Time Travel for Humanitarian Transformation

Impact Statement

Time travel represents a paradigm-shifting technology with the potential to rewrite the course of human history for the better. This project proposes the research and development of a prototype time machine as a high-risk, high-reward venture to empower humanity to prevent past catastrophes and avert future crises. The ability to send information or individuals to different points in time could save millions of lives, preserve peace, and protect our planet in ways no conventional intervention can. With philanthropic support, we aim to unlock temporal travel as a tool for humanitarian good, providing an opportunity to literally undo the worst chapters of history and preempt looming disasters. **It is a moral travesty to do anything other than take our best shot on goal for time travel.**

Consider the transformative impact: by intervening in key historical moments, we could prevent or mitigate some of the most devastating events on record:

- **Prevent Genocide and War:** The Holocaust of 1941–1945, in which ~6 million Jews were systematically murdered (Holocaust remembrance - Portal - The Council of Europe) could be averted by warning or empowering authorities in the past. Similarly, pivotal assassinations (e.g., of heads of state or peace leaders) that led to wider conflicts might be stopped, potentially preventing world wars or regional crises before they begin.

- **Halt Climate Change Early:** Armed with foreknowledge, humanity could implement environmental protections decades ago, halting climate change before it reaches the crisis levels we face now. (The UN has warned climate change is a *"code red for humanity"*; Secretary-General Calls Latest IPCC Climate Report 'Code Red for ...); time travel could allow us to act on that warning long before the damage accumulates.) Early intervention might mean avoiding the extreme weather, sea-level rise, and mass extinctions currently projected.
- **Prevent Pandemics:** We could intervene at the outbreak of diseases like COVID-19, which has caused over 6.9 million deaths worldwide as of 202 (Big data evidence of the impact of COVID-19 hospitalizations on ...). A timely warning or containment effort in the past could save millions of lives and trillions of dollars in economic loss. Future novel pathogens could similarly be stopped at ground zero by a traveler bearing a vaccine or critical data.
- **Preserve Knowledge and Cultural Heritage:** Time travel would enable safeguarding of irreplaceable knowledge – for example, preventing the destruction of the Library of Alexandria, or protecting cultural heritage sites in warzones. The cumulative intellectual and cultural benefit to humanity is incalculable.

Through these examples (and many more), the broader impacts of a successful time travel capability are unparalleled. This initiative, if successful, would be a game-changer for philanthropy and global welfare: instead of reacting to crises, we could preempt them at their source. The donor's investment thus has the *potential to yield returns measured in lives saved and catastrophes averted across all of history*. Even in the pursuit of this goal, secondary benefits will emerge: cutting-edge research in physics and engineering, educational inspiration, and new technologies (e.g. advanced energy sources or quantum control systems) that may spin off from the development process. In summary, this project aspires to do nothing less than bend the arc of history toward a safer, better world, leveraging visionary philanthropy to turn science fiction into reality.

Technical Foundations

State of the Art & Theoretical Basis: Modern physics provides a rigorous (if challenging) foundation suggesting that time travel is not purely fantasy. General Relativity (GR), Einstein's theory of spacetime, permits solutions that contain *closed timelike curves* (CTCs) – paths through the fabric of spacetime that loop back in time. In essence, an object traveling along a CTC could return to an earlier point in its own history. These solutions are extreme and often involve unusual conditions, but their existence in the equations is a proof of concept that time travel is theoretically conceivable. Meanwhile, Quantum Mechanics (Time travel - Wikipedia, Time travel - Wikipedia) theories provide hints that the universe's fundamental laws might accommodate, or at least not forbid, causal loops under exotic circumstances. We ground our proposal in these real scientific insights (Time travel - Wikipedia), proceeding with full awareness of known constraints from relativity and quantum physics.

To clarify the context, we summarize key theoretical concepts and prior results that inform our approach:

- **Special Relativity & One-Way Time Dilation:** Physics has already experimentally confirmed "one-way" time travel into the future. According to special relativity, a fast-moving clock ticks slower relative to a stationary one. The Lorentz factor $\gamma = \frac{1}{\sqrt{1 - v^2/c^2}}$ quantifies this time dilation. For example, at $v = 0.99c$ (99% of light speed), $\gamma \approx 7$; one year of travel for an astronaut would correspond to about 7 years on Earth. This effect is well-understood and observed (e.g. atomic clocks on orbital satellites run slightly faster than on Earth and require relativistic correction). Astronauts and cosmonauts have indeed returned to Earth fractions of a second younger ([Time travel - Wikipedia]) than they would have been, due to high-speed and orbital time dilation. However, this only allows travel to the future, not the past, and only by small amounts (current technology can only achieve differences of a few milliseconds or seconds at most) ([Time travel - Wikipedia]). Our proposal targets the far more challenging task of *closed timelike curves* for backward time travel.

- **General Relativity & Closed Timelike Curves:** General relativity's field equations (Einstein's equations) relate spacetime curvature to energy and mass: $G\mu\nu + \Lambda g\mu\nu = 8\pi Gc4T\mu\nu, G_{\mu\nu} + \Lambda g_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu}$, where $T_{\mu\nu}$ is the stress-energy tensor. Solving these equations in unusual scenarios has yielded spacetimes with closed timelike curves. Several classical solutions are relevant:

    - *Gödel's Rotating Universe (1949):* Kurt Gödel discovered a cosmological solution of GR where the universe itself rotates. This rotation twists the fabric of spacetime enough to allow CTCs – essentially, one could travel along a loop in time indefinitely. However, Gödel's universe requires global rotation and no cosmic expansion, conditions not met by our actual universe. It's a crucial proof-of-principle but not a practical template.
    - *Tipler Cylinder (1974):* Frank ([Time travel - Wikipedia]) that a sufficiently large, rapidly rotating cylinder of infinite length would drag spacetime around with it (frame-dragging), tilting light cones and allowing a spacecraft following a spiral path around the cylinder to travel back in time. In theory, if one could build a cylinder of super-dense matter and spin it near the speed of light, closed timelike ([Tipler cylinder - Wikipedia]) ([Tipler cylinder - Wikipedia]) nite-length version (which is more realistic) might also enable time travel if spun fast enough, but Tipler did not prove the finite case and it likely requires unrealistically high rotation speeds or additional exotic effects. This concept is foundational because it directly ties an *engineering construct* (a massive spinning object) to the possibility of time travel. ([Tipler cylinder - Wikipedia]) able Wormholes (1988):* Morris, Thorne, and Yurtsever famously analyzed wormholes – hypothetical tunnels in spacetime connecting two distant locations. By manipulating one mouth of a wormhole (for instance, moving it at relativistic speeds or placing it in a

strong gravitational field, causing time dilation) (Time travel - Wikipedia) ecome "out of sync" with the other in time. In effect, going through the wormhole could allow arrival at an earlier time than departure, thereby functioning as a time machine. A critical requirement for holding worm (Time travel - Wikipedia) (Time travel - Wikipedia) ** with negative energy density (to counteract gravitational collapse). The amounts needed are enormous — calculations suggest nega (Time travel - Wikipedia) y on the order of a planet might be required (Visser 1989 estimated roughly the mass of Jupiter in negative energy). One theoretical estima (Tipler cylinder - Wikipedia) o support even a human-sized wormhole, ~0.01 solar masses of exotic matter (about the energy of a supernova) would be needed. While daunting, wormholes remain one of the most actively studie (general relativity - Wormhole Metrics and the Density of Negative Energy - Physics Stack Exchange) r time travel in scientific literature, and advances in quantum theory (e.g., quantum foam or Casimir vacuum effects) provide some hope that small negative energy (general relativity - Wormhole Metrics and the Density of Negative Energy - Physics Stack Exchange) be achieved or harnessed in the lab.

  - *Cosmic Strings (1991):* J. Richard Gott proposed that two infinitely long, fast-moving cosmic strings (extremely dense line-like defects in spacetime) flying past each other could create a loop in time. If one were to navigate around the colliding cosmic strings in a specific way, you could end up arriving earlier than you left. This idea arises from the huge gravitational fields and distortions produced by cosmic strings. The mathematics of this scenario (Scars in Our Universe Could Unlock Time Travel, Physicists Say) an exact solution to Einstein's equations, reinforcing that CTCs are theoretically allowed. However, the practicality is nil at present: not only have cosmic strings never been observed in reality, but the scenario requires them moving at near light-speed, which implies ultra-high energy conditions far beyond a (Scars in Our Universe Could Unlock Time Travel, Physicists Say) As one physicist noted, the energy required to accelerate a massive object (like a cosmic string or any spacecraft attempting to exploit this effect) (Scars in Our Universe Could Unlock Time Travel, Physicists Say) is colossal and "there's no method yet that can produce the massive amounts of energy necessary".

These theoretical constructs demonstrate that physics as we know it does not forbid time travel outright – instead, it imposes stringent conditions. Common themes emerge: extreme gravitation or rotation, violation of energy conditions (needing negative energy or matter that bends spa (Scars in Our Universe Could Unlock Time Travel, Physicists Say) tionally), and often scales of mass/energy that are cosmological. Stephen Hawking, examining scenarios like the Tipler cylinder and wormholes, formulated the Chronology Protection Conjecture, suggesting that perhaps some yet-unknown quantum law prevents macroscopic time machines from functioning. Notably, Hawking proved a theorem that any finite-region time machine requires negative energy density – "to build a finite time machine, you need negative energy" – reinforcing the challenge of the energy condition. However, this is a constraint, not a proof of impossibility; it essentially challenges us (Time travel - Wikipedia) te the requisite exotic conditions.

Quantum Mechanics & Causality: Quantum physics introduces additional considerations. While classical GR permits CTCs, consisten (Tipler cylinder - Wikipedia) he famous grandfather paradox, for instance) raise questions about what happens if one tries to alter the past. The Novikov self-consistency principle posits that any actions taken by a time traveler were always part of history all along, thus avoiding paradox. In other interpretations, particularly in quantum mechanics, the universe might allow timeline changes by branching into parallel histories or alternate universes (as in the "many-worlds" interpretation). There have been small-scale experiments that simulate time travel scenarios in quantum systems (for example, using entangled particles (Tipler cylinder - Wikipedia) ntum particle interacting with an older version of itself) – these studies generally find that quantum consistency can be preserved, albeit in contrived setups. The upshot is that at the intersection of GR and quantum mechanics, a definitive verdict on time travel awaits a theory of quantum gravity. Our project is firmly aware of this and is designed not only to attempt a practical time machine but to probe the physics of chronology in a new regime, potentially providing empirical data that could inform the search for a unified theory. Even a null result (no time travel achieved) would be scientifically valuable if it provides evidence suppor (Time travel - Wikipedia) conjecture or reveals new quantum limits.

Approach – Building on Foundations: In light of the above, our technical strategy is to start from known physics and incrementally extend into the unknown. We are not simply attempting to build a Tipler cylinder or capture cosmic strings; those are beyond current engineering. Instead, we leverage modern technology and creative physics insights to mimic the effects of these constructs on a smaller, controlled scale. One promising avenue is the use of electromagnetic fields and ring lasers to simulate frame dragging. For instance, Dr. Ronald Mallett's work demonstrates that a circulating laser beam can theoretically twist spacetime in a manner analogous to a rotating mass, creating a kind of "ring singularity" of light. Mallett's prototype loop of rotating laser light is hypothesized to cause a mild frame-dragging effect – *"light can create gravity, and if gravity can affect time, then light itself can affect time"* as he explains. In principle, such a device could generate closed timelike curves in the region inside the laser ring. It shares a limitation with wormholes: one could only travel back to the point in time when the machine was first turned on. Nevertheless, it's a practical starting point; we intend to build upon experiments like Mallett's, scaling up laser power and using mod (Scientist Says Time Travel Is Possible With Ring Lasers) nd gravitational techniques to maximize the frame-dragging and warping effect.

Additionally, we will investigate quantum sources of negative energy. The Casimir effect, for example, creates a region of negative energy den (Scientist Says Time Travel Is Possible With Ring Lasers) two close plates – this is a tiny, but real, manifestation of "exotic" physics in the lab. Squeezed-light states in quantum optics can also produce effective negative energy in transit. By combining such quantum phenomena with classical GR constructs (e.g., feeding negative energy densities into a small-scale wormhole metric in simulation), we aim to design a hybrid system that circumvents some of the classical barriers. In summary, our technical foundation draws from established theory (ensuring we remain consistent with known physics) while boldly extending these ideas with innovative experimental designs. The feasibility and approach section below will detail how we address the huge gaps between theory and practice, turning these foundations into an actionable R&D plan.

Feasibility Argument

At first glance, building a time machine might appear practically impossible – the theoretical requirements (such as energy exceeding the output of our entire planet, or materials that don't obviously exist) are staggering. However, this proposal frames those very challenges as targets for creative problem-solving and resource mobilization. By leveraging the unique strengths of philanthropic funding and an interdisciplinary approach, we argue that the known constraints, while immense, can be systematically tackled or at least sufficiently reduced to demonstrate a proof-of-concept time travel device.

1. Energy Requirements – Solvable via Resource Innovation: The energy needed to significantly warp spacetime is enormous. For example, as noted, a traversable wormhole might require on the order of 10^{44} joules (equivalent to converting a Jupiter-mass planet entirely to energy via $E = mc^2$). This is 10^{23} times the world's annual energy consumption – clearly beyond direct reach. But we do not need to supply such cosmic energy outright; instead, our strategy is to manage and concentrate energy in space and time in clever ways. We will pursue methods to amplify effects without proportionally increasing input energy: high-Q resonant systems (circulating laser light or e ([general relativity - Wormhole Metrics and the Density of Negative Energy - Physics Stack Exchange]) fields that build up energy over time), ultra-cold rotating superconductors to exploit gravitomagnetic effects, and other resonant phenomena that can create intense local spacetime curvature from moderate power. We also plan to harness advances in energy generation and storage: part of our budget includes developing a pulsed power system capable of delivering short bursts of extremely high power (on the order of terawatts for microseconds) into our experimental setup. Such pulses, focused correctly, could momentarily simulate the stress–energy conditions required for a tiny time loop.

Crucially, philanthropic support allows us to think big: if needed, we can coordinate resources on a global scale. For instance, we envision partnering with large facilities (national laboratories, or even power grid operators) to draw on infrastructure normally unavailable to a single research grant. A philanthropic foundation has the agility to broker such partnerships or invest in dedicated infrastructure (e.g., a field of high-intensity lasers powered by a solar farm or small modular reactors). While we start with tabletop experiments, we are prepared to scale up. The energy challenge, therefore, becomes one of engineering and logistics—areas where human innovation has a track record of achieving the "impossible" when properly funded. It's worth noting the historical analogy: the Manhattan Project in the 1940s marshaled an unprecedented concentration of resources (about $2 billion at the time, equivalent to ~$27 billion in 2023) to achieve nuclear breakthroughs. Our request is a tiny fraction of that, and though our goal is indeed ambitious, the lessons of history show that sufficiently funded and focused efforts in physics can deliver revolutionary results.

2. Exotic Matter and Fundamental Constraints – A Research (Not Roadblock) Opportunity: General relativity's requirements for closed timelike curves often involve " (Manhattan Project - Wikipedia) ons like negative energy. At first, this seems to violate common sense (and classical energy conditions), but quantum theory provides loopholes. We will treat the generation of negative energy density as a research sub-project. Techniques like the Casimir effect and squeezed light have produced small negative energy densities in laboratory settings. These effects are typically fleeting and microscopic, but they prove that the energy conditions can be locally violated without breaking physics. Our theoretical team will explore how to amplify or sustain such effects. One concept is a "Casimir capacitor" – an engineered structure whose quantum vacuum energy can be toggled or enhanced to create a more substantial region of exotic matter. Another is to use high-inte () ulses to borrow energy from the vacuum via quantum perturbations (a phenomena sometimes discussed in semiclassical gravity contexts). While it sounds speculative, these are the kind of boundary-pushing experiments that a dedicated, well-funded team can attempt. In essence, we do not accept "exotic matter required" as a show-stopper; we frame it as a primary scientific challenge that this project is poised to tackle. Success in this area would be groundbreaking on its own, potentially answering open questions about quantum fields in curved spacetime and yielding new physics even if large-scale time travel remained out of reach.

3. Incremental Milestones – Demonstrating Feasibility Step by Step: Rather than attempt a full-fledged time machine in one leap (which is beyond current capabilities), we have a phased plan (detailed in the Project Timeline) that demonstrates feasibility in progressive steps. In Year 1, we aim to produce measurable *time dilation or frame-dragging effects* beyond what current technology has shown – essentially creating a tiny warp in time in the lab. This could be as simple as a particle or clock that experiences time slightly differently (nanoseconds off) in our device compared to a reference. Achieving even a nanosecond closed timelike loop in a controlled experiment would be a historic proof-of-concept, greatly firming up feasibility for larger effects. Each incremental success will justify the next scale of resource investment. This stepwise validation is key to maintaining scientific credibility and learning along the way. It ensures that, at any point, if fundamental physics intervenes (e.g., if Hawking's Chronology Protection truly prevents further progress), we will know *why* and will have gathered valuable data in the attempt. The support of a philanthropist means we can pursue this plan with continuity and focus, without the usual fragmentation into small grants – which often prevents such daring projects from ever getting off the ground.

4. Philanthropic Leverage – Going Beyond Traditional Limits: Feasibility is further enhanced by the nature of our funding. Unlike typical government grants or corporate R&D, philanthropic funding can be nimble, visionary, and patient. We can allocate resources in non-traditional ways that maximize innovation: for example, hosting annual "Time Travel Hackathons" to crowdsource ideas and talent globally, or offering challenge prizes for breakthroughs in key sub-problems (e.g. a prize for achieving a microsecond-scale time loop in a simulation). We can also attract top minds who might not normally work on this topic (due to stigma or lack of funding) by providing a well-supported, legitimate program – already, interest has been expressed by leading physicists willing to consult on the theory, once they saw the seriousness of our approach. The $50M budget, while modest relative to the audacity of the goal, is sufficient to establish a dedicated research center that will act as the world's focal point for time travel physics. This concentration of effort is itself an enabling factor: by uniting experts in general relativity, quantum optics, high-energy engineering, and even philosophy, we create an environment where creative solutions to the "impossible" become conceivable. In summary, our feasibility claim is that with a clear plan, the right team, and $50M of flexible support, we can achieve the first demonstrable steps of time travel. We acknowledge the challenges (energy, exotic physics, causality concerns) but have concrete, funded strategies for each. Every great achievement in science began with confronting "impossible" constraints – this project will do the same, turning barriers into benchmarks on the road to making history reversible.

Project Budget and Justification (3-Year, $50M)

We request a total of $50,000,000 over three years to support this project. This budget is carefully structured to provide the necessary resources for theoretical work, experimental development, and crucial infrastructure, while remaining lean relative to the scope of the challenge. Below is a summary of the budget categories with justification:

- **Personnel ($10M):** Building a time machine is an inherently multidisciplinary endeavor. We will assemble a team of approximately 15-20 top-tier researchers. This includes theoretical physicists (experts in general relativity, quantum mechanics, and quantum gravity), experimental physicists/engineers (specialists in lasers, cryogenics, high-energy systems), computational scientists (for simulations and data analysis), and support staff (lab technicians, postdoctoral researchers, etc.). $10M over three years will cover salaries, benefits, and associated costs for this team. This figure is based on competitive compensation to attract talent from academia and industry, and includes provisions for two endowed visiting professorships to bring in eminent experts for sabbaticals or consultations. By investing in human capital, we ensure that the project has the intellectual horsepower required to tackle problems at the frontier of physics.

- **Equipment & Facilities ($15M):** Time travel experiments demand specialized and state-of-the-art equipment. Major equipment expenditures include: high-power laser systems (ultra-fast pulsed lasers and continuous ring lasers, with stabilization systems, $4M) for implementing the ring-laser frame-dragging experiments; superconducting magnets and cryogenic apparatus ($3M) to attempt gravitational frame dragging with high-density rotating matter or electromagnetic fields; a vacuum chamber and sensor suite ($2M) to create an isolated environment for any wormhole or Casimir-type experiment (including atomic clocks, optical interferometers, and maybe a small particle detector to catch any anomalies); advanced computing hardware ($2M) for on-site simulations (high-performance computing cluster with specialized GR simulation software, to complement external supercomputer use); and general laboratory infrastructure upgrades ($2M) such as radiation shielding, high-speed data acquisition systems, and safety systems for high-energy tests. We will likely house these in an existing research facility (negotiations are underway with a major research university to host the lab), which means we can leverage some existing infrastructure but will still need funds to customize it for our unique needs. This equipment budget also covers initial prototyping materials – e.g., custom optical fiber loops, specialized electronics, and nanofabrication of micro-scale experiment components.

- **Energy Provision & Test Operations ($10M)**: Acknowledging the importance of energy, we allocate a significant portion to ensuring we can deliver and manage power for our experiments. About $5M is earmarked to build or obtain a pulsed power supply capable of discharging extremely high currents in short bursts (for instance, capacitor banks or modular pulse generators). This is essential for experiments that momentarily require huge energy densities (simulating a tiny supernova-like condition for a fraction of a second). Another $3M is dedicated to covering the operational costs of energy consumption – if we run high-power lasers or magnets continuously, electricity costs and cooling costs will be substantial, and we include those to ensure no interruption in experiments. We also set aside $2M to explore novel energy sourcing: for example, contracting time on a large national laboratory's particle accelerator or fusion test reactor if needed to generate exotic states (instead of building our own, we pay for usage). Having a budget line explicitly for energy and operations guarantees that once the equipment is built, we can actually run it at full capacity and not be limited by operational expenses.

- **Theoretical and Computational Research ($5M):** While much of the theoretical work is done by personnel (already budgeted), this category covers specialized needs for theory and simulation. It includes funding for external supercomputer access or cloud computing (maybe $1M, as large-scale GR simulations or quantum field simulations can incur high costs on national supercomputers over 3 years). It also covers publication costs, software development, and data management ($1M), ensuring our team can develop custom simulation codes (for example, to numerically solve Einstein's equations under exotic matter conditions) and publish results open-access for the broader scientific community. We include about $500k for workshops and collaboration meetings – inviting other experts to brain-storm with our team annually, which can accelerate theoretical breakthroughs. The remainder ($2.5M) acts as a flexible fund to support unforeseen theoretical avenues (e.g., if a certain promising idea arises and we need to hire an additional expert or purchase a unique software license or experimental add-on to test a theory in the lab).

- **Travel, Collaboration & Outreach ($3M):** This covers the costs of collaboration across institutions and sharing our progress responsibly. Specifically, it funds travel for team members to work with external collaborators or use off-site facilities (~$1M, given international collaboration likely), attendance and presentations at major scientific conferences (to engage with the scientific community and recruit talent, $300k over 3 years), and hosting an annual advisory board meeting including our philanthropic partners and external experts ($200k/year for logistics, so $600k). Importantly, we allocate about $1M for educational and public outreach materials over 3 years – while we will operate with discretion initially, we plan to develop educational content (lectures, demos, perhaps a documentary) about the physics of time travel. This supports transparency and public communication once we have results to share, and it aligns with the philanthropic goal of inspiring future generations of scientists.

- **Contingency and Administrative Overhead ($7M):** Given the high-risk nature of this project, a healthy contingency is crucial. $5M (10% of direct costs) is reserved as contingency for unexpected expenses or project pivots – for example, if a piece of equipment fails and needs replacement, or if a new opportunity arises (like a chance to test something in space or an unexpected avenue requiring new hardware). This ensures the project can handle surprises without stopping. The remaining $2M is for administrative/organizational overhead. While we aim to minimize overhead by operating via a non-profit research foundation or a university partner with reduced indirect costs, some overhead is inevitable (financial administration, legal compliance, lab maintenance, etc.). We will negotiate overhead rates to be as favorable as possible, prioritizing that funds go directly into research. We note that every dollar is justified in service of the project's goals, and we have budgeted with efficiency in mind – leveraging existing facilities, focusing spending where it accelerates progress, and avoiding excess.

In sum, the $50M budget over three years provides the critical mass of resources to launch this ambitious project and carry it through initial demonstrations. It is a modest investment relative to the potential payoff (transforming human history) and even relative to historical Big Science projects. We will exercise rigorous financial management, with quarterly reviews to ensure funds are translating into tangible research outputs. The budget is structured to be agile: if certain approaches prove unworkable, funds can be redirected (with the donor's guidance) to more fruitful avenues within the project's scope. By funding this proposal, the philanthropist will essentially be establishing the world's first Time Travel research program – a legacy project that will attract additional resources and talent as momentum builds. Our detailed budget spreadsheet and justification are provided in the appendix (available upon request), aligning with NSF cost principles while also meeting the specific needs of this visionary enterprise.

Project Timeline (3 Years)

We propose a three-year timeline with staged milestones to methodically progress from theory to demonstration. The timeline is structured to mitigate risk by achieving early successes and allowing adjustment of approach as needed. Key phases are outlined below:

Year 1: Theoretical Framework & Enabling Experiments

Objectives: Establish the theoretical groundwork and validate crucial sub-components experimentally on a small scale.

- **Q1–Q2:** Recruitment of the core research team and setup of laboratory space. Initial theoretical workshops to refine our approach – updating calculations for required energy densities, identifying the most promising mechanism (e.g., frame-dragging via lasers vs. other methods) to pursue first. During this period we will finalize detailed design of a "Time Manipulation Testbed" – an experimental setup combining high-power lasers and precision timing equipment.
- **Q2–Q3:** Begin baseline experiments. For example, construct a ring laser system and measure any frame-dragging or time dilation effects it produces in the lab. We will use ultra-stable atomic clocks or optical clocks placed at strategic points around the device to detect tiny time shifts. Simultaneously, our theorists will run numerical simulations of the experiment using full general relativistic models to predict the signals we should look for. If a rotating electromagnetic field can even slightly perturb the flow of time, we aim to detect it. We'll also test a micro-Casimir device to see if we can produce a larger region of negative energy between plates than previously recorded, using novel materials or geometries (important for later wormhole-related work).
- **Q4 (End of Year 1) Milestone:** Demonstration of a measurable time anomaly on a small scale. By the end of the first year, we expect to have at least one of two outcomes: (a) a time dilation enhancement experiment where a clock in our apparatus runs off-sync by an extra nanosecond compared to control (beyond known effects), or (b) a confirmed generation of a tiny region of negative energy density in the lab sustained for microseconds. Achieving either (preferably both) will validate our basic approach and inform adjustments. We will document these results in an internal Year-1 report (and ideally a peer-reviewed publication) as proof of principle. Also by end of Year 1, the design of the Year 2 prototype time-machine device will be completed, incorporating lessons learned.

Year 2: Prototype Time Machine Construction & Testing

Objectives: Build and test an integrated prototype capable of producing closed timelike curves (CTCs) or other time-travel phenomena in a controlled environment.

- Q1: Commence construction of the Prototype Temporal Displacement Device (TDD). This device will likely integrate the most successful elements from Year 1 – for example, a larger, high-intensity ring laser array arranged in a cylindrical fashion to simulate a "Tipler cylinder" effect on a small scale, or a pair of synchronized laser loops to attempt a rudimentary wormhole time shift. We will also incorporate a vacuum chamber and magnetic coils if needed to amplify the space-time distortion. The prototype will be built with modularity, allowing adjustments or the inclusion of an exotic matter injector (if our negative energy experiments pan out, we might feed that into the core of the device).

- Q2–Q3: Testing Phase 1: Operate the TDD under increasing power levels and measure outcomes. We will send test particles or signals into the device – for example, firing short laser pulses or neutrons through the region of maximal spacetime distortion – and check for any evidence that they arrive earlier than they should (which would indicate a CTC). We will utilize ultra-precise timing (sub-nanosecond resolution) and possibly quantum optical techniques (like interferometers that could reveal closed-loop phases) to catch any time-loop signatures. The experiments will begin at low power to ensure safety and then ramp up. At each stage, data is analyzed and compared to theoretical predictions. If we observe even a subtle anomaly (e.g., a pulse that effectively travels into the past by a few picoseconds), that will prompt deeper testing and repetition to confirm. If no effect is seen at a given power, we will incrementally increase energy or adjust configuration (guided by ongoing theoretical input).
- Mid-Year 2 Milestone (Q2): Initial CTC Indications or Redesign Decision Point. By the midway point of Year 2, we expect either to have initial indications of a closed timelike curve (even a very small one, such as a particle emerging slightly before it was injected, within experimental uncertainty), or if not, to have identified which aspect of the design is limiting us. In the latter case, we convene a review to decide on design modifications – for instance, do we need to incorporate a different approach like rapid mechanical rotation of mass (a smaller scale "gravity machine"), or to invest more in negative energy production to feed the device? The budget's contingency and flexibility allow us to pivot if needed at this stage without losing momentum.
- Q4: Testing Phase 2 and Refinement: By the end of Year 2, we anticipate either achieving a verified time-loop event or being extremely close. In this phase, we focus on refinement: improving signal clarity, adding shielding or better synchronization to rule out false signals, and perhaps performing a *"closed message" test*. An example of a closed message test: we program the device to send a simple piece of data (say a binary timestamp) to itself a few minutes in the past. If our apparatus succeeds, we might detect that message before we actually send it (consistent with certain self-consistent solutions). Such a test would be a strong demonstration of controllable time travel on a small scale. The End of Year 2 Milestone is a working prototype time machine demonstrator, one that either has produced a repeatable closed timelike curve effect (even if microscopic in duration or scale), or has conclusively shown the elements required for such (e.g., sustained negative energy and frame dragging simultaneously). We plan to document Year 2 results in one or more high-profile journal publications (if allowable) to establish scientific credibility.

Year 3: Operational Demonstration and Application Framework

Objectives: Scale the demonstrated effect to a more noticeable level, address stability and control, and develop the framework for real-world time intervention applications (within ethical boundaries).

- Q1–Q2: Scaling Up: With a successful prototype, Year 3 is about making the effect robust and significant. We will upgrade components as needed – for example, add more laser power (the budget accounted for possibly renting additional lasers or amplifiers in Year 3), or incorporate multiple stages (cascading two time-bending modules in series to amplify the total time shift). We will attempt to go from nanosecond/picosecond scale effects to millisecond or second-scale time displacements. This is an exponential leap, and we expect diminishing returns (each additional order of magnitude may be harder), but our approach will be to methodically push the envelope. We will also focus on stability: ensuring that the time loop can be created reliably and turned on/off at will. Part of this involves developing a feedback control system for the TDD – sensors will monitor any emerging time loops, and adjust fields in real-time to stabilize the phenomenon (preventing unintended escalation or collapse).
- Q2–Q3: Functional Testing: By mid-to-late Year 3, we aim to perform a full demonstration of controlled time travel on a macroscopic scale (though still in lab conditions). One envisioned demo is the "send a particle back to yesterday" experiment: we would attempt to retrieve a particle or a piece of information that was sent 24 hours backward through our apparatus. Practically, this might be done by running the machine continuously in a steady state for 24 hours, during which it creates a small time-loop region. We introduce a test object (perhaps a muon particle, which has a short lifespan, or a small token) and see if after some cycling it appears in a designated "yesterday receptacle" or triggers a detector that was set up the day before. Achieving a 24-hour displacement is extremely ambitious, and it may be that we demonstrate something like a 1-hour loop as a stepping stone. In parallel, we will continue theoretical analysis of everything we observe, comparing with models to understand any limits we hit (for instance, do quantum effects begin to damp out the time loop beyond a certain duration? Does a form of Hawking's conjecture manifest as increased instability?).
- Q4: Final Review, Analysis, and Ethical Guidelines: In the final quarter, we consolidate our findings and prepare for the transition to real-world considerations. If our time machine is operational at some level, we will develop strict protocols and safety guidelines for any future use. This includes building an understanding of paradox risk (if we haven't observed any paradoxes in our experiments, likely due to their design, we will still extrapolate what could happen in larger interventions) and implementing what we call a "Chronology Protection Protocol" – a set of rules and fail-safes to ensure our device cannot accidentally alter history in uncontrolled ways. For example, we might implement an interlock such that the machine cannot send anything back beyond its start time (which is inherently true of many designs, but we double-ensure this via engineering). We will complete a comprehensive final report and hold a demonstration day for the philanthropic sponsor (and a select group of scientific peers) where we show the time machine in action, within safe parameters. By the end of Year 3, we expect to have: (a) a working prototype that has achieved at least minute-scale (if not larger) time displacement, (b) extensive data to verify and st ([Scientist Says Time Travel Is Possible With

Ring Lasers) menon, and (c) a roadmap for scaling up the technology further (which might involve larger funds or global collaboration, outside the scope of this initial project).

This timeline is aggressive but achievable with the planned resources and team. We have built in review points and flexibility to iterate. Each year's milestones ensure that even if the ultimate goal of large-scale time travel proves more distant, meaningful progress will be made and clear deliverables produced. The timeline also integrates risk management by front-loading experiments that test feasibility cheaply and early, and by Year 3 shifting focus to control and safety, which is critical for a technology of this magnitude.

Key Personnel

A project of this scope requires not only expertise and experience, but also visionary thinkers unafraid to challenge conventional limits. We have assembled (and continue to recruit) a team with stellar credentials across all relevant domains. Below we highlight the key personnel and leadership, whose backgrounds combine to cover theoretical physics, experimental engineering, project management, and ethical oversight. *(Note: Full CVs and letters of commitment for each key person are available upon request.)*

- Dr. X. [Name Redacted] (Principal Investigator) – Dr. X is a tenured Professor of Theoretical Physics at [Prestigious University], with 20+ years of research in general relativity and quantum cosmology. He is internationally recognized for his work on spacetime singularities and has published influential papers on hypothetical time-travel solutions of Einstein's equations. Dr. X will devote 100% of his time to directing this project, ensuring scientific rigor and coherence across the theory and experiment sub-teams. He has prior experience managing large interdisciplinary collaborations, and was a co-PI on a major project simulating black hole mergers (so he's familiar with coordinating theory with high-performance computing and experiment). As PI, Dr. X will be the intellectual lead, overseeing all research activities and integration between subprojects (frame dragging experiments, wormhole theory, etc.), as well as the primary point of contact for the Foundation and advisory board.

- Dr. Jane Doe (Co-PI, Experimental Physics Lead) – Dr. Doe is an experimental physicist previously at CERN and later a senior researcher at a national laboratory. She specializes in high-energy laser systems and precision measurement. Notably, she led a team that achieved record-breaking sensitivity in a laser interferometry experiment for gravitational wave detection. Dr. Doe will lead the hardware development and experimental execution for the time machine prototype. Her expertise in handling large-scale, cutting-edge apparatus (lasers, superconducting magnets, etc.) is crucial for building our Time Displacement Device. She will manage a team of postdocs and engineers in the lab, coordinate the installation of equipment, and ensure that experimental data is collected safely and reliably. Her presence guarantees that our ambitious experiments adhere to the highest standards of experimental physics.

- Dr. Alan Turington (Chief Computational Scientist) – Responsible for the simulation and data analysis efforts, Dr. Turington holds a PhD in computational physics and has developed custom general relativity simulation software during his postdoctoral work. He will oversee the numerical modeling of candidate spacetime configurations and help interpret experimental results by comparing them to theoretical predictions. For example, when we try to detect a time loop, Dr. Turington's simulations (running on supercomputers) will tell us what signal signature to expect if our device is creating a CTC of a given size. He will also implement machine learning algorithms to sift through high volumes of sensor data to flag possible time-travel indicators that human eyes might miss. His role ensures that we have a tight theory-experiment feedback loop.

- Dr. Maria Curieva (Materials and Quantum Engineer) – Dr. Curieva, with a background in condensed matter physics and quantum engineering, will lead efforts on exotic matter generation. She has hands-on experience with Casimir effect experiments and quantum vacuum measurements. Her role is to design and run the sub-experiments that attempt to produce and measure negative energy density (for instance, optimizing the Casimir cavity design, or exploring "squeezed light" in optical systems to generate effective negative energy). She provides the crucial link between abstract concept of exotic matter and a tangible lab implementation. Additionally, Dr. Curieva will handle the integration of quantum sensors (like superconducting quantum interference devices, SQUIDs, or single-photon detectors) into our main experiment, to probe the subtle quantum aspects of any time loop we create.

- Dr. Richard Feynman, Jr. (Advisor, Part-time) – Named whimsically after his father's inspiration, Dr. Feynman Jr. is a renowned theoretical physicist (and indeed the son of a Nobel laureate) who has agreed to serve as a senior advisor on this project. He will not be full-time staff but will consult regularly on theoretical matters, particularly quantum gravity aspects and any paradox-resolution mechanisms. He has contributed to leading theories of spacetime topology change. His authoritative guidance will help steer our theoretical approach, ensuring we remain aligned with the latest scientific developments worldwide. Dr. Feynman Jr.'s involvement, even in a limited capacity, adds enormous credibility and insight to the endeavor.

- Dr. Eleanor Knox (Ethics and Causality Officer) – Dr. Knox holds a PhD in philosophy with a focus on the philosophy of time and causality. She also has training in physics (MSc), giving her a rare dual perspective. As the Causality Compliance Officer, she will develop ethical guidelines and review experimental plans to preempt any potential paradox or unintended historical alteration. While our experiments in this 3-year phase are largely self-contained and will not alter history on a macro scale, Dr. Knox's role is to instill a culture of responsibility from the start. She will examine questions like: how do we handle information that might arrive from the future? What protocols do we follow if a time-travel experiment succeeds beyond expected parameters? Dr. Knox will also coordinate an external Ethics Advisory Panel (including historians and ethicists) to periodically evaluate our plans for future, more applied uses of time travel. This is an unusual role in a physics project, but given the stakes, we deem it essential. Her presence underscores to all stakeholders (and critics) that we take the philosophical and moral implications of time travel as seriously as the technical aspects.

- Project Engineers and Support Staff: In addition to the leads above, the team will include a project manager (to handle day-to-day operations, budgeting, and reporting – likely someone with experience managing large science grants or technology projects), several engineers (electrical, mechanical, optical) to build and maintain apparatus, and junior researchers (postdoctoral fellows and graduate students) working under the mentorship of the senior scientists on specific subprojects. For example, one postdoc might focus on the cosmic string simulation calculations, another on the electronics of timing systems, etc. While not all are listed here by name, we have commitments from outstanding candidates for these positions. The project manager in particular will ensure that the technical team and scientific team stay coordinated and that milestones are met on schedule – essentially translating the PIs' objectives into a concrete task plan and tracking progress.

Collaborators and Institutional Support: We have letters of interest from several prominent figures willing to collaborate informally. For instance, Prof. [Redacted], a Nobel laureate in Physics, has expressed enthusiasm to periodically review our results and provide feedback. We also have a partnership in principle with [National Lab]/[University] that gives us access to certain facilities (like their advanced photonics lab and high-performance computing center). These extended team members and supporters strengthen our personnel resources without necessarily impacting the budget heavily. Their roles will be advisory or as external testers of our theories.

Overall, our assembled team combines experience in managing ambitious projects (ensuring we can execute the plan), deep technical knowledge (ensuring we have the skills to build the device and interpret results), and forward-thinking leadership (ensuring we remain innovative and ethically responsible). The humorous undertone in having a "Causality Officer" or an advisor with a famous name is intentional – it signals that we embrace the extraordinary nature of this project – yet every person named has a serious, substantive role. The team as described will give any reviewer confidence that we have "the right people on board" to carry out this audacious research.

Risk Management

Any project attempting something as unprecedented as time travel must confront significant risks. We address these risks with a dead-serious strategy, incorporating redundancies and mitigation plans much as one would in an NSF proposal for, say, a space mission or particle accelerator – but adapted to the unique challenges of manipulating spacetime. Below we detail the major identified risks and our plans to manage each:

- Risk 1: Fundamental Feasibility Risk (Scientific Risk): *There is a possibility that unknown laws of physics (e.g., Hawking's Chronology Protection Conjecture) may prevent time travel from being realized, no matter the approach.* In other words, we might discover that nature simply doesn't permit CTCs in any practical scenario, resulting in no successful outcome. Mitigation: We have structured the project to yield valuable results even if a time machine cannot ultimately operate. Each experimental step is designed to test a specific aspect of physics (energy conditions, frame dragging, quantum effects). If the no-go scenario is true, we expect to encounter clear signs – for example, increasing instabilities as we ramp up a time loop, or anomalies that match theoretical predictions of chronology protection. In that case, our contingency plan is to document a definitive experimental boundary on time travel, effectively turning the project into a validation of physical conjectures (which would still be a high-impact physics result). All knowledge gained (about exotic matter limits, quantum back-reaction, etc.) would be published, contributing to science. Additionally, to avoid *premature* project failure, we pursue multiple concepts in parallel (Tipler cylinder - Wikipedia) (Time travel - Wikipedia) d approaches). It is unlikely that all avenues fail unless time travel is fundamentally impossible, at which point proving that impossibility has immense scientific value on its own.

- Risk 2: Technical/Engineering Risk: *The project might face unforeseen engineering difficulties – e.g., the prototype device could be harder to control or might require precision beyond current technology.* Creating extreme conditions (high energies, vacuum, synchronization of lasers, etc.) is non-trivial. For instance, achieving the required stability in our laser frequencies and timings might prove very challenging, or components could fail under the stresses of our experiments. Mitigation: We have mitigated this by involving highly experienced experimentalists (Dr. Doe and team) and by budgeting for top-quality equipment and spares. We've also built in time for testing and iteration; Year 1's experiments on a smaller scale will shake out many bugs before we commit to the full prototype in Year 2. We are incorporating redundant monitoring systems – multiple independent methods to detect time effects – so that if one instrument fails or gives ambiguous data, another can confirm. For every critical component (e.g., the main ring laser), we have backup units or alternate methods (like if the ring laser lock fails, we could switch to a different configuration such as a fiber optic loop). Furthermore, our partnership with engineering departments and national labs means we can call upon specialist expertise if a particular technical hurdle emerges (for example, if our high-vacuum chamber has leaks at extreme conditions, we can consult experts from a fusion reactor project who handle similar issues). Finally, a portion of the contingency budget is reserved specifically for rapid procurement of improved parts or repairs, to minimize downtime. Our project manager will maintain a detailed risk log tracking technical issues as they arise, ensuring proactive management (this is standard in large NSF projects and we adopt the same discipline here).

- Risk 3: Energy and Safety Risk: *The energies and forces we plan to unleash could pose safety hazards or prove uncontrollable.* In a worst-case scenario, an experiment could, say, create an unintended reaction – from trivial (blowing out an electrical system) to extreme (hypothetically, a micro black hole or radiation burst, though our calculations show minimal risk for such outcomes). Even without catastrophic scenarios, handling high power lasers and magnetic fields has inherent dangers (eye injury, electrical shock, etc.). Mitigation: Safety is a top priority. All experimental setups will undergo a rigorous safety review akin to those for particle accelerator facilities. We will implement multiple containment measures: our lab will have radiation shielding (for any high-energy particle experiments), fail-safe cutoffs for power systems (automated shutdown if any parameter goes out of range), and physical enclosures to contain any mishaps (for instance, the area of spacetime distortion will be within a sealed chamber that can withstand implosions or explosions at small scale). We are also developing theoretical safety guidelines – for example, calculations to ensure any hypothetical wormhole remains microscopic and cannot spontaneously grow. Regarding energy, we plan to ramp up gradually, monitoring at each step for anomalies. If at any point we detect behavior we cannot predict or control, we will pause and analyze thoroughly before proceeding. Our partnership with the host institution means we'll follow institutional lab safety protocols (laser safety training, etc.) and have oversight from their environmental health and safety office. On the positive side, because our ultimate goal is so advanced, many of our intermediate experiments operate in regimes that, while extreme for a lab, are not unprecedented in other contexts (e.g., pulsed lasers are common in industry, high magnetic fields are routine in MRI machines). We benefit from those established safety practices. In sum, careful planning, expert oversight, and adherence to safety standards mitigate the risk of accidents, ensuring the well-being of the team and the environment throughout the project.

- Risk 4: Causality and Paradox Risk: *If we succeed in creating a time loop, even on a small scale, we must consider the risk of causality paradoxes or unintended changes to the timeline.* While Year 1–3 experiments are designed to be self-contained (the time travel effects are minute and not capable of propagating outside the lab or altering macroscopic history), as we approach a functioning time machine, the risk of a paradox – an event that inconsistently changes conditions that led to it – becomes conceptually possible. For example, could sending information to the past inadvertently prevent the experiment from being turned on in the first place? Mitigation: We proactively address this risk by design. In all tests, especially those involving sending information or objects back in time, we adhere to the Novikov self-consistency principle: we set up scenarios that, by construction, cannot create a classical paradox. For instance, our "closed message to self" experiments are structured such that the information sent back is something we were going to generate anyway (like a random number seed that we determine in advance, sealed, and only open after the message is received). This way, any outcome is self-consistent – either the message doesn't get through, or if it does, it merely confirms what we were (Tipler cylinder - Wikipedia) avoid experiments like "send back a message to stop the machine" which are directly paradoxical. Furthermore, Dr. Knox

(Causality Officer) will review each proposed time-transmission test for paradox potential and sign off only if it meets consistency criteria. As an additional safeguard, we keep the magnitude of temporal displacement small in this project's scope (seconds to hours, not years), and within the confines of controlled conditions, reducing the chance of chaotic unintended effects. If at any time we observe any hint of non-compliance with causality (such as an outcome that suggests a paradoxical loop), our protocol is to immediately suspend experiments and convene a review board (including external theorists) to analyze the situation before resuming. In a broader sense, we treat the very possibility of paradox as something to be studied under controlled conditions – effectively turning "paradox risk" into a research question that we are prepared to examine scientifically, with all due caution. In doing so, we aim to develop a sort of "causality safety manual" that will be invaluable for any future scaling up of time travel technology beyond the lab.

- Risk 5: Project Continuity and Public Perception: *There is a risk that external factors (public opinion, regulatory intervention, or even funding changes) could disrupt the project.* A project aiming to achieve time travel might draw skepticism or unwanted attention, potentially leading to pressure to shut it down or divert it. Additionally, while our philanthropic sponsor is committed, unforeseen events (e.g., economic downturns or changes in the foundation's priorities) could pose a funding continuity risk. Mitigation: To manage public and regulatory perception, we have thus far kept a relatively low profile, and we plan to time (pun intended) our outreach carefully. Until we have credible results to share, we will avoid overstating our aims publicly. When we do communicate, we emphasize the scientific merit and humanitarian potential, as done in this proposal. Our inclusion of ethical oversight and alignment with positive outcomes (preventing disasters) is deliberate to frame the project as socially responsible. We are also consulting with policy experts to understand if any regulations (national or international) might eventually apply to time manipulation research – since none exist yet, we aim to help shape best practices proactively. Regarding funding, the requested $50M is expected to be allocated upfront for the 3-year period (perhaps in a trust or dedicated account for the project), which insulates us from year-to-year financial uncertainty. We also have interest from other potential backers (private donors inspired by the idea, tech philanthropists, etc.) should additional funding be needed; importantly, demonstrating early successes in Year 1 and Year 2 will make it easier to secure supplementary funds and buy-in from broader coalitions (including possibly government agencies, once we have proof-of-concept). In essence, we treat the social and financial continuity of the project as another thing to engineer: through clear demonstration of progress, maintaining transparency with the sponsor, and careful narrative management to avoid misrepresentation or premature hype.

In conclusion, our risk management approach is comprehensive and proactive. We recognize that aiming for time travel entails unusual uncertainties, but we have applied sound project management principles to each one. By planning for failure modes and ensuring flexibility, we increase our resilience. This way, even in the face of unexpected challenges, the project can adapt rather than break. The deadpan-serious tone we maintain in analyzing even "ridiculous" risks (like paradoxes) is intentional – it reflects our commitment to treating this research with the utmost professionalism and caution. The donor and all stakeholders can be confident that we combine *ambition with responsibility*: pushing boundaries, but with eyes wide open to the risks and a solid plan to handle them.

Conclusion

In summary, this proposal outlines a bold yet meticulously structured plan to turn the concept of time travel into a scientific reality. By leveraging established physics theories, cutting-edge technology, and the catalytic support of visionary philanthropy, we will attempt to create the first controlled closed timelike curves in a laboratory setting. The transformative impact of success cannot be overstated: the ability to alter past events or send warnings to earlier times would redefine how humanity addresses its greatest challenges – from averting atrocities to averting extinctions. Even the incremental achievements along the way (e.g., generating exotic matter or validating aspects of quantum gravity) will represent major scientific breakthroughs.

This project stands at the nexus of high-risk, high-reward research, a category that traditional funding often hesitates to support, but which has historically yielded some of the biggest leaps forward (the laser, the rocket, the quantum computer – all were once deemed wildly speculative). With a three-year, $50M investment, a philanthropic foundation can do what governments and industries cannot: pursue a dream that, if realized, would better the fate of all humankind. The proposal has detailed how we will tackle the huge scientific and engineering challenges, from energy to ethics, with seriousness and credibility. We have identified qualified personnel and instituted safeguards to maximize the chance of success and minimize risks.

By funding this proposal, the philanthropist will effectively become a partner in one of the most audacious scientific endeavors of our time – a quest to master time itself. The knowledge gained will illuminate the fundamental workings of the universe. And should a working time machine ultimately be achieved, the philanthropic community will have given humanity perhaps the greatest gift of all: a second chance when we need it, a tool to learn from and correct our mistakes, and hope for truly *ending* the worst problems rather than just fighting them endlessly. This is an endeavor that carries profound legacy and responsibility.

Our team is prepared to carry that responsibility with the utmost rigor. We proceed grounded in equations and evidence (as cited throughout), mindful of constraints yet optimistic about human ingenuity. We invite the review and support of this proposal with the confidence that, while the challenge is enormous, the potential reward is literally world-changing. With philanthropic vision and careful execution, "mission impossible" can become possible – and the once-impossible idea of time travel can move from fiction to the realm of achievable science, opening a new frontier for humanity's future and past.