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## An Astronaut's Guide to Life on Earth

by Chris Hadfield

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### 39 Highlights

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Highlight (Yellow) | Location 56

To drift outside, fully immersed in the spectacle of the universe while holding onto a spaceship orbiting Earth at 17,500 miles per hour—it was a moment I'd been dreaming of and working toward most of my life.

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Highlight (Yellow) | Location 81

I also knew, as did every kid in Canada, that it was impossible. Astronauts were American. NASA only accepted applications from U.S. citizens, and Canada didn't even have a space agency.

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Highlight (Yellow) | Location 341

And then, suddenly, calm: we reach Mach 25, orbital speed, the engines wind down, and I notice little motes of dust floating lazily upward. Upward. Experimentally, I let go of my checklist for a few seconds and watch it hover, then drift off serenely, instead of thumping to the ground. I feel like a little kid, like a sorcerer, like the luckiest person alive. I am in space, weightless, and getting here only took 8 minutes and 42 seconds.

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Highlight (Yellow) | Location 345

That was my first launch, on Space Shuttle Atlantis, years ago now: November 12, 1995.

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Highlight (Yellow) | Location 440

Helping to install Canadarm2 and playing a part in building this permanent human habitat off our planet—which is all the more remarkable because it has required the participation and cooperation of 15 nations—made me feel like a contributing, competent astronaut.

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Highlight (Yellow) | Location 469

That third mission, of course, greatly expanded my experience. I didn't just visit space: I got to live there. By the time our crew landed, after 146 days in space, we'd orbited Earth 2,336 times and traveled almost 62 million miles.

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Highlight (Yellow) | Location 486

Competence means keeping your head in a crisis, sticking with a task even when it seems hopeless, and improvising good solutions to tough problems when every second counts. It encompasses ingenuity, determination and being prepared for anything.

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Highlight (Yellow) | Location 523

The Russian rocket ship only carries three people, and between them they need to cover off a huge matrix of skills. Some are obvious: piloting the rocket, spacewalking, operating the robotic elements of the ISS like Canadarm2, being able to repair things that break on Station, conducting and monitoring the numerous scientific experiments on board. But since the crew is going to be away from civilization for many months, they also need to be able to do things like perform basic surgery and dentistry, program a computer and rewire an electrical panel, take professional-quality photographs and conduct a press conference—and get along harmoniously with colleagues, 24/7, in a confined space.

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Highlight (Yellow) | Location 545

Success is feeling good about the work you do throughout the long, unheralded journey that may or may not wind up at the launch pad. You can't view training solely as a stepping stone to something loftier. It's got to be an end in itself.

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Highlight (Yellow) | Location 585

That's how I approach just about everything. I spend my life getting ready to play "Rocket Man." I picture the most demanding challenge; I visualize what I would need to know how to do to meet it; then I practice until I reach a level of competence where I'm comfortable that I'll be able to perform. It's what I've always done, ever since I decided I wanted to be an astronaut in 1969, and that conscious, methodical approach to preparation is the main reason I got to Houston. I never stopped getting ready. Just in case.

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Highlight (Yellow) | Location 680

In my experience, fear comes from not knowing what to expect and not feeling you have any control over what's about to happen. When you feel helpless, you're far more afraid than you would be if you knew the facts. If you're not sure what to be alarmed about, everything is alarming.

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Highlight (Yellow) | Location 684

I think everyone should be afraid of heights. Like fearing pythons and angry bulls, it's a sensible self-preservation instinct.

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Highlight (Yellow) | Location 960

Anticipating problems and figuring out how to solve them is actually the opposite of worrying: it's productive. Likewise, coming up with a plan of action isn't a waste of time if it gives you peace of mind. While it's true that you may wind up being ready for something that never happens, if the stakes are at all high, it's worth it.

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Highlight (Yellow) | Location 973

Like most astronauts, I'm pretty sure that I can deal with what life throws at me because I've thought about what to do if things go wrong, as well as right. That's the power of negative thinking.

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Highlight (Yellow) | Location 1029

And it's true, you don't need to obsess over details if you're willing to roll the dice and accept whatever happens. But if you're striving for excellence—whether it's in playing the guitar or flying a jet—there's no such thing as over-preparation. It's your best chance of improving your odds.

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Highlight (Yellow) | Location 1141

One reason we're able to keep pushing the boundaries of human capability yet keep people safe is that Flight Rules protect against the temptation to take risks, which is strongest when momentum has been building to meet a launch date.

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Highlight (Yellow) | Location 1160

In the case of both Challenger and Columbia, seemingly tiny details—a cracked O-ring, a dislodged piece of foam—caused terrible disasters.

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Highlight (Yellow) | Location 1170

Scott Parazynski and I had been training for a year and a half to install Canadarm2, the robotic arm that would build the ISS, then in its infancy.

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Highlight (Yellow) | Location 1238

Tears need gravity. On Earth, a little duct above your eye generates tears that flush out whatever irritant is in your eye and then overflow down your cheek and drain down your tear duct, making your nose run. But in weightlessness, tears don't flow downward. They just sit there and, as you keep on crying, a bigger and bigger ball of salty liquid accumulates to form a wobbly bubble on your eyeball.

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Highlight (Yellow) | Location 1368

Early success is a terrible teacher. You're essentially being rewarded for a lack of preparation, so when you find yourself in a situation where you must prepare, you can't do it. You don't know how.

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Highlight (Yellow) | Location 1434

The lesson: good leadership means leading the way, not hectoring other people to do things your way. Bullying, bickering and competing for dominance are, even in a low-risk situation, excellent ways to destroy morale and diminish productivity.

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Highlight (Yellow) | Location 1820

focus on the journey, not on arriving at a certain destination. Keep looking to the future, not mourning the past.

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Highlight (Yellow) | Location 1845

On orbit, even a head cold is a big deal. Without gravity, your sinuses don't clear and your immune system doesn't fight back as effectively, so you feel much sicker, much longer—and in such a confined space, it's pretty much guaranteed that the rest of the crew will be infected.

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Highlight (Yellow) | Location 2043

Forward planning was an easy way to show the people who made it possible for me to do my job that I didn't take them for granted. Making a flowery toast afterward, thanking your nearest and dearest for all their support, just won't cut it if, again and again, you've passed up opportunities to show appreciation in real time.

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Highlight (Yellow) | Location 2366

Getting up to the ISS really doesn't take that long: you could make it there from Earth in less than three hours if you had to, and recently, several crews have done so, in the interests of efficiency.

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Highlight (Yellow) | Location 2409

you will almost certainly be viewed in one of three ways. As a minus one: actively harmful, someone who creates problems. Or as a zero: your impact is neutral and doesn't tip the balance one way or the other. Or you'll be seen as a plus one: someone who actively adds value. Everyone wants to be a plus one, of course. But proclaiming your plus-oneness at the outset almost guarantees you'll be perceived as a minus one, regardless of the skills you bring to the table or how you actually perform.

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Highlight (Yellow) | Location 2593

THE ISS IS A ONE-MILLION-POUND SPACESHIP that's the size of a football field, including the end zones, and boasts a full acre of solar panels. Inside, there's more living space than you'd have in a five-bedroom home. It's so big, with so many discrete modules, that it's possible to go nearly a full day without seeing another crewmate.

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Highlight (Yellow) | Location 2697

Exercise is mandatory during a long-duration flight: we'd waste away, literally, if we didn't do it. **We have to work out two hours a day to keep our muscles and bones strong enough to handle the extreme physical demands of spacewalking and also to ensure that when we do get back to Earth, we are still able to stand on our own two feet.**

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Highlight (Yellow) | Location 2731

The CSA's budget, for instance, is less than the amount Canadians spend on Halloween candy every year, and most of it goes toward things like developing telecommunications satellites and radar systems to provide data for weather and air quality forecasts, environmental monitoring and climate change studies.

Highlight (Yellow) | Location 2771

On Earth, the atmosphere and magnetic field provide some protection from the radiation of the sun and billions of other stars, but the ISS is constantly bombarded by high-energy particles. So far, there's no evidence that astronauts have a significantly increased risk of cancer or cataracts, but we do absorb more radiation than we would at sea level, and it's worth figuring out what to do about that.

Highlight (Yellow) | Location 2774

Other anatomical changes associated with long-duration space flight are definitely negative: the immune system weakens, the heart shrinks because it doesn't have to strain against gravity, eyesight tends to degrade, sometimes markedly (no one's exactly sure why yet). The spine lengthens as the little sacs of fluid between the vertebrae expand, and bone mass decreases as the body sheds calcium. Without gravity, we don't need muscle and bone mass to support our own weight, which is what makes life in space so much fun but also so inherently bad for the human body, long-term.

Highlight (Yellow) | Location 2918

Loneliness, I think, has very little to do with location. It's a state of mind.

Highlight (Yellow) | Location 2926

Preparing meals is not laborious on a space station. All liquids, including coffee and tea, come in pouches; most are powdered, and we simply add water, then sip through a straw. The majority of the food on board is dehydrated, so again, we just inject hot or cold water directly into the packages using a kind of needle, then cut open the packages and dig in.

Highlight (Yellow) | Location 3268

Simply getting the Shuttle ready to survive re-entry required multiple systems checks and reconfigurations; one trick—we had to point the belly at the sun for hours to warm up the rubber tires for landing.

Highlight (Yellow) | Location 3564

If you start thinking that only your biggest and shiniest moments count, you're setting yourself up to feel like a failure most of the time. Personally, I'd rather feel good most of the time, so to me everything counts: the small moments, the medium ones, the successes that make the papers and also the ones that no one knows about but me. The challenge is avoiding being derailed by the big, shiny moments that turn other people's heads. You have to figure out for yourself how to enjoy and celebrate them, and then move on.

Highlight (Yellow) | Location 3782

Being in zero gravity is confusing for the body. It not only affects your balance system (the inner ear takes a holiday as your eyes take over telling you which way is up), but it also removes the perpetual weight that pulls the fluids inside your body down toward your feet. When that lets go, you feel like you're suddenly being sucked up toward the ceiling. After a few days you adapt; your legs get visibly skinnier and your face fatter, gorged with blood, like you're endlessly standing on your head. Your sinuses don't drain nearly as well, your head pounds and your tongue feels swollen. It's as if you have a perpetual head cold: your nose and taste buds are not at their best.

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Highlight (Yellow) | Location 3824

The International Space Station circles Earth at tremendous speed—about 17,500 mph, or 8 km/sec—which is necessary to stay in orbit. We make a complete turn around the Earth every 90 minutes, or 16 times per day. That equates to 16 sunrises and sunsets per day, a bizarre and beautiful new reality.

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Highlight (Yellow) | Location 3873

In 1491, for example: "Do you think humans will ever cross the ocean and eventually colonize what they find?" Or in 1900: "Do you think humans will ever travel to Antarctica and even live there?" We have always explored to the limits of our ability and technology, and then moved to the places we found interesting and/or beneficial.

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Highlight (Yellow) | Location 3923

More interestingly, we can predict how many of them resemble Earth in size and temperature, and as a result might have developed life as we know it. The number is staggering: in our galaxy alone, we think there are about 10 billion Earth-like planets orbiting stars like our Sun. Given that there are hundreds of billions of galaxies, the odds are strong that life has evolved somewhere else. To think that we are the only life in the universe is just an extension of the same arrogance that made us think we were the center of it all.

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