

Virtual World Astrosociology

William Sims Bainbridge

*Division of Information and Intelligent Systems
National Science Foundation
4201 Wilson Boulevard, Arlington, Virginia 22230
wbainbri@nsf.gov*

Abstract: This essay introduces the opportunity for theory development and even empirical research on some aspects of astrosociology through today's online virtual worlds. The examples covered present life on other planets or in space itself, in a manner that can be experienced by the user and where the user's reactions may simulate to some degree future human behavior in real extraterrestrial environments: *Tabula Rasa*, *Anarchy Online*, *Entropia Universe*, *EVE Online*, *StarCraft* and *World of Warcraft*. Ethnographic exploration of these computerized environments raises many questions about the social science both of space exploration and of direct contact with extraterrestrials.

The views expressed in this essay do not necessarily represent the views of the National Science Foundation or the United States.

Keywords: Astrosociology, Virtual World, Massively Multiplayer Online Role Playing Game
PACS: 01.75.+m

INTRODUCTION

Many online virtual worlds depict phenomena central to astrosociology, and they can be conceptualized either as the modern form of science fiction or as more-or-less realistic social computing simulations of actual future possibilities. Indeed, they help us define the scope of astrosociology as an intellectual field of endeavor, and suggest questions that astrosociological theory will need to address. Although some online communities that might be called virtual worlds are text-based, and researchers continue to encounter technical barriers in achieving full virtual reality, the visually immersive but sensorial limited examples discussed here represent the current state of the technology and its social expression. This paper is based chiefly upon a wider ethnographic research program, in which the author has already invested about 4,000 hours exploring many online environments of this type.

Often incorrectly called computer games, virtual worlds are computer-generated online environments that resemble the real world visually and in terms of many of their features, in which the user is represented by one or more avatars or characters that to varying degrees express the personality of the user through interaction with others. The examples described here are all set on other planets or in interstellar space, and the first was a direct outgrowth of the social movement that promotes space exploration.

TABULA RASA

This example depicts two alien planets, Foreas and Areki, where a war rages between the Allied Free Sentients, to which the user's avatar belongs, and the Bane who are trying to conquer the universe. The Earth has already been conquered, so humans are refugees, but they have an extensive military force that has allied itself with a somewhat subservient intelligent alien species on each of the planets. This virtual world is officially called *Richard Garriott's Tabula Rasa*, and its chief creator is the son of Skylab astronaut Owen Garriott. Great effort was invested to make the planets interesting natural environments that reward exploration and thus inspire the user to believe that real extraterrestrial worlds would also be appealing. In October 2008, Richard Garriott flew to the International Space

Station, taking with him a data storage device containing all the avatars of *Tabula Rasa* users, thereby explicitly linking this fictional world to the actual exploration of space (Bainbridge, 2010b).

On one level, *Tabula Rasa* is an analysis of all the reasons why intelligent species might undertake space travel and come into contact with one another, because it tells the varied stories of six different groups who did so. A large contingent of humans was forced to flee to other worlds to escape the Bane, but this is only one example of how an intelligent species might need to travel between the stars to avoid destruction. Other such survival-oriented motivations might include a cosmic catastrophe like a swarm of comets headed toward Earth or indications the sun was becoming unstable rather earlier than astronomers had predicted. A second group of humans, the Cormans, left Earth before the Bane invasion, because they were a utopian movement that came into conflict with the authorities, and discovery of an alien spaceship allowed them to establish a colony on Foreas. Although conflict features in this motivation as well as in the first, it was the socio-cultural idealism of the Cormans that provoked the conflict, and thus their ultimate motivation was not survival but revolutionary hopes.

The group whose actions ultimately set the course of history for the other five was an ancient, advanced species called the Elohim. They initially explored the universe long ago in order to learn the secrets of reality, and then traveled between the stars to bring their wisdom to other species. Figure 1 shows my avatar in his battle armor, receiving instruction from a hologram created long ago by the Elohim, at one of the very rare points in *Tabula Rasa* when even this rather distant form of contact was possible. The scene is a Logos shrine inside a hidden cavern, one of many such shrines where he could gain one small piece of the Elohim wisdom. Over time, as he gained wisdom he also gained power, such as the ability to create a clone of himself that could assist him in battles against Bane soldiers.



Figure 1. The User's Avatar discovering a Logos Shrine in *Tabula Rasa*.

The fourth and fifth groups, currently living on Foreas and Arieki, were not native to these planets but traveled to them in hopes of solving one or another of their social problems, in the shadow of Elohim technology. Centuries ago, the Foreans had developed their own technology which unfortunately ruined the natural environment of their home planet. The Elohim took mercy on them and helped them migrate to Foreas where they established a spiritual and nature-oriented culture that lived in harmony with their exceedingly beautiful and benign environment. Arieki, in contrast, is a harsh world with rivers of flowing lava, which was used as a prison planet by the Brann who were native to the planet Erdas, where they had developed a high civilization with a strong sense of justice. Unable to reform the small criminal element within their society, they were too humane to destroy them, so they turned to space technology for a solution. Then the Bane destroyed Erdas, and the convicts took over the prison on Arieki, establishing a society based on the extraterrestrial equivalent of Mafia families.

The Bane, the sixth space-faring group, is an army of insectoid and cyborg soldiers created by the Neph, who were originally a faction of the Elohim. Undoubtedly, the names Elohim and Neph are drawn from the Bible, where *Elohim* refers to God or gods, and *Nephilim* are somewhat ambiguous beings who may be fallen angels, Titans, or other wicked entities opposed to the Elohim. The Elohim are benevolent, if somewhat distant, while the Neph are selfish. The goal of the Neph is power over the universe, and they destroy any intelligent beings they cannot absorb into their army. The conflict between Elohim and Neph seems to be one between good and evil, although the Elohim are rather ambiguous in how much they support individual freedom rather than being merely a more subtle form of dictatorial control. The fact that both groups base their advanced technology on the same Logos system suggests the universe itself may be morally neutral.

The Logos is a system of potentially about two hundred pictographic symbols, each of which communicates a hidden truth or pivotal concept. One can be gained from each of the shrines, and they then appear in a portion of the user interface called the *tabula*. This is the literal *tabula rasa* or clean slate that represents a new intellectual and cultural beginning for humanity, as well as for the user's avatar. *Logos* is the classic Greek word suggesting a divine discourse leading to wisdom about the ultimate meaning of existence. Employed by philosophers like Heraclitus and Plato, it was carried over into Jewish and Christian theology, and expresses the fundamental scientific premise that the universe can be described correctly in a combination of words and mathematics. Logos symbols are often combined to form sentences that often confer abilities on the avatar, or communicate a philosophical proposition, as illustrated in Figure 2.

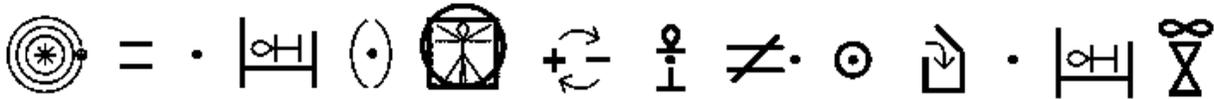


Figure 2. The Logos Sentence Displayed by Richard Garriott in Space.

Shortly after launch, Richard Garriott held up to the cameras a piece of paper carrying this message, challenging viewers to decipher it. I found this very easy to do. The first symbol represents the Earth, and is the last logos a user was able to gain in *Tabula Rasa*. It represents the sun with the orbits of the three inner planets, and a dot for our own planet. The last symbol is a combination of familiar logos, the conventional symbol for infinity over an hourglass which represents time. This is the word *forever*. One symbol that appears twice in the message is not found in *Tabula Rasa*, the fourth and next-to-last pictograms. It seems to depict a small person lying on a bed, and I correctly guessed this is the word *cradle*. Given familiarity with the other logos symbols, I could immediately read this as Konstantin Tsiolkovsky's famous dictum, roughly translated from his Russian, "Earth is the cradle of humanity, but one cannot live in a cradle forever."

Nor, apparently, can one live in a virtual world forever. Shortly after Garriott's flight, the company that hosted *Tabula Rasa* shut it down because it had attracted few subscribers and the company wanted to concentrate its efforts on a new fantasy game that might be more profitable. While the company's action may have been understandable, it is a warning both to enthusiasts for virtual worlds and to proponents of space exploration. Ideally, every valid virtual world would exist forever. Today, an online public digital library could be set up, comparable to the Library of Congress, hosting in perpetuity the high-quality virtual worlds that had exhausted their commercial potential. These would already include not only *Tabula Rasa* but also the famous *Matrix Online* and *Uru (Myst Online)*.

Unfortunately there is no move to set up such a public resource, and the companies would see it as a competitor, just as bookstores compete with public libraries.

Perhaps more relevant for this essay, there is good reason to believe that the vigor of the spaceflight social movement is fading, as young people show less enthusiasm for space exploration than does the generation who came of age during the Sputnik to Apollo days (Bainbridge, 2010a). *Tabula Rasa* was a high quality virtual world, with significant intellectual depth, and frankly much more pleasant than the equally profound *Matrix Online*. It may be that contemporary culture does not value intellectual depth, and arguably, one need only look at today's political debates to see other evidence in favor of this dismal hypothesis.

ANARCHY AND ENTROPIA

Both *Anarchy Online* and *Entropia Universe* are European virtual worlds that let the user experience colonization of a new planet, without contact with native extraterrestrial intelligence, but where intelligent products of human technology have escaped and become hostile. *Anarchy Online* is rather more gamelike than *Entropia Universe*, because it offers set missions, requires users to climb a status ladder consisting of levels of general experience, and encourages battles between users. *Entropia Universe* is closer to non-game virtual worlds like *Second Life*, because it encourages users to think of it as a place where they can live, work, and socialize amicably with each other. Both expect users to explore the wide terrain of a new earthlike planet, hunt animals and other resources along the way, develop crafting skills to transform resources into valuable objects, and even to settle down in their own virtual house or apartment.

Anarchy Online dates from 2001, and much of its technological rhetoric concerns the then-popular nanotechnology, and the convergence of nano with other technologies (Tørnquist, 2001; Roco and Bainbridge, 2001 and 2003). Nearly thirty thousand years in the future, its story goes, the Omni-Tek Corporation took possession of the planet Rubi-Ka and began exploiting its distinctive natural resources. A few centuries later, working class inhabitants so resented domination by the corporation that they staged an uprising and took possession of some regions of the planet, calling themselves the Clans. Subsequently, a smaller area became politically neutral. Users are bombarded with propaganda to join either Omni-Tek or the Clans in order to gain much more scope for action than possessed by the Neutrals, an interesting reflection of the pressures to join big alliances that exist in terrestrial society.

While the natural environment of the planet is somewhat benign, and indigenous animals are not very different from those on Earth, large areas are undergoing terraforming. Each avatar gradually earns nanotechnology enhancements that transform its own human nature. Many of these enhancements are nano-bio implants, for example genetically engineered lungs to replace the ones the avatar was born with. Other nanotechnology systems allow many avatars to create robot assistants to fight alongside them, and a very complex system exists for manufacturing objects and machines out of the natural resources of the planet.

Among the most formidable non-avatar opponents are genetically-engineered mutants who may have been human-animal hybrids or other unethical experiments the corporation carried out, and which have escaped from control as a result of the war between Omni-Tek and the Clans. Thus, the humans on Rubi-Ka are becoming progressively more alien, and the aliens are former humans. The local animals are no more intelligent than rats or alligators, and with comparable dispositions. The most explicit astrosociological issues concern colonization of a new world, competition between capitalism and communalism, and the frequent lawbreaking of individuals under chaotic frontier conditions.

Entropia Universe was launched in 2003, and in August 2009 it underwent a revolutionary transformation when the entire planet Calypso was rebuilt pretty much from scratch for a new and much more demanding graphics system. Like Rubi-Ka, Calypso is colonizable and has indigenous life-forms, but not especially intelligent ones, and some of the enemies are escaped robots or mutants. However the big difference is that Calypso presents itself more as a real world, which the users would want to colonize, with much less emphasis on a story line or goals set by the developers.

In several respects, *Entropia Universe* is more comparable to Linden Lab's *Second Life*, which also launched in 2003, and which is a virtual world where all the content is created by users and there is no over-arching story line at

all (Rymaszewski *et al.*, 2007). Both have internal currencies that are convertible with external currencies: 10 Project Entropia Dollars equal one US dollar, and around 260 Linden Dollars equal one US dollar. As recorded in the current Wikipedia (http://en.wikipedia.org/wiki/Entropia_Universe; http://en.wikipedia.org/wiki/Second_Life) articles about them, both have been criticized for their business practices. However, perhaps the most plausible explanation for these controversies attributes them to an implicit debate over whether virtual property is real, and whether economic activity inside virtual worlds can be profitable. This relates directly to astrosociology, because it raises the question of whether it ever can be profitable to colonize a new planet, from the standpoint of the original investors.

Given the lack of explicit missions, the chief activities on Calypso are exploration, hunting wild animals, gathering natural resources through mining and drilling, and using these resources to craft virtual objects which can be sold in an auction system. The one gamelike aspect of this world is that a notice is automatically broadcast on the worldwide text chat channel announcing the major accomplishments of colonists, thus conferring social status upon them. Figure 3 shows my *Entropia Universe* avatar, in his armor, standing amidst the exotic flora of Calypso and holding the scanner he uses to document the features of animals he encounters. Prior to the technical revolution of August 2009, he had explored all nooks and crannies of both large continents on Calypso, plus both space stations, and since that time he has visited many of the same locations to document the often extreme changes.



Figure 3. An Avatar Studying Flora and Fauna in *Entropia Universe*.

EVE ONLINE

An entire galaxy can be explored in the virtual world *EVE Online*, although the vast majority of planets in it cannot support life, and none of their surfaces can be visited. Over 20,000 years in the future, four competing human civilizations, plus a host of smaller corporations and other groups, vie for control of the resources of asteroids, which they use to build orbiting cities, thereby adapting to zero-gravity rather than paying the rocket fuel penalties for exploiting the planets. This is not our own galaxy, but one similar to it. The premise of *EVE Online* is that long ago, humans discovered a natural wormhole they named EVE through which they could reach the new galaxy, and

through which they began to colonize it. But EVE suddenly collapsed, and the outposts in the new galaxy were unable to maintain an interstellar civilization, so it collapsed as well.

Now, interstellar commerce has been re-established in the EVE galaxy, first by a religiously zealous society called the Amarr, and subsequently by three other societies. The Minmatar were initially dominated and even enslaved by the Amarr, but conflict with a mysterious fifth group, the Jovians, helped many Minmatar rebel and set up their own interstellar community. The two other societies that independently achieved faster-than-light travel, the Gallente and the Caldari, originated in the same solar system, so their destinies are intertwined, but the result of a war between them forced the Caldari to flee and set up their own society elsewhere. Currently, a truce exists across the home and neighboring systems of the four main societies, but much of the galaxy is wide open, disputed by pirates and independent corporations that attack each other in an uninhibited manner.

A very few missions in *EVE Online* hint that alien cultures may also exist, through rumors and strange archaeological artifacts, but they are never encountered directly. However, by any strict definition, the four human societies are extraterrestrial, because they have no contact with Earth and have had centuries to evolve in new directions. This raises an interesting social-scientific question. Will intelligent species that evolved independently really have very different cognitive and social patterns from our own, or do any unique biological factors become insignificant once rational intelligence, scientific research, economic markets, and large-scale governmental systems emerge? Academic disciplines as diverse as sociology and cognitive science make very few claims about how our distinctive mammalian heritage shapes our intelligence, and many theories discount this altogether. To the extent that advanced technological intelligence converges on a universal set of functions, a galaxy that was entirely colonized by humans could be as culturally diverse as one inhabited by several independently-evolved intelligent species.

The Amarr no longer dominate the other groups politically, but they set the initial terms of debate within the galaxy. Amarr is a theocratic society that believes it rules by right of faith, and that members of other groups would benefit from being dominated, and indeed even from being tortured by Amarr slave masters because pain supposedly makes people more spiritual (Gonzales, 2006). Thus it is an allegory for every self-righteous Earth government that has used ideology to justify its naked exploitation of other people, and a rhetoric that rejects the religions that already have been created by humans. Naturally, Amarr itself has a different view. Here is a paragraph of propaganda, from the Militia Office in the Theology Council Tribunal in the Amarr system itself, heart of the Throne Worlds:

The Amarr Empire used to shine as a beacon to humanity of what it meant to be civilized: To be strong, and to lead by example. Through God's words we spread civilization throughout the stars and it is by our leadership that New Eden achieved its wings. It is up to you to carry this example, the lessons of God's chosen, and reinstate the Empire of Amarr to its former and rightful glory. We need to reclaim the Minmatar from the drudge, chaos and inhumanity in which they currently dwell, and into God's light. We are their angels. We must be their saviors. By your power they shall be rescued from the dark. God wills it, and so it shall be.

The three other societies consider Amarr to be devils, not angels, and each in its own way dissents from the concept of centralized political and ideological control. The Minmatar stress political independence. The Gallente and the Caldari stress economic freedom, although the Caldari give a greater role to the government in managing the economy. Advanced users of *EVE Online* form their own independent corporations and set up their own societies in solar systems outside the control of the Amarr, Minmatar, Gallente, and Caldari. A sense of Amarr's style is communicated in Figure 4, which shows an Amarr battlecruiser passing in front of the second moon of the planet Zorast. The large structure at the right is one small portion of the city-sized Theology Council Tribunal, and between the ship and the city floats a monument to Amarr's glorious past. A key measure of progress for the individual user in *EVE Online* is the increasing ability to afford and operate ever bigger spaceships, and this one is just the middle of the range.

For mass interstellar travel to be possible, there must be inexpensive means for rapid flight, and here, as in much written science fiction, *EVE Online* fantasizes. The user is always represented by a spaceship, rather than a body with two arms and legs as in the other virtual worlds, so the functioning of that craft is fundamental to the experience and the plausibility of the world. Over short distances, for example in battles with other ships, acceleration to a modest maximum velocity takes a few seconds but does not consume fuel, and perhaps for

dramatic effect the engines continue to fire after reaching maximum velocity, which is not realistic in terms of physics. Travel from one point to another within a solar system takes longer, but less than a minute, using some kind of warp drive built into the ship. Travel between solar systems can be done only by using pre-existing jumpgates that are much larger than the ships. Despite its physical implausibility, this is actually an interesting premise. The more than 7,000 solar systems are connected through a network of jumpgates, typically two to four per system, each reaching just one other system. A very high quality navigation system provides the user with all the information needed to negotiate this vast network, and must be counted a triumph for the designers of *EVE Online*.



Figure 4. An Amarr Battlecruiser at the Heart of the Empire in *EVE Online*.

STARCRAFT AND WARCRAFT

These two very different virtual worlds were both created by Blizzard Entertainment company in Irvine, California. Blizzard's first great success, over fifteen years ago, was the first of three *Warcraft* online strategy games. In a *strategy game*, a small number of skilled players compete by means of armies of simulated warriors, rather than being represented by a single avatar inside a visually somewhat realistic environment as is the case for role-playing virtual worlds such as *World of Warcraft* which was launched after *Warcraft III* in 2004. The archetypical strategy game is chess, where two players sit on opposite sides of a board and take turns directing armies of pieces that may be moved only in accordance with a strict set of rules. The first *Warcraft* strategy game was similarly limited to two players. *StarCraft* was seen as innovative when it launched in 1998, because it brought together three players, although individuals could play alone against a simulated opponent, without using Internet, to hone their skills.

StarCraft imagines that human civilization had expanded across many solar systems when it suddenly and violently came into contact with two other intelligent species, the Potoss and the Zerg (Grubb *et al.*, 2007). Each of the three combatant species has its own strengths and weaknesses, as well as its own distinctive styles of thought and social organization. The mythos has been expanded through a series of novels by various authors, although the differences between the three species also reveal themselves through the technical functioning of military units in the game itself. The Potoss are most technologically advanced, thus in some ways most intellectual of the three, but they also seem aloof and guided by some kind of spiritual hierarchy. The Zerg are more biological rather than intellectual, radically collectivist, even more like a sophisticated plague than an intelligent species. The key point is that the Potoss and the Zerg are extremely *alien*, to the point that it would be difficult to have a conversation with one of them.

However, the humans in *StarCraft* are alien as well, but in a subtle sense that testifies to how well its creators have thought about the issues. In a strategy game, totally unlike a role-playing environment where each avatar literally has a mind of its own, the chess pieces have no autonomy. The user tells them where to go, and they go there, subject to any random factors and the intervention of an opponent's piece. Thus much of the content of the *StarCraft* novels concerns methods to force soldiers to obey their officers, even to the point of disabling the free-will centers in their brains through reconditioning or implants, and how the military disregards the needs of civilians.

Realistically, space travel will require extreme patience, high reliability, and extremely specialized abilities, of people as well as of machines. Thus, when we send actual explorers into deep space, they may no longer be fully human. Early journalistic writings about the Apollo astronauts already debated this possibility, and it will deserve reconsideration whether any new phase of the manned space program begins (Mailer, 1971; Wolfe, 1979)

In *World of Warcraft*, each user is represented by an avatar that belongs to one of ten "races," most of which are humanoid but non-human, and all of which are extraterrestrials. However, given that each avatar is operated by a human being, their behaviors tend to conform to human expectations. This virtual world is also inhabited by thousands of non-player characters (NPCs) that represent animals, humanoids, or in some cases fictional aliens such as elementals representing the forces of earth, air, fire and water. The exceedingly simple artificial intelligence programs running these NPCs do not give them much scope for innovative behavior, but there are countless minor variations across the numerous categories of them. For example some are apparently capable of fear and rage, while others are not, and many behave somewhat socially in apparent cooperation with others of their type. In addition some avatars have secondary avatars that are somewhat like single chess pieces. For example, hunters in *World of Warcraft* can tame hunting animals and direct their behavior in combat against either NPCs or other avatars.

Figure 5 shows four of the twenty-two avatars I used to explore *World of Warcraft*, representing four separate intelligent species that evolved on three different planets (Bainbridge, 2010c). They are, from left to right, Tarkas the level 20 Orc warrior, Etacarinae the level 50 Draenei shaman, Computabull the level 30 Tauren shaman, and Catullus the level 80 Blood Elf priest. At the times these pictures were taken, 80 experience levels were available, and collectively my avatars explored every geographic area and practically every possible activity in this most popular of virtual worlds. Although all four look somewhat like humans, and each is the avatar of the human user, none of them is actually a member of our species. This is most obvious in the case of the Draenei and Taurens, who possess horns, hooves, and tails, but even the very human-appearing Blood Elf is said to have a different origin from *Homo sapiens*.



Figure 5. Examples of Four Separate Humanoid Species in *World of Warcraft*.

The Orcs were until recently a tribal society living on a planet they called simply the *world*, in their own language, but which the Draenei called Draenor because it was their refuge when they fled their home planet, Argus. Both the Taurens and the Blood Elves evolved on the planet Azeroth, where much of the action in *World of Warcraft* takes place, but did so entirely independently of each other. The Orcs invaded Azeroth in the original 1994 online strategy game *Warcraft: Orcs and Humans*, and Azeroth does have another species not depicted here called Humans. In January 2007, when *World of Warcraft* underwent the major Burning Crusade expansion, a spaceship carrying many Draenei refugees crashed over an archipelago of islands on Azeroth, which they quickly colonized. The home planet of the Orcs was fractured by magical technologies. A huge, crumbling fragment of it called Outland was added to the virtual world at the time of this expansion, so portions of two planets became accessible to users.

Implicitly but very clearly, *World of Warcraft* makes two striking claims relevant to astrosociology. First, the kinds of technologies available to us in the real world are incapable of supporting extensive interplanetary migration. Travel between Azeroth and Outland takes place through teleportation, achieved by magical means. In Outland, Goblins are building a rocket spaceship at an outpost called Area 52, in honor of Area 51, the US Air Force base that UFO enthusiasts think might house an alien flying saucer. But this rocket continually has fuel problems, and it is constantly being damaged by a rampaging robot, suggesting that the real manned rocket programs are going nowhere. At another advanced technology facility in Outland, a place inspired by references in the movies *Star Wars* and *Starship Troopers*, Gnome technicians are adjusting an electrostatic catapult, which is a metaphor for all other hypothetical technical means for space travel, but they cannot seem to achieve a range beyond about one kilometer.

The second firm but debatable astrosociological assumption in *World of Warcraft* is captured in the title: If different intelligent species do come into direct contact with each other, they will compete for resources until one or the other has been destroyed in warfare. To put the point more precisely, *World of Warcraft* assumes that long-term peace between any two societies is impossible, if they must rely upon the same material resources. Indeed, to the extent that they are separate species and do not intermarry, the probability that one will destroy the other is increased. We need only recall that the Earth today contains only one human race, and the Neanderthals have been rendered extinct.

The great popularity of *World of Warcraft* may partly reflect the fact that its rich stories are told on two levels. Superficially, everything is a whole lot of fun, with many jokes and cute fantasy elements. More profoundly, many of the stories and settings are penetrating criticisms of current society. This is the same quality that made L. Frank Baum's *Oz* stories so successful: Children could enjoy them as fairy tales, and adults could appreciate them as allegories. For example, many of the *World of Warcraft* quests fight against environmental degradation caused by technology and by capitalism, such as deforestation in the Stonetalon zone, and water depletion in Zangarmarsh. Several recently added quests require torturing captured enemies, a probable reference to American behavior in the War on Terror.

Some of the most sophisticated allegories portray the human society on Azeroth as ruled by a selfish elite who exploit the working class and the indigenous peoples of the tropics. One series of missions sends the avatar from the human stronghold, Stormwind, to assassinate the leader of the Defias Bandits, in a gold mine deep under the earth. Only after bringing his severed head back to Stormwind, does one realize that he was actually the leader of a legitimate protest movement of workers - defiant not Defias - who had been defrauded by the human government who ordered his assassination. In another series of missions, the user assassinates Colonel Kurzen in the tropical jungles of Stranglethorn, a renegade human military leader who has set up a private army. Only sophisticated players will realize that he is Colonel Kurtz from the movie *Apocalypse Now* about the American involvement in Vietnam, and Kurtz from Joseph Conrad's novella "Heart of Darkness" about European colonialism in Africa. The humans had sought to steal Stranglethorn's resources from the indigenous inhabitants, under a number of false pretenses, and Kurzen's rebellion put the lie to their pretensions.

CONCLUSION

Astrosociology is usually defined as "the social, cultural, and behavioral patterns related to outer space," but many alternative definitions are possible (See: <http://astrosociology.org/>). Two in particular are illustrated by the virtual worlds described here. First, astrosociology may refer to the social processes through which humans will create extraterrestrial and interplanetary societies. Second, it may refer to social relations between separately-evolved intelligent species, whether conducted "in person," via interstellar communication of information, or even more indirectly when members of one react to artifacts or other consequences of another.

It is worth noting that the virtual worlds described here are highly international. *Tabula Rasa* was created by an American company but hosted online by a Korean company. *Anarchy Online* is Norwegian, while *Entropia Universe* is Swedish. *EVE Online* was created by a group of Icelandic enthusiasts who struggled against great difficulties to achieve remarkable success on the global stage. *StarCraft* and *World of Warcraft* were created by a small American company which came to be owned by a French communications company and is now part of a major transnational conglomerate. In the case of *World of Warcraft*, roughly five million subscribers live in China, while about the same number are split between Europe and North America. For the perspective of those who believe that all intelligent species will be cognitively very similar, the international nature of these worlds is not very different from our interplanetary future.

Especially noteworthy is the fact that most users develop social bonds inside the virtual world with people they never meet outside. This is a metaphor for the connections that may arise between intelligent species strewn across the galaxy who might interact only through radio transmission of data. The chief difference would be one of time scale. Under ideal conditions, the Internet latency of these worlds can be as low as 200 milliseconds - one fifth of a second for data packets to complete a round trip between the world's server and the user's computer. For interstellar communications, the latency could be 200 years, precluding development of personal relationships with aliens, at least so long as we and they remain mortals. When sending my spaceship from one star to another, in *EVE Online*, I could easily imagine I was really sending messages to other actual stars across the future galactic Internet.

An optimist would say that these space-oriented virtual worlds inspire hope that actual distant planets can one day be settled by human beings, and that we may eventually come into contact with extraterrestrial intelligences. A pessimist would note that they suggest that interplanetary migration at best would be possible only in the far future and that direct contact with extraterrestrials would inevitably lead to a war of extermination.

Despite its good humor, *World of Warcraft* may be the most pessimistic, because it suggests that our universe is not based on a set of physical principles that would render interstellar flight possible, and that every distinct society will eventually battle with its neighbors to the death, rather than find a way to live in harmony under conditions of material scarcity. *StarCraft* suggests that interstellar flight may be physically possible, but not compatible with democracy. It is worth noting that the early steps toward space travel were taken by Nazi Germany and Soviet Russia, two dictatorial regimes, and in the absence of compelling economic payoffs a free market would never invest the vast sums necessary to colonize Mars (Bainbridge, 1976 and 2009).

Anarchy Online and *EVE Online* are both set many thousands of years in the future, an admission that we presently lack the technical means for interplanetary migration. *Entropia Universe* is especially interesting, because it treats the colonization of Calypso as a real migration to a virtual world, complete with the attempt to establish a novel economic system that would make the whole enterprise sustainable. Although objective figures are unavailable, it is my impression that perhaps a thousand people are on Calypso at any one time, whereas *EVE Online* sometimes reports figures approaching 40,000. At the time I write this, Entropia is going through a great experiment that may lead to a successful business model and a diverse set of virtual worlds for varied purposes. We can respect the attempt, but cannot now predict the outcome of this experiment.

To be sure, there are many differences between the virtual worlds described here and the actual planets astronomers have catalogued. But it may be that they do offer insights about serious barriers to human colonization of Mars. What, to put it bluntly, what would people do on Mars? There are no animals to hunt, nor alien intelligences to battle or learn from. Nobody on Mars hands out interesting quest assignments that would be either fun adventures or clever allegories. Extensive robot surveys could provide geologists with all the information their hearts desire, and it is hard to name another science that might benefit from human exploration. Any human society on Mars

would be established in all its detail by human beings, in the absence of a local biosphere, and it might as well be a less costly virtual world inside a computer.

Tabula Rasa, precisely because of its admirable optimism, leads to the most pessimistic conclusion, for two reasons. First, none of the interplanetary migrations it depicts would have taken place without the angelic Elohim, who have placed their Logos symbols in shrines across the galaxy that must be visited to obtain their wisdom. Second the unpopularity of *Tabula Rasa*, leading to its early closure, suggests that young people are not enthusiastic about space exploration. While there is much to debate, one possible lesson to draw from all these virtual worlds is that our current civilization is neither culturally nor economically capable of extensive interplanetary development. If so, then it is clear what the province of astrosociology must be: We must develop a science of social change that transforms us into the Elohim.

REFERENCES

- Bainbridge, William Sims, *The Spaceflight Revolution*, New York, Wiley Interscience, (1976).
- Bainbridge, William Sims, "The Scientific Research Potential of Virtual Worlds," *Science*, **317**, 27 July, (2007), pp. 472-476.
- Bainbridge, William Sims, "Motivations for Space Exploration," *Futures*, **41**, (2009), pp. 514-522.
- Bainbridge, William Sims, "The Impact of Space Exploration on Public Opinions, Attitudes, and Beliefs," in the *Historical Studies in the Societal Impact of Spaceflight*, edited by Steven J. Dick. National Aeronautics and Space Administration, Washington, DC, (2010a).
- Bainbridge, William Sims, "Science, Technology and Reality in *The Matrix Online* and *Tabula Rasa*," England, Springer, (2010b).
- Bainbridge, William Sims, *The Warcraft Civilization*, Cambridge, Massachusetts, MIT Press, (2010c).
- Gonzales, Tony, *Theodicy*, Reykjavik, Iceland, CCP Games; online novel at <http://www.eve-online.com/races/theodicy/>, (2006).
- Grubb, Jeff, Mesta, Gabriel, Hickman, Tracy and Neilson, Micky, *The StarCraft Archive*, New York: Pocket Books, (2007).
- Mailer, Norman, *Of a Fire on the Moon*, New York, New American Library, (1971).
- Roco, Mihail C. and William Sims Bainbridge (eds.), *Societal Implications of Nanoscience and Nanotechnology*, Dordrecht, Netherlands, Kluwer (2001).
- Roco, Mihail C. and William Sims Bainbridge (eds.), *Converging Technologies for Improving Human Performance*, Dordrecht, Netherlands, Kluwer, (2003).
- Rymaszewski, Michael, Wagner James Au, Mark Wallace, Catherine Winters, Cory Ondrejka, and Benjamin Batstone-Cunningham, *Second Life: The Official Guide*, Hoboken, New Jersey, Wiley, (2007).
- Tørnquist, Ragnar, *Prophet Without Honour*, Oslo, Norway, Funcom, (2001).
- Wolfe, Tom, *The Right Stuff*, New York, Farrar, Straus & Giroux, (1979).