SCIREA Journal of Physics
ISSN: 2706-8862
http://www.scirea.org/journal/Physics
May 29, 2026
Volume 11, Issue 3, June 2026
https://doi.org/10.54647/physics140724

Generic Stellar–Planetary Throat Systems in a Throat –Horizon Framework

Ty Shedleski
Independent Researcher

Abstract

We develop a generic geometric description of stellar–planetary systems within the frame - work we call throat–horizon framework. This framework is independent of any specific planetary configuration. In this work, compact massive objects are modeled as outlet-dominated horizons that source geometric flux into the surrounding manifold, while lower-mass compact bodies embedded within this influence admit stable inlet-dominated throat configurations. Smaller orbiting bodies may function as secondary throats that modulate flux, phase, and holonomy but are not required for the existence of the primary inlet–outlet pair. This proposal estab- lishes a scale-independent geometric interpretation of stars, planets, and natural satellites as structural components of stratified spacetime, replacing system-specific models with a universal formulation suitable for unification with gravitational, gauge, and stability analysis.

1 Introduction

Astrophysical systems consisting of stars, planets, and natural satellites are traditionally modeled using Newtonian gravity supplemented by relativistic corrections. While successful phenomenolog- ically, this approach treats the existence and stability of such systems as contingent outcomes of initial conditions rather than as consequences of spacetime geometry itself.

Within general relativity i.e. horizons and curvature, the gradient of metric tensor symbol play a central role in determining causal structure and energy flow, yet their relevance is often confined to extreme compact objects such as black holes [1,2] which determines the geometry. In this work we adopt a broader geometric perspective: stellar–planetary systems are interpreted as manifestations of stratified throat–horizon geometry, governed by a boundary-correct variational principle.

The goal of this paper is to provide a generic, system-independent description of stellar outlets, planetary inlets, and secondary throats, suitable for integration into a unified geometric ontology of material reality.

2 Geometric Preliminaries

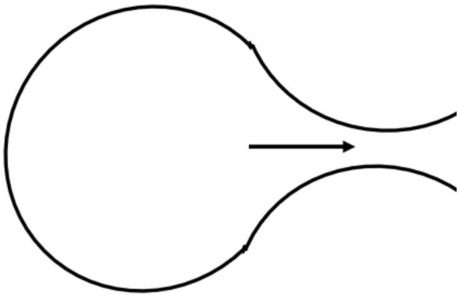
2.1 Horizons and Flux Orientation

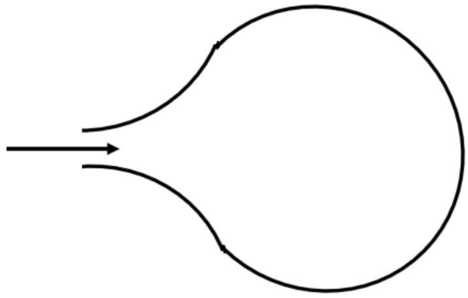
Horizons are null or near-null hypersurfaces bounding regions of spacetime with distinct causal structure [3]. When formulated within a variational principle that includes boundary and joint terms, horizons acquire an intrinsic orientation, corresponding to the direction of geometric flux across the surface [4].

This orientation permits a classification into:

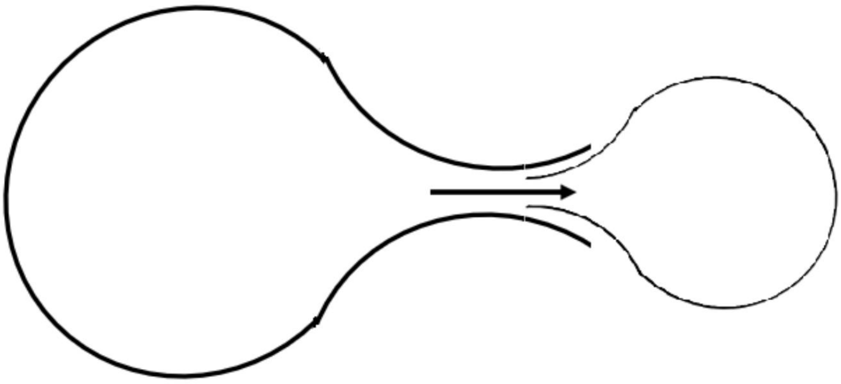
- *Outlet-dominated horizons*, which source flux into adjacent regions, and
- *Inlet-dominated horizons*, which absorb or terminate flux.

The identification of outlet or inlet source is done on the basis of mass, e.g. in the case of Sun -Earth or Sun-Moon system the heavier body acts as the outlet horizon source while the lighter body acts as the inlet horizon source. This distinction is geometric rather than thermodynamic and does not presuppose irreversibility.





(a) Flux outlet. (b) Flux inlet.



(c) Flux movement from outlet to inlet. The connection of outlet with the inlet occurs automatically.

Figure 1: A schematic diagram of outlet, inlet and flux flow through them.

2.2 Throat Hypersurfaces

A *throat* is defined as a codimension-one hypersurface arising as a stationary solution of a boundary- correct gravitational action on a stratified manifold [5]. Throats connect distinct spacetime sheets or regions and mediate the redistribution of curvature and flux sourced through horizons.

Stability of throats is governed by second-variation analysis and depends on curvature and embedding rather than on material composition [6,7].

3 Generic Stellar–Planetary Throat Systems and Framework Components

3.1 Stellar Outlets

Compact, massive astrophysical objects naturally generate strong curvature gradients and admit horizon-like structures in both exact and approximate descriptions [2,8]. Within the present ontol- ogy, such objects are modeled generically as *outlet-dominated horizon systems*.

A stellar outlet is characterized by:

- a horizon or quasi-horizon surface,
- outward-directed geometric flux determined by boundary orientation,
- coupling to surrounding spacetime through curvature rather than material emission alone.

This description applies to stars as a class, independent of their detailed composition, evolution- ary state, or membership in any particular planetary system. The stellar outlet serves as a geometric source that organizes surrounding structure through throat formation rather than through force mediation alone. Thus the area of the stellar outlet will be inversely proportional to the distance from the wavefront center.

Stellar Outlet Area α (Distance from the center)$^{-\alpha}$

where $\alpha > 0$. The value of α will be determined through experiments / observations.

3.2 Planetary Inlets

Lower-mass compact bodies embedded within the geometric influence of a stellar outlet admit stable throat configurations that act as *inlet-dominated sinks* of geometric flux.

In this framework, a planet is not merely a gravitating mass but a geometric inlet whose stability arises from:

- its embedding within an outlet-dominated background,
- the existence of a stationary throat hypersurface,
- curvature bounds ensuring second-variation stability.

This interpretation does not rely on assumptions about material rigidity or compositional tun- ing. Instead, planetary persistence is understood as a geometric consequence of throat stability within a stratified manifold [6,7,9].

3.3 Secondary Throats

Smaller orbiting bodies—such as moons, or analogous compact structures—may function as *sec- ondary throats*. These secondary throats do not source or terminate global flux but instead:

- modulate local flux distribution,
- introduce phase and holonomy effects,
- participate in resonant geometric configurations.

Secondary throats influence stability and long-term dynamics but are not required for the existence of the primary stellar outlet–planetary inlet pair. Their role is auxiliary rather than foundational.

4 Stability and Hierarchy of Throats

The hierarchy of stellar outlets, planetary inlets, and secondary throats corresponds to a hierarchy of curvature scales and embedding depth within the manifold. Stability follows from sufficient geometric conditions involving:

- bounds on normal Ricci curvature,
- control of extrinsic curvature terms,
- admissible boundary conditions on throat deformations [7].

This hierarchy clarifies why:

- stars persist as dominant geometric sources,
- planets form stable, long-lived inlets,
- secondary bodies exhibit conditional or resonant stability.

5 Relation to Gauge Structure

Although the present paper focuses on astrophysical systems, the same throat–horizon logic un- derlies gauge structure in the broader framework. Holonomy around throat junctions produces

U(1), SU(2), and SU(3) structures at smaller scales, while stellar–planetary throats represent a macroscopic limit of the same geometry [10–12].

Thus, stellar outlets and planetary inlets are large-scale instances of a universal throat–horizon ontology.

6 Discussion

By formulating stellar–planetary systems generically, the framework avoids reliance on system- specific coincidences or anthropocentric assumptions. Familiar configurations arise as consequences of geometry rather than as inputs.

This perspective shifts emphasis from force-based interaction models to geometric organization just like in general relativity, aligning astrophysical structure with the same principles governing microscopic and gauge phenomena.

7 Conclusion

We have presented a generic geometric framework of stellar–planetary systems within the throat– horizon framework. Stars function as outlet-dominated horizons sourcing geometric flux, planets as inlet-dominated throats stabilized by embedding, and smaller bodies as secondary throats mod- ulating flux and holonomy. This formulation replaces system-specific models with a universal, scale-independent geometric ontology suitable for unification with gravitational, gauge, and stabil- ity analyses.

References

[1] A. Einstein, Ann. Phys. **49**, 769–822 (1916).

[2] R. M. Wald, *General Relativity* (University of Chicago Press, 1984).

[3] S. W. Hawking and G. F. R. Ellis, *The Large Scale Structure of Space-Time* (Cambridge University Press, 1973).

[4] G. W. Gibbons and S. W. Hawking, Phys. Rev. D **15**, 2752–2756 (1977).

[5] T. Shedleski, *A Boundary-Correct Variational Principle on Stratified Throat–Horizon Space- times* (manuscript).

[6] T. Shedleski, *Second-Variation Stability of Minimal Throats in Boundary-Correct Stratified Spacetimes* (manuscript).

[7] T. Shedleski, *Sufficient Geometric Conditions for Stability of Throat Hypersurfaces* (manuscript).

[8] J. Bardeen, B. Carter, and S. Hawking, Commun. Math. Phys. **31**, 161–170 (1973).

[9] R. Schoen and S.-T. Yau, Ann. Math. **110**, 127–142 (1979).

[10] C. N. Yang and R. L. Mills, Phys. Rev. **96**, 191–195 (1954).

[11] T. Frankel, *The Geometry of Physics* (Cambridge University Press, 2012).

[12] M. Nakahara, *Geometry, Topology and Physics* (CRC Press, 2003).