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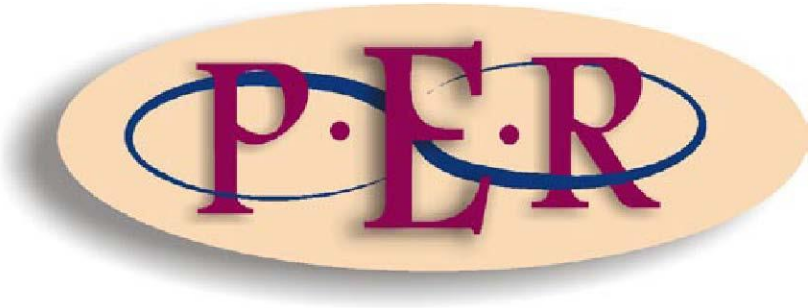

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FINDING PROPERTY IN NEW PLACES – PROPERTY IN CYBER AND OUTER SPACE

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1 Introduction

In honour of the North-West University (Potchefstroom Campus)'s 50 year celebration, this article aims to discuss some new developments in property law that could not have been envisioned a hundred years ago, and would have been regarded as hopelessly wild speculation and careless optimism when the faculty was founded 50 years ago.

Property[2] exists in space.[3] Property or, more specifically, objects of property have always been considered to take up space and be tangible.[4] In the past, this was easily conceptualised, for example, either in terms of movable property such as a chair, or immovable property such as a piece of land. Both take up space. The chair can be moved about and continue to take up (or displace) space. A piece of land, although often thought of as flat and two dimensional, also takes up space[5] and ownership of such property was considered to extend both above and below[6] the surface of the

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1 This article was written specifically for the 50-year celebration of the Law Faculty at the North-West University's Potchefstroom Campus.

2 For the purposes of this article, unless otherwise stated or made clear in the context, the term "property" will refer to objects of property such as "things" (both tangible and intangible) as well as other rights that are considered to be objects of property rights.

3 Space itself could also form the object of property rights. See in general Marsh 1931 *Dicta* 5-13; Gray 1991 *CLJ* 252-307.

4 Van der Merwe and De Waal *Law of Things* 13. However, for a different view refer to Cloete, who asserts that not only a narrow "thing" concept is accepted in South African private law. He illustrates how the prevailing notions of society can influence this restriction. See Cloete *Onstoflike Sake* viii-ix, 318. As such, tangibility or corporeality is not considered to be a determining factor any more in deciding whether something (an object) is an object of property law or not. However, it is still a useful characteristic to consider when determining the legal designation of an object. See the discussions about the tangibility of objects in outer and cyber space later in this article.

5 In three dimensions.

6 This rule does not apply in this form in modern South African law. For example, land ownership is separated from mineral rights that do not accrue to the landowner.

property.[7] In addition, these objects of property (or things) have always been located in and on the Earth.

However, due to recent technological, social and scientific developments, objects can now also be found in both outer space and cyber space. These objects are similar in many ways to their traditional counterparts on Earth. For example, as on Earth, there are also movable and immovable objects in outer space and cyber space. In outer space, one encounters heavenly bodies such as planets, moons and stars that can be considered immovable. At the same time, one also encounters comets, asteroids, space dust and other detritus that can be considered movable. In addition, one also encounters man-made objects such as satellites and spacecraft.

In cyberspace,[8] and specifically in virtual worlds,[9] one encounters all of the same objects[10] that one would encounter in the real, physical world. For example, one encounters movables such as a virtual chair, and immovables such as virtual land. These also (virtually) occupy space inside the virtual world. Of course this is dependent on the design of the virtual world, but normally a virtual world is designed to emulate a three-dimensional space analogous to the real world.[11] As such, any object contained inside the virtual world is described and located in terms of its position inside the virtual world – again, analogous to the real world. A virtual chair can be moved around inside a house, or placed on or under a virtual table. Objects in such a virtual world (virtual objects)[12] are also simultaneously located in the storage system which the virtual world is run from, even if it is just in the form of a database entry.[13]

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7 Marsh 1931 *Dicta* 5.

8 For a discussion about the content and meaning of cyberspace see Folsom 2007 *JTIP* 77.

9 Virtual worlds can be defined as follows: "Virtual worlds … are computer-moderated, persistent environments through and with which multiple individuals may interact simultaneously." Bartle 2004 http://www.themis-group.com/uploads/Pitfalls%20of%20Virtual%20Property.pdf 2. Alternatively "[i]n plain, everyday language, one could define a virtual world as an alternative, non-physical world, in contrast to the real, physical world we live in". Erlank *Property in Virtual Worlds* 46.

10 In addition to a plethora of other objects – not found in the real world.

11 Erlank *Property in Virtual Worlds* 51.

12 For more background on virtual property, see Fairfield 2005 *BUL Rev* 1052-1055; Lastowka and Hunter 2004 *CLR* 29-40*;* Erlank 2015 *PER/PELJ.*

13 See Erlank *Property in Virtual Worlds* 47 for a discussion on how computers control or moderate virtual worlds, which in turn are moderated by human beings.

With this overlap between objects of property found on Earth, in outer space and in virtual worlds in mind, this article will discuss some specific questions that arise in connection with property as determined by the different spaces or environments and dictated by the idiosyncrasies of property in space, followed by property in virtual worlds. By discussing these questions, some of the unique aspects that need to be addressed by property law in each of these areas will be highlighted as an illustration of how the rapidly evolving social and technological developments are forcing property law to deal with familiar property issues in novel ways.[14]

It should be noted that the purpose of this article is not to discuss these issues in depth or to debate the theoretical *minutiae* that one can go into with regard to almost all the issues touched upon. Rather, the purpose is to identify, mention and introduce some new developments – many of which are controversial – as an illustration of how new developments are impacting on and interacting with traditional property law.[15] This article will therefore not cover all the above-mentioned opinions and debates.[16] That is the purview of other articles.

2 Property questions relating to property in space

2.1 Introduction

One can consider the field of property law in space to be brand new, and closely associated with the renewed interest in space travel, exploration and exploitation. This is in spite of the fact that questions about ownership and property rights in outer space have been asked (and dealt with) at least since Roman times, where it was

[14] The property issues in both of these areas are much more comprehensive than can be covered in this article and only certain well-defined and interesting aspects of the property issues will be discussed.

[15] The comparison between property in space and property in virtual words should also not be regarded as being a rigidly regimented comparison between the two. While there might be similarities in the way in which they are discussed, this is purely based on a loosely similar communal framework that shows some similarities on occasion.

[16] In most cases the leading literature dealing in more detail with these aspects is referred to in the footnotes as a source for more in exhaustive reading.

inconceivable that Man[17] would one day go out into space and walk on the Moon. Starting in the previous century,[18] and continuing into the current one,[19] questions about property in space have been discussed with new vigour.

Until the recent development of commercial and private access to space,[20] "property in space" had not been a serious issue and certainly not important enough to be considered as a new field of property law. New developments have now changed this situation. Currently, progress is being made in the creation of a space-tourism[21] industry that will include such enigmatic things such as leisurely trips into space and space hotels. In addition, a number of companies are preparing to start with mining[22] operations in space. There are also a number of different role-players actively preparing for endeavours to take people to Mars[23] (and leave them there).[24] These are not pipe dreams. The technology and expertise, as well as the will to achieve these

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17 For the purposes of this article "Man" refers to Mankind and is considered to be gender neutral and interchangeable with "human beings". This follows the terminology used in international law when dealing with space law and related issues.

18 Some of the more prominent articles that deal with problems of property in space include Fruchterman 1965 *JAG Journal* 13; Scheraga 1986 *Cato Journal* 889-904; Jaffe 1960 *St Louis U LJ* 68-80; Reynolds 1992 *Vanderbilt J Transnat'l L* 225-233; Baca 1993 *J Air L & Com* 1041-1046; Twibell 1997 *ILSA J Int'l & Comp L* 259-295.

19 See Listner 2003 *Regent J Int'l L* 7-94; Cherian and Abraham 2007 *JICLT* 211-220; Blount 2011 *Denv J Int'l L & Pol'y* 515-532; Dalton 2010 http://ssrn.com/abstract=1660163, among others.

20 Via private launches and travel. The defining moment of the new era of space travel was the ending of the United States of America's state controlled NASA space shuttle programme. When the NASA programme came to an end, not only did commercial and private actors for the first time have the opportunity to participate directly in space launches and the resupply of the International Space Station (ISS), for instance, but they were actively encouraged to do so in order to help keep the United States' commitment to the collaborative programme of the ISS functional. See Ferreira-Snyman 2014 *PER/PELJ* 2-5 for a brief discussion of the history and development of commercial spaceflight, with a focus on space tourism. Also see Amos 2012 http://www.bbc.co.uk/news/science-environment-18154937.

21 Ferreira-Snyman discusses this new development in detail. See Ferreira-Snyman 2014 *PER/PELJ* 2-39.

22 See Planetary Resources 2012 http://www.planetaryresources.com/asteroids; Deep Space Industries Date Unknown http://deepspaceindustries.com/nasa-postpones-decision-on-asteroid-redirect-mission-strategy; Thomas 2013 http://www.reuters.com/article/2013/11/21/us-space-mining-asteroids-idUSBRE9AK0JF20131121; Komnenic 2014 http://www.mining.com/is-space-mining-commercially-viable-22553; Planet Science 2012 http://www.planet-science.com.categories/over11s/space/2012/04/mining-in-space.aspx.

23 Mars One 2015 http://www.mars-one.com; Mars Initiative 2015 http://www.marsinitiative.org; Howard 2012 http://www.huffingtonpost.com/2012/06/02/mars-one-colonize-red-planet-video_n_1564745.html.

24 Vincent 2013 http://www.independent.co.uk/life-style/gadgets-and-tech/mars-one-the-dream-of-a-realitytv-funded-colony-in-space-gets-closer-8997732.html.

objectives will prevail and these endeavours will be realised within the near future. Questions about property in space therefore now take on new importance. With this in mind, some of the unique aspects of property in outer space will be addressed in the next section.

2.2 Is ownership prohibited?

The first interesting question of property in space is whether there is a need for property law to take notice of this phenomenon. The reason for asking this question is that in terms of current international law, private and sovereign ownership of objects in space is prohibited by the so-called "non-appropriation principle".[25] This applies to immovable objects in space (heavenly bodies) and not to movables such as satellites and spacecraft. Therefore, at first glance, the question of who owns the Moon[26] is an easy one to answer. No one owns it, since it is incapable of being subjected to private or sovereign ownership. However, this prohibition stemming from outdated cold-war[27] based international conventions does not allow for the new developments in man's ability to venture into space – and this is where the need for (private) property becomes clear. While it was logical to prohibit ownership in space at the time when the international space law treaties and conventions were created, these conventions are incapable of dealing with the current developments regarding Man's ability to travel into and exploit outer space. As Scheraga notes, "… property rights will be created when it is in someone's self-interest to do so".[28] Since it is clearly in the interest of private companies and investors[29] to do so, it is inevitable that private property rights will now be created by the new actors in space travel and exploitation.

Cherian and Abraham also support this viewpoint and note that:

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25 See Freeland "Outer Space and the Non-Appropriation Principle" 85; Goh *Dispute Settlement in International Space Law* 18, 140; Van Wyk 2008 *African Skies* 90; Erlank 2012 http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2216602 5.

26 Marks *New Scientist* 28; Reynolds 2008 http://www.popularmechanics.com/science/space/moon-mars/4264325.

27 Listner 2003 *Regent J Int'l L* 75; Cherian and Abraham 2007 *JICLT* 212. At that stage only Russia and the USA could actually reach any heavenly bodies. Currently a large number of other countries and private companies are capable of getting into space and reaching heavenly bodies.

28 Scheraga 1968 *Cato Journal* 893.

29 Who invest in space exploration, exploitation and associated industries.

> Though the concept of private property rights has been expressly declared to be non-existent vis-à-vis exploration of space, especially in light of the Outer Space Treaty, there is growing convergence of opinion that private property rights must be granted in some form to ensure that proper, optimum and unhindered use and utilization of resources available in space can be effectively implemented.[30]

The international conventions therefore need to be developed[31] to allow for the limited acceptance of private property rights in space.

Historically speaking, the focus on space science before the entrance of private actors into the industry was on space travel and exploration. However, now that commercial interests are at stake and being used to fund new space ventures, the focus has inevitably moved away from pure scientific exploration and is focusing heavily on exploitation as well.[32] This is clear from the fact that the two driving industries of new space access are tourism and mining. Even the non-profit Mars One initiative[33] needs to seriously exploit the commercial possibilities of the trip in order to cover the astronomical associated costs.[34]

If a company spends billions of dollars to get into space, travel to a heavenly body and start mining, then it will require that it be rewarded with property rights to protect the company's investments. Perhaps the question in this case should not be whether property rights should be created, but rather whether property rights should be recognised. Even if the international conventions continue to prohibit private ownership, the *de facto* situation in outer space will be one where private property exists. Essentially, this same question applies to virtual property.[35] As noted above, the private and sovereign ownership of manmade movables is allowed in space[36] and when taking into consideration the argument above, then it is inevitable that the private ownership of parts of heavenly bodies will also eventually become a reality.

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30 Cherian and Abraham 2007 *JICLT* 211.
31 Twibell 1997 *ILSA J Int'l & Comp L* 260, 272.
32 Listner 2003 *Regent J Int'l L* 76.
33 See Vincent 2013 http://www.independent.co.uk/life-style/gadgets-and-tech/mars-one-the-dream-of-a-realitytv-funded-colony-in-space-gets-closer-8997732.html.
34 One way in which Mars One hopes to cover the costs is to exploit reality TV as a funding model. Holligan 2012 http://www.bbc.co.uk/news/world-europe-18506033.
35 See the discussion below.
36 Listner 2003 *Regent J Int'l L* 80-81; Dalton 2010 http://ssrn.com/abstract=1660163 8.

Interestingly enough, when making the determination of whether to allow private (or sovereign) ownership of property in space, property law provides the answer for the problem of possible overreaching when appropriating property in space. Since it would clearly be non-productive to allow for the realisation of cold-war fears that a single nation could claim the Moon or Mars, there has to be some limiting factor when allowing or allocating property rights (and especially ownership) in space. The limiting factor will be the requirement of effective control. Therefore, it is proposed that any nation, company or person will be able to appropriate only such a part of a heavenly body as that nation, company or person can effectively control.[37] This essentially makes it impossible for a company to lay claim to a complete heavenly body (such as the Moon) through so-called flag-planting.[38] For example, if the United States of America (USA) were to return to the Moon and set-up a base there, they would acquire ownership of only that piece of the Moon where the base is located, which would be limited in extent to as large a portion of lunar surface as they could effectively control. Essentially this would be as large an area as an astronaut could travel to from the lunar base and return, before his or her oxygen ran out. Also, if the USA were to remove their means of control of the property (such as removing their astronauts) then they would lose ownership,[39] unless they are able to continue to exercise effective control through proxy by means of (amongst others) remote controlled robots and space craft.

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37 Erlank 2012 http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2216602 4.

38 Like a recent attempt by Russia to further their claim to the North Pole. BBC News 2007 http://news.bbc.co.uk/2/hi/europe/6927395.stm. In a South African context, the case of *Reck v Mills* 1990 1 SA 751 (A) comes to mind as being informative and relevant to the situation in space when it comes to occupation by flag planting. Essentially, it was found that the act of claiming something (in this case a condenser on a sunken ship) - by tying a rope to it attached to a buoy – did not satisfy the requirement of being in physical control. A symbolic *occupatio* without physical control would therefore not be accepted under South African law.

39 The question whether this would be considered to be voluntary or involuntary abandonment remains unclear and could form the topic for a separate article. It is foreseen that a time-limit could be attached to the question of involuntary abandonment. For example, if the current owners of a piece of celestial real estate are unwilling or unable to return to and exert physical control over the property within three to five years of leaving such a property, then it might revert to a status of *res nullius* by becoming a *res derelictae*.

2.3 The characteristics of a thing as applied to heavenly bodies

As discussed in the previous section, the current constraint on ownership in and on heavenly bodies stems from modern international law. However, there is another question, and that is whether heavenly bodies are capable of appropriation in terms of (private) property law. Since Roman times, heavenly bodies were considered objects of property law that were incapable of being bought and sold. This was due to their being classified as being *res extra commercium*.[40] This was not just a policy decision (analogous to the international law prohibitions mentioned above) but also a practical one. There was no way for anyone to get to the heavenly bodies or exert control over them. When one considers that this is, generally speaking, no longer the case,[41] then the modern developments that allow one to reach heavenly bodies have also necessitated that the heavenly bodies should be re-classified as being *res in commercio*.

Aside from the questions of whether private property rights should be allowed in outer space, the next property related questions refers to the aspects of tangibility and the characteristics of a thing.

In South African law, property is traditionally equated to a thing,[42] a thing being something that has the following characteristics: corporeality, external to persons, independence, appropriability/susceptibility to human control and use, and value.[43] Essentially these same characteristics can be used to determine whether an object found in space (or in a virtual world) can also be accepted as an object of property. However, since the areas where the objects are located are not exactly the same as the areas recognised as harbouring property, some allowances have to be made. In

40 Van der Merwe *Sakereg* 28.

41 Man cannot for example (yet) move a planet out of its orbit or exert control over the sun.

42 Van der Merwe and De Waal *Law of Things* 13. However, this strict adherence is not universally accepted as an integral part of South African property law any more. See Cloete *Onstoflike Sake* viii-ix, 318.

43 Van der Merwe *Sakereg* 24.

these circumstances, the law needs to develop to allow the acceptance of these new objects of property law.[44]

The first characteristic to investigate is corporeality.[45] The question should be asked whether an object in space is corporeal or incorporeal. In space, many objects that are of importance at the moment will be corporeal and tangible.[46] The distinction between corporeals and tangibles[47] is blurred slightly because certain heavenly bodies could be regarded as being either or both. Take for example the sun or any of the gaseous planets in the Solar system (Jupiter, Saturn, Uranus, and Neptune). At first glance one would consider all of the planets to be corporeal. However, since some planets are essentially composed just of gas, one would not be able to regard them as corporeal. To address this anomalous situation, one should accept that if a planet or heavenly body is defined and held together into a coherent discrete whole by means of, for example gravity, then it could be classified as corporeal.[48]

Tangibility on the other hand is an important consideration for property in space. While the terms tangibility and corporeality are often used interchangeably, as far as property in space is concerned, tangibility does in fact once again[49] become an important consideration. While not a decisive factor, the ability to touch an object in

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44 Since property rights are considered to be strong rights with *erga omnes* effect, in contrast to weaker contractual or personal rights, it is argued that since these objects are now (arguably) included as part of *res in commercio*, it would logically follow that they should not remain classified as "non-things" and would benefit from the stronger protection of property law.

45 See generally: Van der Merwe *Sakereg* 27; Van der Merwe and De Waal *Law of Things* 13; Badenhorst, Pienaar and Mostert *Silberberg and Schoeman's Law of Property* 14-19.

46 Due to their economic value and being the low-hanging fruit for exploitation.

47 Corporeality and tangibility are concepts that are often used interchangeably, but it is arguable that certain incorporeals are in fact tangible (able to be perceived by touch). For example, while steam and electricity are considered to be intangibles, both can be perceived by touch, thus (arguably) making them tangible incorporeals, although they are not usually considered by property law to be tangible.

48 Another problematic situation is encountered when trying to decide what constitutes a comet. If the main body of the comet is considered to be corporeal, does this apply to the tail as well? Keep in mind that the "tail" and "comma" are essentially comprised of dust and gasses. Some direction might be taken from Working Group Three of the IISL (International Institute for Space Law) which makes mention of the fact that "Celestial Bodies in the sense of this Resolution are natural objects in Outer Space, including their eventual gaseous coronas, which can not be artificially moved from their natural orbits." See Fasan 1998 *J Space L* 36.

49 As it did in Roman law. See Van der Merwe *Sakereg* 25; *Gai* 2 13; *I* 2 2; *D* 1 8 1 1.

space will considerably improve the chances of appropriating such an object (or part thereof), due to the requirement of effective control as mentioned above.[50]

The real importance of the question of tangibility becomes clear when one is to determine if an object in space has been appropriated by means of *occupatio*. As mentioned above, effective control is an important requirement for appropriating property in space, and this goes hand in hand with the issue of tangibility. If one cannot get to an object in space (indirect control such as proxy by remote operated vehicles excluded) then one cannot touch it and cannot control it. This means that finding or discovering a star or comet and naming it will not give the finder ownership thereof. This also applies to the brisk sale of plots of land on the Moon and Mars by a number of companies.[51] Never having been to the Moon and therefore having not appropriated the plots of land by means of occupation, these companies do not have any property rights to transfer to buyers, which makes all sales of property on the Moon merely void *ab initio* since one cannot transfer more rights than one already has.[52]

Incorporeality would not however disqualify something from being classified as an object of property law in space.[53] Examples that come to mind are things such as radio frequency spectra, line of sight access to solar power, or concessions and licences to operate space-related services and activities, all of which could form part of new objects of property law in space.

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50 Of course, the possibility of actually touching something in space will almost always be effected by means of indirect touching. In space, therefore, something will be tangible if it can be touched through a space suit, or by manipulating it with a spacecraft or other remotely operated vehicle. Essentially the question will be whether or not one can control and interact with the object. Remotely operated vehicles and robots could also be considered to act as proxies for human beings "touching" an object in space.

51 See Luna Society International 2012 http://www.lunarregistry.com/info/embassy.shtml; Lunar Republic 2015 http://www.lunarembassy.com/land.

52 According to the *nemo plus iuris* maxim - *nemo plus iuris ad alium transferre potest quam ipse habet*. D 50 17 54; cf *D* 41 1 20 pr.

53 As mentioned above, corporeality is not considered by all scholars to be a prerequisite to classifying something as a thing, but rather a general characteristic employed to help determine whether some object can be regarded as an object of South African property law. See Mostert and Pope *Law of Property* 21, 33.

The second characteristic of a thing, that it should be of an impersonal nature and external to a person,[54] does not pose too great a problem with regard to most objects in space. However, human bodies and derivatives thereof, such as hair and excreta, could become the topic of some interesting legal questions. This is due to the fact that everything on a space-mission that could possibly be of use when repurposed will be recycled – and as such will continue to have value.[55]

The third characteristic, independence,[56] could be used (amongst others) to help with the distinction between movables and immovables in space. For example, is a small piece of an asteroid that broke off from the main body but is still being pulled along by the asteroid's gravity independent of it or not? If the asteroid is too large to control[57] but the broken off piece can be captured and controlled, then the asteroid itself is immovable, while the broken off piece is a movable.

The fourth characteristic, appropriability / susceptibility to human control,[58] is once again very important in space. As on Earth, for an object in space to be appropriable, it must be capable of being subjected to human control. As mentioned above, celestial bodies such as the sun, moon and planets were traditionally examples of things that are not susceptible to human control due to their inaccessibility.[59] In terms of property in space, some celestial bodies are now susceptible to human control. Even when they are not, by giving them independence through the use of human activity (such as collecting space dust), they become susceptible to human control and thus appropriable.

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54 See generally Van der Merwe and De Waal *Law of Things* 13; Badenhorst, Pienaar and Mostert *Silberberg and Schoeman's Law of Property* 19; Van der Merwe *Sakereg* 23.

55 For example, human excrement (both fæces and urine) can be repurposed as (among other things) water, food and building material, where appropriate.

56 See generally: Van der Merwe and De Waal *Law of Things* 14, where it is referred to as *individuality*; Badenhorst, Pienaar and Mostert *Silberberg and Schoeman's Law of Property* 14, 21; Van der Merwe *Sakereg* 25.

57 See the discussion about control below.

58 See generally: Badenhorst, Pienaar and Mostert *Silberberg and Schoeman's Law of Property* 21; Van der Merwe and De Waal *Law of Things* 14; Van der Merwe *Sakereg* 26.

59 Due to technological advances, this category will cease as man finds new and innovative ways to get access to and take control of these things: Van der Merwe and De Waal *Law of Things* 14.

The final characteristic is that a thing must be of use and value to legal subjects and destined to meet the needs of a legal subject.[60] For example, while most asteroids do not currently attract attention for being of value, there are some that are indeed deemed to be exceptionally valuable for their mineral content or purely for their scientific interest.[61] Finally, when creating a colony in outer space, it is possible that the colonists (especially those born in outer space and thus away from the Earth) will have a purely sentimental attachment to the "ground", "land" or other form of space property on which their new home is located.

2.4 New concepts of movables and immovables in space

The final area of property law to be discussed in this article with reference to property in space is the question of the classification of an object in space as being movable or immovable.[62] Generally speaking, spacecraft and satellites could be considered to be movables, while a lunar base or a section of celestial real estate will be considered to be immovable. However, celestial bodies such as planets, asteroids and comets are more difficult to classify since by their nature, all these bodies do move.[63] Analogous to the test or distinction between movables and immovables on Earth, the consideration will most probably be if man is able to move any of these bodies outside of their normal orbits or trajectories. This would mean that for the moment only very small asteroids would be movable. Larger objects would be immovable. In other words, the question will be whether any object in space is movable by man or not. Even though they move by themselves, the fact that man cannot influence or change this movement will designate them as "celestial immovables". For example, if one of the mining companies were successful in catching an asteroid and bringing it back to Earth, then that asteroid will be considered movable. At the same time, larger asteroids that cannot be redirected or manipulated by Man will be regarded as immovable.

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60 See generally: Van der Merwe and De Waal *Law of Things* 15; Badenhorst, Pienaar and Mostert *Silberberg and Schoeman's Law of Property* 21; Van der Merwe *Sakereg* 27.

61 See Deep Space Industries 2015 http://deepspaceindustries.com.

62 See generally: Van der Merwe *Sakereg* 39; Badenhorst, Pienaar and Mostert *Silberberg and Schoeman's Law of Property* 34-39.

63 Also see the example given above with regard to the independence of pieces of an asteroid.

3 Property questions relating to virtual property

3.1 Introduction

Virtual property[64] in the wide sense refers to a broad category of intangible and immaterial property objects that can be regarded as objects of real world property law. Examples include website addresses, email addresses, bank accounts, stocks, options and derivatives.[65] It also includes digital goods, such as digital versions of books (e-books), computer or smartphone programmes or applications (apps), television series and movies, as well as digital music (albums and tracks) as objects of virtual property.[66] The term virtual property is also often used in the narrow sense to refer to property found in virtual worlds.[67] This includes virtual or digital objects found inside such virtual worlds, as well as property objects and rights that relate to a virtual world. For example, a player's virtual world account serves as a single object of virtual property that represents the total patrimonial worth of everything contained in that account.

If one considers that the field of virtual property is much newer than the one of property in space, then it comes as a surprise that a considerable amount of academic research has already been devoted to virtual property.[68] Analogous to the technological developments in space science, virtual property has kept pace with the rapidly developing technologies associated with computers and the internet.[69] While initially only appearing in academic works as musings relating to scientific aspects of computer science, gaming and sociology, the property aspects of virtual worlds are

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64 See in general: Fairfield 2005 *BUL Rev* 1052-1058; Lastowka and Hunter 2004 *CLR* 29-40; Erlank 2015 *PER/PELJ.*

65 See Van Erp "Servitudes" 4; Fairfield 2005 *BUL Rev* 1049, 1055; Erlank "Virtual Property" 10.

66 Erlank 2013 *EPLJ* 194-195, 198, 200-207, 209-212.

67 Virtual worlds can be described in plain, everyday language as an alternative non-physical world, in contrast to the real, physical world we live in. See Erlank *Property in Virtual Worlds* 46. For a broad background about virtual property see Fairfield 2005 *BUL Rev*; Blazer 2006 *Pierce LR*; Deenihan 2008 http://ssrn.com/abstract=1113402; Lastowka and Hunter 2004 *CLR*; Erlank *Property in Virtual Worlds*.

68 See for example Deenihan 2008 http://ssrn.com/abstract=1113402 7, where the academic treatment of virtual worlds as a research area is investigated.

69 See Lastowka and Hunter 2004 *CLR* 14-29 and Erlank *Property in Virtual Worlds* 18-46 for a discussion about the history and development of virtual worlds, since the development of virtual property is inherently tied to that of the virtual worlds where most virtual property is found.

now discussed as subsets of contract and intellectual property law and eventually as a subset of property law.[70]

With this background in mind, it should come as no surprise that the academic discussions and legal arguments about virtual property have resulted in some very interesting questions that arise when trying to define virtual property as objects of real world property. A number of these are discussed below.

3.2 Is ownership prohibited?

As alluded to in the introduction above, virtual property has been discussed and dealt with under both contract and intellectual property law in the past.[71] The reason for this stems from the fact that virtual property has in the past not been viewed as discrete objects of property (or things), but rather as incidental aspects derived from participating in a virtual world or a similar internet based service.[72] This is facilitated by means of a contract in the form of an End User Licence Agreement (EULA) or something similar, where the provision and use of virtual property was initially often described as a service based not on property and aspects of ownership but rather on a limited licence to use.[73] As a result of this, when virtual objects were encountered inside a virtual world or in the form of a digital object such as an e-book, the argument was that similarities to real world property were incidental and that no user could obtain property or ownership rights in any digital objects.[74] This was in spite of the fact that these digital objects resembled or functioned in the same manner as real world objects. The EULA therefore had a similar stifling effect[75] on property rights in virtual worlds as the international conventions had in prohibiting ownership in space.

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70 While there are still many overlaps between the fields, it is becoming clearer that objects of virtual property will more readily benefit from strong property protection instead of the weak contractual-based protection that it had in the past. See Fairfield 2005 *BUL Rev* 1050; Blazer 2006 *Pierce LR* 137-139; Erlank *Property in Virtual Worlds* 258-264; and Fairfield 2007 *McGill LJ* 434.

71 Fairfield 2005 *BUL Rev* 1050.

72 Fairfield 2005 *BUL Rev* 1050 (usually contractually licenced use rights); Yoon 2004 http://ssrn.com/abstract=1113327 6, 31.

73 See in general: Fairfield 2007 *McGill LJ* 429, 432; Miller 2003 *Rev Litig* 435-447; Edelmann 2005 http://www.digra.org:8080/Plone/dl/db/06278.45351.pdf 4; Denapolis 2005 http://ssrn.com/abstract=1154234 10.

74 (Contractually based on one-sided EULAs).

75 Fairfield 2007 *McGill LJ* 432.

However, by attempting to prevent users from acquiring property rights in digital objects, developers of virtual worlds and publishers of digital content such as e-books acknowledge that one cannot deny the creation of property rights in digital objects. While initially denying that property existed in any of the provided "services", the developers and publishers started to acknowledge the existence of the property rights by moving from phrasing that negated property rights in the EULA's to phrasings of retention of title. Thus, while initially stating that there was no property inside the virtual world, the phrasing changed to say that no property rights would be transferred to the user.[76]

Unfortunately (for the content providers), if it walks like a duck and talks like a duck, then it is a duck, even if one denies the fact. Eventually it became clear that there was a need for users to have property rights and interests in their perceived virtual property, even if such property rights were denied by means of contract. The fact that developers and publishers invariably market and promote their virtual worlds or digital goods by means of reference to property in the real world also had the added effect that the broad virtual-object-using public has become more and more vocal about demanding property rights in "their" digital objects. For example, if a developer designs a virtual world such as *Everquest* or *Second Life*, where one of the main selling features is a developed property system that facilitates the creation and trade of digital goods,[77] then it is not surprising that users will claim property rights. The same goes for the publishers of digital books and music albums. If one uses words such as "buy", "sell", "book", "album", "your", "library", "bookshelf" (amongst others), then one should not be surprised that the buying public will not take kindly to being told that the e-books they bought are not theirs and that they have only a limited licence to use such books at the behest and whims of the publishers.[78]

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76 Fairfield 2007 *McGill LJ* 436-436; Erlank *Property in Virtual Worlds* 102.

77 Lastowka and Hunter 2004 *NY L Sch L Rev* 312.

78 See for example Erlank 2013 *EPLJ* 200-202 for a discussion about how Amazon decided to unilaterally remove a bought version of George Orwell's 1984 from the Kindles (e-readers) of owners.

The following example illustrates how customers perceive buying virtual property and why they expect ownership instead of contractual licences. When one wishes to watch a new blockbuster movie available digitally on one of the main electronic stores such as Google Play, or Apple iTunes, one has the option to either buy the movie outright (which implies ownership) or rent it for a limited time (which implies a limited contractual right to use). It is clearly disingenuous of these sellers to then turn around, point to the EULAs and argue that the movie that was bought (sold) outright is not one's property. One only has a limited licence to use the movie that one bought for the same price as a physical copy in a real world store – even though the sellers charge on average four times more for the buying versus the renting. Consumers expect and deserve ownership of their digital movies, but not of the associated intellectual property rights.

It has since become clear that it is possible for users to claim property rights in digital objects.[79] However, due to a number of idiosyncratic issues relating to cyberspace and the virtual and digital nature of virtual property, these claims of having property rights cannot, will not, and should not always be recognised as objects of real world property law.[80]

These issues will be discussed in the following sections by looking at the questions of whether virtual property objects exist and if so, how they can be described in terms of property law by reference to the characteristics of things. This finally leads to the question of whether such property should be protected, even if it is capable of being classified and accepted as objects of property law.

3.3 Does virtual property exist? The tangibility problem

While the trouble with property in space is that even though it is clearly "there", there is always the question of whether anyone can get to it. The trouble with virtual

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79 One of the ways in which this occurs is if the digital object exhibits a number of pre-defined characteristics or *essentialia*. This is discussed in more detail in Erlank 2013 *EPLJ* 208-209.

80 These issues are discussed in detail in Bartle 2004 http://www.themis-group.com/uploads/Pitfalls%20of%20Virtual%20Property.pdf 1-23; Erlank *Property in Virtual Worlds* 188-210; Deenihan 2008 http://ssrn.com/abstract=1113402 1-2, 10-12.

property is that there is always a question of whether such property actually exists. This is the reason for the "virtual" in virtual property. Since the objects do not exist in tangible form in the real world, they are considered to exist virtually in one digital form or another, inside cyber space.[81] Essentially, they can be described as immaterial objects. However, this does not mean that they are restricted to being objects of intellectual property law. While there are almost always certain intellectual property rights that attach to objects of virtual property, the virtual objects themselves are considered to be discrete immaterial objects of real world property law.[82] While similar to other forms of immaterial property such as bank accounts, stocks and derivatives, objects of virtual property tend to mimic real world tangible objects and tend to follow the form and function of real world things. This is especially true of property found inside virtual worlds. For example, while a chair in the real world is destined (in terms of manufacturing and eventual use) to be used by a person to sit on, a virtual chair located in a virtual world is destined to be used by an avatar to sit on.[83] As such it is possible to refer to such chairs as being (in)tangible objects since while they are intangible in the real world, they are tangible inside the virtual world.[84]

As with objects located in outer space, it is once again beneficial to test whether these objects can be considered property by means of reference to the characteristics of a thing.[85] Like objects located in outer space, the unique nature of the virtual world and

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81 The concepts of "cyber space", "the internet" and "the cloud" can be used interchangeably. They are similar in that they represent a place where information (data) is stored "online," and where the interaction with such data happens by means of some device that acts as remote intermediary between the data and the user.

82 Erlank 2013 *EPLJ* 210.

83 For more examples see Erlank *Property in Virtual Worlds* 280-281.

84 To put it differently, "[w]hen I apply the characteristic of corporeality to virtual world things I define them as (in)corporeal due to the fact that they are not regarded as corporeal in terms of real world physics, but they are regarded as being corporeal or tangible by virtual world players". Erlank *Property in Virtual Worlds* 287 fn 259.

85 An alternative way of describing virtual property is by reference to a more Anglo-American orientated set of characteristics. Note that this applies to virtual property in the broadest sense of the word. These are the characteristics of Rivalrousness/Excludability; Persistence, and Interconnectivity. In addition to these three core characteristics, two more are sometimes discussed, being secondary markets, and value-added by users. See Fairfield 2005 *BUL Rev* 1053; Blazer 2006 *Pierce LR* 143; Erlank *Property in Virtual Worlds* 272-285. However, for the purposes of this article the focus will be on the characteristics of virtual things.

or cyber environment necessitates that allowances be made when describing virtual things by reference to the characteristics of real world things.

The first characteristic[86] is once again corporeality, with the accompanying question of whether a virtual object is corporeal or incorporeal. In a virtual world, virtual items are represented in terms of the space that they occupy and they can be seen in the position they are occupying that space. It can also be argued that a user can touch a virtual thing and exert physical control over it by means of controlling his or her avatar. In other words, the user is interacting with and "touching" the virtual thing by means of the avatar as proxy.[87] It can also be argued that the user is (like someone in space) constrained to indirect manipulation of the object. In this case, it will be through the interface of a keyboard and mouse instead of a space suit or remote controlled vehicle. As the levels of immersion[88] in virtual worlds increase, this requirement of corporeality will become less of an issue.

Finally, it is important to note that, as with property in outer space, incorporeality does not disqualify a virtual object from being classified as an object of virtual property or real world property. Rather, as long as the doctrinal requirement of the tangibility of things is still present in a legal system, virtual property should be classified as an intangible thing that is recognised as an exception to the rule.[89] This will follow the precedent set by the recognition of other intangible things in South African law.

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86 Erlank *Property in Virtual Worlds* 278.

87 In the sense of this technology, the "proxy" will of course not be a person – but an impersonal electronic agent acting like a human proxy.

88 Immersion is an important factor to take into consideration. Making use of such technologies as virtual reality (VR) that are designed to make the user believe in the "reality" of the virtual environment will also make the user believe that he or she is really touching and feeling a virtual object. The same technology can be used (and is already used to a certain extent) when remotely operating robots and other vehicles in space. While the technology is not so mature as to introduce a Matrix (the movie)-like illusion, progress is being made. For more on immersion and the associated suspension of disbelief see Erlank *Property in Virtual Worlds* 43-46, 201; Erlank 2015 *PER/PELJ.*

89 In fact, that does not disqualify it from being regarded as a virtual thing or even a real world thing. It is just another factor to take into consideration when describing the unique characteristics of the virtual object. Erlank *Property in Virtual Worlds* 287.

The second characteristic of something being of an impersonal nature and external to a person[90] is slightly more relevant to virtual property than to property in space. This is because avatars are often regarded as being extremely closely related to the users that they represent inside the virtual world.[91] In fact, users tend to identify themselves so closely with their avatars that there have been instances of (and some serious academic research done on) the phenomenon of virtual rape of avatars.[92] There is also a move for the recognition of avatars' personality rights – where avatars in virtual worlds are described as being cyborgs.[93] However, even with this possibly changing scenario in mind, the current situation is still that while closely related to the users that create and control them, avatars and their associated bodies and components thereof are frequently traded, sold, bartered altered and destroyed. As such, they are regarded as being both objects and subjects of virtual property. The same goes for the fact that slavery is rife in virtual worlds, with many users happily subjecting themselves (by means of their avatars) to enslavement.[94] In this aspect, the virtual world clearly differs from the real one, where human beings are not regarded as objects of property anymore.

In the virtual world, the third characteristic of independence is provided by the (programming) code that separates and rebuilds the individual bits of code into recognisable and manageable entities that are recognisable as virtual objects.[95] When data is transferred from the storage server and recreated into identifiable things on the screen, the independence of the virtual item is attained.[96] This independent object

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90 When dealing with virtual property inside virtual worlds, one can also refer to this characteristic as being external to avatars. Erlank *Property in Virtual Worlds* 288-289.

91 Lastowka and Hunter 2004 *CLR* 65.

92 See Dibbel 1994 *Ann Surv Am L* 471; Lastowka and Hunter 2004 *NY L Sch L Rev* 294-295; Lastowka and Hunter 2004 *CLR* 67-68.

93 Lastowka and Hunter 2004 *CLR* 63-72. A cyborg can be described as the "mechanical extension of one's persona". See Lastowka and Hunter 2004 *CLR* 49.

94 This is often linked but not limited to sexual role-play and fantasies. See Wagner 2007 http://www.informationweek.com/news/software/hosted/showArticle.jhtml?articleID=199701944 . Some virtual worlds include feudal-type role-play and associated property systems – where, curiously enough, not everyone wants to be a feudal lord, and many choose to be serfs. See Lastowka and Hunter 2004 *CLR* 33 fn 161.

95 Erlank *Property in Virtual Worlds* 290.

96 While many digital objects are exactly similar to one another and can be recreated and copied *ad infinitum*, each (apparently identical) object still needs to have a unique discrete identifier and associated attributes in the virtual world's database. At the very least, items that are

is then imported into the virtual world either as a feature of the virtual landscape, or as an item lying around as *res nullius*, *res derelictae* or carried around by wild beasts.[97] The idea behind most virtual objects is that they should at one stage or another be acquired by a player's avatar as a possession.[98] Many virtual worlds are designed in such a manner that, as in the real world, things like running water, crops and minerals are not initially considered to be independent. They are designed to be separated by an avatar into manageable and independent entities, as would be the case with mining, harvesting, or the bottling of water in the virtual world.[99]

The fourth characteristic of appropriability[100] / susceptibility to human control is once again an important one. As with real world things, a virtual thing should also be a thing that could be subjected to human control. Virtual things are by their nature controlled by a computer, although the software enables the player to manipulate his or her avatar and virtual items in real time in the same way as would be possible in the real world.[101] Most virtual world items are explicitly designed (from a code level) to be appropriable and susceptible to control by avatars. Many items are also subject to decay and wear and tear – thereby stimulating the in-world economy and motivating users to create and acquire new virtual objects.[102] The only exclusions would be so-called communal areas or buildings that are provided as background scenery or essential infrastructure to the game and as such are not appropriable by an avatar.[103] Other examples in the virtual world mirror those in the real world and

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indistinguishable from one another will differ in terms of their unique identifier, their (spatial) location inside the virtual world, and certain other attributes, such as whether the object is owned or possessed and by whom, whether it is interactive (destructible), and whether it is subject to wear and tear or decay.

97 Assuming for the purposes of the discussion that the object is indeed a thing – virtual or not.

98 In most virtual worlds, possession equals ownership (at least inside the virtual world).

99 See for example Lastowka and Hunter 2004 *CLR* 47 fn 246, where a process of new-item creation by means of an avatar is explained.

100 For a more detailed discussion about the acquisition of property inside virtual worlds see Erlank 2013 *De Jure* 775.

101 In this case, it would indirectly be subjected to human control and directly subjected to avatar control.

102 See for example the *Ultima Online Playguide,* which explains this very well. Ultima Online 2010 http://www.uoherald.com/node/216.

103 Objects that are not regarded as things would be most non-interactive objects. Generally speaking, if an object in a virtual world is non-interactive, that means that it is not subject to avatar control and therefore will not be classified as a virtual thing. An example of this would be a building in a virtual town that was created and coded into the virtual world with the sole purpose of being a

include objects such as the virtual sky, sea and planets. However, if any of these objects can be separated into manageable units and therefore subjected to avatar control, they could be regarded as virtual things.[104]

The fifth and final characteristic of a virtual object is being of use and value. Virtual property is normally associated with the considerable economic value that is contained in the virtual objects. Objects such as e-books, virtual swords and even complete virtual world user accounts are bought and sold using real world money. To put things into perspective, the 2007 estimated value of virtual world goods (excluding e-books and other wider categories of virtual property) was $20 Billion USD.[105] Apart from economic value, sentimental value is also recognised in virtual property.[106] Most virtual things are normally of use and value for an avatar where objects such as swords can be sold or traded for other objects, in virtual world currency or even real world currency. The sword can also have utilitarian use and value inside the virtual world – as a tool to fight with, or to cut down virtual trees. Finally, the ownership of virtual objects could confer on the owner a certain sought after status inside the virtual world – thereby having sentimental value without having any other financial or utilitarian use.

3.4 Should it be protected?

The final question to be addressed concerning the property aspects of objects found in virtual worlds (and virtual objects more broadly speaking) is whether an object of virtual property should in a given instance be recognised as an object of real world property, and protected as such.[107] While this can easily be answered in the affirmative

non-functional piece of scenery. Other examples of this include town commons, developer-controlled taverns, municipal buildings, bridges and road infrastructure, to name but a few. Erlank *Property in Virtual Worlds* 290.

104 An example of this would be a virtual world where one of the goals of the game was to take control of a whole planet in a galactic war. In that case, the player and her avatar could indeed exert control over the planet and make use of it. For the purposes of that virtual world, a planet would qualify as a thing.

105 See Erlank 2015 *PER/PELJ*.

106 Erlank *Property in Virtual Worlds* 292.

107 For more on the problems of recognition and enforcement, see Erlank *Property in Virtual Worlds* 182-188.

when addressing virtual property in the wide sense, such as with e-books and digital music, the opposite seems to be true when it comes to property inside virtual worlds, and this section will therefore focus on property inside virtual worlds. This does not mean that virtual objects in virtual worlds should not receive property protection, but rather that for some of the reasons discussed below, the instances where real world property recognition will be given will depend on a number of very specific factors.

One of the biggest[108] concerns when dealing with property rights in virtual worlds stems from the problem of game conceit.[109] Essentially this refers to the fact that very often a virtual world is designed as a game (or for clear entertainment purposes), and therefore recognising all the virtual property contained therein and giving it real world protection would make the reason for the existence of the game falls away. This can be explained by analogy with reference to a board game such as Monopoly.[110] While there is clearly an exchange of (imaginary) property inside the game associated with buying and selling as well as with the transfer of both property and money, it would clearly be ludicrous to institute court proceedings for the transfer of property in a Monopoly game when one of the players cheats. It is just a game and therefore does not have any real world property effect. The same applies to virtual worlds.[111] Courts will not and should not recognise claims for the protection of property inside virtual worlds, where there is no real world property effect. It would once again be ludicrous for one user to institute the *rei vindicatio* against another user because he or she stole his or her virtual property as part of the game-play. For example, certain virtual worlds have built in classes of avatars such as "warlocks", "mages", "healers" and "thieves". It follows that part of the game-conceit is that the theft of objects by one user from

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108 The general arguments or concerns about recognising virtual property in the real word are described by Bartle, who notes the following areas of concern or what he refers to as pitfalls. The first relates to uncertainty about the definition of virtual property, the second is responsibility incurred by the developer of a virtual world, the third relates to the game conceit (discussed below), the fourth refers to player resentment, and the final one relates to questions about intellectual property. See Bartle 2004 http://www.themis-group.com/uploads/Pitfalls%20of%20Virtual%20Property.pdf 1-23.

109 Bartle 2004 http://www.themis-group.com/uploads/Pitfalls%20of%20Virtual%20Property.pdf 13-16; Erlank *Property in Virtual Worlds* 201. See also Camp 2007 *Hastings LJ* 60.

110 See also Bartle 2004 http://www.themis-group.com/uploads/Pitfalls%20of%20Virtual%20Property.pdf 4.

111 Erlank *Property in Virtual Worlds* 401-402.

another is not only endorsed but also encouraged.[112] To allow for the return of such virtual property by means of the *rei vindicatio* would clearly not be logical and therefore in the case where pure game-conceit is concerned, no real world property rights should be accorded to the stolen property.

However, there are instances where there is a cross-boundary[113] effect between the real and virtual worlds.[114] If one user were to force another user in the real world to transfer virtual property from one avatar to another, or steal another user's virtual property by means of hacking, then the theft of the virtual property clearly occurred outside of the game conceit.[115] In such cases, the virtual property should be recognised as objects of real world property and protected as such.

There is a final and associated means of determining whether virtual property should be protected, which is by looking at some of the normative reasons for accepting the ownership of virtual property. This is closely associated with the characteristics of use and the value of things, as discussed above. The three main normative justifications used to argue for the recognition and protection of virtual property are the Utilitarian justification of Bentham,[116] Locke's labour theory[117] and Radin's personality theory.[118] All three of these theories can be used to justify the recognition and protection of virtual property (in both the narrow and the wide sense) – when taking into account that they will need to be interpreted to address the unique nature of virtual property. Essentially the arguments can be reduced to the following. In terms of the Utilitarian justification, virtual property has economic value and as such should be protected. In

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112 Lastowka and Hunter 2004 *NY L Sch L Rev* 309.

113 "Cross-boundary" and its synonym "cross-barrier" refer to the conceptual barrier between the real and the virtual worlds. As soon as an action in a virtual world has a real world effect, then there is a cross-barrier effect. For example, if a user were to sell a virtual object to another user inside the virtual world and pay for it with virtual currency inside the virtual world, then there would be no cross-barrier effect. If, however, the payment were to be done with real money in the real world, then there would be a cross-boundary effect. See in general Erlank *Property in Virtual Words* 265-268..

114 Fairfield 2005 *BUL Rev* 1084-1089

115 And has a cross-barrier / boundary effect.

116 Burns and Hart *Bentham: Introduction to the Principles of Morals*; Erlank *Property in Virtual Worlds* 157.

117 Laslett *Locke: Two Treatises*; Erlank *Property in Virtual Worlds* 144.

118 Radin 1982 *Stan L Rev* based on Hegel *Hegel's Philosophy of Right*; Erlank *Property in Virtual Worlds* 165.

terms of Locke's labour theory, since users expend time and effort (and money) to acquire and sometimes create their virtual property, it should be protected. Finally, in terms of Radin's personality theory, since virtual property has personal and sentimental value, it should be protected.

In conclusion, the answer to the question posed above, of whether virtual property should or should not be protected, is unclear and must always be answered by starting with "it depends". It will depend on a large number of factors as alluded to above, and in most cases will have to be decided on an *ad hoc* basis taking into account the specific circumstances of each case.

5 Conclusion

It is clear that the new and rapidly developing fields of property in outer space and virtual property raise many property related questions. They share some commonalities, such as the fact that the location of the property in their respective spaces leads to a number of specific and idiosyncratic issues that have to be focussed on when dealing with any property question. In addition this leads to their sharing many of the same fundamental questions, such as does property exist in these areas? Can one acquire property in these areas? Could, would and should property be recognised in these areas and be protected? How does one reach and control such property?

While the discussions above are not exhaustive of the property law issues related to these new fields, they do illustrate some interesting aspects of how new technological, scientific and societal developments over the past few years have resulted in the need for and creation of new fields of property law. They also underline the fact that while a lot of academic scholarship has been done in these fields in the past few years, there is still much that need to be done before the law and especially property law can catch up with the current developments. The fact that the technological, scientific and societal reasons for the development of these new fields of law continues to evolve rapidly underscores how much more legal research will be needed in the future to try to keep up with even more new developments. As such, the next 50 years in the

Faculty of Law should see some interesting research, and possibly lead to the development of new fields of property law that cannot be envisioned today.

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LIST OF ABBREVIATIONS

Ann Surv Am L	Annual Survey of American Law
Apps	(Computer or Mobile) Applications
BUL Rev	Boston University Law Review
CLJ	Cambridge Law Journal
CLR	California Law Review
Denv J Int'l L & Pol'y	Denver Journal of International Law and Policy
E-book	Electronic Book
EPLJ	European Property Law Journal
EULA	End User Licence Agreement
Hastings LJ	Hastings Law Journal
ILSA J Int'l & Comp L	ILSA Journal of International and Comparative Law
ISS	International Space Station
J Air L & Com	Journal of Air Law and Commerce
J Space L	Journal of Space Law
JICLT	Journal of International Commercial Law and Technology
JTIP	Tulane Journal of Technology and Intellectual Property
McGill LJ	McGill Law Journal
NASA	National Aeronautics and Space Administration
NY L Sch L Rev	New York Law School Law Review

PER/PELJ	Potchefstroom Elektroniese Regstydskrif / Potchefstroom Electronic Law Journal
Pierce LR	Pierce Law Review
Regent J Int'l L	Regent Journal of International Law
Rev Litig	Review of Litigation
SSRN	Social Sciences Research Network
St Louis U LJ	Saint Louis University Law Journal
Stanford Law Review	Stan L Rev
Vanderbilt J Transnat'l L	Vanderbilt Journal of Transnational Law
VR	Virtual Reality