nanotechnology, the commercial realisation of nano-scale applications has already occurred [3]. Yet the majority of present day applications appear to be 'relatively mundane' [1]. Current, 'first generation' commercial applications include scientific tools such as atomic force microscopes and the creation of simple nano-scale compounds and composites (or particles) for use in sunscreens, cosmetics, coatings, and paints, as well as with dirt-resistant bathtubs, self-cleaning glass and smaller, faster computer memory [3,20].

The rapid commercialisation of pure carbon molecules, most notably carbon nanotubes (CNTs) and buckminsterfullerene (fullerenes or 'buckyballs') hold promising applications. Simply, CNTs are naturally occurring hollow tubes of rolled carbon sheets (graphene sheets), which have extraordinary strength, novel chemical properties and high electricity conductivity [21]. Applications range from nano-electronics to drug delivery mechanisms [22]. Fullerenes are perfect spheres of carbon atoms, which exhibit many of the same desirable physical and chemical properties as CNTs [23], with the ability to enclose other elements. Short-term applications of these geodesic domes will likely be drug delivery mechanisms where the individual drug molecules will be enclosed within the fullerene, with the advantages over traditional drug administration being the prevention of partial degradation of the pharmacological agent prior to reaching the target cells, optimal release at the target site [24,25], as well as preventing the drug being 'taken up by cells where larger particles

[1]To provide an example of scale, with a nanometer (nm) being one billionth of a meter (10^{-9}), the width of a human hair is approximately 80 000 nm [22].