

THE CHALLENGE PRIZE— HISTORY AND OPPORTUNITY

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The Challenge Prize: What Is It?

The “Challenge Prize” is a special type of award or prize that has been employed throughout human history to encourage new creative, innovative, and often heroic achievements.

The offer of a challenge reward has been used historically to draw forth previously unknown individuals to lead armies to conquests, to motivate individuals or teams in sport to championships, to find hidden secrets in nature, to discover mysteries in science, to innovate new tools to facilitate research, and to produce products that might prove adaptable in altering or “improving” life or the human condition. Kings, generals, and the captains of industry have understood the usefulness of throwing out a challenge that might just captivate the imagination or spirit of a single human being to produce a product or result that can advance national leadership, military conquest, or a hefty profit.

Whether issued in the form of promised reward heralded by royal trumpeters and posted on every tree in the realm, issued before throngs of citizenry or soldiery, or posted on the internet as a request for proposals (RFP), the notion of a earning or winning a prize for producing a result that surpasses all others or solves a particular problem, humans—particularly in competitive and entrepreneurial societies—are fully familiar with the notion of the challenge prize and recognize—viscerally if not consciously—the allurements and romance of meeting a challenge, being proclaimed the victor, and securing the promised reward.

Such challenges rewarded by prizes—real and honorific—can be traced from the ancient world of Alexander the Great and Sophocles through the Renaissance and from European Enlightenment of the 18th century to the flowering of American technology in the 20th.

In recent years the perennial enchantment of the challenge prize and their potential for profound effects has been dramatized for millions in the gripping story of Dana Sobel’s best-selling book *Longitude* recounting the life of the humble English carpenter turned clockmaker John Harrison and his quest to design a chronometer with such accuracy that it could be used by mariners throughout the world to establish longitude. Harrison was lured to what turned out to be a lifetime pursuit by the promise of winning a Longitude Prize of £20,000 offered by the British Parliament’s Longitude Act of 1714.

An equally absorbing contemporary challenge prize story has been the successful pursuit of the \$10 million Ansari X-Prize by the private aeronautical adventurer Bert Rutan.

Offered by the X Prize Foundation of Santa Monica, CA, for the first successful flights of humans by private conveyance to the edges of outer space, the story captivated millions of Americans and others around the world who marveled at the daring and swagger of Rutan and his associates.

These valiant and captivating stories are excellent examples of the special character, allure, and potential impact of challenge prizes.

The Challenge Prize in the World of Awards

The Challenge Prize is a very special kind of prize or award that should be carefully distinguished from other types of prizes, awards, and competitions.

The world of prizes and awards is as old as humanity itself and a primordial essential social function of recognizing human beings for extraordinary, sometimes heroic achievements. Beads and baubles for accomplishment in hunting, farming, or warfare predate civilization and recorded history. The presentation of buttons, plaques, mileage awards, trophies, and public recognition is a vital, though little noticed custom of societies, primitive and modern. A society without a system of awards and prizes—whether they are bestowed by kings, presidents, or peers—would be an impoverished culture indeed.

There are so many prizes and awards that we have to be careful of what we speak when we talk about particular types of prizes. With more than 30,000 known and recognized awards in the world—not counting those given in clubs, schools, communities, armies, sports—we have to focus our discussion when speaking of challenges prizes.

Prizes and awards may be divided into several very broad categories by the function or type of achievement they are intended to recognize. A classification of prizes and awards being used for analytical purposes by the International Congress of Distinguished Awards is as follows:

Recognition of Past (or Concurrent) Achievement

Achievement—

Lifetime achievement

Unique accomplishment

Notable act (perhaps noble or sacrificial)

Notable work (particularly art, music, literature)

Competition—

Masters competitions—professional or amateur

Student identification and recognition competitions

Discovery—physical, biological, or sociological phenomena
Innovation—invention and/or practical application
Peer Recognition—among professional, social, or cultural groups

Recognition of Future Achievement:

Fellowship Award—recognition of potential to achieve
Challenge Grant—underwriting to produce a specific achievement
Challenge Prize—reward for a specified achievement

Basic Characteristics of a Challenge Prize

True challenge prizes and their competitions bear certain characteristics that distinguish them from other types of awards:

1. There is a stated challenge which must be joined by participants.
2. There is a specific goal, outcome, or product to be achieved which is measurable in some universally accepted terms.
3. There is a specific prize to be awarded.
4. All terms of the challenge are clearly stated, including any expiration date for the challenge.
5. The challenge is open to any participant without qualification
6. Entrants in the challenge are responsible for and at risk for costs involved in participation.
7. Challenge prize sponsors provide base information to all participants equally and provide an objective evaluation of the results achieved.
8. Challenge prize sponsors promote the challenge and the eventual winners as broadly as possible

Classification of Prizes by Topic or Theme

Since the Challenge Prize to be effective must be subject to measurable results, not all realms of human accomplishment for which awards are given are easily approached through the challenge prize. Some topics, fields, or themes are by their very nature

capable of only subjective and non-measurable evaluation. Others may be approached with objective measures and measurable results achieved.

Awards and prizes are used to recognize achievement in many realms of topical or disciplinary interest. The current classification of prizes and awards used by the ICDA in recognizing “distinguished awards” includes the following very general fields of endeavor:

	<u>Sub/Objective</u>	<u>Measurable</u>	<u>Competitive</u>
Arts	Subjective	yes/no	yes
Courage	Subjective	no	no
Culture	Subjective	no	yes
Economics	Subjective	yes/no	no
Education	Subjective	yes/no	yes
Engineering	Subj/Obj	yes/no	yes
Environment	Subj/Obj	yes/no	yes
Excellence	Subj/Obj	yes/no	yes
Exploration	Subj/Obj	yes/no	yes
Humanitarianism	Subjective	no	no
Humanities	Subjective	no	yes
Innovation	Objective	yes	yes
Literature	Subjective	no	yes
Medicine	Subj/Obj	yes/no	yes
Music	Subjective	no	yes
Peace	Subjective	yes/no	no
Psychology	Subj/Obj	yes/no	yes
Religion	Subjective	no	no
Science	Subj/Obj	yes/no	yes
Technology	Subj/Obj	yes/no	yes

In addition to listing the general topics and themes of award giving in the world today, there is a further indication of those awards that are generally susceptible to subjective or objective analysis; which may be organized into measurable achievements; and those in which there either are or could be competitions for the awarding of prizes.

As will be readily seen most of the realms in which awards are given are by nature subjective or with some difficulty converted into objective terms for measurement or for a defined competition.

History and Uses of Challenge Prizes

Antiquity

Ancient mythologies and religious history are replete with allegories of challenges among the gods and beings of the nether world. But there are also many stories of challenges that are firmly rooted in history.

Greeks and Romans used the concept of challenge and reward to build literature, history, and architecture. During the course of the annual spring Festival of Dionysus, Athenians young and old were challenged to write ever more complex and meaningful tragedies for presentation in public theatre. The major Greek dramatists known from that time to the present came to public attention through this cutthroat, but very formal process of submission and evaluation. Aeschylus (525 to 456 BC) established his reputation through the competition. He was supplanted by Sophocles (496-406 BC) who introduced through the prize process a different genre of tragedy. Sophocles was then outdistanced by up and coming Euripides (480-406 BC). The reward in all cases was adjuration as the greatest dramatist of the realm and, of course, the production of the winning plays.

Alexander the Great's life is surrounded by legendary challenge stories. One apparently based in history was Alexander's historic encounter of the famous Gordian Knot while his army encamped at the town of Gordia in its march to the east. Many had sought to solve the conundrum of a giant knot long present in the place which seemed to have no rope ends. After puzzling for days over the challenge, Alexander produced rope ends by cutting the rope with his sword. By solving what was to a devotedly religious Alexander, the greatest of human challenges, the gateway to Asia was opened to him and his armies.

Biblical history is filled as well with stories of challenges. The story of David and Goliath in the Torah or Old Testament is in the form of a challenge where an unknown individual is plucked out of the crowd to use ingenuity to solve a formidable problem.

Renaissance and Enlightenment

Many of the best examples of challenges which resulted in awards appear in the realms of architecture and engineering. Indeed, challenge competitions have historically been one of the most fruitful forms of advancing design and technology.

Among the classic and inspiring stories is that of Brunelleschi's Dome in Renaissance Florence, Italy. As one of the most creative centers of the European Renaissance, church elders in Florence brought the two century development of Santa Maria del Fiore—the Duomo of the elegant city—to its culmination. Wishing to crown the cathedral with a dome that would eclipse even the Pantheon of Rome, the Opera de Duomo held a contest in 1420 for the design and a construction plan for a dome that would become the largest in the world for the next five centuries. Filippo Brunelleschi (1377-1446) offered the elders a plan, in the form of a secret promise, to build a 142 foot suspended dome. His

secret plan was accepted and got his reward—the successful construction of perhaps the world’s most elegant dome.

John Harrison’s design and fabrication of the world’s first accurate chronometer also belongs to this period when self-taught individuals might step from obscurity to take up a challenge. The challenge emerged as the European world moved from the elegance of the Renaissance to the scientific explorations of the Enlightenment. One of the lessons to be learned from the often-repeated Harrison story is one of the manners in which a challenge may be offered and the prize ultimately awarded. Although the Longitude Act went on the books in 1714 during the reign of Queen Anne, no serious takers on the challenge appeared until years later. Harrison did not begin work on a chronometer until 1727 and he did not present his invented time piece until ten years later. His pursuit of the £20,000 prize forced the establishment of a formal Board of Longitude to evaluate his chronometer. But since the provisions of the prize required that any chronometer brought forth had to be tested at sea, he was not able to prove that he had met the requirements of the challenge until 1765—fifty years after the issuance of the challenge.

The Mechanic Arts of the Industrial Revolution

In the United States a wide and effective use of challenges prizes—or as they were called “premiums”—came with the creation of schools or institutes for “promotion of the mechanic arts” in the 1820s in the cities of the industrializing world. Such schools—created at the initiative of budding industrialists in a world absent of training for engineers—appeared in most of the coastal cities of the US from Boston, New Haven, New York, and Philadelphia in the north to Baltimore, Richmond, and Charleston in the south.

During the first year in which it came in to existence in Philadelphia in 1824, “The Franklin Institute of the State of Pennsylvania for the Promotion of the Mechanic Arts” began holding annual exhibitions of the new products of industry. From the outset the Institute awarded prizes for those new products it found to be the most “useful improvements” for the welfare of society. This interest in inherently useful products led almost immediately to the establishment of a standing Committee on Science and the Arts to evaluate not only the value of new products, but also the trustworthiness of claims made by manufacturers and of inventors for their innovations.

One of the direct products of this creative impetus at The Franklin Institute was the establishment of an office that presaged and played the role of a proving ground for the US Patent office which would not take on the evaluation of new inventions until 1835. The other product at The Franklin Institute was the annual formulation of a list of innovations needed in American society. For many years prior to the American Civil War the Institute published its list of needs for new products, evaluated inventions submitted to fit the specified requirements, and turned the best inventions or innovations over to the gentlemen entrepreneurs and industrialists who made up the board of the Institute. This creative forum which provided a meeting place for inventors,

entrepreneurs, and industrialists helped to make Philadelphia a productive “workplace of the world” in the middle of the 19th century.

Speed and Flight

No where has the application of the challenge prize been more effective than in the emergence of engines of steam and internal combustion that permitted a revolutionary transformation of all means of transportation in Europe and the United States at the turn of the twentieth century. Concurrent revolutions in communication via telegraph, phone, and wireless connections made possible the rapid dissemination of information about an endless plethora of challenges and competitions that filled the front pages of newspapers.

From roughly 1900 until the First World War there were ongoing and transformative competitions for challenge prizes to increase the speed and endurance of automobiles, trains, ships, and all manner of flying machines. Each time luxury liners crossed the Atlantic from England, France, and Germany to the United States they sought to establish new records for speed. Hundreds of automobile manufacturers and daring drivers accompanied by equally adventurous mechanics entered automobile races and distance challenge events that proliferated throughout the United States and Europe soon after 1900. The first LeMans road race was held in 1906. Closed circuit races emerged simultaneously in New York, Philadelphia, Boston, and Chicago in the US. And the media got into the act as well. The *New York Times* in 1908 sponsored the first around the world automobile race challenge. Challengers from Germany, France, Italy, and the US entered the race. To cover the race in detail in every daily issue of its paper, the *New York Times* sent along a full time reporter to travel with the American car. Newspapers in France, Germany, and Italy arranged to have daily reports from the competitors in the challenge from those nations.

Flight, however, has been the realm that has elicited some of the most dramatic and publicized challenge prizes. Although human flight in hot air and gas balloons had been around since the 1780s in France and shortly thereafter in the United States, it was powered and controlled flight that caught the imagination of humans at the turn of the twentieth century. While balloon flight was mainly for observation and sport, the idea of controlled flight held within it so many applications—from transport and mail delivery to warfare—that the world’s first flight and space race was launched soon after 1900.

To promote the advancement of flight in their own countries such mass media newspapers as the *New York Herald*, the *Daily Mail* (UK), and *Le Monde* (FR) began offering or promoting challenge prizes to spur rapid progress in flight. In some cases the newspapers offered their own prizes. In others they promoted prizes offered by private individuals.

The new generation of flight prizes got started in April 1903 when Octave Chanute, a French American engineer located in Chicago, arrived in Paris with an eye-witness report on the amazing glider flights of Wilbur and Orville Wright at Kitty Hawk, NC. His

speech to the Aero Club of France created a sensation among French aeronauts who believed that France was at the forefront of new developments in flight. To counter the possibility that Americans might be moving ahead in the development of an airplane, Ernest Archdeacon, wealthy attorney and entrepreneur in France, immediately declared that “The aeroplane must not be allowed to be perfected in America.” Asking his fellow French, “Will the homeland of the Montgolfiers have the shame of allowing the ultimate discovery of aerial science to be realized abroad?” Archdeacon called for the establishment of prizes that would cause French aeronauts to move ahead of the Wright brothers.

By October 1904, when it was known that the Wright brothers had succeeded in powered flight, the Aero Club of France, with the assistance of various wealthy individuals, offered three challenge prizes to stimulate flight in France:

- (1) Coupe Ernest Archdeacon, for the first powered machine to fly in excess of 25 meters, a trophy;
- (2) Coupe Ernest Archdeacon, for the first powered machine to fly at least 100 meters, a prize of 1,500 francs; and
- (3) Grand Prix d’Aviation Deutsch-Archdeacon, for the first person in a powered machine to fly one kilometer in a circle, a prize of 50,000 francs.

These inducements had the desired effect: Santos-Dumont, a Brazilian living in France, won the first prizes with flights in 1906. The Deutsch-Archdeacon Prize was won by Henri Farman flying the first circle at Issy in France on 13 January 1908.

The excitement over Farman’s accomplishment and a new round of flights by the Wright brothers at Kitty Hawk in May 1908 inspired the *Daily Mail*—eager to advance flight in England which was lagging badly in aerial science—to offer a new set of prizes. Alfred Harmsworth, Lord Northcliffe, publisher of the *Daily Mail*, set out a prize of £1,000 for the first pilot to cross the English Channel. He followed this with a richer prize of £10,000 for the first aviator to fly from London to Manchester in England. Both of these challenges seemed so preposterous to the editors of *Punch Magazine* that they poked a typical puncheon jibe at Lord Northcliffe by offering a prize of £10,000 for the first manned flight to Mars.

Much to Northcliffe’s dismay his English Channel challenge was won by the brilliantly innovative French pilot Louis Bleriot with a successful flight on 25 July 1909. And the Manchester to London challenge was won by another French pilot Louis Paulhan flying a Farman-type French plane in April 1910.

Prizes and aviation seemed to go hand in hand almost from the beginning. Publisher James Gordon Bennett offered a prize for the greatest speed attained by any plane during the course of each year eliciting rapid increases in flight speed year by year until 1926. Frenchman Andre Michelin in 1908 began offering an annual cup and prize for the longest flight achieved. Wilbur Wright won the coveted Michelin Cup for 1908 on 31

December with an incredible flight of two hours and eighteen minutes. With the cup that year went a cash prize of 20,000 francs.

In addition to the increasingly lucrative annual prizes for speed and distance, the drama and lure of achieving the first flights across menacing natural barriers became and has continued to be the mainstay of challenge prizes for flight. The most formidable barrier for the early twentieth century was the Atlantic Ocean. In 1913 the *Daily Mail* offered a new challenge for someone to fly non-stop across the Atlantic from any point to any point. As the First World War intervened to forestall trials, the adventurous pursuit of the prize did not begin in earnest until 1919. After several abortive attempts earlier in the year two British pilots completed the first direct non-stop flight from Newfoundland to Ireland on 14 June of that year, winning the *Daily Mail's* £10,000 prize.

No sooner had this been accomplished when a French American New York hotel owner, Raymond Orteig, offered in 1919 a prize of \$25,000 for the first flight from New York to Paris without a stop. Not until 1927 was an aviator able to meet this challenge when Charles Lindbergh flew his *Spirit of St. Louis* across the course in 33 and 1/2 hours, making him one of the most famous individuals in modern history. Although the prize conditions did not require a solo flight, Lindbergh's status as hero was certainly enhanced by his singular feat.

Intellectual and Mental Challenges

In the second half of the twentieth century challenge prizes came to be associated more with the wizardry of the mind than the technical and physical brawn associated with speed and flight.

In 1959 the Nobel Prize physicist Richard Feynman began establishing prizes for achievements in the bewilderingly small molecular world of nanotechnology. After setting forth challenge prizes to build a motor smaller than 1/64th of an inch cubed and to print successfully using electron beam lithography (both of which were eventually won), Feynman's Foresight Institute has issued an additional \$250,000 grand prize for specific additional advances in nanotechnology.

In 1980 Edward Fredkin, a computer science professor at Carnegie Mellon University, offered a \$100,000 prize in the realms of artificial intelligence and computer technology. The Fredkin Prize would be given for the development of the first computer software program that could be used to defeat a reigning world chess champion. After many years of trials the prize was won by a team of IBM scientists who developed the IBM Deep Blue computer system and successfully defeated Gary Kasparov. By the time the prize was awarded IBM had increased the prize by an additional \$1 million, awarding \$700,000 to the IBM team and \$400,000 to Kasparov.

But some of the late 20th century challenge prizes also looked toward the realm of paranormal intelligence. In 1964 the James Randi Educational Foundation established a

prize of \$1,000 to be awarded to any person who “can show, under proper observing conditions, evidence of any paranormal, supernatural, or occult power or event.” The Foundation established a protocol for evaluating the claims of applicants and began receiving applications. By 1982 the Foundation had formally processed more than 650 claims according to a rigorous and detailed set of procedures. By 2005 the prize had been increased to \$1 million and as yet no winners had been identified.

The 1990s and a Renaissance of Challenge Prizes

During the 1990s a fundamental shift began to occur in the world of awards. The numbers of prizes—especially in the United States—began to grow exponentially and the cash amounts of prizes began increasing dramatically. While there were not more than a dozen or so award programs with cash prizes over \$100,000 in 1990, by the year 2003, the number of such programs had increased to nearly a hundred and the number of individual prizes in that amount had increased to more than three hundred.

But there was also a tidal change in the way awards were being offered and given. Whereas traditionally most awards have been given as unrestricted cash prizes to individuals or organizations with past accomplishments, beginning in the 1990s old and new award programs began to become more active in effecting change. Prize awards took on the cast of investment in the future as well as rewarding past accomplishment.

The MacArthur Fellowships of the John D. and Catharine T. MacArthur Foundation, Chicago, IL, opened a new future in the world of awards by both recognizing past achievement and in investing in the future accomplishments of individuals. The Foundation was certain that some individuals with demonstrated qualities of “genius” would be able, given base sustenance funds, to make great contributions to both human knowledge the human condition.

The Hilton Humanitarian Prize of the Conrad Hilton Foundation of Los Angeles of \$1 million per year was developed to be given to organizations already established and providing humanitarian services, but as a targeted investment in the further growth or financial solidification of the organization. The Families Count Awards of the Annie E. Casey Foundation, Baltimore, MD, consist of cash prizes of \$500,000 each to organizations in five separate communities which are working to assist children by strengthening families. The William E. Simon Foundation also established two annual cash prizes of \$250,000 to honor and stimulate innovators and philanthropies working to keep children in school and to encourage them in lives of work and self-support.

But during the 1990s classic challenge prizes came to be increasingly popularized and romanticized particularly in the United States. It was perhaps inevitable that the re-popularization of the challenge prize would come in that realm where it had already proved to be so useful and successful—flight.

In 1996 the X Prize Foundation, a not-for-profit educational corporation, brought the world's attention back to one of those frontiers in flight that had not yet been penetrated. Deliberately patterned after the Orteig Prize which had brought so much attention in the 1920s to St. Louis and Charles Lindbergh, the foundation offered the Ansari X Prize of \$10 million for the development of a craft by a private, non-government person or entity that could be flown to the edges of space and be recycled to produce an identical flight within the space of two weeks. It was the goal of the foundation to “jump-start the personal spaceflight industry.” The prize was to be revoked if it had not been claimed by the end of calendar 2004.

A year later in 1997 the Anheuser-Busch Company, a major beer producer also with deep St. Louis ties, offered a \$1 million prize called the Budweiser Cup for the first person or team to make a non-stop circumnavigation of the earth in a balloon.

Just as the early flight prizes at the turn of the twentieth century had brought world focus to particular achievements in flight, these new prizes attracted wide attention from first announcement, wide-spread recognition of contenders for both prizes, and live minute-by-minute coverage of both failed and successful attempts to win the prizes.

The Budweiser Cup was captured in 1999 by a team of Swiss and British balloonists who began and ended their flights in Egypt. But the publicity surrounding the circumnavigation unleashed a new round of around the world balloon flights of all types that has continued periodically from 1997 to the present.

It long appeared that the Ansari X Prize would go unclaimed. Although more than 20 teams from seven nations competed for the prize, it was not until 4 October 2004 that Bert Rutan's team of aerospace innovators captured the prize.

Engineering Inducement Prizes

The furor and adulation that surrounded the Budweiser Cup and X Prize flight challenges stimulated America's engineering community to look toward the challenge prize concept as a way of generating public and private investment in engineering innovations and advancements.

In 1999—amidst the glow of new challenges in flight—the National Academy of Engineering (NAE)—the premier learned body for engineering and engineers in the United States—commissioned a study of challenge prizes and organized a workshop on 30 April 1999 to analyze the subject. The outcome of the study and workshop was the issuance of a report which the NAE entitled *Concerning Federally Sponsored Inducement Prizes in Engineering and Science* which it made available in 1999.

The study was a very intelligent assessment of the history and function of challenge prizes and covered much of the background and fundamental philosophy of challenge prizes. The report contains a well-documented “Taxonomy of Technology Prizes and

Contests” and is thus tremendously useful in understanding the technical history of challenge prizes.

But the report is limited in its ultimate usefulness in two major respects: First, it is written as a study to be used to persuade the US federal government and Congress to increase spending on engineering and technology by introducing a new and separately funded category of challenge prizes. The report is, in this respect, essentially a lobbying tool for use in the Congressional appropriations process.

Second, the NAE report devalues the illustrious history and career of challenge prizes by suggesting that they should henceforth be known as “inducement prizes.” The fundamental meaning of the verb “to induce” in this connection is “to invite” or “to persuade.” That allusion is far different from the historic and fundamental thrust of challenge prizes which may be found in the special character of the word challenge. “To challenge” is “to dare” or “to engage” someone into a contest of some sort.

An inducement is too much akin to what has become known in government and industry as an “RFP” or request for proposals, whereas a challenge is a call to action. An inducement is a lure into an enterprise specifically for a financial reward. A challenge is demand for boldness, for heroism; a test of wit, wisdom, and skill as well as of knowledge.

Despite the variance of what NAE conceived of as “inducement prizes” from traditional challenge prizes, the NAE report had a significant impact on programming by those federal agencies which have traditionally funded essentially engineering and scientific innovation and development.

By 2003 the Defense Advanced Research Projects Agency (DARPA) had issued what it called the DARPA Grand Challenge—an \$11 million prize for the first and fastest autonomous vehicle capable of finding its own way over a defined course from Barstow, CA, to Primm, NV in less than ten hours. The goal of the challenge or inducement was to encourage the development of a robotic vehicle for military application.

By 2004 the National Aeronautics and Space Administration (NASA) had developed a program of NASA Centennial Challenges with prizes of \$250,000 and up for the private sector development of technologies required for America’s space exploration program. This program devolved into a number of NASA collaborations to mount several \$250,000 challenges known as the NASA Space Elevator Climber Competition, the NASA Beam Power Challenge, and the NASA MoonROx Challenge all of which were in the process of being activated during 2004 and 2005.

But not only did NAE influence federal spending policies, it also adapted its concept of an “inducement prize” in its own award giving. With a significant private gift to be used for a new engineering award, NAE established in 2005 what it is calling the Grainger Challenge Prize (noticeably not the “Grainger *Inducement* Prize”) to deal with national and international concerns in the realms of natural resources, the environment, and

agriculture. The first prize of \$1 million is to be awarded in February 2007 to an individual or individuals in the not-for-profit or for-profit world who will design an efficient and economical water-treatment system for arsenic contaminants found in the ground waters of Bangladesh, India, Nepal, and other developing countries.

Despite the glowing embrace of “inducement prizes” by NAE and some of the federal agencies with which it interacts, by July 2004, other observers of the US government role in technology advancement began to raise important questions. On 15 July 2004, Molly K. Macauley, Senior Fellow at Resources for the Future, a non-partisan research organization in Washington, DC, appeared before the Committee on Science of the US House of Representatives and presented testimony titled “Advantages and Disadvantages of Prizes in a Portfolio of Financial Incentives for Space Activities.”

According to Macauley the “inducement prizes” developed at DARPA and NASA presented mainly disadvantages in the advancement of innovation in the United States. A prize approach to technology innovation, she argued, would delay the pace of innovation in the United States by introducing a variety of variables never before present in twentieth century approaches to research and development. US R&D programs, as historically cast since the Second World War, assured the steady growth of industry, research, a stable research community, and, most of all, innovation. Pointing out that DARPA had not been able to attract entries for its robotic vehicle and NASA’s projects had yet to bear fruit, she threw considerable doubt on the use of inducement or challenge prizes by government.

But despite her pessimism in July 2004 it is a fact that three months later Bert Rutan’s SpaceShipOne touched the edges of space twice. And a year later a group of Stanford University students guided “Stanley” a modified Volkswagen across DARPA’s desert course with only the use of computers and on-board sensors.

Concurrent Advancements in Challenge Prizes

Quite apart from the somewhat rarified world of government and quasi-government funding, the concept and reality of the challenge prize has been advancing through the 1990s and to the present at an impressive and increasing rate.

Human powered flight has been an aspiration of man from the days of speculations by Leonardo da Vinci to the present. A British industrialist, Henry Kremer issued a challenge prize of £5,000 later increased to £50,000 in 1960 for a human to fly a one mile figure eight course under his own power. The challenge was finally met in 1977 which led to a larger prize of £100,000 for the first human powered flight across the English Channel in the 1990s—all from private sources. The prize remains unclaimed.

In 1994 the Rockefeller Foundation offered a \$1 million prize for the development of a low cost method of testing for gonorrhea and chlamydia in underdeveloped countries of the world with a growing epidemic of HIV infection. Although there are many rapid tests

for syphilis, gonorrhea, and chlamydia, all are too expensive for third world countries. But despite the attractiveness of the prize amount no private sector entity was able to develop a test that met the foundation's requirements before the prize expired in 1999.

A very different and much more successful challenge program was initiated by the City of Stockholm in 1995—known initially as the Bangemann Challenge and later renamed the Stockholm Challenge. The purpose of the initial challenge was to encourage competition between government entities, private corporations, and universities to innovate information technology applications that could improve life and advance private enterprise in Europe. When the first awards program was held in 1997 in Stockholm, the program included innovative projects from 25 European cities. The program proved to be so successful that it was renewed for 1999 as the Stockholm Challenge with almost 700 projects from 56 countries. By 2004 the program had grown to include 900 projects from 107 countries. As the Stockholm Challenge enters into its 2006 competition, the program is inviting the submission of innovative information technology applications in six major realms: (1) public administration; (2) culture; (3) health; (4) education; (5) economic development; and (6) environment. While the Stockholm Challenge does not involve the giving of cash prizes, it fosters the advancement of information technology by promoting competition between cities and nations throughout the world. And it provides a vital awards forum in Stockholm presided over by the King of Sweden to facilitate information sharing and cooperation.

Another challenge prize program of \$1 million was announced by Clay Mathematics Institute of Cambridge, MA, in 1998 to elicit solutions to seven classic problems in mathematics. The open ended challenge has not yet resulted in the awarding of any prizes.

The Methuselah Mouse Foundation announced in 2003 that it would offer a prize of \$3 million to a researcher who can develop a method of extending the lifespan of mice from three years to five years, thereby opening up the possibilities of also extending human life.

Other challenge prizes have been developed in recent years to encourage advances in caring for the global environment. Two notable new prizes were established in 2005: The Schweighofer Privatstiftung announced the Schweighofer Prize for 2005—a prize program of 300,000 EUR for innovations in improving the timber production chain through advancements in forestry, wood technology, and timber products. Meanwhile, in the United Kingdom the Ashden Trust and Forum for the Future announced the creation of a prize program of £135,000 to honor innovative energy production schemes to protect the environment and enhance quality of life.

Also in 2005 the Bill & Melinda Gates Foundation announced the largest challenge program unveiled in history. Called the Grand Challenges for Global Health, the Foundation announced a commitment of \$436.6 million in funds to be distributed to 43 different groups challenged to find treatments for 14 human diseases, among them

malaria, tuberculosis, and HIV; of developing methods of preventing insect-borne diseases; and of finding better crops to feed the hungry.

At the outset of 2006 the private sector world was abuzz with the opportunities and potential successes that might derive from a wider and expanded use of challenge prizes to bring about technological, social, and economic change.

The founder and president of the X Prize Foundation, Peter Diamandis, flush with the successes and wide-spread approval of the \$10 million Ansari X Prize for space flight, was indicating publicly that his foundation would be announcing a new set of challenges in the near future, among them a much larger prize to encourage attempts at private sector space flight. Committed to the viability of challenge prizes as the best method of obtaining innovation, Diamandis promised that the future of the challenge prize was alive and well.

At the same time another foundation, Civic Ventures, inaugurated a new prize program titled “The Purpose Prize” that also seeks to facilitate innovation in American society. A not-for-profit “think tank and an incubator, generating ideas and inventing programs to help society achieve the greatest return on experience,” Civic Ventures announced the receipt of financial support from the John Templeton Foundation to establish an annual program of five \$100,000 prizes to social innovators over the age of 60. The prizes will enable individuals with a record of entrepreneurialism in addressing community and national problems to enter a period of “engaged retirement” to continue facilitating social innovations. Rather than losing accomplished older individuals from the social fabric, these carefully selected persons will be employed to apply the lessons of their lives to social problems.

The Challenge of Challenge Prizes

By the early days and months of 2006 the notion of using the challenge prize as a useful and appealing tool for advancing knowledge and for solving the ills of human society had captured the imagination of entrepreneurs, activists, and learned societies in America. Indeed, the American Association for the Advancement of Science (AAAS) made the concept of challenge the theme of its annual convention. Calling its 2006 meeting—the world’s largest annual meeting of scientists—“Grand Challenges, Great Opportunities”—AAAS demonstrated that the idea of challenge prizes had captivated the citadels of learning and research.

Proponents who have argued for the last decade that the challenge prize should be employed to solve long standing problems of technology and society have clearly gotten the attention of the world’s decision maker—at least in the United States—in Congress, in the executive branch of government, and among the nation’s leaders in engineering and science. The time could not be riper for the employment of challenge prizes.

However, as foundations, government agencies, and learned societies rush into the embrace of challenge prizes as the wave of the future, it is well to pause a moment to recognize the special nature of challenge prizes and the limitations that are built within them. Indeed, the effective use of challenge prizes poses in and of itself a special set of challenges.

Among the guiding principles that govern the development and application of challenge prizes are the following:

1. *The challenge issued by a challenge prize must be both dramatic and daring.*

The challenge must be capable of capturing the imagination of both potential participants and a general public. It must be seen by both participants and the public as a dare that calls forth imagination and heroic achievement. For a major part of the reward—perhaps even the greatest reward—of a challenge is that the successful entrant has gone beyond what is perceived as normally possible in meeting the challenge. Any challenge that could be interpreted as a subterfuge for procurement or as a fancy way of contracting for work to be done must be avoided.

2. *The prize offered in a challenge prize must be translatable by the participant as a financial reward worthy of all the effort.*

The prize component of a challenge prize need not be calculated as sufficient to pay all of the costs of an entrant for the prize. But it must be at a magical level that enables the candidate to pursue the prize with pride and a certain swagger that enables the candidate's public and potential funders to view the pursuit of the challenge as a worthwhile and laudable effort. And in establishing prize amounts, funders should understand that round figures have a much greater plausibility as a prize than an amount of money that might be calculated as somewhere near the costs of a potential participant.

3. *Challenge prizes should be employed mainly in finding solutions to problems that can be described as perennial, elusive, or seemingly intractable.*

The challenge prize should not be viewed as a replacement for procurement, for the gradual advancement of any field, or for developing a program of sustained research. It is best used in situations that require creative thought, cross disciplinary applications of knowledge and techniques, and where wholly new approaches need to be found to attack a problem or series of problems.

4. *The challenge component and resulting goal of a challenge prize should be capable of succinct description and simple measurement.*

The reason why challenge prizes have always been so easily adaptable to speed and flight is that the goals to be achieved can be simply stated and are easily measurable. E.g., the first flight across the English Channel, the Atlantic, or to the outer edges of space at a specified elevation for a stipulated period of time. If the goal cannot be stated

in easily measurable terms, the goal is not suitable for a challenge prize. I.e., the “best” entry, the “most practical” result, and the “most beautiful” product are not suitable goals for the application of challenge prizes. Nor “greatest stimulus for economic development,” the “best approach” to education, nor the “wisest investment.” No goal or result that cannot be stated and evaluated in measurable terms should be proposed for the use of challenge prizes.

5. The highest and best use of a challenge prize technique is in situations where the greatest need is a creative or innovative solution.

The best challenges are those where potential participants will need to devise creative methods for achieving a stated objective, where there is a need for an expansion of thought process, or for new and better methodologies. The best challenge prize competition is one that lavishly recognizes the ingenuity of the participant as an essential part of the reward.

6. Challenge prize contests should only be used in situations where the goal or product is not required on a specific schedule or deadline.

Since the most important component of the challenge prize is the development of creative strategies for solving a stated problem, the challenge prize schedule should be open-ended until the challenge has been successfully met. To establish dates of delivery converts a challenge prize into a “best product” subjectively evaluated competition. But to establish a lapse date for a challenge prize has proved to be an important ingredient in the mystique of this form of prize.

7. In challenge prize competitions all conditions of participation and the results to be achieved must be clearly stated and made available to all participants.

To assure equity and fairness to all potential participants all requirements of participation, timetables for production, and characteristics of the end product must be clearly set forth when the challenge is issued and adhered to until the challenge is met.

8. It is a duty and responsibility of the challenge prize sponsor to promote the challenge contest as broadly as possible and to make known, as well, the successful participant

Since public recognition is one of the major driving forces for participants in challenges of all sorts, it is important for challenge sponsors to do all they can to promote their contests and their recipients.