

# Investment Financing of Exploration to New Worlds

## Historical Investment Financing of Exploration for New Worlds, Current Analogies to Other Industries, and Ideas for the Future.

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**Abstract.** How have expeditions of past exploration been financed? Do these historical explorations for new worlds provide any insights into how to finance future exploration of the Moon, Mars and new worlds yet to be decided upon? The purpose of this paper and this presentation is to discuss some of the history of exploration financing and how it relates to sources of financing available today. It will look at some specific expeditions to then New Worlds and at exploration in general. It will also comment on what investors are looking for and what needs to happen for the Space industry to attract their consistent attention. There are and have been many sources of funds, from investors, for exploration endeavors over the centuries. Some of these have been governments, as is the case with most lunar and space exploration to date. There have also been wealthy individuals and consortiums involved. Motivations have differed. Some exploration has been motivated by pursuit of profit while at other times it is the pursuit of knowledge, military conquest, defense, glory, adventure or the search for new worlds and territory for settlement. Competition, formal or unstated, has also had an impact on exploration success and exciting new examples of its importance to achievements are happening now. All these continue to be motivators today – though some more than others, - and which the motivator is, may determine the potential sources of financing.

Space exploration is much like early exploration for new territory, and the discovery of New Worlds. There are, however, other types of exploration as well. Industries other than Space have similar challenges as it relates to investment financing. Examples of creative financing techniques from industries such as Mining, Oil and Gas and Biotech will also be looked at to see if, and/or how, these strategies could be applied to the Space industry. What are the best investment vehicles needed to finance the exciting exploration ahead?

### EXPLORATION – A HISTORICAL PERSPECTIVE

Over the years there have been many explorers of our beautiful world. Some have made it into the history books, and others have not. How well they are remembered frequently has much to do with how well recorded (or verbally passed on) was the record of their travels. Of what is recorded, much more is of the trips and expeditions themselves than of how these excursions were financed. Following is a short summary of past exploration and some of the ways it was made possible.

## Past Exploration

Prior to the 15<sup>th</sup> Century, **trade** and the search for new sources of **natural resources** were the primary motivation for exploration, and with these excursions came **new settlements** as desirable sites were found, and colonies established. The monarchs of various nations commissioned some of these expeditions, but the traders themselves initiated and financed many others. The new colonies and settlements which resulted tended to maintain trading relationships with their founding nations and form a continuous part of the known world.

Alexander the Great is the most famous and remembered of Pre-Christian Era explorers, though most of us don't think of him as an "explorer" since his extensive travels were for **military conquest** and the goals of uniting and **creating a massive Empire**. However, he was responsible for gaining invaluable knowledge, opening trade and traffic between far-flung locations and spreading the use of Greek language and customs throughout Asia.

**Religion**, especially the desire to spread Christianity throughout the world, was also a motivator for many early explorers. Monks discovered the Faroe Islands and Iceland. Later rediscovered by the Vikings, Iceland became a stepping stone for Viking excursions to Greenland, Labrador and Newfoundland in the New World. These were motivated by the **curiosity and the sense of adventure** of Erik the Red during a period when he was under exile. He was followed later by his son and others in the early 11<sup>th</sup> century. These settlements did not survive long however.

In the 13<sup>th</sup> Century, Franciscan monks (first Giovanni di Piano Carpini and later Wilhelm von Rubruk) undertook voyages of **diplomacy** to Mongolia and the Courts of the great Khans. Powerful religious leaders, the Council of Lyon and Ludwig the Holy of Akkon, sponsored these respectively.

Merchant trading families also traveled extensively and explored new places (or old places with new eyes). They paid for their own travels, frequently trading enroute. The most famous of these was Marco Polo.

In the 14<sup>th</sup> Century, the Canary Islands were discovered several times, more Franciscan monks (Oderich of Porenone and later Marignolli) traveled to Asia. Arabic scholar and pilgrim Ibn Battuta journeyed to Beijing, India and later Sudan and the legendary city of Timbuktu. In his case, his travels were motivated by a **desire to travel** and, by comparison, to prove to himself the beauty and splendor of the Islamic Holy places.

Early in the 15<sup>th</sup> Century, a new theory suggests that a fleet of great ships was sent out by the Emperor of China which reached the New World, Antarctica and Australia. The ships and most of their logs were, however, destroyed upon their return to China due to a change in the political administration upon the death of Emperor Zhu Di and the resulting isolationist policy which ensued.

The 15<sup>th</sup> Century started a long period of intense exploration. Prince Henry the Navigator, of Portugal, initiated this with the creation of a Nautical Academy to help create a seafaring Portuguese Empire. He sent out explorers and founded colonies. The motivation of Portugal was a mixture of **national prestige**, **power** and the opening of new **trade routes** for spices from India that would by-pass the Islamic Arabs who were acting as middlemen in the trade with Asia. The Portuguese explored much of Africa, as they tried to find another route to India, creating substantial trade in gold, wheat and African slaves. In the process of these trips, they also found Brazil and other parts of South America and explored it extensively. Some of the more famous

Portuguese explorers were: N. Tristao, L. Goncalves and Diniz Diaz during Henry's time; later Fernao de Pao, Diego Cao, Bartholomeu Diaz, Pero da Covilha, Pedro de Alvarado, Vasco da Gama, Pedro Alvarez Cabral and Diego Diaz. Portugal later sponsored Amerigo Vespucci, Franz Xaver, Fernando Magellan and in the 1800s Alexander Pinto to Africa.

Spain became very competitive with Portugal in her expansion efforts near the end of the 15<sup>th</sup> Century and into the 16<sup>th</sup> Century. Conquest, colonization and trade continued to be the motivations with Pope Alexander VI determining which country received rights to which newly discovered region and those yet to be discovered. Portugal received South America and Africa. Spain got the rest of the Americas and the Canary Islands. While the Spanish motivations were primarily the same as the Portuguese, more focus was on the forced **conversion of the natives to Christianity**. Christopher Columbus, of course, was one of the earliest and the most famous of the Spanish explorers with his discovery of the New World.

Christopher Columbus was a Genoan, who, early in his life, had sailed on behalf of the Centurion Bank of Genoa. He traveled throughout the Mediterranean until he settled in Lisbon, married and his son Diego was born (though there are several other early histories of his life circulating). He had a theory that if you sailed far enough West, you would find a direct sea route to India and could initiate trade through that route with India as well as Japan, Cathay (Northern China) and Mangui (southern China), bringing back gold and the riches of the Orient. In 1483, he started trying to persuade the Portuguese King John II to finance this undertaking. He was rejected. He then went to Spain where he attempted to persuade the Spanish King and Queen to finance him. After some time, his persuasive skills paid off and Queen Isabella and King Ferdinand agreed to partially finance the expedition. (There are theories that competition drove this decision by the monarchs as Columbus had approached or was about to also approach the Kings of Britain and France and that France was very interested in the endeavor.) Wealthy Italian investors, Martin Pinzon (the captain of the Pinta), and the wealthy Dukes of Medina-Sedonia and Medina-celi, provided the remaining financing, with two of the ships (the Nina and the Pinta) contributed as a fine on the town of Palos by the monarchs.

Key Spanish explorers included Francisco de Orellano, Gonzalo Pizarro, Francisco Pizarro, Ponce de Leon, Martin and Vicente Pinzon, Vasco Nunez de Balboa, P. Andagoya, Alvaro Mendaria, Hernando de Soto and A. N. Cabeza. Spain also sponsored Amerigo Vespucci, Sebastian Cabot and Fernando Magellan extending their reach to the Pacific Ocean. The Spanish goals were **systematic settlement**, the **conversion of the inhabitants to Christianity** and (while they still believed they had reached the Far East) **establishing diplomatic and trade relations** with the Great Khan.

Shortly thereafter in 1497, sponsored by a group of Bristol merchants, John Cabot sailed west from Britain and discover Nova Scotia, Newfoundland and Labrador.

Joining the Portuguese and the Spanish at this time were the French and British whose efforts were initially focused on North America, the French arriving in 1535. British explorers started searching for Northern passages to the Far East. Their Admiralty carried out most of the British explorations. They sometimes hired on temporarily, then permanently, former privateers (or pirates). These included Francis Drake, Martin Frobisher and Walter Raleigh (all of whom were later knighted for their efforts on behalf of Britain) and William Dampier. These individuals' initial motive was **profit**.

The Dutch, Russians and the Germans also started exploring. The Germans explored as conquistadors in Venezuela. The Dutch circumnavigated the Earth, explored Indonesia,

discovered Antarctica and also explored the Arctic. The Russian Cossack Jermak conquered Siberia for Russia.

In the 17<sup>th</sup> Century and most of the 18<sup>th</sup> Century, the focus of exploration became mostly oriented towards **settlement and colonization**, and some **conquest**, with many new areas discovered and settlements starting to form. Searches for **optimal trade routes** such as the Northeast and Northwest passages continued to take place. Most of the financing was from the various governments of the exploring nations and their Navies, but importantly, new **“trading companies”** begin to form. Many of these trading companies were set up for the purposes of colonization and settlement, whether in North America or Asia (East India). The British East India Company was formed in 1600 as a joint-stock company. (This is similar to a corporation except as to limited liability. While shareholders share according to their percent of ownership in the profits, they also must pay their percent share of the losses.) The Dutch East India Company was founded in 1602. The Virginia Company, which settled Virginia, was created in 1606. The British West India Company opened offices in the Bahamas in 1647 and Jamaica in 1655 and started trading and exploration activities (again motivated by future trading opportunities). The Hudson Bay Company was launched in 1670 (and continues to this day to operate, now as a department store, in Canada). The Scandinavian countries became “formally” active sponsoring Arctic expeditions.

In 1687, the most famous insurance company in history began, first as a coffee house, a favourite gathering place of sailors and captains of ships moored at London docks, evolving over the years into Lloyd’s of London. Edward Lloyd kept “Lloyd’s List” of the comings and goings of ships, information and intelligence on conditions abroad and at sea. Ships were auctioned there. Brokers would hawk the risk of an excursion to the individuals (gamblers and risk-takers) interested in sponsoring the trading and exploration ships. Because of the insurance protection offered, investors were far more prepared to provide capital for these endeavors than had their own funds been entirely at risk.

Much exploration of the Pacific Ocean started to occur by the Dutch. Wealthy merchant Isaac Le Maire, (who was the largest subscriber to the Dutch East India Company and with which he had had a falling out), sponsored his son Jacob le Maire and Willem Schouten to circumnavigate the globe, using a new route. Later explorers were Abel Tasman, D. Hartog, Nuytz, and Carstenz.

In the 18<sup>th</sup> Century, expeditions whose missions were primarily or exclusively **scientific research** were formed. One of the earliest is C.M. de la Condamine’s 1735-47 expedition, commissioned by the French Academie des Sciences, to the South American equator. This confirmed that the Earth is indeed round, and made many scientific discoveries about Equador, Brazil and the Amazon tribes.

Organizations were also formed to pursue exploration and the sharing of knowledge. In 1788, Joseph Banks, the botanist who accompanied Cook on his explorations, formed the British African Association. (It later became the Royal Geographical Society, London). It sponsored the African expeditions of Mungo Park, the German explorer Friedrich Hornemann, Hugh Clapperton, and L.J. Burckhardt. In the 19<sup>th</sup> Century, it commissioned Richard Burton and J. H. Speke on their expeditions to Africa.

The British (George Vancouver, James Cook, William Bligh) more extensively explored the Pacific Ocean, as did the Dutch (Jakob Rogeeveen). The Duke of Sandwich was James Cook’s patron for his circumnavigations. Whalers conducted substantial trade and were responsible for further exploration.

In the 19<sup>th</sup> Century, the focus of explorers became Africa, Australia and the Arctic with a variety of motives and sponsors. There was less direct government involvement and more self-financing, with scientific research and the quest for knowledge sharing the stage with the quest for adventure, wanderlust and missionary work.

Most of Australia was explored by individuals: Edward-John Eyre, Friedrich Leichhardt, W. Wills and Robert O'Hara Burke, John McDouall Stuart as well as several expeditions sponsored by the British government carried out by explorers Matthew Flinders and later Charles Sturt.

Africa attracted many explorers at this time, including David Livingstone who went to do missionary work and Henry Morton Stanley, a journalist with the N.Y. Herald who was subsequently sent by the newspaper to assist him. Later Stanley served the British government in Africa and then later King Leopold of Belgium. Unlike Livingstone, Stanley's explorations of Africa were more motivated by fame and fortune than altruism. Alexandra Tinne, a wealthy Dutch lady, led several African excursions to fight against slavery.

Asia attracted explorers that were mostly financed by the British such as Ney Elias and George Everest.

The United States as a nation formally started to explore her West in the early 1800s, with the expedition of Meriwether Lewis and William Clark to the Pacific Ocean. President Jefferson was the driving force behind this expedition that was led by his friend and former personal secretary. The primary stated motives were scientific knowledge of the flora, fauna, geography, ethnography of the resident Indian tribes and, to a lesser degree, geology. Jefferson wanted to find an all water passage (likely from the Missouri to the Columbia) across the continent, or if unavailable, the best route. It was also important for the Discovery expedition team to return home with records and ideas of how to unite the Indian tribes, take over the fur trade from the British and form a continent-wide country. Country building and scientific knowledge were the prime motivations. The government financed this expedition. Lewis was to benefit from the subsequent publication of his journals and the scientific data he gathered during the expedition, but he died before preparing the information he had brought back for publication. Jefferson had also put an earlier expedition together through subscription by members of the American Philosophical Society of Philadelphia. Unfortunately the individual chosen to conduct the exploration was a secret agent for the French Republic, so as soon as that was discovered, the mission was cancelled.

In the 20<sup>th</sup> Century, scientific discovery was again the key motive and governments were the key financial backers, with the greatest exploration occurring in the Arctic, Antarctica and later in Space. There was some University sponsorship of Arctic expeditions but primarily governments were paying. In Antarctica, national pride and rivalry motivated, or perhaps inspired, Scott for the British and Amundsen for Norway in their searches for the South Pole. In Space, the "race" for military superiority between the U.S.A. and Russia (then the U.S.S.R.) was also a motivator. It led to many new discoveries and accomplishments culminating, at least in the mind of the public, in the landings on the Moon by the United States. In the 1950s and 1960s, the U.S. government was more prepared than it had historically been to fund large numbers of scientific research projects.

Now we are in the 21<sup>st</sup> Century and there are exciting Space and Lunar exploration missions being planned by many nations and some companies, starting to be implemented, and some being discussed at this conference. The explorers of today and tomorrow are the people behind the scenes, as much as they are the astronauts flying the missions.

(A small aside about doing research on explorers for this paper, I am amazed how little historians focus on, are concerned with, or even mention in books about specific expeditions or exploration in general, how the projects were financed. Either it's magic or they don't have any comprehension about how very difficult it can be, then or now, for explorers and entrepreneurs and even governments to find funds for exploration projects.)

### Sources of Financing

Very often financing was shared by individual investors, entrepreneurs and by monarchs or governments. To what degree this was shared frequently depended on the mission and who proposed it. If the government proposed it, then equipment and explorers (frequently military personnel or commercial ship captains) were hired to carry out the mission. (This is why certain explorers, like Vespucci and Magellan, sailed on behalf of, and made discoveries for, more than one country.) If it was proposed by the explorer and "sold" to the monarch, for example Christopher Columbus, the monarch/government might be persuaded to partially or fully pay. Even in Columbus's time, elaborate contracts were negotiated as to who received what rewards as a result of the success of an expedition. His persuasive skills and what he was able to negotiate for himself were remarkable, perhaps because his success was unexpected. The hybrid nature of these financings was especially prevalent when the expedition wasn't the monarchs' idea.

Individual explorers have been driven by profit motives, greed, thirst for adventure and knowledge, desire to travel, to spread their religious beliefs or to prove those beliefs, fame, fortune, glory, ambition and philanthropic motives. They have also desired to form settlements where their definition of personal and religious freedom could exist, to create a "better", perhaps utopian society. The individuals themselves had tremendous courage, drive, perseverance and determination. Many spent all they had, sometimes including their own lives, in pursuing their dreams.

Monarchs and governments had somewhat different approaches. Monarchs were also frequently motivated by greed. Governments were, and still are, motivated by "higher potential tax revenues". Both were motivated by increased trading opportunities for their citizens, by establishing diplomatic and trade relations with new countries (particularly if it was at the expense of their enemies or rivals, i.e. the Portuguese and Spanish vs Islamic nations or the British vs the French, Spanish and Portuguese), conquest, colonization, religious conversion and political supremacy. Country building and military and/or naval supremacy were also important drivers of exploration. While it could be considered the same motivator for individual explorers and governments (and the Church as State was very prevalent), the motivation of "religious conversion" was somewhat different in execution by say the Spanish, and that of individual missionaries such as David Livingstone! Governments were more interested in financing scientific exploration and research than were most monarchs and that continues to be a focal point of motivation for government funding today. Financing exploration to develop infrastructure was and continues to be a motivation for which governments remain a primary source of funds. These investments have paid enormous dividends to taxpayers. Governments and politicians are also motivated by job creation for their constituents. If a project results in substantial new jobs (and therefore a positive cascading effect throughout the economy), governments are much more likely to contribute to its financing, either through grants, loans or direct investment.

Most monarchs fulfilled the role of patron to explorers. Patrons, past and current, are wealthy individuals who are prepared to finance projects they believe in. Paul Allen (of Microsoft) and his investments in Scaled Composites and SpaceShipOne is a great example of a contemporary

patron at work. Patrons, and monarchs (of the past), make a decision and fund it, sharing a freedom of execution that governments don't have. They don't have to rationalize, lobby for or justify their chosen expenditures the way our politicians do. There is a big difference between the autocratic processes of a patron and the democratic processes that a government must go through.

Scientific exploration, in many forms, has historically received funds primarily from governments, institutions (such as Universities, Societies or Associations put together for a specific purpose) and some wealthy, philanthropically inclined individuals.

Exploration is, and has been, a very expensive proposition and is often too expensive for any one individual to finance. Therefore consortiums and companies have been formed to share the risk between a number of investors who desire to and can afford to participate. Corporations with their "share"d ownership and limited liability have been and continue to be an ideal way for individuals to invest. The development of capital markets and publicly traded companies has made these accessible to everyone. Some companies, however, (such as Richard Branson's Virgin and therefore Virgin Galactic) have preferred to remain private.

Protection against risk is also very important. While corporations offer this to some degree through their limited liability, there are other ways to protect your investment. Commercial risk management has been important historically to exploration and continues to be important today. How can you insure against some of the risks? The insurance industry has developed an amazing degree of sophistication since early times and even since the start of Lloyd's of London. Borrowing by the owner of a ship has been documented and was discussed as "bottomry" as long ago as the "Codes of Hammurabi" in Babylon, dating back to @ 1800 BC. If an "insured" ship was lost, nothing had to be repaid. This ancient financing technique is still pertinent today and forms the basis of most general property and casualty insurance contracts. Insurance companies continue to offer protection against unsuccessful launches of satellites and loss of ships.

Already this century, the private space industry has one great example of the innovative use of commercial risk management to fund achievement – the ANSARI X PRIZE for the successful flight of SpaceShipOne. The \$10 million prize was paid, not by the X Prize Foundation itself, but by the insurance company the group dealt with in what's known as a "hole-in-one" insurance policy. Primarily used in golf tournaments or fishing contests, the insurance company is paid premiums based on the odds for the success of a hole-in-one shot on a particular hole, or a certain type and weight of fish being caught in a certain location during a tournament. Had the prize not been won by the end of 2004, the insurers would have kept the premiums and the \$10 million policy would have expired worthless. In recent years, the premiums have been primarily paid from more than \$1 million in contributions made by two Iranian-born telecom entrepreneurs: Anousheh Ansari and her brother-in-law, Amir Ansari. This is a great example of philanthropy and risk management operating effectively together.

The X Prize Foundation has also demonstrated how formal competition serves to drive accomplishments, as have informal or unstated competitions between explorers of the past. Peter Diamandis, Gregg Maryniak and several others developed the idea of a cash prize based on the aeronautic prizes of the 1920s, such as the \$25,000 1927 Orteig prize awarded to The Spirit of St. Louis and Charles Lindbergh, which helped to kick-start the private aviation business. The goal of the ANSARI X PRIZE is "to spur the creation of a vibrant commercial space industry through the \$10M competition."

## ANALOGIES TO OTHER TYPES OF EXPLORATION

### Mining (and Oil/Gas)

There are many similarities between mining (or oil/gas) exploration and space or lunar exploration. Other than scientific motivations and perhaps tourism, the search for natural resources (which may lead to mining of Helium3 and other minerals on the Moon) may be one of the key commercial motivators in establishing a permanent human presence there. Within the asteroid belt are many new worlds that would be attractive to visit and explore for their mineral content. Mining can be a very high-risk proposition. You may start with the best geological inferences and still end up with nothing. It is a very capital-intensive industry, in both the exploration and the development stages. It is crucial to ensure that you secure title for exploration and extraction to the property being explored. (In Canada, these “claims” are filed with the territorial governments. It is not always necessary to own the land itself as long as you have secured the mineral rights.) The higher the price of a commodity, be it a mineral or oil or gas, the more exploration that begins to occur and the more development projects that become viable.

In Canada, federal and provincial tax incentives are often available to encourage exploration. This is because there are major benefits to society, particularly to the infrastructure development of, and employment opportunities for the residents of, rural and remote communities. Mining has been responsible for the founding and continued existence of many Northern communities. It could easily form the basis for communities on other worlds as well. Incidentally, mining has also been a major user of technologies developed by the Space industry such as GPS, satellite phone communications and small plane technologies.

Resources, as an investment, have different economic dynamics from other industries. A mine (or an oil or gas property) has a limited life span and once the commodity is extracted there is no longer value to the mine itself.

Junior exploration companies that explore for new mines are often selling a dream. Usually these are companies with few assets but some key people, land to explore and an idea. Canadians, as a whole, perhaps because of our resource heritage, are more likely to gamble on a penny mining company than finance a high-tech company out of someone’s garage. Usually these types of mining companies are very inexpensive (per share – resulting in the term “penny” mining stocks to describe many juniors) but the reward, if ore is discovered, is substantial.

Mining companies have raised almost twice as much equity capital on the TSX (Toronto Stock Exchange) and TSX Venture exchanges in Canada as on any other major exchange in the world.

How are exploration companies financed? For a senior (large) mining company, exploration tends to be financed internally. The junior exploration companies usually raise funds by issuing shares. This could be by private placement – issuing shares to institutions or highly qualified investors, called “sophisticated investors”, avoiding the need (and the cost) to prepare and issue a prospectus. (A prospectus is a legal document that describes securities being offered for sale to the public. It must be prepared in conformity with requirements of applicable securities commissions.) They might also sell shares through the TSX or an appropriate stock exchange. If the owners don’t want to dilute the existing ownership by offering more shares, they could borrow, either through bank financings or debt (bond/debenture/convertible bond) offerings.

To encourage investment in exploration and mining in Canada, the federal and some provincial and territorial governments offer tax incentives. In October 2000, the federal government introduced a 15% non-refundable tax credit known as the Investment Tax Credit for Exploration (ITCE). This is in addition to the existing 100% deduction of eligible exploration expenditures. These “super” flow-through shares, as investors know them, have been used successfully in the past to help finance discoveries. Between October 2000 and December 31, 2003, over \$750 million in flow-through financing has been raised for exploration in Canada. This financial incentive encourages exploration within the country, with the intention of replenishing mineral reserves that have been depleted by mining. Because the investment is 115% deductible against other income, it encourages investors to take risks they might otherwise not consider.

More commonly used in producing oil and gas companies than juniors (oil and gas or mining), an operating company may adopt a legal structure of a trust instead of a corporation. This allows all income (after expenses but before taxes) to flow through to the investors as income and the taxes to be paid in their hands instead of the companies'. Any exploration tax credits would also be passed through to the investor. These income trusts can be very attractive to investors who want current income flow as opposed to capital appreciation.

Techniques used by the mining companies could easily be applicable to space exploration funding. The tax incentives of an exploration tax credit deductible against other income would make these types of high-risk investments more attractive and encourage investment by investors who might otherwise be scared off by the risks involved. In providing these credits, a government would encourage the development of their commercial space industries, resulting in job creation and the multiplier benefits these bring to their economy and society. Since these types of jobs would likely need a higher degree of education, it would also result in the additional benefits to society that would accrue from a well-educated labour force.

### Biotech

Whether exploration is for new lands, new resources such as minerals and oil/gas deposits, new information or new species, it ideally leads to discoveries and the Biotechnology industry is focused on taking discoveries and research about how genes work and translating them into new drugs to cure diseases. Like exploration of other types, Biotech companies require huge amounts of capital to fund their R&D activities and when they have developed potentially viable drugs as a result, they need more funds to conduct the following clinical trials necessary for drug approval.

In addition to the usual sources any company might consider in acquiring capital (founders money, Angel investors, Venture Capital funds, “bootstrapping” using own internally generated cash flow, and capital markets), the biotech industry makes use of several other techniques.

Partnerships, Collaborations and Licensing Agreements between biotechnology companies and larger pharmaceutical companies are one way that companies in this industry get financed. These strategic partnerships finance the growing biotech company and help it with expertise such as R&D, product development or marketing.

One of the techniques that established Biotech companies have used more than most industries, and one that could apply to such companies as Lockheed Martin and Boeing in the future, is that of the creation of “tracking stocks”. First used by GM in 1984 and 1985, these are a class of shares that tracked the performance of its Electronic Data Systems and Hughes Electronics subsidiaries. These allow investors to focus on a specific part of the business while it still remains part of the

parent for tax and administrative purposes. Since then, Genzyme has been a key proponent of this technique, distributing its Molecular Oncology, Surgical Products and Tissue Repair divisions as tax-free dividends to Genzyme shareholders. These shares then start to trade independently. Since they are initially distributed to existing shareholders of the parent, they have support from those already familiar with the company. It is a tax-free distribution, so there is more incentive to keep the position, with its zero cost base, than to sell it and realize the inherent capital gain. Wall Street analysts then have an increased ability to focus on and track a technology or industry otherwise hidden within the parent.

Biotech companies frequently receive funding in the form of grants from governments or research institutes such as the National Institutes of Health.

SPEs (Special Purpose Entities) include Research and Development limited partnerships and SPCs (Special Purpose Corporations), which include SPARCs (Special Purpose Accelerated Research Corporations) and SWORDs (Stock Warrant Off-Balance Sheet R&D Corporations). These are used by Biotech companies to isolate specific assets and potential liabilities for investors (usually new projects). They usually contract to the parent for management and R&D services, using capital raised by the issuance of their shares to pay these fees.

The use of tracking stocks would benefit the Space industry. Today, there are very few pure-play publicly traded space companies. Spacedev, Orbital Sciences and Spacehab are a few. There are numerous companies who have operations in the industry but are classified as defense contractors, or aircraft, electronics, component or other types of manufacturers. Spinning off their subsidiaries as tracking stocks could help to kick start a new “industry” for investors to consider. Buying Honeywell or Boeing because of their space divisions is not how investors like to participate in an exciting emerging industry.

## KEY CONSIDERATIONS FOR INVESTORS

### Property Rights

Private property rights and a capitalist approach are crucial to attracting investors in any endeavor. Ownership leads to better care than renting. “No one ever returned a rental car waxed.” Owners invest in what they own both to maintain and improve it. Land grants and property rights spurred the settlement of the United States and Canada. Patent rights are a crucial element in the development of most technologies. Without these rights and protections, most inventors would not have spent the time, energy and perseverance needed for many of the wondrous breakthroughs throughout the years.

Hernando de Soto, not the famous explorer, but author of “The Mystery of Capital: Why Capitalism Triumphs in the West but Fails Everywhere Else” and President of the Institute of Liberty and Democracy in Peru (regarded by The Economist as the second most important think-tank in the world), discusses the impact and importance of formal property systems – including property rights, records and titles with legal rules governing the process.

De Soto argues in his book (based on extensive research) that this is what separates the poverty of Third World and former Communist nations from that of the more wealthy western society. The effects of a formal property system allow for an asset to become its economic concept or value and to be used for its productive potential, to be borrowed against, used as collateral etc. The legal property system, that we take for granted, is a formal representational system. It has taken time to develop, as politicians, legislators and judges pulled together scattered facts and rules

from farms, villages and cities into one integrated system. Developing and former communist nations have not done this. There are dozens or hundreds of legal systems, some extra-legal and few organized. Formal property law makes people accountable for respecting property titles, honouring contracts (paying their debts) and obeying the laws. Lack of this makes it difficult or impossible for citizens in those countries without a formal property system to enter into contracts or offer appropriate types of collateral. Once assets are in a formal property system, they can be divided into shares or combined in numerous ways so they can be used more effectively. This system is like a web, forming ties between individual citizens, government and private enterprises, establishing credit records, verifying assets, owners and values. It allows for risk to be spread through insurance instruments. And perhaps most importantly, it protects transactions. Capital makes economies run and it needs a system to optimize this.

The International Institute of Space Law summarized the state of property rights in a recent statement on their web site, “The prohibition of national appropriation... includes appropriation by non-governmental entities (i.e. private entities whether individuals or corporations) since that would be a national activity.” That is, no one can claim anything, not governments, corporations or individuals. Then it later says: “Notwithstanding matters covered in the above Statement, the Board of Directors of the IISL recognises that other private activities on the Moon and other celestial bodies are permitted. Article VI of the Outer Space Treaty affirms that non-governmental entities, including private individuals, companies, and organizations, have the right to conduct activities in space in accordance with international space law, and subject to the authorization and continuing supervision of the appropriate State Party.” These statements and the apparent contradictions and lack of clarity make it very confusing to the layman and to potential investors.

Until this issue of legal property rights on New Worlds, be they planets or other planetary bodies, is clarified, it will continue to be an issue for investors and their willingness to finance such endeavors.

I note that other papers and presentations here at this conference will address this issue in more detail, so I’ll stop here (and will be very interested in the comments in those papers), but from an investment point of view, this is one of the key deterrents.

Interestingly, the “lack” of property rights may be responsible for some of the current focus on Space Tourism. If you own the ship that people are traveling and staying on, then there are no Outer Space Treaty issues and lack of property rights to worry about. Operators are being paid for the service they are providing on property that they own.

#### Profit Potential

An investor is providing funds to make a profit, whether it is in the form of current cash flow or a gain to be made in the future. If there is no potential for profit, any funds advanced are a gift, not an investment.

When an investor looks at a company or project, they are trying to determine if, and when, the company will give a profit back to them. They may also be concerned about liquidity. How easily and how quickly can that investment be sold?

Investors will look at earnings and profits if they exist, balance sheets, cash flows and cash, “burn ratios” (how quickly the cash the company has available is used up is a key factor looked at by investors in biotech companies and would also be important for investors in Space companies), management and their past accomplishments and track records, proprietary technology and

intellectual property, people and many other factors. They will be comparing this information to other opportunities that exist and while an opportunity may appeal to investors, they may perceive, at the moment, better choices elsewhere.

Investors can be very emotional, and can be ruled in the short term by fear and greed, though in the long term, earnings and inflation rates drive stock prices and markets. Investors can become strongly enamoured with a certain sector – today oil and gas, in 2000 technology and biotech. At these times, investors will frequently shove money at anything seemingly connected to the industry. This “habit” of investors leads to bubbles, manias and subsequent collapses. So when money and financings are available, companies should take it, even if they are not ready to use it. If you are desperate for financing, it is always most difficult to get it then, whether through banks, private investors or public markets.

The bottom line is that investors focus on results.

### Investment Type

There are many types of investment that appeal to many different investors. Briefly, and simply though, there is owning and there is lending. Equity or share financing represents ownership of a company, whether it is public (listed on a qualified stock exchange), or private (not listed, shareholders tend to be friends, family, employees, venture capital and/or private placements with “Angel” investors). Debt financing represents a debt on the part of the company (borrowings and bond or debenture offerings) and investors are owed the principal they have lent and the agreed upon interest payments. This can be a safer way to invest but its return is fixed and there is no additional growth. (In both cases if the company goes bankrupt, you have likely lost your entire investment. However if there are residual assets, debtholders receive payment before shareholders are entitled to anything). There are also hybrid investments such as convertible debentures. If you want to participate in the growth of a company, equity ownership is the most attractive way to invest.

### Risk Management

The insurance industry is a very sophisticated and innovative industry and they are willing to be on the other side of a great many bets. The issue for investors is, at what cost, or in insurance language, at what premium? Insurance also protects against many of the risks that exist and give investors some reassurance, and compensation, if the worst case scenario occurs.

Options strategies (which give the right to buy or sell an asset by a future date, for a specified price), when available, can also protect against the decline in the value of certain investments.

### Pure-Plays

As mentioned earlier, one of the reasons that the investment industry has been, at best, ambivalent to the Space industry is because it is not well established and there are few choices of companies to invest in. There are not enough companies within the industry to base analysis on and develop industry comparisons and statistics. Until a larger number of participants exist, and/or subsidiaries of large organizations trade independently of their parents, this is unlikely to change. Also, judging by chat rooms and bulletin boards of some space websites I’ve visited, a lot of space enthusiasts are naïve (perhaps just young) and unfamiliar with the process of buying shares in a corporation.

## CONCERNS OF ENTREPRENEURS

While investors have a number of things they are concerned about, there are several additional issues for the entrepreneurs themselves. Those entrepreneurs often are the explorers or they may be behind the scenes with someone else making the trip and “getting all the glory”. They are the risk-takers who start a business that reflects their passion. They want to grow and build their business. They are almost always investors and the source of some funds but rarely are they the exclusive source.

### Raising Capital

Raising funds is a key concern for entrepreneurs. Usually they start with their own funds, and if necessary, that of family and friends. If they can, they “bootstrap”, and use cash flow generated from sales to grow the company. “Angel” investors often provide some initial capital. An “Angel” is usually a knowledgeable, wealthy individual who provides funds larger than most family or friends but smaller than most venture capital firms. Often Angels operate in syndicates. When the sums required start to get larger, venture capital firms may be a potential source of funds. Entrepreneurs must be very cautious in these dealings so that they don’t give away too much ownership or control too early. With each round of financing, comes added dilution to their ownership.

From a VC’s (venture capital firm’s) point of view, they are in competition with other VCs for the “good deals”, especially potential IPOs (initial public offerings) out there. VCs need to see thoroughly thought-out business plans and love to see existing earnings. They are primarily interested in equity financing but lately seem to be providing some debt financing, though usually convertible into equity at a later date. There are a number of VCs that specialize in various specific industries such as the Biotech and Technology industries. Spacevest is one VC that states its specialty as the Space Industry. VCs not only offer entrepreneurs cash but many provide excellent contacts and advice on how to grow the business.

For entrepreneurs and their companies, building relationships, particularly with bankers, VCs and large institutional investors, investment bankers and underwriters, is well worth most companies’ time and effort.

Ideally VCs and Angels are looking for companies where their “exit strategy” (or the way they get their money and profit back) will be through taking the company public as an IPO. The company will then trade on a recognized stock exchange where individual and institutional investors can easily buy and sell its shares. Being a public company involves additional disclosure, reporting and other requirements and works for most, but some entrepreneurs prefer to remain private.

### Maintaining Control

Richard Branson took Virgin PLC public in 1986 and then after considerable frustration with stock market corrections and his resulting inability to fund takeovers and raise capital, in 1988 he took it private again, where it has stayed. He would rather depend on borrowing to expand than raising additional equity through the capital markets. If Virgin Galactic is successful, there will not be a way for most individual investors to participate directly. Robert Bigelow (of Bigelow Aerospace and Budget Suites of America) is another space entrepreneur who prefers (at least thus far) that his holdings, privacy and control, remain in his hands. Most of the other new space

entrepreneurs today seem to have experience owning both public and private corporations. So far their new endeavors remain private but that could change as these companies develop and grow.

## CONCLUSIONS

All historical sources of financing exploration continue to be valid today, except possibly monarchs. Monarchs now are primarily figureheads for democratically governed countries, without the autonomous decision making ability they once had. (They could, however, still act as patrons if interested, as most are wealthy.) Many, but hopefully not all, of the motivations for exploration and the reasons to finance it, continue to exist. Conquest and religious conversion should be irrelevant as, unless we find "E.T.", there is no one out there to be conquered or converted and these are motives that many of us would prefer never to see again. We are still thirsty for adventure, new and novel experiences and knowledge. We desire to travel to new places and new worlds. Fame, fortune, glory, ambition and philanthropic motives all continue to drive some of us. Later the desire to form new and potentially unique settlements will no doubt be renewed. Profit, trade and the search for new sources of natural resources will always continue as motives. There is a fine line between the profit motive and greed, human nature being what it is. In the investment industry we have a saying "bulls and bears can both make money but pigs eventually get slaughtered".

One of the reasons the private sector is becoming more prominent, I believe, is because of baby boomers. This generation grew up watching lunar landings, dreaming of space colonies, spaceships and the high frontier, and believing more would happen in their lifetimes. Now they look at what the government has accomplished since their youth. Boomers have become, anywhere from somewhat, to totally, disillusioned with the lack of progress. Some have decided to take matters into their own hands by starting new Space businesses. These are not, however, businesses that will be created and rise to prominence overnight. They are technology-intensive and there are still significant technological issues to overcome. It takes time, but it has started. If this trend continues, I believe the private sector ventures will indeed achieve greater things far sooner, at least within the Earth Moon system and perhaps as far as Mars and the asteroid belt. Exploration beyond that will likely remain the realm of governments for some time to come. Historically, when private industry and a government organization try to do the same thing, the private sector usually does it better, cheaper and more efficiently. As the private space industry, and particularly, as individual companies, achieve more success, awareness will increase and sources of capital will be more readily accessible to these companies. Individual investors, both small and large will have ways to participate in the growth and development of the industry and of Space.

Another thing we can learn by looking at past explorers is from examples such as Christopher Columbus. While it took more than seven years, his persistence, perseverance and his ability to persuade, network and inspire paid off. These are qualities that we can all try to emulate. Space exploration has many advocates but it could always use more with the drive, determination and creativity needed for the huge opportunities ahead.

As far as Space exploration is concerned, there is an assumption that only the government has sufficient funds to pay for it. While government has historically been the most significant contributor to expensive exploration and major infrastructure development such as railways and roads, it is possible for other models to work. Once innovative new infrastructure was in place, private industry became more involved, and has historically grown exponentially around it. I believe that the expectation had been that government would build the roads to Space and then private industry would get involved. Existing space companies have looked to benefit by

providing services and tools to the government for that purpose. This attitude is starting to change. The private sector is trying to figure out how best to build those roads themselves.

Government has stated they would like to see a sustainable commercial space industry. Few mechanisms to allow and encourage this have been put into place thus far. There are now incentive prizes through NASA's Centennial Challenges Program to encourage competition. This is a small start but much more would help. Interest free loans could benefit many small space companies. Tax incentives such as the exploration tax credits discussed earlier could result in significant inflows of capital to companies if these credits were deductible against the investors' other sources of income.

What needs to happen for the Space industry to attract investors' consistent attention? Investors need to see clear ways they will make a profit on their investment beyond selling cost-plus services to the government. Tourism could be the motivation/driver. Mining, zero gravity manufacturing or energy could do it. Years ago, the focus of science (and science fiction) writers was on energy from Space. This could be achieved either through Solar Power Satellites (being discussed here at this conference) or lunar mining of Helium3 and the use of in-situ resources to create the infrastructure necessary to build or utilize these. With oil over \$70US as I write, these ideas could still be the catalyst.

I believe, where there is a will, there is way, but there has to be a plan. As Friedrich Nietzsche said "He who has a strong enough why can bear almost any how." In the Apollo era, the United States had a very strong mandate, and then seemingly lost it. Is there currently a strong enough WHY today? Perhaps the plans of the Chinese will lead to a new Space race, as competition has driven NASA in the past.

What are the best investment vehicles needed to finance the exciting exploration ahead? From an investors' point of view, equity ownership is the favoured way to participate. They need more choices though. In the past few years, private industry has had a number of great achievements. New companies have been, and are being, formed and though most are currently obscure, that is starting to change. Space is making the front page in main stream media for the first time in years. As the investing public discovers this emerging Space industry, the tipping point will be reached, companies will be able to raise capital and investors will have many choices of investments to own and an exciting new emerging industry will be born.

#### PRINCIPAL AUTHOR'S BIO

Eva-Jane Lark is a Vice-President and Investment Advisor with BMO Nesbitt Burns, one of Canada's leading full-service investment firms. In her day-to-day life, she has been advising individuals and families on wealth management issues and their investments for over 20 years. She also shares a very strong interest and passion with other National Space Society and Planetary Society members in ensuring humans venture to, live and thrive on new worlds beyond Earth. Eva has been interested in Space since she was a child. However, like many others, she has been sidetracked with the usual life events such as getting an education, building a business and raising a family. Recently, in the little free time she has, she has been getting back on track, learning what is happening in the industry and trying to figure out a way she can make a difference and contribute to a permanent human presence in Space. This paper is a preliminary step in that process.

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Concerted evaluation of new exploration opportunities will not remove many of the difficult to predict risks and uncertainties, but it can improve the economic efficiency of exploration investments, resulting in annual savings of billions of dollars for the industry as a whole. This course has been designed to provide a practical approach to assessing the economic merit of investments made in exploring for new reserves of oil and gas in environments of technical uncertainty. It strives to embrace the spectrum of business disciplines and technological and financial considerations involved and is also a leader in exploration and mining around the world. Immense mineral potential from aluminum to zinc. Canada is a reliable and responsible supplier of over 60 minerals and metals.Â Canada has the lowest overall tax rate for new business investment among the G-7 countries with corporate tax rates as low as 15% at the federal level and varying from 10% to 16% at the provincial and territorial level. The federal government and provinces/territories also offer a variety of mining sector-specific fiscal incentives, such as unique and innovative flow-through shares (FTS), to help mitigate the risks associated with mineral exploration.Â While Vancouver is also home to the worldâ€™s largest cluster of exploration companies, the city of Toronto is a major global hub for mining financing.