Temporal Sovereignty:
Juridical Plurality and the Ontology of Time Beyond Earth

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ABSTRACT

Human expansion beyond Earth calls for not merely geographical, but also crucial temporal disconnections, wherein Martian sols, lunar phases, and relativistic velocities fracture the monolithic timeline that underpins terrestrial law. Contemporary legal instruments, including the Outer Space Treaty and the Moon Agreement, are ominously quiet on temporal sovereignty, and hence form simultaneously ontological, moral and legal lacunae. This paper advances the unorthodox thesis of temporal sovereignty and maintains that space polities have legitimate normative control of calendars, legal time constraints and socio-temporal regimes regardless of Earthly time. It raises questions of whether temporality constitutes a shared substrate, public good or social construct and of the effects of temporal jurisdiction on the identity, self-governance and moral responsibility of off-world populations. Historical analogies, the colonialist imposition of temporal regimes, the standardisation of longitude at sea and the codification of Greenwich Mean Time are exemplars of the ways in which time regulation has historically ingrained power, ethics and cosmopolitan order. Through the reconceptualisation of time itself as a jurisprudential and philosophical axis, this question sets temporal sovereignty as a radical frontier with a mandate for humankind to rethink law, ethics and selfhood for the era of interplanetary space.

KEYWORDS

Temporal Sovereignty
Juridical Plurality
Extraterrestrial Governance

INTRODUCTION

The form of terrestrial jurisprudence,[1] from remedy to simple contract to complicated international agreement, is built upon an implicit, cosmic foundation: a common, harmonised conception of time. That underlying assumption is torn violently asunder in the fictional, yet increasingly plausible scenario of a contractual dispute between a Martian consortium that does business under the twenty-four-hour, thirty-nine-minute sol[2] and an earthly corporation that is tied to the Gregorian calendar.[3]

To argue that this problem can be broken down to a simple contract rule about a particular time zone or jurisdiction is to expose considerable legal–geographic parochialism and fundamentally to misunderstand the meaningful relativistic and operational gap between Earth and Mars. This is not simply a static time arbitrage like time zones on Earth; it is a constantly compounding

1 Cornell Law School, "Jurisprudence," https://www.law.cornell.edu/wex/jurisprudence.
2 NASA, "In Depth | Mars," https://mars.nasa.gov/all-about-mars/facts/.
3 Encyclopedia Britannica, "Gregorian Calendar," https://www.britannica.com/science/Gregorian-calendar.

desynchronisation, and the thirty-nine-minute sol–day gap[4] means that any Earth time reference point, whether UTC or otherwise, will inevitably process across the Mars shareholding consortium's twenty-four-hour business day, ensuring operational fidelity is impossible. This intractable problem is then catastrophically compounded by random signal latency; the fundamental three-to-twenty-two-minute light-time gap[5] means that agreement as to contract-melding questions of consensus and duty of care breaks down because the instantaneous formation of legal contract and consensus ad idem[6] is lost in the instant respect for the operationalising world of Mars, where a legal acceptance or default point no longer exists.

This means that any lex fori (choice of law)[7] is a delusion since, in this case, any writ from an earth court has no power in situ on another planet anywhere, meaning that any decision would be nothing more than an indistinct legal formalism without enforceable weight beyond its geographic locus.[8] When a date for delivery agreed upon in "days" is not honoured, a fundamental jurisprudential breakdown obtains: which day, whose day, defines the breach? The chronometric rupture reveals an enormous lacuna within our legal framework, a failure to appreciate that humanity's extension into space is not only a geographic extension, but also a temporal extension, creating a plurality of incommensurable worlds of time.

Justice and law are chrono-normatively essential; they posit a single, objective flow of time to localise culpability, ordering and causality. However, interplanetary society's new epoch confronts us with a poly-temporal world. Beyond the desynchronisation of Martian day and terrestrial day, we must come to grips with the 708-hour synodic period of a lunar colony, and, more radically, with the relativistic requirements of high-speed spaceflight,[9] in which time itself elongates. An event can thus possess multiple, equally valid coordinates of time and hence render tragically uncertain terms like "simultaneity" and "duration."

The existing space law, notably the Outer Space Treaty of 1967[10] and the Moon Agreement of 1979,[11] rests upon spatial concerns, territorial appropriation, regulation of celestial bodies and resource allocation. These foundational texts share at their core a chronometric silence, never once discussing the question of how to resolve conflicts crossing divergent regimes of time. This critical oversight necessitates the enunciation of a hitherto novel legal doctrine, that of ruling not merely over subjects, territories and activities, but also over time itself. This paper thus puts forward a thesis of paramount importance for the off-world future of jurisprudence: that the envisagement of a coherent framework of temporal sovereignty is not merely an abstract desideratum of the legal academy, but it is rather a practical prerequisite of the provision of justice to an interplanetary society. Without principles for the selection of temporal law, for the determination of temporal conflict and for the recognition of local chronometric standard, the rule of law will remain perilously centred upon Earth. The following analysis first anatomises the existing doctrinal silence and its inherent perils. It then unearths analogues from terrestrial legal history—from conflicts of calendars[12] to standardisation of time zones[13]—to shed light upon the inquiry. It then constructs theoretical models of temporal sovereignty before arriving at its prescriptive conclusion of the necessity for a vigorous legal architecture capable of harmonising justice amongst the disparate calendars of our solar system.

PART II: THE TIME SILENCE OF SPACE LAW

The grand architecture of terrestrial law built over millennia is based on an invisible foundation: the rhythmic, predictable and universal time of Earth. Our legal systems are powered by a geocentric clock, a silent metronome that governs justice, commerce and human rights, all calibrated to the planet's twenty-four-hour day and 365.24-day year. This has been unprob-

4 NASA, "Mars Fact Sheet," 2025, https://science.nasa.gov/mars/facts/.
5 NASA, "Mars Fact Sheet."
6 Smith v. Hughes, LR 6 QB 597, Queen's Bench Division (1871), https://www.lawteacher.net/cases/smith-v-hughes.php.
7 Lord Collins of Mapesbury, general editor, *Dicey, Morris and Collins on the Conflict of Laws,* 16th ed. (London: Sweet & Maxwell, 2022), https://www.sweetandmaxwell.co.uk/en-gb/products/dicey-morris-and-collins-on-the-conflict-of-laws-16th-edition-2nd-cumulative-supplement-print-and-proview-ebook-bundle-43367004.
8 American Law Institute, *Restatement (Fourth) of the Foreign Relations Law of the United States* (Philadelphia: American Law Institute, 2018), https://www.ali.org/publications/restatement-law-fourth/foreign-relations-law-united-states.
9 Paul M. Sutter, "What is Special Relativity?," 2017, https://www.space.com/36273-theory-special-relativity.html.
10 United Nations Office for Outer Space Affairs (UNOOSA), "Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies," 1966, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html (hereafter Outer Space Treaty).
11 UNOOSA, "Agreement Governing the Activities of States on the Moon and Other Celestial Bodies," 1979, https://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/moon-agreement.html (hereafter Moon Agreement).
12 Royal Museums Greenwich, "The Gregorian Calendar," https://www.rmg.co.uk/stories/topics/gregorian-calendar.
13 Bill Chappell, "The Railway Man Who Gave Us Time Zones," NPR, March 8, 2015, https://www.npr.org/sections/thetwo-way/2015/03/08/391522045/the-railway-man-who-gave-us-time-zones.

lematic for the whole of human history. However, as humanity is on the cusp of becoming a multiplanetary species, this foundational assumption has become a major vulnerability. The foundational treaties of space law, which are based on international maritime law, were drafted in an era of exploration not settlement and are silent on the governance of time. This silence is not neutral: it is a vacuum, and a dangerous one, that will allow a new form of terrestrial imperialism to extend into the heavens by default.

THE GEOCENTRIC CLOCK: LAW'S HIDDEN EARTHLY CADENCE

Every aspect of our legal world is built on temporal assumptions derived from our planet. These are not just conventions, but the very gears of the justice machine, so embedded we do not see them as planetary artifacts. Consider the most basic legal concepts:

1. **Statutes of Limitation**: All legal systems impose deadlines, after which many legal claims are barred—three years for a tort, seven for a more serious crime. The concept of a "year"[14] is an astronomical measurement: the time it takes Earth to orbit the Sun. On Mars, where a year is 687 Earth days, a seven-year statute of limitation would be nearly thirteen Earth years.[15] Would Martian colonists be subject to an Earth-based clock or have their rights judged according to the local solar cycle? The law, as written, has no answer.
2. **Labour Law**: The eight-hour workday and forty-hour workweek are social and legal constructs built on the twenty-four-hour solar day. They are designed to structure human activity around a predictable cycle of light and dark. Apply this to a lunar settlement where a single "day" (one full rotation) is 29.5 Earth days[16] and the results would be absurd. A Martian "sol" is twenty-four hours and thirty-nine minutes long;[17] over a week this would desynchronise a terrestrial work schedule from the local environment by nearly four hours, causing immense psychological and physiological strain. Without a new temporal–legal framework, labour rights become untethered from their biological basis.
3. **Criminal Procedure**: The principle of habeas corpus[18] and related rights often involve strict time limits, such as a suspect's right to be charged or released within 48 hours of detention. This is a precise duration on Earth, a bulwark against indefinite state power. What does it mean for a detainee on a deep-space vessel traveling at relativistic speeds where time dilation is real?[19] What does it mean on a Jovian moon,[20] where a "day" is hours? The guarantee of liberty is meaningless without a defined temporal jurisdiction. In contract law, commerce is time-bound. Leases are signed for a "term of five years," interest accrues "per annum," and deliveries are promised by a specific "date." These are all dependent on a shared, fixed calendar. When parties to a contract live on different worlds with different calendars, the potential for conflict is huge. Is a payment due on a Martian date that has no equivalent on Earth? How do you calculate interest across planetary systems?

DOCTRINAL GAPS IN FOUNDATIONAL SPACE TREATIES

One might expect the foundational charters of space exploration to address this basic issue, but they are silent. The two pillars of international space law, the Outer Space Treaty of 1967[21] and the Moon Agreement of 1979,[22] were ahead of their time, but their vision was focused on preventing conflict over territory and resources, not on governing settled societies.

The Outer Space Treaty of 1967 is brilliant in establishing that space is the "province of all [hu]mankind," prohibiting national claims of sovereignty over celestial bodies (Article II), assigning state responsibility for national space activities (Article VI), and assigning liability for damages (Article VII). It tells us where we can go and what we can do, but not when. Its legal imagination extends to astronauts as "envoys of [hu]mankind," but not to residents, workers and families whose lives would be governed by a non-ter-

14 International Astronomical Union Office of Astronomy for Education (OAE), "Glossary Term: Year," 2023, https://astro4edu.org/resources/glossary/term/389/.
15 NASA, "Mars," NASA Solar System Exploration, 2025, https://solarsystem.nasa.gov/planets/mars/overview/.
16 NASA, "Earth's Moon," NASA Solar System Exploration, https://solarsystem.nasa.gov/moons/earths-moon/overview/.
17 NASA Jet Propulsion Laboratory, "Mars in a Minute: How Long is a Day on Mars?," 2022, https://www.jpl.nasa.gov/images/pia03531-mars-in-a-minute-how-long-is-a-day-on-mars.
18 Legal Information Institute, "Habeas Corpus," Cornell Law School, 2022, https://www.law.cornell.edu/wex/habeas_corpus.
19 NASA, "Ask an Astrophysicist—Relativity," Imagine the Universe!, NASA Goddard Space Flight Center, 1997, https://imagine.gsfc.nasa.gov/ask_astro/.
20 NASA, "Jupiter Moons," NASA Solar System Exploration, 2025, https://solarsystem.nasa.gov/moons/jupiter-moons/overview/.
21 UNOOSA, Outer Space Treaty.
22 UNOOSA, Moon Agreement.

restrial clock.

The Moon Agreement of 1979 went further, proposing a framework for the orderly and equitable development of lunar resources under the principle that the Moon is the "common heritage of [hu]mankind." It gets into the specifics of resource sharing, environmental protection and scientific exploration. However, despite its more detailed focus on creating a sustainable presence on a specific celestial body, it has no provision for temporal jurisdiction. The drafters envisaged states and organisations operating on the Moon, not a society of the Moon with its own rhythm and attendant legal needs.

THE LIMITS OF COORDINATED UNIVERSAL TIME (UTC)

In the absence of a formal legal standard, a de facto one has emerged: *Coordinated Universal Time (UTC)*.[23] This high-precision terrestrial time standard is the operational backbone of modern spaceflight. It is used to launch, navigate and schedule the daily lives of astronauts on the International Space Station (ISS).[24] For these purposes it is essential. Its reliability and universality make it a powerful tool for coordinating complex technical activities over vast distances.

However, its strengths as an operational tool are its weaknesses as a legal framework for permanent off-world societies. To make UTC the only legal clock for a Martian or lunar settlement would be a big mistake due to three main flaws:

1. *It is detached from the environment*: UTC is a completely abstract standard, far removed from the physical reality of another world. Moreover, it is impractical, indeed jarring, to have a Martian society running its courts, schools and marketplaces on time that ignores the local rising and setting of its sun.
2. *It is culturally restrictive*: Shared time—calendars, holidays and work rhythms—is the basis of culture. A community's ability to define its own temporality is a core aspect of self-determination to which families attach moral and historical significance. Denying this right would be to treat off-world settlements not as new societies but as remote-controlled terrestrial outposts.
3. *It risks temporal colonialism*: The unthinking imposition of a terrestrial standard on non-terrestrial peoples would be colonialism. Just as European powers imposed their calendars and time zones on colonised peoples in the 19th century as an instrument of control, the enforcement of UTC would make Earth the permanent temporal metropole and all other human worlds its perpetual dependents.

Unless we consciously and deliberately reform the hidden temporal assumptions of terrestrial law, the silence in our foundational treaties will be filled by the loudest voice—Earth's clock. This is an urgent imperative: we must start working on a new legal code that recognises time like territory as a dimension of sovereignty, so that future off-world societies can march to the beat of their own suns.

PART III: POWER AND PRECEDENT – A HISTORY OF TEMPORAL CONTROL

The problem of temporal sovereignty in space is not new. Long before we were thinking about off-world settlements we had to synchronise law, commerce and power across vast non-sovereign spaces on Earth. The history of how we standardised time on our own planet is not a simple story of scientific consensus; it is a story of power, empire and the creation of legal order in jurisdictional vacuums. By looking at the establishment of Greenwich Mean Time (GMT) and the law of the sea as global standards, we can see powerful analogies that explain the stakes of temporal governance in space. These precedents are both a model and a warning, showing that time regulation has always been an expression of authority and worldview with big ethical implications.

23 NASA, "International Space Station," 2025, https://www.nasa.gov/mission/international-space-station/.

24 Anne Buckle and Konstantin Bikos, "What Is UTC or Coordinated Universal Time?," Time and Date, https://www.timeanddate.com/time/aboututc.html.

CASE STUDY 1: FORGING A GLOBAL CLOCK AT GREENWICH

Global time standardisation, culminating in the adoption of GMT as the world's prime time zone,[25] is the ultimate expression of time-as-power. Before the nineteenth century, time was local, a matter of a town's clocks being set to the noon sun. This patchwork of "sun-times" was fine for agrarian societies but was a recipe for chaos with the rise of two British Empire game-changers: the railway and the navy. Railways, needing to coordinate schedules across hundreds of miles to avoid collisions, were the first to demand a standardised "railway time." At the same time, the British Royal Navy, the instrument of a global empire, needed a single longitudinal reference point for navigation across the world's oceans.

The solution was to make the time at the Royal Observatory in Greenwich the national and global standard. The critical moment came at the International Meridian Conference of 1884 in Washington, DC.[26] While presented as a matter of science and commerce, the decision to make Greenwich the prime meridian (0° longitude) was a geopolitical masterstroke. At the time, Britain was the world's leading industrial, economic and naval power, and over 70% of global shipping used charts based on Greenwich. The conference did not so much create a global standard as ratify a temporal reality that the British Empire had already established through its dominance.

The lesson is clear: time standardisation is an instrument of empire. It creates a predictable, legible and unified framework for the projection of power, the coordination of armies and the expansion of trade. GMT put the world on a single clock, a clock that ticked to the beat of the most powerful nation on Earth. This historical fact provides a direct and cautionary parallel for space. As Earth-based agencies and corporations lead the settlement of the Moon and Mars, their operational standard—UTC, the modern successor to GMT—will become the default time for all off-world activities. Without a conscious counter-effort, Earth will not need to conquer space colonies with force; it can simply impose its clock and be the permanent temporal centre of the human universe.

CASE STUDY 2: THE LAW OF THE SEA AND THE JURISDICTIONAL VACUUM

If GMT demonstrates that power creates temporal order, the international law of the sea, which is the foundation of current space law, demonstrates how legal order can be developed in a physically defined space that, by definition, has no single sovereign.[27] The deep seas, like outer space, are considered by many to be a global common—a space that is not recognised as the territorial claim of any one nation. This creates a jurisdictional vacuum whereby our traditional laws, which are territorially based, do not apply, and there is a separate body of law of the sea to facilitate interactions in the non-sovereignty of this space.

Many of these laws have temporal attributes, created to correlate with the creation of rights and obligations evolving in a fluid environment along a temporal track. Consider salvage rights. A ship and crew can collect a reward for bringing assistance to another distressed vessel and towing it to any reasonable location to seek salvage.

The claim belongs to the party that *first* offers assistance. This legal principle creates order by establishing a timeline of intervention, turning a chaotic event at sea into a sequence of legally significant moments. Resolving maritime disputes, like collisions, requires reconstructing event timelines—when was the helm turned, when was the horn sounded, when was the impact? In the absence of a territorial sovereign, the law itself imposes a temporal framework to adjudicate actions.

The analogy to space is obvious. Outer space is the ultimate high sea, a jurisdictional vacuum defined by the Outer Space Treaty as the "province of all [hu] mankind." The legal challenges that will arise there—from resource claims on asteroids to contractual disputes in Martian settlements—will require a similar creation of time-sensitive legal principles. Maritime law shows that communities can develop sophisticated time-based legal doctrines for non-sovereign territories. It also shows that these doctrines were created by and for a community with a shared temporal foundation (Earth's day and year). The challenge in space will be to create a system that can function when that shared foundation no longer exists.

25 Royal Museums Greenwich, "The Royal Observatory," https://www.rmg.co.uk/royal-observatory.

26 Anne Buckle, "Why Do We Have Time Zones?," Time and Date, 2024, https://www.timeanddate.com/time/time-zones-history.html.

27 United Nations, "United Nations Convention on the Law of the Sea," United Nations Division for Ocean Affairs and the Law of the Sea, https://www.un.org/depts/los/index.htm.

SYNTHESIS: A WARNING FROM HISTORY

This sends an urgent message to the architects of interplanetary law. The history of GMT shows that time standardisation is never neutral; it is an exercise of power that can embed and perpetuate power imbalances. The law of the sea shows that legal frameworks can be adapted to govern non-sovereign spaces, but that it always relies on a shared underlying temporal reality.

History's warning is this: if we do not design a system of temporal governance for space, one will emerge by default, and it will be a colonial one. Earth's clock, under the seemingly benign banner of UTC, will become the universal standard, not through debate or consensus but through inertia due to being first. This will subordinate the natural rhythms of new worlds to the convenience of the old one, replicating the very patterns of dominance that characterised the colonial era on Earth. To build a truly just and equitable multiplanetary society it is essential to acknowledge that the right to one's own time is a fundamental component of sovereignty. The first step is to learn from our own history, or to risk repeating it on a cosmic scale.

PART IV: BUILDING TEMPORAL SOVEREIGNTY

THREE MODELS OF INTERPLANETARY LAW

Space colonisation of human society necessitates a basic reappraisal of jurisprudence,[28] calling for a transition from spatially based legal consciousness to concern with the ordering of time itself. The chronometric background silence of today's space law[29] is untenable; to prevent the desynchronisation of justice, a conscious and resilient chrono-normative edifice needs to be established. The following analysis examines three major models for the institution of temporal sovereignty of the solar system as a whole: universalism, imposing a single terrestrial standard; pluralism, permitting complete temporal autonomy; and federalism, proposing two-tiered double sovereignty. Subjecting their mechanisms, virtues and jurisprudential weaknesses to rigorous examination, it is apparent that only the federalist model can balance the requirements of local autonomy with the functional needs of integrated planetary order.

MODEL A: UNIVERSALISM AND THE SUPREMACY OF EARTH-STANDARD TIME

The easiest answer, if jurisprudence is blunt, to interplanetary conflict over the long run is *universalism*, a system founded upon the precept of Earth-standard supremacy. Its uncomplicated machinery is to extend by legal fiat the UTC standard,[30] terrestrial globalisation's chronometric lingua franca, to all human activity everywhere throughout all celestial bodies. All compacts, statutes, and legal procedures, from a Martian settlement labour agreement to an asteroid belt shipping manifest, would be regulated in the twenty-four-hour day and 365.24-day year of Earth.

The model's overriding virtues are uncompromised clarity and administrative effectiveness. A universal standard obliterates doubt in interplanetary commerce, travel, and communication, creating a frictionless and predictable legal environment. Coordination of divergent settlements is frictionless, since all parties operate within the same, interchangeable temporal environment. The system obviates the need for cumbersome "temporal exchange rates" or prolonged choice-of-law contests[31] and minimises transaction costs, facilitating the administration of justice over vast distances. It allows for a unifying instrument of strength, linking together an embryonic interplanetary society by the shared identity of a single clock.

However, universalism's crushing liabilities far outweigh its administrative conveniences. The template is itself a form of temporal imperialism, superimposing a terrestrial chronometric standard upon worlds to which it is a total stranger. For a colonist from Mars, whose planet is governed by the 24.6-hour sol,[32] an eight-hour UTC-oriented workday would continuously slip against the natural cycle of local illumination and darkness, inducing severe biorhythmic dissonance and psychological alienation. Imposing it transforms it from a practical coordination tool into an instrument of cultural and biological tyranny, subjecting off-world populations' lived experience to the arbitrary convenience of the home world. It is a solution of worldbound chauvinism, one that sets the interests of the home world's ancestors over its diaspora's comfort and autonomy, making it not only inefficient for the long-term settlement, but also ethically unacceptable.

28 Cornell Law School, "Jurisprudence."
29 UNOOSA, "Space Law," https://www.unoosa.org/oosa/en/ourwork/spacelaw/index.html.
30 Buckle and Bikos, "What Is UTC?"
31 Cornell Law School, "Choice of Law," https://www.law.cornell.edu/wex/choice_of_law.
32 European Space Agency, "A Day on Mars," https://www.esa.int/Science_Exploration/Human_and_Robotic_Exploration/Mars_Express/A_day_on_Mars.

MODEL B: DOCTRINE OF TEMPORAL DUALISM AND FEDERALISM

As a sophisticated alternative to the monolithic hardness of universalism, the federalist system proposes a system of *temporal dualism*, or double-timed bifurcated jurisdiction. Such a system would operate under the doctrine of juridical subsidiarity,[33] much like the division of powers in terrestrial federal states. The basic mechanism of the system would divide two fields of legal activity: internal and external. Local temporal regimes, e.g., a Martian Coordinated Time (MCT)[34] synchronised with the sol, would hold exclusive jurisdiction over all internal matters of a given settlement. They would be in charge of domestic law, labour codes, criminal cases, and the daily civic life of society, so that society could develop in harmony with its natural astral surroundings. In the meanwhile, a special universal standard, based presumably upon an evolutionary variant of UTC, would be the only ruler of all interplanetary matters, including interstellar contracts, diplomatic treaties and navigation grids.

The first virtue of that model is that it can strike a subtle and practical balance between systemic coordination and local autonomy. It provides off-world settlements with the strength to cultivate unique chrono-social cultures, freeing them from the paralysing imposition of an Earth-based clock and allowing innovation in law and culture. It does so, meanwhile, by keeping a common language of time for commerce and diplomacy over the broader interplanetary system as a whole that keeps it functionally coherent. This dualism acknowledges that human cultures require local adaptation at least as much as they require universal interoperability.

However, that equilibrium is purchased at the cost of much elaboration. The line between external and internal affairs is an undefined frontier, with all the potential for jurisdictional strife. Interplanetary treaties would be convoluted documents, bristling with stipulations for the governing temporal frame and complicated algorithms for *chronometric arbitrage*—the swapping of, for example, a Martian sol-based remittance period and a terrestrial fiscal year. Boards of arbitration would require new sophistication to cope with these "time exchange rates." Whilst manageable, their inherent elaborations invite their own dimension of legal inefficiency and foci of conflict that the universalist approach entirely avoids, requiring a powerful and highly advanced interplanetary judiciary to function at all.

MODEL C: PLURALISM AND THE RISKS OF COMPLETE TEMPORAL AUTONOMY

The pluralist model is the theoretical apogee of self-determination, demanding total and unlimited temporal autonomy for every discrete off-world settlement. In such a system, every settlement, on the Moon, on Mars, or on Titan, would have the unlimited right to imagine, implement, and administer its own idiosyncratic system of clock keeping, calendars, and temporal regulations, without coerced coordination with any extraneous standard. One settlement might use a decimalised clock, another might structure its calendar by the orbital period of its parent planet, and yet another might do away with the standard week.

Its strongest point is its maximisation of cultural experimentation and political liberality. It is the purest expression of the right of self-rule, allowing emerging societies to construct their interactions over time from abstract first principles, potentially giving rise to unexpected social and economic structures unmoored from terrestrial precedent. It creates an energetic "marketplace of temporalities," in which competing systems could be tried out, allowing emerging, organically optimal resolutions of idiosyncratic environmental and social conditions. It is profoundly anti-imperialist in that no specific chronometric worldview can be hegemonic over another.

But the practical effects of such an extremist compartmentalisation approach verge upon systemic failure. An interplanetary civilisation under pluralist jurisdiction would be reduced to a mosaic of mutually inconsistent legal islands, with regular commerce, travel, and diplomacy becoming overly impeditive. Imagine it: a Lunar settlement, with its own chronology and non-recognition of Earth-based statutes of limitations,[35] thus making cross-jurisdictional legal redress unworkable. The expense of transacting within this quilt of temporalities would be vast, chilling economic unification and fostering mutual suspicion. Without reference to common temporal coordinates to permit interstellar navigation or emergency beacons, disaster failures would be unavoidable. In attempting to achieve ultimate freedom, the pluralist model for interplanetary law would remove the possibility of an interplanetary civilisation that is coherent and cooperative at all, increasing the probability of future existence in a state of legal confusion and isolation.

33 European Union, "Principle of Subsidiarity," EUR-Lex, https://eur-lex.europa.eu/EN/legal-content/glossary/principle-of-subsidiarity.html.

34 Michael Allison and Robert Schmunk, "Mars24 Sunclock—Time on Mars: Help and Technical Notes," NASA Goddard Institute for Space Studies, 2023, https://www.giss.nasa.gov/tools/mars24/help/notes.html.

35 Cornell Law School, "Statute of Limitations," https://www.law.cornell.edu/wex/statute_of_limitations.

CRITICAL EVALUATION AND THE FEDERALIST IMPERATIVE

In ordering these competing frameworks, appeals to precepts of international political philosophy and analogies from international law are decisive. The universalist model, with its application of a universal standard, is attractive to particular streams of liberal universalism[36] that value efficiency and universalised common rights. However, the application is equivalent to a colonialism that offends the pluralist requirement [37] to respect varied lifestyles. It fails the test of Rawlsian fairness; behind the "veil of ignorance"[38] no rational agents would agree to a system that would condemn them to a life of complete biorhythmic discord for the simple fact of having been born on Mars rather than Earth.

By contrast, the pluralist approach, in celebrating the merits of communal autonomy, forgets the liberal requirement to facilitate interaction and trade between communities. Its intensely fragmenting approach is redolent of the pre-Westphalian period of unsynchronised lords,[39] something international law still struggles to move beyond. True sovereignty in the interdependent world is not autonomy at all but is rather relational, requiring it to be complemented by mutual recognition and common norms to be effective at all. So, the federalist model seems to be the fairest and most practical synthesis. It constitutes the advanced legal form of quasi-federal, supranational bodies like the European Union,[40] able to combine the sovereignty of previous states in a manner that serves the practical needs of supranational law in areas of common interest like trade and human rights. It enshrines a post-Westphalian idea of sovereignty[41] as fractionable and communal rather than unconditional and indivisible. Temporal federalism applies the doctrine of subsidiarity, so that decision-making takes place at the lowest level of local decisional that is compatible with maintaining the overall integrity of the system. It alone creates a system in which a Martian can live by the Martian sol and an Earthling by the terrestrial day, yet they can nonetheless enter into contract, treaty, and common endeavours under a reliable and equitable legal regime. It is that fine balance, securing local identity and allowing universal cooperation, that holds out the only conceivable way of bringing into existence a genuinely just and sustainable interplanetary legal order.

PART V: CONCLUSION—A TEMPORAL PROTOCOL FOR THE STARS

This paper has shown that the foundational charters of space law, born from a geocentric perspective, are silent on time. This is not an oversight; it is a ticking time bomb of interplanetary justice. This is flat-out inaction, and if no thought is taken as to how time might be governed off planet, it will lead to a default to a state of temporal colonialism, imposing the Earth's clock and time regime on an entirely new society, erasing its cultural independence and creating irreparable conflicts in lawsuits. As history has shown us through the imposition and global standardisation of GMT[42] and the development of admiralty law, control of time is a function of power. To build a fair future in space, it is necessary to design a legal framework consciously that does not repeat those patterns of dominance.

The three models discussed—universalism, pluralism and federalism—present different futures. A universal Earth standard would be a tool of empire; total temporal pluralism would be legal chaos and fragmentation. The only viable and just path forward is a federalist model of temporal dualism, one that balances the fundamental right of an off-world settlement to govern its internal life by its own local clock with the need for a shared standard for interplanetary commerce and law. This approach respects the unique biological and social rhythms of a Martian sol[43] or a lunar day while preserving the cohesion required for a multi-planetary human civilisation.

This is not a problem for some distant future; the groundwork for permanent off-world habitation is being laid today. So, here is the concrete recommendation: the international community, led by the UN Committee on the Peaceful Uses of Outer Space (COPUOS),[44] must start drafting a new annex to the Outer Space Treaty[45]—a Temporal Protocol. This protocol would formally recognise the principle of temporal sovereignty and establish a clear legal framework for time across dif-

36 Stanford University, "Liberalism." Stanford Encyclopedia of Philosophy, 2022, https://plato.stanford.edu/entries/liberalism/.
37 Encyclopedia Britannica, "Pluralism," https://www.britannica.com/topic/pluralism-political-science.
38 Stanford University, "Original Position," Stanford Encyclopedia of Philosophy, 2021, https://plato.stanford.edu/entries/original-position/.
39 Ian Shapiro, "Westphalian State System," Oxford Bibliographies, 2017, https://www.oxfordbibliographies.com/display/document/obo-9780199743292/obo-9780199743292-0081.xml.
40 European Union, "Founding Agreements," https://european-union.europa.eu/principles-countries-history/principles-and-values/founding-agreements_en.
41 E-International Relations, "The End of Westphalian Sovereignty?," 2018, https://www.e-ir.info/2018/02/10/the-end-of-westphalian-sovereignty/.
42 NASA Jet Propulsion Laboratory, "Mars in a Minute."
43 Royal Museums Greenwich, "What is Greenwich Mean Time (GMT)?," https://www.rmg.co.uk/stories/topics/what-gmt-greenwich-mean-time.
44 UNOOSA, "Committee on the Peaceful Uses of Outer Space," https://www.unoosa.org/oosa/en/ourwork/copuos/index.html.
45 UNOOSA, Outer Space Treaty.

ferent celestial bodies, the legal architecture for the proposed federalist system. It is essential to have a dialogue before the first off-world baby is born, before the first interplanetary contract is disputed and before precedent becomes unbreakable habit. To govern time in space is not just a technical problem of synchronising clocks; it is an existential question of what our future will be. The jurisprudence of off-world time will reflect our deepest values and whether our expansion into the universe is a story of freedom or oppression. As humanity goes beyond Earth, so must its definition of justice—a definition that will change and expand with its very experience of time itself.