

INTELLECTUAL PROPERTY LAW IN THE COLONIZATION OF MARS

Kunike Khera*

Abstract

Mars is one the eight planets in the solar system and is telluric in nature. Owing to its atmospheric lining, gravity and other resources, the researchers and astrophysicists believe 'the Red Planet' to be capable of sustaining life and, as probably the best shot to colonize any another astronomical body in the universe at the present moment. In the light of the current endeavours and developments, the same is no longer a distant dream. But as the several space agencies and institutes around the globe are making this a reality, a major issue remains undebated: The absence of intellectual property (IP) law in the expedition and how it can assist the whole mission in becoming a success.¹ The present articles shall deal with the current developments in the 'Mission to Mars' along with how the various Intellectual Property laws and policies can play a significant role in its triumph. The research work discusses how various IP mechanisms such as crowd funding and brand funding can be utilised to facilitate the Mars-colonisation project. The author has also attempted to incorporate the game theory in understanding the effectiveness of sharing trade secrets, among government space agencies around the world, for ensuring greater success rates of attempts at Mars exploration and settlement. The research contemplates usage of intellectual property not just to reach the planet; but also, to aid and assist in the settlement and future sustenance of life there. The concepts of Three-Dimensional Printing and international patenting regime are suggested in that regard. To summarize, this whole new arena of space and intellectual property law has remained untapped for the longest time. The author has attempted to combine the two in the spirit of advancing technological development through theoretical and juridical assistance.

"I have always dreamt of humans leveraging science and technology to break the shackles imposed by the speed of light and spreading to every corner of the known universe. Colonising Mars is the first baby step towards it."

-Ramgopal Vallath

*5 th Year Law Student, Army Institute of Law, Mohali, khera.kunika@gmail.com.

¹ Dr. Amir H. Khoury, *Intellectual Property and the Red Planet*, 1 NORTH CAROLINA JOURNAL OF LAW & TECHNOLOGY 337, 392 (2017).

Introduction

The human mission to the Red Planet is no longer an issue of ‘if’ but more of ‘when’ and ‘how soon.’² Since the 19th century, the space experts and academicians have been developing proposals to utilize the resources of the planet and eventually, settling there. The reason behind that the space agency’s does believe that Mars is the best option for settlement is its similarity to the Earth. It is almost half its size, has microgravity as well as some traces of water on its surface.³ A day on Mars is also almost the same as the Earths’. Apart from the physical conveniences, the technological advances and the uncertainties with regard to future of humanity on Earth also act as driving forces behind this expedition. The same would also help in answering the biggest question; that is, can life exist other than on our planet Earth? Wernher von Braun was probably the first man who headed a detailed research on humans to Mars in his publication, *Das Marsprojekt*. The book described a comprehensive and meticulous plan of around 70 members going to Mars for a period of 443 days in 10 spacecrafts.⁴ The plan may not have materialised as envisioned by Braun, however, it started a chain of events that has shaped the space exploration as we know today. From 1960, there has been 56 missions organised all over the world; and only 26 have been successful.⁵ Out of the 56, the Mars spacecraft attempts to explore the planet have been 48 as per the statistics released by National Aeronautics and Space Agency (NASA).⁶ This clearly indicates towards the difficulty in reaching and gaining access to the planet. The NASA as part of its goals under the NASA Authorization Act, 2010 and the United States Space Policy Act, 2010⁷ has targeted to send humans to Mars by the 2030s.⁸ The Agency aims to organize a robotic mission, the Orion spacecraft launched by Space Launch System (SLS) to study the asteroid in the 2020s and return back with samples.⁹ Apart from NASA, there are several other institutions around the world, both the Governmental and Private, endeavouring to make the operation a reality. SpaceX was founded by tech entrepreneur, Elon Musk with the goal of colonizing Mars in the next 50 years. According to Musk, the plans for settlement of Mars, goes beyond the SpaceX projects and would require participation from various financial

² *Ibid.*

³ *Mars: In Depth* (Feb. 20, 2019), <https://solarsystem.nasa.gov/planets/mars/in-depth/>.

⁴ Wernher von Braun, *The Mars Project*, 3 UNIVERSITY OF ILLINOIS PRESS (Feb. 20, 2019).

⁵ Ed Oswald, *All past, present and future missions to Mars* (Feb. 20, 2019), <https://www.digitaltrends.com/cool-tech/future-mars-missions/>.

⁶ Siddiqi Asif, A. *Beyond Earth: A Chronicle of Deep Space Exploration*, NASA HISTORY PROGRAM OFFICE (Feb. 20, 2019), <https://lccn.loc.gov/2017058675>.

⁷ *Presidential Policy Directive 4 (PPD-4)*, HOMELAND SECURITY DIGITAL LIBRARY (Feb. 20, 2019), <https://www.hsdl.org/c/help/citing-resources/>.

⁸ *Policy Documents*, NASA (Feb.20, 2019), <https://www.nasa.gov/offices/olia/policydocs/index.html>.

⁹ *Ibid.*

partners including men, companies and governments.¹⁰ Various other governmental institutions such as Russia's Roscosmos, China National Space Administration, European Space Agency and Indian Space Research Organisation have been making several strides in pursuance of making Mars more accessible and reachable. However, it is humbly submitted that the operation to Mars would be very difficult, if not impossible, unless all of these organisations collaborate on an international forum to bring this scientific ambition into motion.

The Role of IP Laws in Aiding Colonization of Mars

The Intellectual Property Rights, as defined by the World Trade Organisation, means rights that a person has over "creations of his mind."¹¹ Thus, IP Laws ensure the protection of enforcement of these rights over one's ideas, inventions, designs, discoveries and other technological developments. From one perspective, the scope of IP Laws may be believed to be restricted to promoting individual self-interest for financial gains. However, another way of looking at the IP system highlights the role it plays in expanding the reach of new innovations and findings. Considering the latter view, the IP system can have a huge part in assisting the mission to Mars. The following sections delve deeper into how intellectual property can find a place in operation of settlement on the Red Planet.

Financing the Mission

One of the biggest challenges that the project faces is the financial expenses. While the technology required to reach Mars in itself would cost billions, the amount and resources vital for settlement itself would be humongous. According to Pascal Lee, the operation for sending a single person to Mars could reach up to \$1 trillion, spread over the next 25 years. The colonization would require several resources for making the planet liveable. Great strides in technology and infrastructure would be essential for this. For example, a excessive volume of fuel would be needed; that would essentially require protection against the temperature variabilities regularly to prevent any explosion.¹² Another major challenge is the colony sustainability itself. Lack of basic resources such as water, oxygen, gravity and other resources make the task of settling tougher.¹³ Thus, we can conclude that the dream of reaching Mars is far from easy, and definitely not cheap. Following this realisation, the question arises how the government or the private institutions can accumulate such a sum?

¹⁰ Eric Berger, *Musk's Mars moment* (Feb. 20, 2019), <https://arstechnica.com/science/2016/09/musks-mars-moment-audacity-madness-brilliance-or-maybe-all-three>.

¹¹ *What are IPRS?* WTO (Feb.20, 2019), https://www.wto.org/english/tratop_e/trips_e/intel1_e.htm.

¹² *supra* note 1.

¹³ Donald Rapp, *Mars Life Support Systems*, THE INTERNATIONAL JOURNAL OF MARS SCIENCE AND EXPLORATION 72,82 (2006).

A solution to this issue can be found in two concepts: (A) Crowdfunding and (B) Brand-funding.

Crowd-Funding

Crowd-funding refers to the process by which people finance a particular operation by accumulating money through various modes such as online websites, fundraisers etc. This machinery aids the founders of various ventures to find economic backing for their efforts by drawing small payments from a large number of people, without the involvement and intervention of financial intermediaries.¹⁴ According to Freeman and Nutting, the concept of crowd-Funding is nothing new and has been used for several years in exchange for equities in the company or the venture for which the contributions are being raised.¹⁵ Mars exploration and eventual, colonization would result in great technological advancements and discoveries. These developments would not only result in scientific benefits, but also yield commercial profits for the people on Earth in form IP rights. Thus, the citizens can be encouraged to contribute to the operation as an investment opportunity (in lieu of certain IP benefit) for ensuring financial patronage to the whole mission.

Brand-funding

Brand-funding is another mode of raising revenue. It could be considered an indirect method of crowd funding. This involves owners of certain brands sponsoring a particular venture in return of visibility of their brand on the final produce. The idea of brand-funding could really help in collection of massive amounts of finances. The kind of exposure that the mission would help the products receive is incomparable. For example, a product could find place on the spaceship *en route* to the Red Planet. This level of advertisement is what any product and its brand owner could ask for. This mechanism is not only limited to taking off but also to actual settlement on Mars. We must realize that the whole idea of the expedition has been to ensure another planet for human settlement. Thus, Mars is a new territory altogether and must be treated as such for various commercial enterprises and commodities. Licensing agreements on lone usage and shipment of goods and products to Mars would ensure a “planet-wide exclusivity” for the brands and protection of other IP rights and privileges for decades. The idea of being the first soap/shoes/or any other product to be used on Mars would tempt many huge corporations to back the endeavour. Hence, it is a rational and realistic assumption that

¹⁴ Ethan R. Mollick, *The Dynamics of Crowdfunding: An Exploratory Study*, 29 JOURNAL OF BUSINESS VENTURING. 1, 16 (Feb.20, 2019), <https://www.sciencedirect.com/science/article/pii/S088390261300058X>.

¹⁵ David M.Freedman & Matthew R. Nutting, *A Brief History of Crowd funding* (Feb.20, 2019), <http://www.freedman-chicago.com/ec4i/History-of-Crowdfunding.pdf>.

product owners would compete to participate in the mission.¹⁶ Brand auctioning can also be used to increase the money raised, where different corporate houses could bid for the top position. This idea is very much in line with patent auctions as well. Both the mechanisms of crowd and brand-funding, as powerful marketing and publicity tools, would not only bring enormous sums of monies, but also help in ultimately sharing the risk of what is probably the biggest project undertaken in the scientific history of mankind.

International Collaboration

The present section seeks to put up an alternate IP trade policy in pursuance of aiding the process of taking human to Mars. As mentioned before, the goal of reaching and settling on Mars cannot be done in isolation. It requires vast resources and technologies; which would be far easier, if the players would all join hands at an international level. Instead, numerous administrative and commercial organizations from all around the world are independently focusing on their respective Mars mission. As an outcome, it is not a surprise that they are all involved in a sort of what may be called as a ‘space-race’. Each is trying to outdo the other in hopes of being the first one to colonize the planet. In such a power struggle, it is predictable that a sense of secrecy is being created; that is to say, no institution would like to disclose their information and knowledge in fear of losing the ‘race’. This is where the concept of trade secrets comes in. Trade secrets refer to classified business information that a corporation seeks to protect against disclosure for a competitive edge. It includes all kinds of information such as commercial, production and business secrets.¹⁷ The main aim behind trade secrets is to thwart unfair competition and the same is regulated by the legal system or case-laws decided in the respective countries.¹⁸ However, it is humbly submitted that in respect to mission to the Mars, this approach would cause more harm than good. Adopting this method would diminish the possibilities of the expedition. The mission would be successful only with full cooperation and collaboration of everyone involved in the research. In relation to this, it is suggested we must adopt the idea of sharing of “negative trade secrets.” Negative trade secrets refer to the information about failures and mistakes of the experiments and research. They act as guide of what not to do.¹⁹ The financial implications and risks involved in the project Mars is far-reaching and wide. The whole project is complex

¹⁶ Robert Copeland et.al., *Understanding the Sport Sponsorship Process from a Corporate Perspective* 32,48.

¹⁷ *What is a Trade Secret?*, WIPO (Feb.20, 2019), https://www.wipo.int/sme/en/ip_business/trade_secrets/trade_secrets.htm.

¹⁸ John Richard Brady & Ors. v. Chemical Process Equipments., AIR 1987 Delhi 372.

¹⁹ Michael Rosen, *The role of ‘negative trade secrets’ in the Uber-Waymo settlement* (Feb.20, 2019), <http://www.aei.org/publication/the-role-of-negative-trade-secrets-in-the-uber-waymo-settlement/>.

and could impact those involved negatively on any failure.²⁰ Thus, disclosure of information pertaining to what one should not do shall prevent great losses that people may suffer for the same mistakes. As Amir Khoury said, “Placing such negative trade secrets in the public domain would essentially revitalize and invigorate entrepreneurship, research, and development.”²¹ To explain the point further, we could apply the game theory.

The Application of Game theory

The Game Theory is a tool, used in economics, to understand the future consequences through evaluation of different outcomes. It uses numerical patterns of dispute and agreement between intelligent reasonable decision-makers.²² Whether the theory works or not, it is an insightful way of reaching at logical solutions and predictions. In the present illustration, we shall take the example of two organizations involved in the research and development of the human colonization of Mars: Company X and Company Y. Now, both the companies have two choices: either share their negative trade secrets or not share them. The outcome would be different in varied scenarios.

The game is explained in the following payoff matrix.²³

| | COMPANY X: | |
|-------------------------------------|-------------------------------------|--------------------------------|
| COMPANY Y: | Not Sharing Negative Trades Secrets | Sharing Negative Trade Secrets |
| Not Sharing Negative Trades Secrets | 0,0 (D) | 8, -2 (B) |
| Sharing Negative Trade Secrets | -2,8 (C) | 4,4 (A) |

This illustration shows that if both the companies do not share their negative trade secrets, both do not suffer any loss or profit (0,0), which would mean the research would be stagnant and both would have to learn from their mistakes, risking many financial and other assets. If one company shares the information, the one sharing shall suffer a loss, while the other shall benefit from it [(8, -2), (-2,8)] and would protect its resources from not doing experiments that have already resulted in failure for the other company. And finally, if both companies

²⁰ Fredric Taylor, *The Scientific Exploration of Mars*, 253 CAMBRIDGE UNIVERSITY PRESS (Feb.20, 2019), https://assets.cambridge.org/97805218/29564/frontmatter/9780521829564_frontmatter.pdf.

²¹ Amir H. Khoury, *The Case Against the Protection of Negative Trade Secrets: Sisyphus' Entrepreneurship*, 54 THE INTELLECTUAL PROPERTY LAW REVIEW 432 (Feb.20, 2019) https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2964707.

²² 1, ROGER MYERSON, *The Game Theory: Analysis of Conflict* HARVARD UNIVERSITY PRESS (1st ed. 1997).

²³ Amir Khousry, *Intellectual Property and the Red Planet*, 1(2) NORTH CAROLINA JOURNAL OF LAW & TECHNOLOGY 337, 392(2017).

share the information, they would profit from the disclosure (4,4) as their time and funds would be prevented from being wasted and there are higher chances of success.

Thus, the decision taken by the companies would produce following different combinations:

Outcome A: Good for both Company X and Company Y.

Outcome B: Good for Company Y, but bad for Company X.

Outcome C: Bad for Company Y, but good for Company X.

Outcome D: Bad for both Company X and Company Y.

Considering the aforementioned results, we can conclude the following:

- Outcome A is best for both the companies. Thus, both must share the negative trade secrets. If there is full collaboration, this would ensure that no one is at a loss and both companies can benefit from the disclosure.
- Outcome B and C is hardly possible since no company would agree to divulge information about their failures without getting anything in return.
- Outcome D is not favourable for both companies as none of them would gain or lose from the bargain. Hence, they would have to find their way through a trial and error method which could result in huge costs and risks.

The theory concludes that the best results would be possible if the approach of sharing of negative trade secrets is adopted by all parties. It would be counter-productive for the researchers to replicate the mistakes of others. From the perspective of single business owner, not sharing data may seem like a more rational and convenient choice. However, the scientific costs cannot be overlooked. No secrets should be allowed when the aggregate social benefit is at risk. According to Lemly, protecting information that is for the welfare of the public defeats the purpose of the concept of trade secrets as an IP right.²⁴ It must be accepted that utmost importance is to be given to the Mars project and human progress, as one community, should be a priority over the personal interests of different countries and ventures. The operation requires adoption of a more inclusive IP regime than an exclusive one.

Development for Better Sustainability On The Planet

The real challenge of the human mission to Mars is the sustainability on the planet. This can be countered in two methods: easy access to technologies and inventions as well as ability to

²⁴ Mark, A. Lemly, *The Surprising Virtues of Treating Trade Secrets as IP Rights*, 61(2) Stanford Law Review, 311.

build infrastructure for survival on Mars. And IP laws can help in achieving both in the following ways:

Establishment of an International Patenting Regime

When humans would finally settle on Mars, they would be greatly dependent on the machineries and discoveries back on Earth. Such new ideas and innovations would be communicated from time to time and thus, would make the colonization more convenient and speedier. However, the current patent system tends to make the whole process supremely intricate. As we know, patents refer to an intellectual property right whereby a person obtains a license issued by an authority (generally, the government) bestowing the right of exclusivity over manufacturing, utilizing and selling of an invention.²⁵ The present patenting system is different in different countries. Each nation has a National Patent Office (NPO)²⁶ of their own, which is the regulatory body in respect to issuance, revocation and other matters relating to patents. Though the NPOs have been reasonably successful in regulating IP rights in their respective countries, it is humbly submitted that they have over the years hindered the growth of inventions and innovations. The standard form of business of the institution is no longer viable in today's world where global interdependence is the solution to social harmony and progress. We must realise that collective knowledge makes the knowledge more equitable and accessible.²⁷ To make technology easily accessible in the long run, it is proposed that a fresh international patenting regime must be introduced. As Margaret Chon in her paper proposed for a system of global IP laws "that is responsive to development paradigms that have moved far beyond simple utilitarian measures of social welfare."²⁸ Already comprehensive and detailed treaties are in place i.e., TRIPS and PCT. The PCT is the treaty that aims to accept and decide on applications of patents for members all around the world. Currently administered by the World Intellectual Property Organization (WIPO), the PCT allows citizens of any member state to get patent protection that would be recognized in all other member nations. The PCT has provided a cheaper and more efficient alternative to national patenting regime as it ensures exclusivity internationally. It has wider scope and affords the owner an opportunity to test the potential of the invention. The present statistics also show the rising trend of countries opting for PCT in recent years. In 1978, the PCT started off with mere 18 contracting nations; but now as of February 2019, the number has

²⁵ *What is a Patent?*, WIPO (Feb.20, 2019), <https://www.wipo.int/patents/en/>.

²⁶ *Country Profiles*, WIPO (Feb.20, 2019) <https://www.wipo.int/directory/en/>.

²⁷ Gregorio Giménez, *The impact of the patent system on the social welfare: A critical view*, 14 INTANGIBLE CAPITAL (Feb.20, 2019), <http://www.intangiblecapital.org/index.php/ic/article/view/789/707>.

²⁸ Margaret Chon, *Intellectual Property and the Development Divide*, 27 CARDOZO L. REV. 2821 (Feb.20, 2019), <https://digitalcommons.law.seattleu.edu/faculty/558>.

increased to 152 including India.²⁹ The growing shift towards the national interest and resistance towards the global patent system would be a huge blow to the evolution and ever-increasing character of new ideas, industries and technologies. The international patent regime would definitely contribute to social welfare. Though the PCT is a great step in this regard, it still suffers from major lacunas.³⁰ A new international patent system, that is more organized and harnessed with power to enhance consistency and regularity in the patent system, would aid in increasing the range of knowledge. And ultimately, would support the existence of life on Mars.

Manufacturing Through Three-Dimensional (3-D) Printing

Infrastructure is probably one of the first and foremost prerequisite for starting a new community and would also prove to be a hurdle for survival of life on Mars. A solution to this can be the technology of three-dimensional (3-D) printing. The technology of 3-D printing refers to a manufacturing process in which three-dimensional structures are made through digital records and files.³¹ This involves an additive process; whereby successive layers of material are laid down till the object itself is produced. These layers are usually “thinly sliced horizontal cross-sections”³² of the ultimate object. They not only replicate the structure of the object but also its functioning powers. In respect to use of 3-D printing for space exploration and endeavours, NASA has been using the technology to develop various parts of space launch system, which have proven to be more dependable and tougher than those developed by conventional modes of manufacture.³³ Though 3-D printing has been successfully used for manufacturing of objects on Earth, the real challenge is to reproduce the same result in the orbit in the absence of gravity. A US-based company, Made in Space, funded by NASA, has developed the first 3-D printer called *Archinaut*, that could function to produce large structures in space.³⁴ According to Mark A. Lemley, the concept of 3-D printing along with the internet, the engineering and the artificial biology can create a world without scarcity.³⁵ The process provides special machinery that ensures manufacturing of new objects is uncomplicated, affordable and expeditious. Various scholars have voiced their fears that 3-

²⁹ *List of PCT Contracting states*, WIPO (Feb.20, 2019), https://www.wipo.int/export/sites/www/pct/en/list_states.pdf.

³⁰ Vivek Wadhwa et al., *U.S.-Based Global Intellectual Property Creation*, KAUFFMAN FOUNDATION (2007).

³¹ *Supra* note 26.

³² *Ibid.*

³³ Catherine Jewell, *3-D Printing and the Future of Stuff*, WIPO MAGAZINE (Feb.20, 2019), https://www.wipo.int/wipo_magazine/en/2013/02/article_0004.html.

³⁴ *Archinaut*, MADE IN SPACE (Feb.20, 2019), <http://madeinspace.us/archinaut>.

³⁵ Mark A. Lemley, *IP in a World Without Scarcity* SSRN (Feb.20, 2019), <https://ssrn.com/abstract=2413974>.

D printing may have a negative impact on IP rights.³⁶ The process of 3-D printing allows for unauthorized replication of structures and designs that violates copyrights, patents etc. This in turn is believed to impact incentives for investing in businesses and innovations.

In light of this, it is humbly suggested that with intention of cultivating a sustainable life on the Red Planet, formulation of necessary regulations and laws must become a priority. The exploits of this vital tool for evolving infrastructure on a different planet altogether, where there is negligible gravity and almost zero resources, outweighs the minor, though legally recognized and significant, IP rights of people on Earth. Hence, encouraging 3-D printing for facilitating the colonization of Mars would prove to be highly beneficial and advantageous in the long haul.

Conclusion

Buzz Aldrin called the expedition to Mars “not as a destination but more a point of departure, one that places humankind on a trajectory to homestead Mars and become a two-planet species.”³⁷ It is just a matter of time when the Red Planet becomes colonized by humans. Technology and science are regarded as the two planks for its triumph; and law is believed to have taken a backseat. A change in the legal system, especially in the IP policies, may have a negligible affect in totality; however, the same can support the mission in the long run. The present paper seeks to suggest ways by which the IP law and rights would act as an instrument to increase the odds of success of this interplanetary vision. With the rising evolvment of technical know-how and scientific discoveries, a complete transformation and development of IP legal system would be a step towards societal welfare and health which is the ultimate end of the whole plan. The Mars Mission shall face many hurdles; but the inquisitive, intelligent and ever-agog minds of the scientists, astrophysicists and scholars will overcome them all and make the colonization of the Red Planet a reality.

³⁶ Ruth Jianga et al., *Predicting the future of additive manufacturing: A Delphi study on economic and societal implications of 3D printing for 2030*, 117 TECHNOLOGICAL FORECASTING AND SOCIAL CHANGE 84, 97(2017).

³⁷ Buzz Aldrin, *The Call of Mars*, *Opinion* THE NEW YORK TIMES (Feb.20, 2019), <https://www.nytimes.com/2013/06/14/opinion/global/buzz-aldrin-the-call-of-mars.html>.