# T vs K Affs

## Top Level

### NC – T v K Affs (2:00)

#### Interpretation: the affirmative must defend the hypothetical implementation of the resolution or a subset thereof –

#### Appropriation includes making space unusable.

Stephen **Gorove, 69** - ("Interpreting Article II of the Outer Space Treaty" 1969, 12-10-2021 https://ir.lawnet.fordham.edu/cgi/viewcontent.cgi?article=1966&context=flr)//AW

With respect to the concept of appropriation the basic question is what constitutes "appropriation," as used in the Treaty, especially in contradistinction to casual or temporary use. The term "appropriation" is used most frequently to denote the taking of property for one's own or exclusive use with a sense of permanence. Under such interpretation the establishment of a permanent settlement or the carrying out of commercial activities by nationals of a country on a celestial body may constitute national appropriation if the activities take place under the supreme authority (sovereignty) of the state. Short of this, if the state wields no exclusive authority or jurisdiction in relation to the area in question, the answer would seem to be in the negative, unless, the nationals also use their individual appropriations as cover-ups for their state's activities.5 In this connection, it should be emphasized that the word "appropriation" indicates a taking which involves something more than just a casual use. Thus a temporary occupation of a landing site or other area, just like the temporary or nonexclusive use of property, would not constitute appropriation. By the same token, any use involving consumption or taking with intention of keeping for one's own exclusive use would amount to appropriation

#### Outer space begins at one hundred kilometers above sea level.

Pershing 19

Abigail Pershing (J.D. Candidate @ Yale, B.A. UChicago). “Interpreting the Outer Space Treaty’s Non-Appropriation Principle: Customary International Law from 1967 to Today.” Yale Journal of International Law 44, no. 1. 2019. JDN. https://digitalcommons.law.yale.edu/cgi/viewcontent.cgi?article=1697&context=yjil

A. An Introduction to the Outer Space Treaty ¶ Even defining “space” is itself a legally fraught exercise—where does the Earth’s atmosphere end and space begin? Various legal theories have been advanced to demarcate this limit.11 There is no universally accepted boundary, but the Kármán line, at an altitude of one hundred kilometers (sixty-two miles) above sea level, is the most widely recognized.12

#### Private entities mean commercial groups. Cornell Law:

https://www.law.cornell.edu/definitions/uscode.php?width=840&height=800&iframe=true&def\_id=6-USC-625312480-168358316&term\_occur=999&term\_src=title:6:chapter:6:subchapter:I:section:1501

(A) In general Except as otherwise provided in this paragraph, the term “private entity” means any person or private group, organization, proprietorship, partnership, trust, cooperative, corporation, or other commercial or nonprofit entity, including an officer, employee, or agent thereof.

#### Unjust is the opposite of right or in violation of somebody else’s rights. Black Laws No Date "What is Unjust?" <https://thelawdictionary.org/unjust/> //Elmer

Contrary to right and justice, or to the enjoyment of his rights by another, or to the standards of conduct furnished by the laws.

#### Not reading a topical aff creates incredible structural advantages for the aff – they get first and last speech and perms which means without a stable advocacy they get to morph their aff into whatever minimizes direct clash, and allows for a retreat to moral high ground

#### There’s two Impacts –

#### Clash – it’s a pre-requisite to debate which is an intrinsic good since we are all here for the purpose of debating – yes this may seem tautological, but so is every impact – you should use your ballot to assert that since we all took our weekend and spent it here, that clash does have meaning

#### Iterative argumentative testing – the ability to subject controversial ideas to rigorous testing allows debaters to better engage in the research process, discern what arguments are most accurate, and learn how to refine our own beliefs to become more compelling advocates – not reading a plan allows a constant spew of new content that never reaches those high levels of contestation without the constraints of the topic – Even if this topic isn’t the perfect topic, the predictability of debates under it are worth potential substantive tradeoff. Without a bridge for subjecting beliefs to a rigorous test, we are left with might-makes-right.

Cheryl MISAK Philosophy @ Toronto ‘8 “A Culture of Justification: The Pragmatist's Epistemic Argument for Democracy” *Episteme* 5 (1) p. 100-104

The charge that Rorty has had to face again and again is that he really is a relativist, holding that one belief is no better than another, and that one must “treat the epistemic standards of any and every epistemic community as on a par” (Haack 1995, 136). Rorty, that is, leaves us with no way of adjudicating claims that arise in different communities. It is argued that this is not only an unsatisfactory view, but it is incompatible with his commitment to his own set of beliefs and with his practice of arguing or giving reasons for them. Peirce would join in this charge, arguing that it is the community of inquirers or reasoners that matter, not this or that local community. One of Rorty’s responses to this clutch of objections is to say that he doesn’t have to treat the epistemic standards of every community as on a par: “I prize communities which share more background beliefs with me above those which share fewer” (Rorty 1995b, 153). There is nothing incoherent about asserting that your community has it right, for all “right” amounts to is what your community agrees upon. I have argued (2000, 12ff) that this kind of comeback puts Rorty in a very difficult position, giving him nothing to say against the likes of Carl Schmitt, the fascist legal philosopher who found it natural to join the Nazi bandwagon. Schmitt, like Rorty, argued that there is no truth and rationality in politics. Rather, politics is the arena in which groups assert themselves, with the strongest coming out on top and the weaker groups disappearing. One makes an existential choice – opts for a conception of the good – and then tries to attain “substantive homogeneity” in the population. Might ends up being right and the elimination of those who disagree with us ends up being a fine method of reaching our political decisions. A democrat or liberal like Rorty has an impossible time in giving us – and himself – reasons for opting for his view rather than his fascist opponent’s view. Once you give up aiming at truth, once you give up aiming at something that goes beyond the standards of your own community, then you give up the wherewithal to argue against the might-is-right view. The charge I am trying to answer here, on behalf of the non-Rortian pragmatist, is that mixing truth and politics is dangerous. One of the points I want to make is that, whatever the dangers are in saying morals and politics aim at the truth, the dangers of denying it are even more alarming. If we were to get rid of the notion of truth, nothing would protect us from the idea that there is nothing to get right, no better or worse action, and no better or worse way of treating others. Nothing would protect us from the Schmittian worldview. Another point is that the pragmatist view encourages something which is downright salutary, not dangerous at all. It encourages a culture of justification, a culture the importance of which grows as we face the challenges of living in a global society with worldviews struggling against each other. This thought was prominent in the debate about how the new democratic order in South Africa should be conceived. Here is how Etienne Murienik put it: If the new constitution is a bridge away from a culture of authority, it is clear what it must be a bridge to. It must lead to a culture of justification – a culture in which every exercise of power is expected to be justified; in which the leadership given by government rests on the cogency of the case offered in defense of its decisions, not the fear inspired by the force of its command. The new order must be a community built on persuasion, not on coercion.4 A final point rests on the nature of the kinds of answers the pragmatist envisions. Rorty and Rawls seem to think that any view of truth carries with it the idea that there is one and only one true answer to every question. It is important to see that, whatever the case might be for other views of truth, the pragmatist’s view of truth does not entail anything about the precise nature of right answers. On the Peircean view of truth, it might be true that the best solution to a problem is to compromise in a certain way. Or a question might have a number of equally right answers: it might be true that either A or B or C is an acceptable solution to a problem. That is, bringing truth into politics need not result in a view on which one theory of the good triumphs over the others. Indeed, the pragmatist account of truth does not require agreement at the end of the day (whatever that might mean) and it does not require the consent of all who are affected by a particular decision here and now. The right answer to a question might be one that only a few see is right. A right answer is the one that would be best – would stand up to the evidence and arguments – were we to inquire into the matter as far as we fruitfully could. That is, we are not primarily aiming at agreement in deliberation – we are aiming at getting a view that will stand up to reasons and evidence**.** That said, there may be cases in moral and especially political deliberation in which we do aim for agreement because we think that what will best stand up to reasons in that case is a solution that is agreed upon by all or by all who are affected. But this will be just one kind of case amongst many. Right answers aren’t necessarily answers that are acceptable by all. Nor are right answers necessarily those that resolve a conflict with a compromise, although sometimes a compromise or cooperative solution may indeed be what is required. Nor is bargaining always not conducive to truth – in some cases, that may be exactly what is required. This view of truth does not lead to zeal, oppression, closing off of discussion, or a squashing of pluralism, even if it might happen to be the case that there is only one reasonable conception of the good out there. The idea is that we are always aiming at getting the best answer – whatever that may be – and to do that we need to take into account the views of all. 6 . WHO DECIDES? One of the first questions put to those who would like to think of politics as a species of truth-oriented deliberation is this: why deliberate with the ignorant multitude? Would it not be better to expose our moral and political beliefs only to the reasons and experience of experts? Science, after all, doesn’t work by asking the person in the street what he or she thinks about quantum mechanics. The reason that the pragmatist’s epistemic justification is a justification of democratic politics, rather than of a hierarchical politics, in which an elite makes decisions, is that we do not and will not ever have an identifiable pool of moral and political experts. Dewey saw this clearly. As experts become specialized, “they are shut off from knowledge of the needs which they are supposed to serve” (Dewey 1926/1984, 364). Everyone engages in moral and political deliberation and it is not obvious that having special education makes you better at it – just look at priests, politicians, and moral philosophers/political theorists and ask yourself if they seem especially decent or especially wise when it comes to practical matters. Some people are good at examining moral and politi\cal issues, but it’s not clear that they are the ones trained to do so. Even if we could identify genuinely wise people, this kind of expertise is liable to be corrupted merely by being identified – merely by the wise person starting to think of herself as a moral expert.5 And it is far from clear that the rule of the wise would really take the views and experiences of all into account better than the democratic rule of the people. So how do we distinguish deliberating well and deliberating badly if we cannot appeal to education and training? No account of deliberative democracy can ignore the call to make the distinction. The trouble is that, in saying what good, as opposed to poor, deliberation amounts to, one finds oneself facing a justificatory problem: how can we specify what good deliberation is without simply assuming that our current standards of deliberation and inquiry are the gold standards? (This is the deep and central question of pragmatism: how do genuine norms arise out of contingent practices?) It will be unsurprising that I agree with Robert Talisse that the way forward is to focus on an epistemic justification of the whole range of deliberative virtues. Some of the virtues we think important in inquiry are open-mindedness, courage, honesty, integrity, rigor, willingness to listen to the views of others and to seriously entertain challenges to one’s own views, willingness to put oneself in another’s shoes, and the like. These virtues may well have a number of kinds of justifications – justifications, for instance, with their origins in the canons of etiquette or in this or that substantive moral or religious view. Politeness and Christianity (do unto others . . . ), for instance,may both dictate that we should listen to the views of others. But this kind of justification doesn’t break out of the circle of local practices. Talisse argues that the virtues are justified because they lead to true belief. Listening to others is not merely the polite thing to do, but it is also good because we might learn something. The epistemic argument I have presented on Peirce’s behalf gets us this far: we need to expose our beliefs to the views of others if we are to follow a method that will get us good or better or true beliefs. Talisse takes us the next step – there are other characteristics that make one an inquirer who aims at the truth. Honesty is the trait of following reasons and evidence, rather than self-interest. Modesty is the trait of taking your views to be fallible. Charity is willingness to listen to the views of others. Integrity is willingness to uphold the deliberative process, no matter the difficulties encountered. The distinction between deliberating well (having deliberative virtues) and deliberating badly (having deliberative vices), that is, is drawn in terms of whether a method promotes beliefs which are responsive to and fit with the reasons and evidence. 7 . THE SOURCE OF AUTHORITY The pragmatist has offered us a compelling reason to take the views of others seriously and encourage the values associated with deliberative democratic politics. For inquirers must engage in the ongoing project of continually subjecting their beliefs to the tests of further experience and argument. The virtues inherent in a deliberative model of democratic citizenship must be cultivated if we are to come to good beliefs about how to treat others, how to resolve conflicts, and how to arrange society. The model of democratic citizenship which results is one that makes democratic citizenship part of a culture of justification. Citizens search for how best to structure our institutions and how best to live our lives. Democratic citizenship is a quest to get things right, with a genuine engagement in looking for right answers to pressing questions.We are not after mere agreement and we are not after the transformation of initial preferences into something that others can accept. We aim at getting things right – at getting beliefs that would forever stand up to scrutiny. In so aiming, citizens commit themselves to abiding by the decisions produced by the democratic procedure. For those decisions are the best we can do here and now. Here we find the justification of the coercive power of democracies. Eventually there has to be a decision in politics. The question that faces all societies is who decides and who wields the power to coerce once the decision is made? My argument is that as more people deliberate and more reasons and experience go into the mix, it will become more likely that the decisions made will account for the reasons and experience of all. The more likely, that is, that the answer will be right. Decisions produced by a democratic deliberative process are made by a rational method and so they are enforceable.

#### Frame procedural impacts through a lens of optimization – we don’t need to win they make the game impossible, just relatively less effective. In the same way you would vote aff to reject a bad process CP even if there are theoretically solvency deficits based on certainty and immediacy – the fact that we still have some neg ground doesn’t mean that reading the cap k for the 87th time against a survival strategy aff is a good debate to have for anyone involved

#### They have no offense

#### View T impacts as a process, not a product – any education impact about their content being important are solved by reading a book – filter impacts through what is unique to the process of debating itself

#### They get to read it on the neg – if their k of being topical is true then reading the aff as a K on the neg means they get auto-wins, we still access their education, and if forces affs to shift to better arguments

#### The TVA solves – they could have read an aff that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - this would allow a discussion of the aff in a forum that allows us to have nuanced responses – yes, it isn’t perfect, but those imperfections are neg ground – if they aren’t forced to defend a controversy, then the meaning of any wins the gets become hollow anyway which takes out solvency

perform racial authenticity in a way that doubles as an appeal for moral recognition from those with the power to bestow it. **Winning anything politically—policies or changes in power relations—is not the point.** That is why the jeremiads offered by contemporary racial voices so commonly boil down to calls for “conversations about race” or equally vapid abstractions like “**racial reckoning” or “coming to terms with” a history defined by racism.** The black leadership role was always at best an accommodation to disfranchisement, going back to its first modern incarnation with Booker T. Washington and his cohort of racial advocates. It is a politics of elite transaction. That is not in itself necessarily a bad thing—President Franklin D. Roosevelt’s “black cabinet,” or Federal Council of Negro Affairs, advised him on matters related to black Americans. But unlike today’s freelance racial voices, they were administration functionaries, and most had standing in racial advocacy, education, labor, and government institutions prior to joining the “cabinet.” The backdoor dealings between King and Johnson during the Selma campaign that DuVernay found too messy to include in her portrait of King’s heroic persona were also part of mundane political maneuvering, the inside-outside game of institutional politics. King and the SCLC, like FDR’s black cabinet, had constituencies that underwrote their standing as representatives of racial interest—which in turn **gave them leverage to make political demands and pursue policy agendas.** A. Philip Randolph used the March on Washington Movement to pressure President Roosevelt in 1941 to issue “Executive Order 8802,” prohibiting racial discrimination in the national defense industry. Randolph, Bayard Rustin, the Negro American Labor Council, and others organized the 1963 March on Washington as part of an **inside-outside strategy** to build support for a jobs program and passage of the 1964 Civil Rights Act. All this painstaking political effort could not be farther from the careerist pursuits of contemporary racial voices, whose standing depends entirely on the favor of powerful opinion-shaping elites in corporate media and elsewhere. Thus, for example, Touré Neblett and others in MSNBC’s stable were unceremoniously expunged from the lineup of talking heads when the network reconfigured its marketing priorities. More dramatically, Melissa Harris-Perry, apparently believing that her viewing audience gave her leverage, openly rebuffed the network’s demand to reorient her program to fit in with its election coverage. In short order, she and her program vanished without a trace from its schedule. Such incidents, and scores of others like them, make it indelibly clear where the lines of authority run when it comes to winning elite-media recognition as a black voice. For Their Own Good The race voices I’ve discussed express a particular class perspective among black Americans, one that harmonizes with left-neoliberal notions of justice and equality. That harmony may help explain why those racial voices—like the black political class in general—are so intent on disparaging the social-democratic politics associated with Bernie Sanders, even though a 2017 Harvard-Harris survey found that Sanders was far more popular with African Americans than with any other demographic category except declared Democrats. He boasted a 73 percent favorable rating among black voters—higher than his approval numbers among Hispanics, Asian-Americans, and considerably higher than those for whites or even 18-34 year-olds. This disjunction between popular opinion and the priorities of the black chattering class underscores the extent to which the racial programs and priorities advanced by those recognized black voices remain much as they were in the Age of Washington. Now as then, we have a leadership stratum dedicated to the class-skewed pursuit of “managerial authority over the nation’s Negro problem.” And the net effect of this top-down model of black discourse is to tether a politics of racial representation to the ruling-class agendas that generate and intensify inequality and insecurity for working people across American society, including among the ranks of black Americans. Black Clintonites, like Congressmen John Lewis (D-GA), James Clyburn (D-SC) and Cedric Richmond (D-LA), all clearly displayed this commitment during the 2016 Democratic primaries when they attacked Sanders as “irresponsible” in calling for non-commodified public goods in education, health care, and other areas. Richmond’s rebuke was especially telling in that he couched it in terms of his role as chair of the Congressional Black Caucus and the group’s “responsibility to make sure to know that young people know that” a social-democratic agenda is “too good to be true.” Richmond’s invocation of civic instruction for the young may be revealing in another way. Lurking beneath that piety is the deeply sedimented common sense of underclass ideology, which posits a population mired in pathologies and hemmed in by an overwhelming racism, and the corollary of interventions aiming to enhance capabilities for individual mobility. (It is, indeed, this same tacit rhetoric of permanent crisis that fuels the notion that black young people must be raised on a diet of inspirational movies.) This vision of unyielding black pathology is yet another testament to the harmony of antiracist and neoliberal ideologies—and it, too, harks directly back to the origins of the black leadership caste at the dawn of the last century. Washington and Du Bois, together with Garvey and other prominent racial nationalists, envisioned their core constituency as a politically mute black population in need of tutelage from their ruling-class-backed leaders. Touré F. Reed persuasively argues that the mildly updated version of this vision now serves as an essential cornerstone of the new black professional-managerial class politics. Underclass mythology grounds professional-class claims to race leadership, while providing the **normative foundation of uplift programs directed toward enhancing self-esteem** rather than the material redistribution of wealth and income. Exhortations to celebrate and demand accolades, career opportunities, and material accumulation for black celebrities and rich people—e.g., box office receipts for black filmmakers or contracts and prestigious appointments for other well-positioned black people—as a racial politics are consistent with the sporadic eruptions of “Buy Black” campaigns since the 1920s and 1930s. Such efforts stood out in stark contrast to more working-class based “Don’t Buy Where You Can’t Work” campaigns that demanded employment opportunities in establishments serving black neighborhoods. Like “Buy Black” campaigns, which seem to have risen again from the tomb of petit-bourgeois wishful thinking, projections of successes for the rich and famous as generic racial victories depend on a sleight-of-hand that treats benefits for any black person as benefits for all black people. This brings to mind comedian Chris Rock’s quip that he went to his mailbox every day for two weeks after the not guilty verdict in the O.J. Simpson murder trial looking for his “O. J. prize,” only to be disappointed. At times, this tendency to absorb the plural into the singular can be strikingly crude and transparently self-interested. The torrent of hostility directed at Rachel Dolezal for having represented herself as black rested on groundless—sometimes entirely made up—claims that she had appropriated jobs, awards, and other honorifics intended for blacks. In addition to the annual contretemps over whether blacks win enough of the most prestigious Oscars, recent racial controversies in the art world illustrate how easily the narrowest guild concerns can masquerade as burning matters of racial justice. The Brooklyn Museum’s hiring of a white person as consulting curator of African art sparked objections that the hire perpetuated “pervasive structures of white supremacy in the art field.” The 2017 furor over the Whitney Biennial’s display of Dana Schutz’s “Open Casket”—inspired by the infamous 1955 photograph of Emmett Till’s brutalized body—reduced to a question of ownership of “black suffering,” or more accurately, of the right to represent and materially benefit from the representation of black suffering. The protesters’ objection, as Walter Benn Michaels put it succinctly, was that “black pain belongs to black artists.” It’s worth noting that one of the leading critics of the painting and its display was Hannah Black, who contended that “non-black people must accept that they will never embody and cannot understand” the gesture Till’s mother, Mamie, made in insisting on an open-casket funeral. Black, who not only called for the painting to be removed from display, but also offered an “urgent recommendation” that it be destroyed, is a Briton who lives in Berlin. From a different standard of cultural proprietorship, one might argue that Schutz, as an American, has a stronger claim than Black to interpret the Till story. After all, the segregationist Southern order and the struggle against that order, which gave Till’s fate its broader social and political significance, **were historically specific moments** of a distinctively American experience. In fact, most claims of cultural ownership and charges of appropriation are bogus. While sometimes they provide an instrumental basis for tortious claims, as in pursuit of restitution for Nazi and other imperialists’ looting of artifacts, more often they posit a dead-end conflation of **fixed and impermeable racial identity** with cultural expression. As Michaels has argued for more than twenty-five years, the discourse of cultural ownership stems from the pluralist mindset that treats “culture” as a key marker of social groups and thereby inscribes it as racial essentialism.¶ In order to legitimate what Michaels describes as “racial rent-seeking,” a curiously inflexible brand of race-first neoliberalism has taken root in American political discourse, proposing a trickle-down model of racial progress, anchored in the mysticism of organic black community. Against this exoticized backdrop, neoliberal race leaders stage the beguiling fantasy that individual “entrepreneurialism” is the key path to rising above one’s circumstances—i.e., the standard American social myth that obscures the deeper need to combat systemic inequalities. The most tragic, and pathetic, expressions of this faith are the versions of the “gospel of prosperity,” which fuse pop **self-realization psychology** and a barely recognizable Christianity to exploit desperation and the desire for life with dignity and respect among their black-majority congregations. The false hopes of the prosperity gospel encourage already vulnerable people to fall prey to all sorts of destructive get-rich-quick schemes; they are the “sigh of the oppressed creature, the heart of a heartless world, and the soul of soulless conditions” channeled through a market-idolatrous Protestant psychobabble. Black ministers and other proponents of entrepreneurialist ideology as racial uplift also played a largely unrecognized role in pushing subprime mortgages, and even payday loans, in black communities. The racial trickle-down success myth is partly a vestige of an earlier era, during which individual black attainments could be seen as testaments to the race’s capacities—and a refutation of the white-sanctioned view of black people as generally inferior. Even then, however, this model of black uplift was enmeshed in the race theory of the time—notably the belief that a race’s capacities were indicated by the accomplishments of its “best” individuals—and it was always inflected with the class perspectives of those who saw themselves as such individuals. The class legacies of this foundational moment in modern black politics may well contribute to the firm insistence among today’s “black voices” **that slavery and Jim Crow mark the transcendent truth of black Americans’ experience** in the United States—and that **an irreducible racism is the source of all manifest racial inequality**. That diagnosis certainly masks class asymmetries among black Americans’ circumstances as well as in the remedies proposed to improve them. Nevertheless, we continue to indulge the politically wrong-headed, **counterproductive**, and even reactionary features of the “**representative black voice” industry** in whatever remains of our contemporary public sphere. And we never reckon with the truly disturbing presumption that any black person who can gain access to the public microphone and performs familiar rituals of “blackness” should be recognized as expressing significant racial truths and deserves our attention. This presumption rests on the unexamined premise that blacks share a common, singular mind that is at once **radically unknowable to non-blacks** and readily downloaded by any random individual setting up shop as a racial voice. And despite what all of our age’s many heroic narratives of individualist race-first triumph may suggest to the casual viewer, **that premise is the essence of racism**.

## Asteroid Mining DA

### New V

#### The private sector is essential for asteroid mining – competition is key and government development is not effective, efficient, or cheap enough. Thiessen 21:

Marc Thiessen, 6-1, 21, Washington Post, Opinion: SpaceX’s success is one small step for man, one giant leap for capitalism, https://www.washingtonpost.com/opinions/2020/06/01/spacexs-success-is-one-small-step-man-one-giant-leap-capitalism/

It was one small step for man, one giant leap for capitalism. Only three countries have ever launched human beings into orbit. This past weekend, SpaceX became the first private company ever to do so, when it sent its Crew Dragon capsule into space aboard its Falcon 9 rocket and docked with the International Space Station. This was accomplished by a company Elon Musk started in 2002 in a California strip mall warehouse with just a dozen employees and a mariachi band. At a time when our nation is debating the merits of socialism, SpaceX has given us an **incredible testament to the power of American free enterprise.** While the left is advocating unprecedented government intervention in almost every sector of the U.S. economy, from health care to energy, **today Americans are celebrating the successful privatization of space travel.** If you want to see the difference between what government and private enterprise can do, consider: It took a private company to give us the first space vehicle with touch-screen controls instead of antiquated knobs and buttons. It took a private company to give us a capsule that can fly entirely autonomously from launch to landing — including docking — without any participation by its human crew. It also took a private company to invent a reusable rocket that can not only take off but land as well. When the Apollo 11 crew reached the moon on July 20, 1969, Neil Armstrong declared “the Eagle has landed.” On Saturday, SpaceX was able to declare that the Falcon had landed when its rocket settled down on a barge in the Atlantic Ocean — ready to be used again. That last development will save the taxpayers incredible amounts of money. The cost to NASA for launching a man into space on the space shuttle orbiter was $170 million per seat, compared with just $60 million to $67 million on the Dragon capsule. The cost for the space shuttle to send a kilogram of cargo into to space was $54,500; with the Falcon rocket, the cost is just $2,720 — a decrease of 95 percent. And while the space shuttle cost $27.4 billion to develop, the Crew Dragon was designed and built for just $1.7 billion — making it the lowest-cost spacecraft developed in six decades. SpaceX did it in six years — far faster than the time it took to develop the space shuttle. ***The private sector does it better, cheaper, faster and more efficiently than government***. Why? Competition. Today, SpaceX has to compete with a constellation of private companies — including legacy aerospace firms such as Orbital ATK and United Launch Alliance and innovative start-ups such as Blue Origin (which is designing a Mars lander and whose owner, Jeff Bezos, also owns The Post) and Virgin Orbit (which is developing rockets than can launch satellites into space from the underside of a 747, avoiding the kinds of weather that delayed the Dragon launch). In the race to put the first privately launched man into orbit, upstart SpaceX had to beat aerospace behemoth Boeing and its Starliner capsule to the punch. It did so — for more than $1 billion less than its competitor. **That spirit of competition and innovation will revolutionize space travel in the years ahead.** Indeed, Musk has his sights set far beyond Earth orbit. Already, SpaceX is working on a much larger version of the Falcon 9 reusable rocket called Super Heavy that will carry a deep-space capsule named Starship capable of carrying up to 100 people to the moon and eventually to Mars. Musk’s goal — the reason he founded SpaceX — is to colonize Mars and make humanity a multiplanetary species. He has set a goal of founding a million-person city on Mars by 2050 complete with iron foundries and pizza joints. Can it be done? Who knows. But this much is certain: **Private-sector innovation is opening the door to a new era of space exploration**. Wouldn’t it be ironic if, just as capitalism is allowing us to explore the farthest reaches of our solar system, Americans decided to embrace socialism back here on Earth?

#### Taking away property rights scares investors away and spills over to other space activities. Freeland 05

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V. THE NEED FOR CELESTIAL PROPERTY RIGHTS? ¶ The fundamental principle of "non-appropriation" upon which the international law of outer space is based stems from the desire of the international community to ensure that outer space remains an area beyond the jurisdiction of any state(s). Similar ideals emerge from UNCLOS (in relation to the High Seas) as well as the Antarctic Treaty, 42 although in the case of the latter treaty, it was finalised after a number of claims of sovereignty had already been made by various States and therefore was structured to "postpone" rather than prejudice or renounce those previously asserted claims.43 In the case of outer space, its exploitation and use is expressed in Article I of the Outer Space Treaty to be "the province of all mankind," a term whose meaning is not entirely clear but has been interpreted by most commentators as evincing the desire to ensure that any State is free to engage in space activities without reference to any sovereign claims of other States. This freedom is reinforced by other parts of the same Article and is repeated in the Moon Agreement (which also applies to "other celestial bodies within the solar system, other than the earth")." Even though both the scope for space activities and the number of private participants have expanded significantly since these treaties were finalised, it has still been suggested that the nonappropriation principle constitutes "an absolute barrier in the realization of every kind of space activity., 4 ' The amount of capital expenditure required to research, scope, trial, and implement a new space activity is significant. To bring this activity to the point where it can represent a viable "stand alone" commercial venture takes many years and almost limitless funding. From the perspective of a private enterprise contemplating such an activity, it would quite obviously be an important element in its decision to devote resources to this activity that it is able to secure the highest degree of legal rights in order to protect its investment. Security of patent and other intellectual property rights, for example, are vital prerequisites for private enterprise research activity on the ISS, and these rights are specifically addressed by the ISS Agreement between the partners to the project and were applicable to the experiments undertaken by Mark Shuttleworth when he was onboard the ISS.46

#### Asteroid mining can happen with private sector innovation and is key to solve a laundry list of impacts--climate change, economic decline and asteroid collisions. Taylor 19

Chris Taylor [journalist], 19 - ("How asteroid mining will save the Earth — and mint trillionaires," Mashable, 2019, accessed 12-13-2021, https://mashable.com/feature/asteroid-mining-space-economy)//ML

How much, exactly? We’re only just beginning to guess. [Asterank](http://www.asterank.com/" \t "_blank), a service that keeps track of some 6,000 asteroids in NASA’s database, prices out the estimated mineral content in each one in the current world market. More than 500 are listed as “>$100 trillion.” The estimated profit on just the top 10 asteroids judged “most cost effective” — that is, the easiest to reach and to mine, subtracting rocket fuel and other operating costs, is around $1.5 trillion.¶ Is it ours for the taking? Well, here’s the thing — we’re taking it already, and have been doing so since we started mining metals thousands of years ago. Asteroid strikes are the only reason rare metals exist in the Earth’s crust; the native ones were all sucked into our planet’s merciless iron core millions of years ago. Why not go to the source?¶ As a side project, space mining can grab water from the rocks and comets — water which, with a little processing makes rocket fuel. Which in turn makes even more currently unimaginable space operations possible, including ones that could give the planet all the energy it needs to avert climate catastrophe. Cislunar space — the bit around us and the moon, the local neighborhood, basically — is about to get very interesting.¶ It’s hard, even for the most asteroid-minded visionaries, to truly believe the full scope of this future space economy right now. Just as hard as it would have been in 1945, when an engineer named Vannevar Bush first proposed [a vast library of shared knowledge that people the world over would access via personal computers](https://en.wikipedia.org/wiki/Memex), to see that mushroom into a global network of streaming movies and grandmas posting photos and trolls and spies who move the needle on presidential elections. ¶ No technology’s pioneer can predict its second-order effects.¶ The space vision thing is particularly difficult in 2019. Not only do we have plenty of urgent problems with democracy and justice to keep us occupied, but the only two companies on the planet to have gone public with asteroid-mining business plans, startups that seemed to be going strong and had launched satellites already, were just bought by larger companies that are, shall we say, less comfortable executing on long-term visions.¶ Planetary Resources was founded in 2012 in a blaze of publicity. Its funding came from, among others, Larry Page, Eric Schmidt, Ross Perot, and the country of Luxembourg. It had inked an orbital launch deal with Virgin Galactic. And it was sold last October to a blockchain software company. (To 21st century readers, this paragraph would look like I’m playing tech world mad libs.)¶ In January, the other company, Deep Space Industries, also partly funded by Luxembourg (way to get in the space race, Luxembourg!), was sold to Bradford Space, owned by a U.S. investment group called the American Industrial Acquisition Corporation. Maybe these new overlords plan on continuing their acquisitions' asteroid mining endeavors rather than stripping the companies for parts. Both companies have been notably silent on the subject. “The asteroid mining bubble has burst,” [declared The Space Review](http://www.thespacereview.com/article/3633/1), one of the few online publications to even pay attention.¶ That’s also to be expected. After all, anyone trying to build Google in 1945 would go bankrupt. Just as the internet needed a half-dozen major leaps forward in computing before it could even exist, space industry needs its launch infrastructure.¶ Currently, the world’s richest person and its most well-known entrepreneur, Jeff Bezos and Elon Musk, respectively, are working on the relatively cheap reusable rockets asteroid pioneers will need. (As I was writing this, Bezos announced in an email blast that one of his New Shepherd rockets had flown to space and back five times like it was nothing, delivering 38 payloads for various customers while remaining entirely intact.) ¶ Meanwhile, quietly, Earth’s scientists are laying the groundwork of research the space economy needs. Japan’s Hayabusa 2 spacecraft has been in orbit around asteroid Ryugu for the last year and a half, learning everything it can. (Ryugu, worth $30 billion according to Asterank, is the website's #1 most cost-effective target.) The craft dropped [tiny hopping robot rovers](https://www.space.com/41941-hayabusa2-asteroid-rovers-hopping-tech.html) and a [small bomb](https://www.space.com/japan-hayabusa2-asteroid-bomb-video.html) on its target; pictures of the small crater that resulted were released afterwards.¶ Officially, the mission is to help us figure out how the solar system formed. Unofficially, it will help us understand whether all those useful metals clump together at the heart of an asteroid, as some theorize. If so, it’s game on for asteroid prospectors. If not, we can still get at the metals with other techniques, such as optical mining (which basically involves sticking an asteroid in a bag and drilling with sunlight; sounds nuts to us, but [NASA has proved it in the lab](https://www.nasa.gov/directorates/spacetech/niac/2017_Phase_I_Phase_II/Sustainable_Human_Exploration/)). It’ll just take more time.¶ Effectively, we’ve just made our first mark at the base of the first space mineshaft. And there’s more to come in 2020 when Hayabusa 2 returns to Earth bearing samples. If its buckets of sand contain a modicum of gold dust, tiny chunks of platinum or pebbles of compressed carbon — aka diamonds — then the Duchy of Luxembourg won’t be the only deep-pocketed investor to sit up and take notice.¶ The possibility of private missions to asteroids, with or without a human crew, is almost here. The next step in the process that takes us from here to where you are? Tell us an inspiring story about it, one that makes people believe, and start to imagine themselves mining in space. How would you explain the world-changing nature of the internet to 1945? How would you persuade them that there was gold to be mined in Vannevar Bush’s idea? You’d let the new economy and its benefits play out in the form of a novel.¶ As Hayabusa dropped a bomb on Ryugu, Daniel Suarez was making the exact same asteroid the target of his fiction. Suarez is a tech consultant and developer turned New York Times bestselling author. His novels thus far have been techno-thrillers: his debut, [Daemon](https://www.amazon.com/dp/B003QP4NPE/ref=dp-kindle-redirect?_encoding=UTF8&btkr=1), a novel of Silicon Valley’s worst nightmare, AI run rampant, made more than a million dollars.¶ So it was a telling shift in cultural mood that Suarez’s latest thriller is also a very in-depth description of — and thinly-disguised advocacy for — asteroid mining. In [Delta-v](https://www.amazon.com/Delta-v-Daniel-Suarez-ebook/dp/B07FLX8V84/ref=sr_1_1?crid=UMNUUSR3NCBX&keywords=delta-v&qid=1556930756&s=digital-text&sprefix=delta-v%2Cdigital-text%2C204&sr=1-1), published in April, a billionaire in the 2030s named Nathan Joyce recruits a team of adventurers who know nothing about space — a world-renowned cave-diver, a world-renowned mountaineer — for the first crewed asteroid mission.¶ Elon Musk fans might expect this to be Joyce’s tale, but he soon fades into the background. The asteroid-nauts are the true heroes of Delta-v. Not only are they offered a massive payday — $6 million each for four years’ work — they also have agency in key decisions in the distant enterprise. Suarez deliberately based them on present-day heroes. The mission is essential, Joyce declares, to save Earth from its major problems. First of all, the fictional billionaire wheels in a fictional Nobel economist to demonstrate the actual truth that the entire global economy is sitting on a [mountain of debt](https://www.washingtonpost.com/opinions/the-247-trillion-global-debt-bomb/2018/07/15/64c5bbaa-86c2-11e8-8f6c-46cb43e3f306_story.html?noredirect=on&utm_term=.5fb3ff1155d9). It has to keep growing or it will implode, so we might as well take the majority of the industrial growth off-world where it can’t do any more harm to the biosphere.¶ Secondly, there’s the climate change fix. Suarez sees asteroid mining as the only way we’re going to build [solar power satellites](https://en.wikipedia.org/wiki/Space-based_solar_power). Which, as you probably know, is a form of uninterrupted solar power collection that is theoretically more effective, inch for inch, than any solar panels on Earth at high noon, but operating 24/7. (In space, basically, it’s always double high noon). ¶ The power collected is beamed back to large receptors on Earth with large, low-power microwaves, which researchers think will be harmless enough to let humans and animals pass through the beam. A space solar power array like [the one China is said to be working on](https://www.forbes.com/sites/scottsnowden/2019/03/12/solar-power-stations-in-space-could-supply-the-world-with-limitless-energy/#2d3f78a54386) could reliably supply 2,000 gigawatts — or over 1,000 times more power than the largest solar farm currently in existence. ¶ “We're looking at a 20-year window to completely replace human civilization's power infrastructure,” Sua

rez told me, citing the report of the Intergovernmental Panel on Climate Change on the coming catastrophe. Solar satellite technology “has existed since the 1970s. What we were missing is millions of tons of construction materials in orbit. Asteroid mining can place it there.”¶ The Earth-centric early 21st century can’t really wrap its brain around this, but the idea is not to bring all that building material and precious metals down into our gravity well. Far better to create a whole new commodities exchange in space. You mine the useful stuff of asteroids both near to Earth and far, thousands of them taking less energy to reach than the moon. That’s something else we’re still grasping, how relatively easy it is to ship stuff in zero-G environments. ¶ Robot craft can move 10-meter boulders like they’re nothing. You bring it all back to sell to companies that will refine and synthesize it in orbit for a myriad of purposes. Big pharma, to take one controversial industry, would [benefit by taking its manufacturing off-world](https://medium.com/fitch-blog/why-is-big-pharma-interested-in-the-space-economy-c078ac1bf67c). The molecular structure of many chemicals grows better in microgravity.¶ The expectation is that a lot of these space businesses — and all the orbital infrastructure designed to support them — will be automated, controlled remotely via telepresence, and monitored by AI. But Suarez is adamant that thousands if not millions of actual human workers will thrive in the space economy, even as robots take their jobs in old industries back on Earth.¶ “Our initial expansion into space will most likely be unsettled and experimental. Human beings excel in such environments,” he says. “Humans can improvise and figure things out as we go. Robots must be purpose-built, and it's going to take time and experience for us to design and build them.”¶ Which is another way startups back on Earth will get rich in the new economy: designing and building those robots, the nearest thing to selling picks and shovels to prospectors in the space gold rush. Thousands of humans in space at any one time will also require the design and construction of stations that spin to create artificial gravity. Again, this isn’t a great stretch: Using centrifugal force to simulate gravity in space was first proposed by scientists in the 19th century. NASA has had workable designs for spinning cislunar habitats called [O’Neill cylinders](https://en.wikipedia.org/wiki/O%27Neill_cylinder) since the 1970s. We just haven’t funded them. ¶ But the trillionaires clearly will.¶ In short, Suarez has carefully laid out a vision of the orbital economy that offers something for everyone in our divided society. For Green New Deal Millennials, there’s the prospect of removing our reliance on fossil fuels at a stroke and literally lifting dirty industries off the face of the planet. For libertarians and other rugged individualists, there’s a whole new frontier to be developed, largely beyond the reach of government. ¶ For those who worry about asteroids that could wipe out civilization — though luckily, [this isn't likely to happen any time soon](https://mashable.com/article/armageddon-asteroid-threat) — here is a way for humanity to get proficient in moving them out of the way, fast. Indeed, the National Space Society has offered [a proposal](https://space.nss.org/technologies-for-asteroid-capture-into-earth-orbit/) to capture the asteroid Aphosis (which is set to miss Earth in the year 2029, but [not by a very comfortable margin](https://www.space.com/asteroid-apophis-2029-flyby-planetary-defense.html)), keep it in orbit, and turn it into 150 small solar-power satellites, as a proof of concept. ¶ For the woke folks who care about the bloody history of diamond production, there’s the likelihood that space mining would wipe out Earth’s entire diamond industry. “They will be found in quantities unattainable on Earth,” claims Suarez, with good reason. We are starting to discover that there is more crystalized carbon in the cosmos than we ever suspected. Astronomers have identified one [distant planet made entirely of diamond](https://www.nationalgeographic.com/science/phenomena/2014/06/24/diamond-the-size-of-earth/); there may be more, but they are, ironically, hard to see. ¶ We don’t have diamond planets in our solar system (and we can’t do interstellar missions), but we do have diamond-studded asteroids. Mine them for long enough and you will wear diamonds on the soles of your shoes.¶ For investors and entrepreneurs, there is the thrill of racing to be the first member of the four-comma club. ([Neil deGrasse Tyson believes that the first trillionaire will be an asteroid mining mogul](https://www.nbcnews.com/science/space/neil-degrasse-tyson-says-space-ventures-will-spawn-first-trillionaire-n352271); Suarez isn’t sure whether they’ll be the first, but he suspects that asteroid mining “will mint more trillionaires than any industry in history.”) ¶ For the regular guy or gal with a 401K, there’ll be a fast-rising stock market — inflated not by financial shenanigans this time, but an actual increase in what the world counts as wealth.¶ For workers, there is the promise of sharing in the untold riches, both legally and otherwise. It would be hard to stop miners attaining mineral wealth beyond their paycheck, under the table, when your bosses are millions of miles away. Then there’s the likelihood of rapid advancement in this new economy, where the miners fast gain the knowledge necessary to become moguls.¶ “After several tours in space working for others, perhaps on six-month or year-long contracts, it's likely that some workers will partner to set up their own businesses there,” says Suarez. “Either serving the needs of increasing numbers of workers and businesses in space, marketing services to Earth, or launching asteroid mining startups themselves.” All in all, it’s starting to sound a damn sight more beneficial to the human race than the internet economy is. Not a moment too soon. I’ve written encouragingly about asteroid mining several times before, each time touting the massive potential wealth that seems likely to be made. And each time there’s been a sense of disquiet among my readers, a sense that we’re taking our rapacious capitalist ways and exploiting space.¶ Whereas the truth is, this is exactly the version of capitalism humanity has needed all along: the kind where there is no ecosystem to destroy, no marginalized group to make miserable. A safe, dead space where capitalism’s most enthusiastic pioneers can go nuts to their hearts’ content, so long as they clean up their space junk. ¶ ([Space junk](https://mashable.com/category/space-junk) is a real problem in orbital space because it has thousands of vulnerable satellites clustered closely together around our little blue rock. The vast emptiness of cislunar space, not so much.)¶ And because they’re up there making all the wealth on their commodities market, we down here on Earth can certainly afford to focus less on growing our stock market. Maybe even, whisper it low, we can afford a fully functioning social safety net, plus free healthcare and free education for everyone on the planet.¶ It’s also clearly the area where we should have focused space exploration all along. If we settle on Mars, we may disturb as-yet-undiscovered native bacteria — and as the character Nathan Joyce shouts at a group of “Mars-obsessed” entrepreneurs in Delta-V, Mars is basically filled with toxic sand and is thus looking increasingly impossible to colonize. (Sorry, Mark Watney from The Martian, those potatoes would probably kill you.)

#### Warming causes extinction.

Bill McKibben 19, Schumann Distinguished Scholar at Middlebury College; fellow of the American Academy of Arts and Sciences; holds honorary degrees from 18 colleges and universities; Foreign Policy named him to their inaugural list of the world’s 100 most important global thinkers. "This Is How Human Extinction Could Play Out." Rolling Stone. 4-9-2019. https://www.rollingstone.com/politics/politics-features/bill-mckibben-falter-climate-change-817310/

Oh, it could get very bad. In 2015, a study in the Journal of Mathematical Biology pointed out that if the world’s oceans kept warming, by 2100 they might become hot enough to “stop oxygen production by phyto-plankton by disrupting the process of photosynthesis.” Given that two-thirds of the Earth’s oxygen comes from phytoplankton, that would “likely result in the mass mortality of animals and humans.” A year later, above the Arctic Circle, in Siberia, a heat wave thawed a reindeer carcass that had been trapped in the permafrost. The exposed body released anthrax into nearby water and soil, infecting two thousand reindeer grazing nearby, and they in turn infected some humans; a twelve-year-old boy died. As it turns out, permafrost is a “very good preserver of microbes and viruses, because it is cold, there is no oxygen, and it is dark” — scientists have managed to revive an eight-million-year-old bacterium they found beneath the surface of a glacier. Researchers believe there are fragments of the Spanish flu virus, smallpox, and bubonic plague buried in Siberia and Alaska. Or consider this: as ice sheets melt, they take weight off land, and that can trigger earthquakes — seismic activity is already increasing in Greenland and Alaska. Meanwhile, the added weight of the new seawater starts to bend the Earth’s crust. “That will give you a massive increase in volcanic activity. It’ll activate faults to create earthquakes, submarine landslides, tsunamis, the whole lot,” explained the director of University College London’s Hazard Centre. Such a landslide happened in Scandinavia about eight thousand years ago, as the last Ice Age retreated and a Kentucky-size section of Norway’s continental shelf gave way, “plummeting down to the abyssal plain and creating a series of titanic waves that roared forth with a vengeance,” wiping all signs of life from coastal Norway to Greenland and “drowning the Wales-sized landmass that once connected Britain to the Netherlands, Denmark, and Germany.” When the waves hit the Shetlands, they were sixty-five feet high. There’s even this: if we keep raising carbon dioxide levels, we may not be able to think straight anymore. At a thousand parts per million (which is within the realm of possibility for 2100), human cognitive ability falls 21 percent. “The largest effects were seen for Crisis Response, Information Usage, and Strategy,” a Harvard study reported, which is too bad, as those skills are what we seem to need most. I could, in other words, do my best to scare you silly. I’m not opposed on principle — changing something as fundamental as the composition of the atmosphere, and hence the heat balance of the planet, is certain to trigger all manner of horror, and we shouldn’t shy away from it. The dramatic uncertainty that lies ahead may be the most frightening development of all; the physical world is going from backdrop to foreground. (It’s like the contrast between politics in the old days, when you could forget about Washington for weeks at a time, and politics in the Trump era, when the president is always jumping out from behind a tree to yell at you.) But let’s try to occupy ourselves with the most likely scenarios, because they are more than disturbing enough. Long before we get to tidal waves or smallpox, long before we choke to death or stop thinking clearly, we will need to concentrate on the most mundane and basic facts: everyone needs to eat every day, and an awful lot of us live near the ocean. FOOD SUPPLY first. We’ve had an amazing run since the end of World War II, with crop yields growing fast enough to keep ahead of a fast-rising population. It’s come at great human cost — displaced peasant farmers fill many of the planet’s vast slums — but in terms of sheer volume, the Green Revolution’s fertilizers, pesticides, and machinery managed to push output sharply upward. That climb, however, now seems to be running into the brute facts of heat and drought. There are studies to demonstrate the dire effects of warming on coffee, cacao, chickpeas, and champagne, but it is cereals that we really need to worry about, given that they supply most of the planet’s calories: corn, wheat, and rice all evolved as crops in the climate of the last ten thousand years, and though plant breeders can change them, there are limits to those changes. You can move a person from Hanoi to Edmonton, and she might decide to open a Vietnamese restaurant. But if you move a rice plant, it will die. A 2017 study in Australia, home to some of the world’s highest-tech farming, found that “wheat productivity has flatlined as a direct result of climate change.” After tripling between 1900 and 1990, wheat yields had stagnated since, as temperatures increased a degree and rainfall declined by nearly a third. “The chance of that just being variable climate without the underlying factor [of climate change] is less than one in a hundred billion,” the researchers said, and it meant that despite all the expensive new technology farmers kept introducing, “they have succeeded only in standing still, not in moving forward.” Assuming the same trends continued, yields would actually start to decline inside of two decades, they reported. In June 2018, researchers found that a two-degree Celsius rise in temperature — which, recall, is what the Paris accords are now aiming for — could cut U.S. corn yields by 18 percent. A four-degree increase — which is where our current trajectory will take us — would cut the crop almost in half. The United States is the world’s largest producer of corn, which in turn is the planet’s most widely grown crop. Corn is vulnerable because even a week of high temperatures at the key moment can keep it from fertilizing. (“You only get one chance to pollinate a quadrillion kernels of corn,” the head of a commodity consulting firm explained.) But even the hardiest crops are susceptible. Sorghum, for instance, which is a staple for half a billion humans, is particularly hardy in dry conditions because it has big, fibrous roots that reach far down into the earth. Even it has limits, though, and they are being reached. Thirty years of data from the American Midwest show that heat waves affect the “vapor pressure deficit,” the difference between the water vapor in the sorghum leaf’s interior and that in the surrounding air. Hotter weather means the sorghum releases more moisture into the atmosphere. Warm the planet’s temperature by two degrees Celsius — which is, again, now the world’s goal — and sorghum yields drop 17 percent. Warm it five degrees Celsius (nine degrees Fahrenheit), and yields drop almost 60 percent. It’s hard to imagine a topic duller than sorghum yields. It’s the precise opposite of clickbait. But people have to eat; in the human game, the single most important question is probably “What’s for dinner?” And when the answer is “Not much,” things deteriorate fast. In 2010 a severe heat wave hit Russia, and it wrecked the grain harvest, which led the Kremlin to ban exports. The global price of wheat spiked, and that helped trigger the Arab Spring — Egypt at the time was the largest wheat importer on the planet. That experience set academics and insurers to work gaming out what the next food shock might look like. In 2017 one team imagined a vigorous El Niño, with the attendant floods and droughts — for a season, in their scenario, corn and soy yields declined by 10 percent, and wheat and rice by 7 percent. The result was chaos: “quadrupled commodity prices, civil unrest, significant negative humanitarian consequences . . . Food riots break out in urban areas across the Middle East, North Africa, and Latin America. The euro weakens and the main European stock markets lose ten percent.” At about the same time, a team of British researchers released a study demonstrating that even if you can grow plenty of food, the transportation system that distributes it runs through just fourteen major choke-points, and those are vulnerable to — you guessed it — massive disruption from climate change. For instance, U.S. rivers and canals carry a third of the world’s corn and soy, and they’ve been frequently shut down or crimped by flooding and drought in recent years. Brazil accounts for 17 percent of the world’s grain exports, but heavy rainfall in 2017 stranded three thousand trucks. “It’s the glide path to a perfect storm,” said one of the report’s authors. Five weeks after that, another report raised an even deeper question. What if you can figure out how to grow plenty of food, and you can figure out how to guarantee its distribution, but the food itself has lost much of its value? The paper, in the journal Environmental Research, said that rising carbon dioxide levels, by speeding plant growth, seem to have reduced the amount of protein in basic staple crops, a finding so startling that, for many years, agronomists had overlooked hints that it was happening. But it seems to be true: when researchers grow grain at the carbon dioxide levels we expect for later this century, they find that minerals such as calcium and iron drop by 8 percent, and protein by about the same amount. In the developing world, where people rely on plants for their protein, that means huge reductions in nutrition: India alone could lose 5 percent of the protein in its total diet, putting 53 million people at new risk for protein deficiency. The loss of zinc, essential for maternal and infant health, could endanger 138 million people around the world. In 2018, rice researchers found “significantly less protein” when they grew eighteen varieties of rice in high–carbon dioxide test plots. “The idea that food became less nutritious was a surprise,” said one researcher. “It’s not intuitive. But I think we should continue to expect surprises. We are completely altering the biophysical conditions that underpin our food system.” And not just ours. People don’t depend on goldenrod, for instance, but bees do. When scientists looked at samples of goldenrod in the Smithsonian that dated back to 1842, they found that the protein content of its pollen had “declined by a third since the industrial revolution — and the change closely tracks with the rise in carbon dioxide.” Bees help crops, obviously, so that’s scary news. But in August 2018, a massive new study found something just as frightening: crop pests were thriving in the new heat. “It gets better and better for them,” said one University of Colorado researcher. Even if we hit the UN target of limiting temperature rise to two degrees Celsius, pests should cut wheat yields by 46 percent, corn by 31 percent, and rice by 19 percent. “Warmer temperatures accelerate the metabolism of insect pests like aphids and corn borers at a predictable rate,” the researchers found. “That makes them hungrier[,] and warmer temperatures also speed up their reproduction.” Even fossilized plants from fifty million years ago make the point: “Plant damage from insects correlated with rising and falling temperatures, reaching a maximum during the warmest periods.”

#### An asteroid collision would ensure extinction – would fundamentally alter the biosphere, don’t underestimate its risk. Hudson 19

Wesley Hudson ’19, news reporter for Express, “Asteroid alert: NASA warning as kilometre long space rock set to skim Earth at 25,000mph”, 8/28/19, Express, https://www.express.co.uk/news/science/1170826/asteroid-news-NASA-latest-space-rock-asteroid-1998-HL1-earth-danger-apocalypse

AN ASTEROID almost a kilometre wide is currently barreling through space at more than 25,000mph and is due to skim the earth towards the end of October. NASA’s Jet Propulsion Laboratory (JPL) claim the space rock will shoot past the earth within a “close” proximity of the planet in the early hours of October 26. The asteroid, dubbed 1998 HL1, is a so-called Near-Earth Object (NEO) flying on a Close Approach Trajectory. NASA expects the 1998 HL1 to come flying by dangerously close around 1.21am BST (17.21pm PDT). The daunting moment will mark anther journey around the sun for the asteroid since it was discovered in 1998. The asteroid will be travelling at a staggering speed of over 25,000mph as it barrels past the Earth. The JPL predict the asteroid could be between 440m and 990m wide. At its largest an asteroid of this size is bigger than the tallest building in the world, the Burj Khalifa in Dubai. Even at it’s smallest, 1998 HL1 is still bigger than The Shard. Since it was discovered, 1998 HL1 has been seen up to 408 times. An NEO is an asteroid or comet which is on an orbital path intersecting that of the Earth's. This asteroid will miss the Earth by almost four million miles. If it were to strike the Earth, an asteroid of this size would cause catastrophic damage. The extinction of the dinosaurs in the Cretaceous-Tertiary event 65million years ago is famously believed to have been caused by a massive asteroid impact. The Chicxulub Crater in Mexico is the most commonly accepted point of impact, with the responsible body thought to be around 10km in diameter. A car-sized asteroid is estimated to hit the Earth roughly once a year. The majority of asteroids on track for the planet are usually burnt up as they enter the Earth's atmosphere. NASA administrator Jim Bridenstine has previously warned a potential asteroid collision is more likely then people realise. He said: "We have to make sure that people understand that this is not about Hollywood, it's not about the movies. "This is about ultimately protecting the only planet we know, right now, to host life - and that is the planet Earth.” NASA is currently in the process of developing the Double Asteroid Redirection Test (DART). DART will test if it is possible to redirect asteroids that are threatening to impact with Earth. SpaceX chief Elon Musk had previously tweeted fears of a deadly collision that Earth was not prepared for. Mr Musk tweeted: “A big rock will hit Earth eventually & we currently have no defence.”

#### Don’t write our impacts off as low probability – asteroid collision is complex and the existence of space keyholes exponentially increases the risk of collision. Vereš ’19

Peter Vereš ’19, Harvard-Smithsonian Center for Astrophysics, “Chapter 6 Vision of Perfect Observation Capabilities”, 2019, Planetary Defense, Space and Society, https://dl1.cuni.cz/pluginfile.php/634091/mod\_resource/content/1/Planetary%20Defence.pdf

Often, uncertain orbits are a source of elevated impact risks of some NEOs with the Earth. The impact probability of an asteroid with Earth is a complex problem. First, the orbits of Earth and the asteroid should be close enough or even intersect; second, the Earth and asteroid should meet at the intersection at the same time. If these conditions are met, then one can assess how close the asteroid flies around the Earth at a given time, or whether it will hit the Earth. One must remember that each asteroid orbit comes with uncertainties and therefore, instead of a single accurate solution where the asteroid will hit the Earth or miss it, there is always a realm of possible solutions within the orbit uncertainties. The tangent plane to the asteroid’s trajectory at the time of impact, or close approach, is called a b-plane. At a given time of a predicted impact, all possible closest distances to the Earth of possible orbits create an area on the tangent plane. If the area contains the Earth, then the impact probability for that epoch is non-zero and in a simple approximation can be denoted as a ratio of an area of Earth cross section and the entire area with possible orbits going through the b-plane. It happens that a newly discovered NEO with a short arc that is coming very close to the Earth has a non-zero impact probability, because its orbit is highly uncertain and the area on the b-plane is very large. Typically, further observations improve the orbit, and the impact risk for a given epoch falls to zero. Some objects, however, have orbits with low orbital uncertainty, but still have non-zero impact probability, such as Bennu. The non-zero impact probability is computed for a given time in the future, but even if the orbit is known very well today, small perturbations from planets and non-gravitational forces increase the uncertainty for future impacts. That is why NASA’s Sentry is providing predictions only for the next 100 years. A close flyby of a spacecraft around an asteroid may improve the asteroid’s orbit significantly, however, it does not fully mitigate its impact in the future, due to the presence of keyholes (Chodas 1999)—small areas in space near Earth. Keyholes are specific for asteroids flying very close to the Earth and are rather small, from a few to hundreds of kilometers across. If the keyhole is hit during the NEO flyby, the orbit of the NEO becomes resonant with Earth and the NEO will return to Earth regularly, increasing its impact probability. Thus, in case of a very near Earth flyby, the orbit needs to be known with such precision (~km) that keyhole avoidance is confirmed. NASA has even created the NEO Deflection App,1 where the public can try to change the orbit of a hypothesized NEO on direct impact trajectory. For Earth impact monitoring, the accuracy of orbits and orbital uncertainties is crucial and deserves more attention. The future of orbit determination and uncertainty mitigation will depend more and more on sophisticated software that will be able to handle orbital computation in detail; assess uncertainties and errors of measurements; coordinate a list of objects that are crucial for follow-up or orbit improvement, or even automatically point the telescopes in a network to observe those asteroids; measure their positions; and submit the data to MPC. This automated process is more or less implanted by several surveys (CSS, LCOGT) and agencies (ESA, MPC).