



Полезная лексика по теме
«Видеоурок: учим
АНГЛИЙСКИЙ И ОСВАИВАЕМ
КОСМОС»

Hi! I'm Joe Strout. I have two boys, 10 and 14 years old, and three of us have been working for the last year or so on a video game about **space settlement**. But it's not just a game. In fact, it's the most **detailed** and **accurate space colony simulation program** that has ever been made.

We simulate everything from gravity, radiation, and rotational dynamics down to individual buildings and **traffic paths** for the people inside. All this is quite a lot of work as you can imagine. But we feel it's important. For my part, I'd say it's the most important project I've ever worked on. I'd like to share with you some of the big ideas behind it and why **it matters** so much.

In the early days of **space exploration** things **proceeded** very **rapidly**. Twelve years from Sputnik to the first **Moon landing**. People **assumed** this **pace** of change would continue and we would soon be moving into space in large numbers. So **researchers** looked carefully whether the best **site** for a growing society is Earth, the Moon, Mars, some other planet or **somewhere else entirely**.

a space settlement — космическое поселение

detailed — подробный

accurate — точный, доскональный

a space colony — космическая колония, поселение

a simulation program — программа имитационного моделирования

a traffic path — полоса уличного движения

it matters — это имеет значение, это важно

space exploration — освоение космоса

to proceed — происходить, развиваться, разворачиваться

rapidly — быстро, стремительно

Moon landing — высадка на Луну

to assume — допускать, предполагать

pace — темп, скорость

a researcher — исследователь

a site — место, площадка

somewhere else entirely /ɪn'taɪəli/ — в совершенно другом месте



Surprisingly, they found the answer to be **inescapable**: the best site is somewhere else entirely. Researchers **concluded** that the best place for **humanity** to live in space isn't **on the surface** of any planet or Moon, but rather in free-floating orbital space colonies. **Numerous** papers were written and studies were done **working out** the details. This was just before the Space Shuttle, which was expected to **dramatically lower the cost to orbit**. The cost analysis showed that we could have orbital cities of **tens of thousands** of people, perhaps by 1995 or so.

Well, **obviously** that didn't happen. The Shuttle program **turned out** to be quite a bit more expensive than expected, and **funding** for the space program **was reduced**. Also the energy crisis of the 1970s **temporarily abated**, reducing the need to look for clean, cheap **energy sources** such as **space-based solar power**. So we **retreated** to low Earth orbit going around in circles for more than three **decades**.

But now things are changing again. **Private enterprises** are entering the space business in an aggressive way with **ventures** like SpaceX reducing the cost to orbit down to the sort of levels we were expecting in the 70s. Virgin Galactic is preparing to make routine passenger flights to the **edge** of space. Bigelow Aerospace has tested private **inflatable** space stations, and several companies **are** now seriously **proposing to mine** near-Earth asteroids. So, **amidst** all this renewed activity, people are starting to think again about colonizing space.

inescapable — неизбежный, неотвратимый

to conclude — сделать вывод

humanity — человечество

on the surface — на поверхности

numerous — многочисленный

to work out — вычислять, прорабатывать, разбираться

dramatically lower the cost — значительно снизить стоимость

an orbit — орбита

tens of thousands — десятки тысяч

obviously — очевидно

to turn out — выясняться, оказываться

funding — финансирование

to be reduced — быть сокращенным, уменьшенным

to abate temporarily — временно снизиться, уменьшиться; пойти на спад

an energy source — источник энергии

space-based solar power — космическая солнечная электростанция

to retreat /rɪ'tri:t/ — отказываться, отступать

a decade — десятилетие

a private enterprise — частное предприятие

a venture — авантюра, рискованное предприятие или начинание

an edge — край

inflatable — надувной

to propose — предлагать

to mine — взрывать

amidst — в условиях, среди



But what **destinations** do people think about? The top of the list is, as always, Mars. Mars holds **fascination** for us, and it has been a **target** of colonization dreams **since** the early days of space exploration.

Next up is the Moon, which has the unique advantage of being only a **few** days away all the time. A few thinkers have **considered** Venus, which might support **floating cities** at just the right level in the atmosphere to have Earth-like temperatures and **pressures**. And then, so far down on the list, that most people don't even **give** it **any thought**, orbital space colonies. So let's talk about those. How do they work? And should we be giving them more attention?

First, let's look at **gravity**. We know that one Earth's gravity, like what we're all sitting in right now, is good for us. And we know from years of living **aboard** space stations that zero gravity is not healthy for us. It **causes** bones and muscles **to weaken**, **immune deficiency**, heart problems, and **increased risk** of things like **kidney stones**.

But what do we know about **intermediate** levels of gravity, like the 1/3 G on Mars, or the 1/6 G on the Moon? Well, here is what we know: nothing. Nobody has ever lived at any intermediate level of gravity for more than a few days, so we just don't know the effects of these G levels, even on **adults**. Much less children, who are likely to be more **susceptible** to **developmental problems**.

This is a big problem for planetary colonies, because you can't get Earth-like gravity anywhere **except** Earth and **possibly** Venus. But without children you don't have a colony, you have **at best an outpost**.

a destination — место назначения

fascination /fæsi'neɪʃn/ — притягательность, пленительность

a target — цель

since /sɪns/ — с того момента, как

a few — немного, несколько

to consider — рассматривать, учитывать

a floating city — плавучий (парящий) город

pressure — давление

to give some (any) thought — всерьез задуматься

gravity — гравитация, притяжение

aboard — на борту

to cause — вызывать, быть причиной

to weaken — ослаблять

immune deficiency — иммунодефицит

an increased risk — повышенный риск

a kidney stone — камень в почках

intermediate — промежуточный, средний

an adult — взрослый

susceptible /sə'septəbl/ — восприимчивый, чувствительный

a developmental problem — проблема, связанная с развитием

except — кроме

possibly — возможно

at best — в лучшем случае

an outpost — отдаленное поселение, представительство, застава



Orbital space colonies produce **pseudo** gravity through **rotation**, just like **amusement park rides** some of you may have tried. The larger the radius of rotation is, the slower it can **spin** and still produce an Earth-like gravity. A one-kilometer colony, for example, only needs to spin 1.3 times **each** minute to produce one Earth's gravity.

Of course, if we **discover** that less gravity is **acceptable**, then we can **either** build smaller **or** spin slower. In fact, one cool thing about an orbital colony is that you can have **multiple**, different levels of gravity at the same time. Higher **decks**, closer to the **spin axes** have proportionally less gravity. So maybe if we'll find that **elderly or injured patients** are safer at 1/2 G, they can just stay on a higher deck.

And in the center, you can have zero gravity sports and **recreation**, and still be at home in time for dinner.

OK, let's talk about radiation. **Free space is filled with** radiation from the Sun, and much harder radiation in the form of **cosmic rays** which **stream in** from all **directions**. Here on Earth we're protected largely by the Earth's **magnetic field**, and secondarily by the tons of air above our heads. Mars, Venus and the Moon have no **significant** magnetic fields. And apart from Venus, not much atmosphere either. So every time you **step outside** there, you're dosing yourself with radiation. You'd have to stay underground most of the time **to avoid** problems like cataracts, **cancer** and **infertility**.

pseudo /'sju:dəʊ/ — псевдо

rotation — вращение

an amusement park ride — аттракцион в парке развлечений

to spin — крутиться, вращаться

each — каждый

to discover — обнаруживать

acceptable — допустимый

either ... or... — или ... или...

multiple — многочисленный

a deck — палуба, площадка

a spin axe — ось вращения

the elderly — пожилые

an injured patient —

травмированный/раненный пациент

recreation — отдых, развлечение

free space — свободное пространство

be filled with — быть наполненным чем-либо

a cosmic ray — космическое излучение, луч

to stream in — вливаться

a direction — направление

a magnetic field — магнитное поле

significant — значимый, важный

to step outside — выходить

to avoid — избегать

cancer — рак (болезнь)

infertility — бесплодие



Orbital space colonies are built **outside-in**. We're going to need a few meters of **soil beneath our feet** anyway to support a **robust biosphere**. And that alone provides **substantial shielding** against space radiation.

In fact, a colony in a low Earth orbit would have less radiation inside than we **experience** here on Earth. Outside of Earth's magnetic field some additional shielding might be necessary, but it's still nicer to have that beneath your feet than over your head.

I'm going **to touch** only briefly **upon** the day/night cycle. Obviously, we **evolved** with the 24-hour day. The Martian day is very similar: 24.6 hours, and this may be a part of our fascination with Mars. A space colony would have exactly the day length that you want, most likely, **matching** Earth's. **Daylight** would either be sunlight, **reflected** into the **habitat** through shield mirrors, or artificial lighting, but so far overhead that it produces an **outdoorsy daytime feel**.

So you can probably tell by now that I see a lot of advantages to orbital colonies. **As soon as** you **let go** of the **assumption** that we need a planetary surface to live on, you quickly **come to the conclusion** that orbital space colonies are the best place to be. In short, we can do better than Mars.

This is why my sons and I are building our game which we called "High **Frontier**". We have built it to be as accurate as possible: the physics, radiation levels, ecology and everything else **is based on** real **science**. So players of the game aren't just playing, they're exploring the **vast** design space and finding **solutions** that might actually work.

outside-in — наизнанку

soil beneath /bɪ'ni:θ/ our feet — почва у нас под ногами

robust — крепкий, прочный

substantial shielding /'ʃɪ:ldɪŋ/ — усиленная защита

to experience — ощущать, испытывать

to touch upon — затрагивать, упоминать

to evolve — развиваться

matching — совпадающий

daylight — дневной свет

reflected — отражаемый

a habitat — среда обитания, место проживания

an outdoorsy daytime feel — ощущение пребывания на улице в дневное время

as soon as — как только

to let go — отпустить

an assumption — предположение

to come to the conclusion — прийти к выводу

a frontier /'frʌntɪə/ — граница, рубеж

to be based on — быть основанным на science — наука

vast — обширный

a solution — решение, выход из ситуации



<p>At the very least, they're learning about an alternative to planetary colonies. And we hope that someday some of those smart, educated players might help to make it actually happen. When it does, it might unfold something like this. The little green dots you see here represent orbital space colonies. Each one is home to anywhere from 10 thousand to 10 million men, women and children.</p> <p>A recent work based in part upon "High Frontier" has shown its best to begin in low Earth orbit, within the Earth's magnetic field. But we'll expand from there to higher Earth orbits, and then orbits near the Moon. After that, colonies around Mars might make sense with its two moons providing materials.</p> <p>From there we'll expand into the Asteroid Belt with an estimated billion or so objects, at least 100 meters in diameter, which may not sound like much, but a 100-meter asteroid weighs about 10 million metric tons. In fact, experts estimate that there is enough material in the main Asteroid Belt alone to build space colonies with the combined area of 3000 times the livable land area of Earth.</p> <p>And then there are more asteroids in Jupiter's orbit, and of course the Jovian System itself which has dozens of minor moons and rings massing about 10 billion tons.</p> <p>After that we'll move to the Saturn System which has similar resources. Just think of the view you would have out of the windows there!</p>	<p>at the very least — как минимум</p> <p>to unfold — разворачиваться, происходить</p> <p>a dot — точка</p> <p>to represent — представлять</p> <p>recent — недавний, крайний</p> <p>within — в рамках</p> <p>to expand — расширять</p> <p>to make sense — иметь смысл</p> <p>the Asteroid Belt — пояс астероидов</p> <p>estimated — установленный</p> <p>a billion — миллиард</p> <p>to weigh — весить</p> <p>enough — достаточно</p> <p>a livable land area — территория суши, пригодная для жизни</p> <p>the Jovian System — Юпитерианская (кольцевая) система</p> <p>a dozen /dʌzn/ — дюжина</p> <p>minor /'maɪnə/ — меньший, второстепенный</p> <p>massing — с массой</p> <p>to move — (про)двигаться</p> <p>a view — вид</p>
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And then **onward** to Uranus and Neptun. And then **the Kuiper Belt**, with an estimated 70 thousand **dwarf planets** out in the cold and dark.

The Solar System is vastly larger and richer than most people **realize**. It's full of exactly the materials and energy that we need. And remember, unlike past human migrations, there are no ecosystems here, no **natives** that will **be displaced**; these are sterile **chunks of ice and rock** just waiting for us to bring warmth, and light, and life.

This **greening** of the Solar System, turning dead chunks of rock into millions of **inside out** worlds full of trees, and birds, and **bugs**, and people. This is the bright future I see for us. And it all starts here: smart, **enthusiastic** kids are playing a video game where they get to decide how and where to build space colonies, how **to run** them when they are built, how to balance the ecosystem, manage resources and budgets, and educate each **generation**. That's why we're building "High Frontier" and that's why it's not just a game.

onward — далее, вперед

the Kuiper Belt — пояс Койпера

a dwarf planet — карликовая планета

The Solar System — Солнечная система

to realize — осознавать, понимать

a native — местный житель

to be displaced — смещать, быть перемещенным

a chunk of rock — кусок камня

greening — озеленение, экологизация

inside out — вывернутый наизнанку

a bug — жук

enthusiastic — увлеченный, мотивированный

to run — управлять

a generation — поколение