

A NEW PERSPECTIVE ON ‘HIGHER EDUCATION’ EDUCATIONAL INSTITUTIONS IN LOW EARTH ORBIT

Frank White
The Overview Institute

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Introduction

In the early 1600s, Puritans in England began settling a ‘New World’ across the ocean from their homes in England. Less than a decade after establishing the Massachusetts Bay Colony, they turned their attention to the matter of education. In their own words:

“After God had carried us safe to New England, and wee had builded our houses, provided necessaries for our liveli-hood, rear'd convenient places for Gods worship, and setled the Civill Government: One of the next things we longed for, and looked after was to advance Learning and perpetuate it to Posterity; dreading to leave an illiterate Ministry to the Churches, when our present ministers shall lie in the Dust.”¹

The result of the Puritans' 'longing' was the establishment of a small college in 1636 that eventually grew into Harvard University. As the description above indicates, the Puritans saw advancing learning as an important priority after building their homes and churches, establishing a government, and taking care of their livelihoods (commerce).

Today, we are witnessing a growing consensus that the next frontier for space commerce and space settlement is Low Earth Orbit (LEO).² While 'space' is usually envisioned as being at a great distance from the Earth, it is actually quite close. In fact, the distance from the Earth to LEO is far less than the distance the Puritans had to travel from England to New England. The challenge to space commerce and settlement has always been cost, not distance.

Satellites are already a LEO commercial success because of the return on investment (ROI). Lifting a satellite into orbit is far less expensive than putting a person there, and the financial return makes the investment worthwhile. The real payoff, however, will occur when the cost of access to LEO is low enough that it is profitable to send people there.

When observers talk about what is next, they most often mention space tourism, hotels, and similar translations of Earth-based activities to the space environment. Ultimately, to create a spacefaring civilization, we must assume that whatever human communities do on the surface of the Earth, they will do in LEO as well.

If this is so, then education, one of the most essential of human activities, will also take place in LEO.

Historically, higher education has, in particular, played a major role in commerce on the Earth. From private research universities to land grant colleges, these institutions have provided research and development, as well as training and education, to produce innovation and a talented, skilled workforce.

Given this historical symbiotic relationship between education and commerce, we might want to consider the role of 'higher education' (aptly named in the case of space!) in helping to grow orbital commerce.

Current situation

After a half-century of space exploration and development, the space environment is used for educational purposes, but not as extensively as we might expect. This does not mean that educational institutions are not interested. Many have space science departments or other levels of involvement in the space exploration enterprise. Others, like the International Space University (ISU), are wholly dedicated to matters related to the human expansion off of the Earth, into the solar system, and beyond. From the beginning (as the following chapter by Michael Simpson illustrates), ISU has envisioned itself as being located in orbit eventually.

The question remains, however, do any institutions of higher education imagine themselves having a presence in orbit? In most cases, it would of course be unrealistic for the entire college or university to be located in LEO, but it is not hard to imagine a unit of the institution in space and connected with the Earth-based campus. And just as some new organizations are located completely in cyberspace and never go through a bricks-and-mortar stage, so might future educational institutions skip the Earth-based stage and be located in orbit from the beginning.

This would certainly give new meaning to the term ‘higher education.’ It would also transform both space commerce and education at the same time.

Consider the possibilities

1. Imagine a history lesson covering the Crusades. As students learn more about the invasion of the Holy Land by the European knights, they would be able to see the area under discussion rotating beneath them.
2. Picture a debate about immigration. As students discuss the issue of borders and migrations, they will do so with a perspective that shows how borders are mental constructs that are not visible from orbit. What does this mean for immigration policy?
3. Imagine a philosophy class, asking basic questions about the meaning of existence while looking at the Earth from space and in space.
4. Consider a physics class on the force of gravity, held in Zero-G.

The possibilities are endless, limited only by the imaginations of students and faculty. The question before us in 2010 is, ‘How do we begin?’

Given that access to orbit for human beings remains quite expensive (\$35M to place one person on the International Space Station for one week, for example), establishing LEO-based educational institutions is likely to take a phased approach. Moreover, the rise of online and distance learning suggests that what it means to have a ‘presence in orbit’ may require careful definition.

Stages of Placing the Educational Enterprise into Orbit

Stage One: Using what we have today

The cost of establishing a large-scale physical presence in orbit today would be prohibitive for educational institutions even in good economic times. In the wake of the recent financial crisis, many (in the United States,

at least) are struggling to maintain what they have and trying to avoid cutbacks.

Nevertheless, our vision of orbital education, making use of both a virtual and physical presence, can still begin to unfold. For example, an institution might be able to make an arrangement with the managers of the International Space Station to use views of the Earth from orbit at specific class times during the day or evening. As the previously mentioned class on the Crusades is being held, for example, the astronauts' view could be projected onto a screen in the Earth-based classroom. If it were relevant, some of the astronauts might participate in the class, commenting on what they are seeing from space.

Increasing numbers of courses today include online and distance components, and the distant students could also see the view from the space station on their home computer screens.

Stage Two: Having an orbital presence linked with an Earth-based presence

In Stage Two, the institution keeps most of its infrastructure on the Earth, while establishing an initial presence in orbit, perhaps with a professor and a few students.

This model mimics something that happens on Earth quite often: a group of students and professors goes abroad for a year to a pre-specified site that the college or University rents or owns.

Envisioning this stage moves beyond our current situation and raises two significant questions:

1. Where would the orbital group be housed?
2. How would the venture be financed?

These are real problems to be overcome. Still, we can see ways in which they might be managed. If, for example, the Bigelow structures being developed for space habitats prove successful, one of these might support a small educational presence. In addition, the financial challenges might be overcome if a consortium of institutions banded together and shared the costs.³

By having an off-world presence that can stand alone or be linked to the Earth-based facilities, such an institution would be able to differentiate itself from competitors and would also have the opportunity to begin supplying services to the burgeoning NewSpace industry. Through online connectivity, many other students could benefit as well. Donors, including the government, might find the opportunity to support such a pioneering venture interesting as well.

Even this modest step would require visionary leadership by the university or college, coupled with a willingness to innovate on the part of the government and/or private industry. Nevertheless, just as we can

imagine modest beginnings for space tourism in the near future, we can imagine an initial orbital education presence of this kind.

Stage Three: Creating an orbital university

The ultimate vision of space-based education would be a much more significant orbital presence, up to a fully functional college or university. This facility would have most of the capabilities of an Earth-based institution, including living quarters and the ability to sustain a reasonably large population of students and teachers through an academic year. At the same time, the current distance education model would most likely be continued, with students on the Earth's surface participating online.

The growing importance of the cyberspace component makes a major difference in how an orbital facility would be structured. Today's Earth-based model has thousands of students physically present on campus and thousands more participating online. The orbital university might, at its most extensive, have no more than a few hundred people in orbit at any one time, with many more students and teachers being virtually present.

As is the case with some continuing education programs on Earth, the orbital university might require that distance students spend at least a semester 'in residence,' i.e., in orbit, while spending most of their time benefiting from the space perspective without leaving the surface of the Earth.

While this vision is unlikely to become a reality any time soon, it will become a necessity as space commerce and space settlement mature. Eventually, a spacefaring civilization is going to require a spacefaring educational system to be relevant to the needs of the new explorers and settlers.

The Overview Institute as an example

It may be helpful to describe planning for one component of an orbital educational system with which I am quite familiar, The Overview Institute (TOI). This organization grew to a large extent out of my work in the book *The Overview Effect*, which examined the impact of seeing the Earth from space and in space on the astronauts.⁴ The Overview Effect represents a cognitive shift experienced by space travelers, personified by Apollo 9 astronaut Russell L. ('Rusty') Schweickart's description:

"And that whole process of what you identify with begins to shift. When you go around the Earth in an hour and a half, you begin to recognize that your identity is with that whole thing."⁵

Many of us who had been working on this issue separately gathered for the first conference on the Overview Effect in the summer of 2007, and

a core group has been building the organization since that time (The institute is currently a project of the Space Frontier Foundation).⁶

In talking with David Beaver, one of the co-founders of the Institute and the prime mover behind the conference, it became clear to me that the institute ultimately had to be located in orbit.⁷ How could we examine the long-term impact of the Overview Effect on the surface of the Earth when its most powerful manifestations occurred in LEO or on the moon?

Our vision of the Overview Institute's orbital facility is not that of an entire educational institution. Rather, it will be more like an institute for advanced study, or 'think tank.' One of the models that has inspired me in this regard is the Radcliffe Institute for Advanced Study at Harvard (RI). The Radcliffe Institute selects 'fellows' from a variety of fields, including academics, artists, and writers, to spend a year in Cambridge, Massachusetts, working on their own projects and interacting with the other fellows, faculty, students, and the public at large.⁸

A key ingredient of this model is that the fellows continue the work they have already begun elsewhere, with the expectation that being connected with Harvard for a year will enrich their work in ways that cannot be predicted in advance.

With an orbital facility in place, TOI will be able to offer the opportunity for thinkers from different fields to experience the Overview Effect and learn how 'overview thinking' might affect their work. We are interested in knowing, for example, how an economist would write about economics while viewing the Earth from orbit, or whether an artist would produce different work from that perspective.

We would expect the impact of the experience to continue when our fellows return to Earth, thereby spreading overview thinking even further. Some of the astronauts have also commented on the possibility of 'summit conferences in orbit,' believing that the decisions of political leaders would be fundamentally different if they discussed the world's problems with the orbital viewpoint in mind.

We would therefore design the orbital facility so that it could accommodate not only individuals pursuing their specific interests but also groups of people who might come together to talk about topics of common interest, with the Overview Effect as a backdrop.

Like many of the ideas discussed here, the Overview Institute's facility will remain in the planning stages until the cost of access to LEO becomes reasonable. However, we have already begun to explore prototypes of potential designs for our future home in a virtual world called Second Life.⁹

We plan to use our Second Life orbital facility for fundraising purposes, i.e., to show potential donors what we have in mind, and also to simulate the experience that we hope to create in the future. We also see this as an environment for communication, collaboration, seminars, and

classes where participants can further explore the Overview Effect and its impact. We are currently working with Robin Snelson, who has been instrumental in creating a presence for the Space Frontier Foundation and Space Studies Institute in Second Life, and a talented designer, Motoko Karu, to develop our virtual facility.

Robin has also supported another group to create a presence for an ‘orbital university’ and Teachers in Space in Second Life.

Over time, we will look for opportunities to create even more immersive experiences on Earth, to give people an increasingly better idea of what we have in mind.^{10,11}

Summary

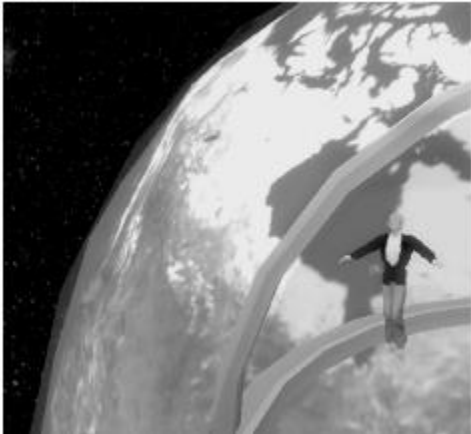
As we saw in the case of the Massachusetts Bay Colony, when societies confront new frontiers, they tend to the most important priorities first. As they solve the problems of security and sustenance, they eventually turn to the need for education.

While educational institutions in orbit or on the moon are a matter of speculative planning today, there seems little doubt that they will eventually become a reality. The issue is not if but when, and the answer to that question depends on the extent to which costs are reduced and financial support is forthcoming.

As with many space-related issues, higher education in orbit is just a matter of time.

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Frank White



Frank White (Second Life avatar shown to the left) is the author of *The Overview Effect: Space Exploration and Human Evolution*, first published in 1987 and re-issued in 1998. Based largely on interviews with astronauts, *The Overview Effect* documents the space flight experience, especially the impact on consciousness of seeing the Earth from orbit or the moon.

A member of the Harvard College Class of 1966, Frank concentrated in Social Studies, graduated magna cum laude, and was elected to Phi Beta Kappa. He attended Oxford University on a Rhodes Scholarship, earning an M.Phil. in 1969. He is the author or co-author of five additional books on space exploration and the future, including *The SETI Factor*, *Decision: Earth, Think About Space* and *March of the Millennia* (both with Isaac Asimov), and *The Ice Chronicles* (with Paul Mayewski). He also contributed chapters on the Overview Effect to three additional books on space exploration, *Return to the Moon*, *Beyond Earth*, and *Living in Space*.

Frank has also spoken at numerous space-related conferences. In 1988, he delivered the keynote address at the International Space Development Conference in Denver. In 1989 he spoke at George Washington University to mark the 20th anniversary of the Apollo 11 moon landing. In 2006 the Space Tourism Society awarded Frank a 'Certificate of Special Recognition.' In 2007 he delivered the keynote address at the first Overview Effect conference in Washington, D.C., and he was one of the main presenters on the occasion of the announcement of the Overview Institute's "*Declaration of Vision and Principles*" (also known as the "*Declaration of Interdependence*") at the 2008 ISDC conference in Washington, D.C.

Frank is now working with several associates to create the Overview Institute, which will conduct continuing research on the Overview Effect and share the findings as widely as possible.

He is married to Donna White. They have five children and five grandchildren.

References

1. Excerpt from First Fruits, a fundraising pamphlet published in 1643 for potential donors to Harvard College. (Sabin's Reprints, Quarto Series, No. VII, New York, 1865. Google Books online, 2010.)
2. Kenneth J. Cox, retired NASA engineer and the moving force behind ATWG (Advanced Technology Working Group), has been a strong advocate of this idea, and has urged me to explore the role of higher education in LEO. This chapter is, in part, a result of that.
3. An idea suggested to me by David Beaver (see footnote 7 below) when he reviewed this chapter.
4. *The Overview Effect: Space Exploration and Human Evolution*, Frank White, American Institute of Aeronautics and Astronautics (AIAA) Reston, VA, 1998.
5. Ibid, p. 11.
6. To learn more, go to the Overview Institute website: www.overviewinstitute.org
7. David is now working on a new project to bring the Overview Effect 'down to Earth' through a space-themed multimedia coffee house called Starport Café.
8. To learn more, go to www.harvard.edu and click on Radcliffe Institute under 'Schools.'
9. Second Life is a three-dimensional environment in which 'residents' are represented by avatars (www.secondlife.com). The residents create everything that happens in Second Life.
10. I've discussed this at some length with John Spencer, founder of the Space Tourism Society and developer of a fascinating immersive experience, Mars World™. We agree that 'it's the experience that counts,' and there may be a number of ways to provide powerful simulations of the space experience on Earth.
11. Along those lines, I am currently working on developing the *Overview Experience Workshop* with colleagues Charlie Smith and Neil Mahoney, along with several other supporters of the idea.

