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Imperfect Circles: Asymmetrical Orbital Motion from the Rim to the Centre in *Gravity's Rainbow*

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Abstract: This paper reconsiders the rarely uncontested consensus that the core rocket-arc metaphor in *Gravity's Rainbow* has to be read as a symbol of rigid binarism, of fall latent in rise, death latent in birth, and thus that figures associated with, or whose trajectories follow this arc are to be associated with entropy and the novel's more destructive forces. Instead, it proposes that the "Perfect Rocket Arc" discussed by pessimistic figures in the novel is in fact only one way of reading the flight path. Taking into account the distorting effects of resistance on the flight path of non-spherical objects, as much of *Gravity's Rainbow* does, gives us a different, less perfect, more 'ecologically valid' asymmetrical rocket arc. This paper addresses the many different thematic implications that arise from this shift in perspective, most notably the importance that it gives to the gravitational power of centre. Most extant readings of the novel see *Gravity's Rainbow* as engaged in a standard postmodern project of de-centering, and the "holy centres" it discusses as avatars of outdated delusion. Instead, this paper proposes that the novel closely associates the rocket centre with a zero-membrane between negative and positive realms, and with the movements of electric current, and thus that rather than being an indefinitely postponed and fallacious centre, the rocket is a crossable, operant centre that plays a fundamental role in the outward-looking movements of the novel's later pages. The paper redraws previously mapped flight paths, interpreting the move from symmetrical Rocket Arc to an asymmetrical rocket arc, to a spiral approach to centre, to a vortical passage through centre. It posits, and begins to answer, the question of just what it might mean to read a Pynchon for whom figurative centres do valid political work.

This paper was originally proposed and delivered at International Pynchon Week 2008 under the title "Pynchon's Vocabulary of Curves—Circular Motion Metaphors Beyond the Rocket Arc." I had intended to provide a survey of the various images relating to circularity in all of Pynchon's books, and to try to show a common thread between them. I still think such a project can be carried out, but what actually emerged was a paper that had to proceed from the

correction of what I saw as a ballistic misreading of Rocket-Arc symbolism in *Gravity's Rainbow*. This issue seemed so fundamental to me that it could hardly coexist with an overview in a paper of this length; it would have to be put forward on its own. As such, this paper is not so much a survey of curves as a redrawing of flight paths, a tracing of implication from a symmetrical Rocket Arc, to an asymmetrical rocket arc, to a spiral approach to centre, to a vortical passage through centre. The wider engagements for this tracing within Pynchon criticism, as with its relationship to the wider vocabulary of curves in Pynchon's other novels, I hope to map in future work. For now, though, I refrain from straining too intently beyond the rim of geometry.

Symmetry and Asymmetry

The most visible and most discussed of Pynchonian curves is the symmetrical flight arc of what Pökler calls with capital letters "the Perfect Rocket" (*GR* 426). Its symmetry makes it a symbol of binary opposition, of cause and effect, of teleology, entropy and mortification, of fall latent in rise, of death latent in birth. In all this it has frequently been aligned with another Pynchonian governing metaphor, the V-shape. I clarify this now because my major proposal in this paper is that this vision of a Perfect Rocket Arc is not the encompassing authorial meaning it has been discussed as, nor the only curve that the fired rocket follows, nor the only thing that its ballistic path signifies. It is only one perspective, one interpretation, and is elucidated mostly through the perspectives of characters whose worldviews already tend towards teleology, entropy and mortification. Taking into account the distorting effects of resistance on the flight path of non-spherical objects, as much of *Gravity's Rainbow* does, gives us a different, less Perfect, more—to use experimental language—'ecologically valid' asymmetrical rocket arc, and this has its own entirely different thematic implications.

The notion of the Perfect Rocket Arc as an epitome of the architectonic metaphor *per se* has had a somewhat exclusive effect. Edward Mendelson wrote in the late 1970s that Slothrop's quest follows the Arc's parabola and that "outside the disintegrating Slothrop the book insists on calling attention to real tasks and

purposive choices that cannot be avoided" (13), and since then, despite a move towards discussing Slothrop's final diffusion in more positive terms, it has been conventional to look for the "real...purposive" moral and philosophical energy of the novel in any movement of its story *except* the Rocket's flight path.

Molly Hite's book *Ideas of Order in the Novels of Thomas Pynchon*, probably the fullest analysis of Pynchon's structural figures,¹ demonstrates how the novel allows differing framework metaphors to coexist, but in prioritizing her exposition of the Perfect Rocket Arc as an epitome of traditional narrative teleology, Hite conflates all of these metaphors to the same fallacious purpose: "Pynchon makes the providential plot the type of all attempts to make sense out of the world by giving events narrative coherence" (20).

Yet alternative flight shapes are discussed within the novel, and skepticism about the typical perfection of the rocket's flight is encouraged. As such, I would question Hite's conflation of "all attempts" into this one single Perfect structure. Rejecting reliance on a single structural motif in *Gravity's Rainbow*, as Hite quite rightly does, should lead us to look at how each of them is constructed. One aspect of the Rocket parabola that has generally gone uninterrogated is the fact that the Perfect vision is itself a subjective idealization, opposed in the novel to the ballistic path of the Rocket in actual flight. I call it a subjective idealization because the passages in which the symbolism of the symmetrical arc is expounded do not come from an omniscient narrator. Instead, the widely discussed link between symmetrical arc and entropic, teleological, restrictive mindset is constituted throughout the text by insistent but not infallible voices. They may be projections from characters whose worldview is already morbid, paranoid, hypercoherent and teleological; they may be, whether narratorial or within reported thought, projections *onto* the philosophy of a culture or ideology. In either case, however, we are given no reason to believe that this explicated symbolism is the sum total of what the Rocket and its flight path can represent, and above all we are shown repeatedly that its association with symmetry is a construction opposed to practical physics.

By way of a brief example, consider Slothrop's conviction that he and Katje are restricted by the determinism of the perfect arc, a belief that arises out of discussions with Dodson-Truck (*GR* 207) and Katje herself (*GR* 209):

It is a curve each of them feels, unmistakably. It is the parabola [...] everything, always, collectively, had been moving toward that purified shape latent in the sky, that shape of no surprise, no second chances, no return. Yet they do move forever under it, reserved for its own black-and-white bad news.... (GR 209)

The language of purification and binary opposition here emphasizes that this arc is a refined or idealized version of an unrefined or impure counterpart. This is the height of Slothrop's paranoia, his wish to construct and understand his relation to control (GR 207); in the surrounding text it is made clear that the ideas of control and symmetry, summations of Dodson-Truck's job and Katje's sensibility respectively, have merely been adopted by Slothrop in response to Tantivy's death. Just as we are not led to take seriously his hopes of discovering the mechanisms of a "they" that control his life in secret, neither should we endorse unquestioningly his vision of the Rocket's arc as a "purified" teleology.

The idealization of the rocket's flight is similarly questioned by hindsight. Early on, we see how hindsight changes Blicero's geometric vision: first he conceives of "[m]irror-metaphysics," and is "[s]elf-enchanted by what he imagined elegance, his bookish symmetries" (GR 101). Elegance and symmetry are tied to bookishness and imagination; in practice, however, because of "the shape to which the War has now grown [...] [t]hose symmetries were all pre-war luxury" (GR 101-02). I will not dwell too long on this undermining of the Perfect Rocket Arc, in order to focus rather on showing where Pynchon offers alternative readings of the Rocket that proceed from its "operational" (GR 400) arc. It is worth stating once more, however, that even though the Perfect Rocket Arc certainly does represent absolutist determinism and the death-wish, this symbolism is not itself given a totalizing power by Pynchon's novel; it is shown to be merely one way of reading the rocket's flight, and others *are* offered.

Before looking at the most central of these oppositions of the rocket operational to the Perfect Rocket, let me clarify the basic physics involved. The Perfect Rocket Arc is symmetrical because ideally, in a vacuum, direction and acceleration on either side of a parabola's highest point above a globe are identical, so the arc's shape similarly is identical on either side. To go back to Blicero's notion, this is mirror physics, without the *meta*. However, it can only be a

metaphysical conception of the arc, because when air resistance is factored in, acceleration decreases as the parabola goes on, and the shape of the arc becomes unbalanced.² Thus what had been a symmetrical arc with an apex above a gravitational point becomes the widest arc of a spiral. Whereas in a symmetrical orbit the gravitational centre merely dictates movement around it, the direction of a spiraling centripetal orbit is eventually towards that centre. If there is no surface—that is if the object providing gravitational centre is infinitely small and has infinite mass—then the orbiting object, in this instance the rocket, will keep approaching the spiral's centre until the spiral becomes tight enough to bend and destroy the object through G force. Other things that preclude symmetry in flight paths include a non-spherical shape for the propelled object (GR 403, 422-23), changes in the object over the course of its flight (GR 424), and artificial propulsion on the rising part of the parabola (GR 402-03, 409). Pynchon describes the problems caused by all these factors.

These allusions to practical ballistics, which demonstrate the spuriousness of the symmetry projected onto the arc, cluster densest in the central chapter covering Pökler's career in rocketry. Pökler, as someone working on the rocket both at the stage of its ideal conception on paper and then once again after it becomes an operational proposition, is the character most clearly associated with the forces that make the flight arc's asymmetry physically axiomatic. His companion in resolving "a problem with getting the rocket's long axis to follow the tangent, at all points, to its trajectory" (GR 403) is the mystical "aerodynamics man" (GR 403) Fahringer, who despite his title is less concerned with practical flight than idealized identifications of engineer and equipment (GR 403). In this environment, Pökler must take the vision of the Perfect Rocket, handed down to him by his superiors, and make it operationally effective, forcing the text to make a distinction between ideal and pragmatic concerns—"While the military wallowed in victories not yet won, the rocket-engineers had to think non-fanatically [...]" (GR 401).

The most personal scene of physics to Pökler, in which he does submit to Fahringer's conflation, is the one that shows how destructive asymmetry can be to a flying object. It comes when he is simulating G force and air resistance in the wind tunnel; there he has

seen the true profile of the Rocket warped and travestied, a rocket of wax, humped like a dolphin at around caliber 2, necking down towards the tail [...]—and seen how his own face might be plotted, not in light but in net forces acting upon it from the flow of Reich and coercion and love it moved through ... and known that it must suffer the same degradation, as death will warp face to skull.... (GR 422-23)

In the Rocket curled up by centripetal force and the flow of resistance, Pökler, Pointsman-like, conflates death and the flight path even as he elucidates its asymmetry. It is worth noting that the R of “true Rocket” is capitalized and the r of “rocket of wax” is not. In viewing the undistorted pre-flight rocket as “true,” Pökler betrays that for all his awareness of the arc’s imperfection and his conception of approach to death as approach to a centre rather than descent on a wheel, he yet shares a reverence for the Rocket’s terminality with the idealists and rocket-mystics whose visions of symmetry he knows to be wrong. An awareness of the difference of the operational rocket arc from the Perfect Rocket Arc, then, is not necessarily enough to attain a non-deterministic worldview. Rocket-reverence can still persist.

Asymmetry, Spiral and the Rocket-Centre

The two rocket arcs are similarly synthesized earlier in the Pökler chapter, when we hear how “[t]he Serpent that announces ‘the World is a closed thing, cyclical, resonant, eternally returning,’ is to be delivered into a system whose only aim is to *violate* the Cycle. Taking and not giving back...” (GR 412). Here as for Pökler, there is the implication that an idealized cycle will be the aegis under which a practical system must become centripetal and “sooner or later must crash to its death” (GR 412). This establishes that the distinction to be made is not just between spiral descent from orbit to centre and an ideal arc that launched from earth thus crashes to earth, but between that spiral approach to a gravitational point and a full circle/cycle *around* a gravitational point. In order to begin differentiating the implications of the asymmetrical path, it is necessary to view these images of the rocket subject to gravity as parallel with the imagery of the Rocket itself as a centre of gravity—not only the object travelling along its various launched parabolae, but also the gravitational force by which these curves are dictated. While Rocket-determinism is

sometimes presented in *Gravity’s Rainbow* as a force that attaches characters to a revolving wheel of fate, the Rocket is also frequently depicted as a central force drawing paths in and out of a spiral centre, an image conferring greater agency than the imagery of wheel or rim that it counterpoints.

It is notable that the central Pökler chapter takes the opportunity to hark back to the shape of the rocket’s place of manufacture (GR 402). The double integral SS shape is used in mathematics to calculate centers of circles or centers of gravity, and the most extended reference to the shape’s significance, which proceeds from the shape of the Mittelwerke (GR 302), explicitly links the idea of the Rocket in flight and as a centre of gravity; “what is the specific shape whose center of gravity is the Brennschluss Point?” (GR 302) Throughout the text the one object that attracts most imagery related to gravitational centre is the Rocket itself. Where the Rocket has previously been seen evolving from a “determinist [...] piece of hardware” (GR 275) to a force “generating items” (GR 275) outside its orbital arc, it is here shown to have actually shifted its determining mathematical power to the centre.

The clearest imagery of the Rocket as a centre comes in the passage on the death-wish of the Herero: “Vectors in the night underground, all trying to flee a center, a force, which appears to be the Rocket: some immachination, whether of journey or of destiny, which is able to gather violent political opposites together [...] for the sake of its scheduled parabola” (GR 318). The concomitant imagery here of gathering and attempted flight, motivated by a single centre which exercises its power “for the sake of” an arc, links vectors drawn outward from a single centre-point with the need to escape a gravitational pull. We are told within a page that “the Final Centre can easily be seen as the Final Zero” (GR 319). With the express stipulation that this Herero perception is subjective, the Rocket here represents for them a final zero that should be quested towards. However, most others who view centre as final are more compelled towards that punning notion of flight as fleeing.

Pökler is one of these. His relation to the Rocket is consistently expressed in terms of center’s pull rather than of attachment to the wheel or rim of its arc. His knowledge of the inevitable decline of Perfect orbit into concentric spiral means that his visions of escape tend to involve reversing this process: justifying his work to Leni

before the rocket becomes operational, he says "'[w]e'll all use it, someday, to leave the earth. To transcend. [...] Borders won't mean anything. We'll have all outer space...'" (GR 400).³ Meanwhile, as the specter of the rocket takes over his life, he finds refuge by taking his alleged daughter's rocket-dreams of space travel and regressing into them himself—"[...] sometimes Ilse whispered to him bedtime stories about the moon she would live on, till he had transferred silently to a world that wasn't this one [...] in which flight was as natural as breathing" (GR 410).⁴ Earlier on, pre-rocketwork, Pökler had hoped that Leni might "carry him away to a place where Destiny couldn't reach. As if it were gravity" (GR 162). Here, the link between final destination, struggle for volition and gravitational pull that structures Pökler's later rocketry chapter is introduced, but what is most remarkable is that when this relationship to gravity is directly recapitulated in the rocketry chapter, the operational rocket has fully taken the place of abstract destiny at the gravitational centre. In an earlier passage with Leni, Pökler ponders that "real flight and dreams of flight go together" (GR 159). Harking back to the pun of the Herero passage, it is clear that in his dreams that stay the specter of the rocket, Pökler is in "real flight" from his own agency. Where the symmetrical 360-degree rim arc represents passivity in determined orbit, a spiral pull towards the centre demands volition, either a quest towards the centre or a striving away from it.

Rocket-Centre, Agency and Labyrinth

Pökler wishes to escape the rocket-centre by clearing the rim of its gravitational force, whereas the Slothrop of *Gravity's Rainbow's* first half wishes to escape the determinist rim by pursuing the rocket and thereby approaching the centre. This geometrical opposition is crucial to the novel. It also shows how closely gravitational geometry and personal agency are linked. When Slothrop is recaptured in Rocketman costume as he attempts to conclude his drug run, we are told that "he's away, on the Wheel, clutching in terror to the dwindling white point of himself" (GR 383). There are two ways to read this, the first being that the Wheel threatens to tear Slothrop away from the dwindling point and remove his selfhood in the sense of his agency, and the second that it is the clinging to this selfhood that

drags him along on the Wheel and thus denies him agency. The latter certainly endorses Mendelson's view that the "centripetal" Modernist concern with selfhood finds its Pynchonian analogy in the determinist Perfect Arc (4, 11). However, such a reading cannot provide a positive account of the subsequent diffusing of Slothrop's personality into a "scattered" (GR 712) spirit for the counterforce. I want to suggest that this scattering comes neither from a happy abandonment of all pursuit nor from entropic attachment to the arc, but is a consequence of his approach to a gravitational rocket-centre. Those "purposive" choices Mendelson correctly identifies as the final offering of the book are to be found not "outside" the wheel, but somewhere along that line to and through the centre.

The opposition between point and wheel persists throughout the novel. While Slothrop is taken away on the Wheel, his self is shrinking to a point; later, as he and Närrisch are "Holy-Centre-Approaching" (GR 508), we are made aware for the first time that Slothrop's shape of self is widening—he "has begun to thin, to scatter" (GR 509). In the Pökler section on the "rocket of wax," we have seen that a spiral approach to a centre has a distorting effect on physical bodies, and here it seems to be distending Slothrop's once 'point'-like sense of self. Gilbert-Rolfe and Johnston point out, regarding the form of the mandala, that a circle around a central cross is "a juxtaposition of open and closed limits" (74). That central cross, modeled by both Slothrop and the Herero (notably the two perceiving subjects who approach rather than flee the zero rocket centre) on the Rocket's fins, posits the Rocket not only as a centre, but also as a point facing isotropically outward, and hence as a possible opening force.⁵

The relationship between central point and circumscribing wheel opposes opening and closing, generation and limitation, throughout the text. That well-quoted passage about cusps and cathedral spires which leads into Pökler's chapter offers a series of images on points as meetings of arc. The last point described, however, is not on an arc but "the infinitely dense point from which the present Universe expanded" (GR 396). The list culminates in contrast, with a vision of point as centre, and point as creative, expansive centre at that. "Do all these points imply, like the Rocket's, an annihilation?" we are asked (GR 396). The ending of this passage, though, would allow us to answer in the affirmative only if we imagined annihilation and primal

generation as located in a single point and happening absolutely concurrently. This brings us back to whether or not a central zero is always and only a point of terminality.

I have already noted that the Herero both identify zero with centre and—with exceptions like Enzian—actively seek that centre as extinction. Their idea of zero/extinction in this sense chimes with that of Pointsman and his fellow Pavlovians in the first section of *Gravity's Rainbow*, for whom its title *Beyond the Zero* refers to the fact that to destroy a reflex you must continue to decondition it even after it has stopped manifesting. Here, zero is a point of insufficient mortification on a parabola, and what goes beyond it is purely destructive. Pointsman's relation to zero-centre, meanwhile, is elucidated in terms not of rocket-flight but of labyrinth. His dream of receiving the Nobel Prize is likened to a final minotaur (GR 142), but only after we have been told that compromises made in his past await restitution at the centre of another labyrinth (GR 88). His coexistent fear of being inevitably drawn to a "central chamber" (GR 88) where he will be punished, and wish to rush into "the last room" (GR 142) where he will prove himself, lead his most vivid thoughts on labyrinth to depict self-limits opening up and melting away: "[...] he begins to expand, an uncontainable light [...] what there is of labyrinth collapsing in rings outward, hero and horror, engineer and Ariadne consumed, molten inside the light of himself, the mad exploding of himself..." (GR 143). Resolution of his self-engineered ambivalence is only conceivable in terms of an annihilatory movement outward from a central crux-point. There is a linear Ariadne-path inward, but his only imaginable outward motion is total, destructive of limit but also of self.

Despite being a man of spiral rather than symmetry in rocket-arc terms, Pökler's methods for keeping the Rocket's specter at bay share the image: "his own engineering skill, the gift of Daedalus that allowed him to put as much labyrinth as required between himself and the inconveniences of caring" (GR 428). Labyrinth then is constructed around a central zero point, and the text hints at its relation to spiral approach by the frequency with which it links the entry into "final rooms" with turning (GR 589), curves (GR 485), or corners (GR 177). Labyrinthine constructs that keep characters away from a spiral-centre they identify with a terminal zero also keep them away from the open limit at the heart of the mandala shape, and hence involve shying

away from "caring" and from "purposive choices."⁶ Essentially, through labyrinth, the Pökler or Pointsman view remains of spiral towards zero as another form of restrictive, symmetrical, determinist arc, and elicits agency only in the avoidant sense. Nevertheless, these labyrinths each propose a centre that dictates action around it just as, in certain imagery, does the rocket.⁷

Two Conceptions of Zero and its Holiness

As the book posits various notions of centre—effectual, absent, terminal, generative—it also posits divergent concepts of zero. Like labyrinth, one of these is deployed defensively: the idea of zero as a point of rest at which there is no longer any need to struggle against gravitational pull. "Only at moments of great serenity is it possible to find the pure, the informationless state of signal zero" (GR 404). Pökler, avoidant of centre, expresses a wish for this kind of zero state: "[...] in something like this extinction he could be free of his loneliness and his failure [...]. So he hunted [...] across the Zero, between the two desires, personal identity and impersonal salvation" (GR 406). The two desires here seem similar to the two conceptions Pointsman had of labyrinth, and again extinction is posited as the solution, something like the unconstructive "meta-solutions" (GR 102) that arise within the closed limits of Blicero's Oven-state. But Pökler, as with his awareness of the symmetrical and asymmetrical rocket arcs, is again the character across whom two versions of the same concept, in this case zero, are drawn. Particularly in the first part of the novel the imagery of boundaries between two states abounds; Slothrop at one point is even described in the same terms as Pökler, "hunting across the zero between waking and sleep" (GR 119). What is novel in Pökler's wish, though, is the idea of zero not only as a kind of membrane that can be crossed repeatedly but as a membrane that could be inhabited. Pökler's wish to rest is an explicit abdication of purposive choice, but it does represent a definite shift away from the Pointsman/Herero notion of zero as terminal point. It is a notion of zero not as point but as interface.⁸

How, then, can this idea of crossing the zero, of an opposite world on the other side of the zero interface, be conceived of in terms of the spiral, whose terminus zero is a single point? The most explicit

encounter with any kind of zero in the book is Tchitcherine's experience at the Kirghiz light, which the Aqyn's song links to the linguistic zero of aphasia, and to notions of rebirth: "But if you would not be born / [...] the Light will never find you" (*GR* 358-59). The idea of rebirth through re-emergence from the terminal point hints that a zero like Kirghiz does not have to be final, indeed that if it is conceived of as final it will remain asymptotically distant like Pökler's "someday" moon-rest. Tchitcherine's ride out to the Light is described in fairly simple, intentional terms, without the imagery of curve, corner or turn, and it is perhaps because of this that he "will reach the Kirghiz Light, but not his birth" (*GR* 359). To merely reach the zero end of an approach is not enough to pass through it, to make it an interface.

Another way in which characters seek the spiral-zero, in this case the Rocket, and then fail to cross it is expounded when Thanatz and Greta approach the old launch site. They walk on with a growing sense of ruin until "[a]head of them, the path curved on, into trees. But something stood now between them and whatever lay around the curve [...]. They were both terrified. They turned, feeling it at their backs, and moved away quickly" (*GR* 485). The image of the approach to something hidden behind a curve certainly endorses a tightening spiral conception of an approach to centre. Here however, unlike Tchitcherine who reaches the zero point and comes away having failed to pass through, Thanatz and Greta turn around before they actually reach that point. The outward freeing from limit offered by the cross at the centre of a mandala is no freeing at all if the turn is made before the central point of the cross.

Slothrop and Närrisch, visiting the same site soon afterwards, are compared to Tchitcherine in terms of being "ill-equipped to approach a holy Center" (*GR* 508). Associating no conscious teleology with the centre, they are not overcome by a need to turn away. Regarding Slothrop, the narrator apostrophizes the "Egg the flying Rocket hatched from" (*GR* 509): "forgive him his numbness, his glozing neutrality. [...] Forgive him as you forgave Tchitcherine at the Kirghiz Light" (*GR* 510). Here, the links between Kirghiz Light and Rocket—*flying* rocket, rocket operational—are made explicit, but Slothrop, unlike Tchitcherine, does not attempt to undergo revelation at his Holy Centre. Of course, Slothrop actually meets Tchitcherine at the launch-site (*GR* 512), but it is Slothrop and not Tchitcherine

whose movement away from this centre is described. Slothrop is not hoping for the centre like Greta, for whom "that first glimpse of it" remains "an absolute need, a ruling target" (*GR* 509), yet who had to turn away when she approached final curve before that glimpse.

After this entry and immediate flight, this movement in and out of, this *crossing* of the rocket launch site, the compassionate Slothrop described in Michael Harris's essay in this collection, "wandering into enlightenment" and "walking away" from war, takes his place in the text. Unlike Greta—who turns before the Holy Centre and remains teleologically obsessed with it—or Tchitcherine—who goes expectant to the Kirghiz Light, "reaching" it rather than letting it "find" him, and hence remains "drawn" by other similar centers—Slothrop crosses the site of rocket-centre unconsciously, with "numbness," and walks away changed. When he and his pig companion, who is "a wandering eastern magus" (*GR* 575) that Slothrop by now merely drifts along with, enter Zwölfkinder, they see that "the great wheel, dominating the skyline for miles out of town, leans a little askew" (*GR* 575). Now that Slothrop is a passive wanderer rather than a determined seeker, the horizon-wheel imagery to which he had felt bound is itself subject to decay.

Joseph Slade sees Slothrop as "approaching the final zero in an asymptotic curve" (200), but I would contend that going beyond the asymptotic is precisely what differentiates Slothrop from all the other approachers in the novel, and that the finality of zero is elided because of this. In spiral terms an asymptotic curve is one that never quite touches the centre; consider for example Enzian and Tchitcherine finally walking past each other and moving onward unaware (*GR* 734-35). As I mentioned earlier, this can apply to an object orbiting a centre of gravity that is infinitely small and of infinite mass, in other words the perfect spiral arc. Hite's mention of "asymptotic approach to an unavailable centre" (Hite 22), meanwhile, could only be visualized as a spiral. This notion of the center's "unavailability" is essential to how we read the novel. Does it mean that the centre is not accessible, not knowable, not present? All of these? Since Tchitcherine is present at the Kirghiz Light, at the Rocket-site and finally on the same stretch of road as his half-brother, and yet fails to achieve any sort of revelation,⁹ it is clear that the physical accessibility of these centers is not in doubt. What is in doubt is Tchitcherine's ability to metaphorically pass through them.

To allude again to Michael Harris's paper on the Tao, it is precisely the seeking for a determined centre that ensures it will not be passed through. In Pynchon's repeated imagery of the delta-t, it is made clear that arrival and rest at the precise final zero, rather than an infinitesimal distance either side of it, are not consciously possible. Centre is not somewhere that can be experienced, known or revealed,¹⁰ just as Pökler's wish to come to rest at a zero state that absolves him of the struggle against the weight of the Rocket's zero is a fallacy. But with the imagery of a crossable zero and an alternative world on its other side so prevalent in Pynchon's work, we may think of those who have been to a Holy Centre and emerged again without intentional revelation as having actually crossed the zero. If so, the shape that they have followed is no longer a spiral, but a vortex.

Vortex—A Motion Through Centre

The Vortex¹¹ is a shape that takes the spiral's outline and allows it a mirror version. Whereas a spiral has no symmetry, a vortex passes through a central point and recapitulates the spiral on the other side in the opposite direction. As such, it is one shape that allows us to reconcile the ideas of zero as a central point, and zero as a boundary on an interface between two states.¹² In terms of *Gravity's Rainbow*, this allows the zero point of a vortex to be the point that offers Mendelson's "turn away" from "dead ends" and towards "purposive choices" (13). As Daniel Albright says in his book *Quantum Poetics*: "A vortex is a turning, and it is specifically the kind of turning in which something turns into something else" (177). The last sections of the novel, with their numerous recapitulated images of rebirth, of return, of rising, of reversal, are turnings, and turnings into something else. Moreover, they are "drawn" into this turn by the momentary charisma of the Rocket's launch.

At the end of *Gravity's Rainbow* the Rocket is a site of integration and of outward potential. As it becomes fully identified with gravity, the Rocket's significance as centre shifts from a terminality to be fled to a crucible in which dead matter is revived, drawing objects inward to unite and re-mold them. Rocket launching day is "a Collection Day, and the garbage trucks are all heading north toward the Ventura Freeway, a catharsis of dumpsters all hues, shapes and

batterings. Returning to the centre with all the gathered fragments of the Vessels..." (GR 757). This echoes an earlier passage in which the mystic concern with "Outer Radiance" is linked to myths of ultimate return: "Fragments of vessels broken at the Creation. And someday, somehow, before the end, a gathering back to home" (GR 148). The Collection Day finally delivers Pökler's "someday." There is a plausible apocalyptic reading of this passage, to the effect that the gathering return to home is a last preparation for "the end." However, there is not only gathering late in the book, but also generation and transfiguration, an insistence on outward movement and futurity. In Lyle Bland's own late turn, he finds that Gravity has, "having hugged to its holy center the wastes of dead species, gathered, packed, transmuted, realigned, and rewoven molecules to be taken up again [...]" (GR 590). Gravity is described as "messianic" (GR 590). Centre here is significant as a locus for change, and—to extend the religious or mystical tone of the earlier passage—the transmuting of wastes for offering outwards has implications for the conversion of the Preterite into potentially viable, electable spiritual vessels. This work of redemption seems to be the work of the Rocket's launch, drawing all inward with its centripetal force, but at its heart, just as each approaching figure begins to warp and to diffuse, offering opportunities to pass through its vortex centre and look outwards, much as Slothrop's passing through turned him into a distended positive force that could be widely scattered. That super-comprehensive world hinted at in the "Outer Radiance" passages of the novel's first part becomes a figure for a certain kind of enlightenment to be gained through crossing the zero, an enlightenment that makes "purposive choice" more viable.

Gravity's Rainbow eventually presents the making of such "purposive choices." Where Slothrop's works after his turn represent selfless small-scale kindness, when Pökler finally loses his struggle against centripetal force he goes through a turn of his own and finds that he has at last to care. The Dora concentration camp had been on the other side of his workplace all along, and in his aversion from the other side of the zero centre he had never known it. But moving purposively into the darkest part of the abandoned camp, he finds a woman and performs his one act of outward-looking care. He gives her a ring, perhaps a symbol of a more positive cycle that he now, beyond the zero, has access to (GR 433). The positive implications of

a zero-crossing become clear in that Pökler, the most determined resister of centralizing pull in the novel, can yet cross the zero when his resistance is exhausted, and begin to do good.

"But what's north? [...] what good's a bearing?" (GR 706-07)

As the novel accelerates to its close, the Rocket—through an identification with Gravity that proceeds from its increasingly explicit centrality in the text—becomes a centre for change as its launch approaches. It can offer the perspective for outward-looking "purposive choice" and hence provide a simultaneous counterpoint to its general conception as determinist hardware that denies change and restricts choice. The Rocket can be figured as the crossable zero point of a vortex because the imagery proceeding from the asymmetrical operational rocket arc posits the Rocket itself as the centre of a spiral. I have hopefully made clear to what considerable extent all meanings of zero and of flight arc in *Gravity's Rainbow* are contingent on character-perception, but these are the ones that proceed from practical ballistics as opposed to idealizations. Nevertheless, I also hope to have shown that my alternative readings of the arc exist concurrently with rather than counter to the existent readings that they complicate.

The problem with attributing vortical structure to a work of art is that the term has such historically vague connotations that the specificity of the analogy cannot be taken for granted. Albright notes that the Vorticists in the 1920s chose the vortex as their emblem not because of any specific physics, but because it was a "pan-theistic atom; deliberately neutral, applicable on the broadest possible field, suggestive of no specific art form, only a focused dynamism" (9). In my understanding, Pynchon uses the vortex differently from the Vorticists precisely because he does not just use it as a figure of force and dynamism, but employs its specific geometry in essential ways. The specific ballistic analogies traced in this paper may help to contribute to a framework for looking at notions of stability and influence in Pynchonian structure, particularly as regards the way that ideas of centre and boundary function. The scientific element may also provide a perspective on how Pynchon ratifies or undermines the various structural metaphors his texts offer. This relates to the ongoing

examination of which parts of Pynchon's philosophy, his plots and his worlds can be elaborated on what epistemological grounds, and thus how we can hope to elaborate the "purposive choices" posited by the text on any basis beyond pure skepticism.

To end on the level of mere geometry, though, the conception of an alternative vortical structure to the rocket-arc and to the text—a structure that begins with descent towards a terminus yet leads to a look outward to compassion and purposive choice—provides one way that Pynchon's idea of zero as terminus *and* interface, his use of circular motion metaphors for destructive teleological forces *and* ongoing narratives of return, may be reconciled in a single structure without endorsing an overt teleology.

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Notes

¹ In terms of focus on the imagery of circle, wheel and rim, Thomas Moore's *The Style of Connectedness* is richer than Hite's book, indeed truly comprehensive, but does not deal in much depth with other circular metaphors.

² It is a pleasingly elegant irony that what complicates the vision of the Perfect Rocket Arc as a perfect analogue of entropic symmetry should itself be an entropic factor like air-resistance.

³ The first section of the novel uses a great deal of gravitational rim imagery in its distinctions between two spiritual worlds. This is particularly true of the passages on "Outer Radiance" (e.g. GR 150). The idea of gravitational pull constituting a spherical boundary layer that separates two states of existence is relevant to the latter part of this paper.

⁴ In this section, the word 'someday' that characterized Pökler's conversation with Leni years earlier is repeated: "'Someday,' Pökler told her. 'Perhaps someday to the moon'" (GR 410). His dreams of escape constitute an indefinite target perpetually postponed that correlates with the absent-centre structures of *Gravity's Rainbow* proposed by Hite, David Seed and others. However, as will be shown when I look at labyrinth imagery, there are different centers for Pökler that are pressing and not indefinitely postponable. Indeed, to be very literal, what is absent or perpetually delayed for him is that escape which is outside the rim, and which a present metaphorical gravitational centre *denies* him.

⁵ The text also contains mandala images that are associated with the forces of determinism, such as Jamf's fob (GR 413). In that instance the outer circle is bent into straight lines, evoking the closing off of possibility, the delineation of rim-like

boundaries. It seems that there is a contrast between mandalas that establish new boundaries and those that encourage movement towards the central 'open limit.'

⁶ This negative tone to labyrinth imagery is one thing that makes it hard for me to accede to the idea of Pynchon as a committed deconstructionist. As opposed to J. Hillis Miller's notions of labyrinth, especially his approving comment that each and every text leads us to confront an "aporia [...] that blind alley, vacant of any minotaur" (112) at the heart of the text, Pynchon's labyrinths certainly reflect a different view; the centers of Pynchon's labyrinths contain minotaurs referred to as such. For Miller, text is labyrinth, authentic text performs labyrinth, and this is its virtue. For Pynchon, it seems, labyrinth is some kind of inauthentic insertion between experience and knowledge, self-awareness and agency, in other words between "text" and the action it could prompt.

⁷ Although it is far too large an argument to engage with fully here, it is worth considering what this labyrinth imagery might mean for the numerous readings of Pynchon that see him endorse Derridean notions about the perpetual absence of centre. David Seed for example writes, not specifically about the rocket, of "an absent centre which paradoxically by virtue of its absence still attracts characters towards it" (188). While it is certainly possible to think of absence attracting action as a vacuum pump draws in water, it makes less physical sense to consider action motivated *outward* by absence. Central force in *Gravity's Rainbow* does not always attract, and as with Pökler the action it induces is not always towards it. To exert a consistent influence, as does the central pull of the rocket on Pökler, implies that even if the centre cannot be touched or marked or notated, it is still present through its measurable and unshifting influence. Pynchon makes it clear that mathematical calculation of centre is not a guarantee of its objective existence (*GR* 700). Nevertheless, this calculable centre remains practically useful in terms of its dictating and our predicting action, just like the concept of centre in *Gravity's Rainbow* as a whole.

⁸ To hark back to the passage in which rocket arc and rocket centre are first linked, Pökler's thoughts here bind his own self-perception with earlier narratorial speculation about the Rocket; the shape whose centre is a Brennschluss "is most likely an interface between one order of things and another" (*GR* 302). Pökler's wish to establish a rest-point at interface-zero is in this respect a further rejection of an already authorially hinted opportunity to change, a further subscription to the "order" under which he suffers.

⁹ It could actually be argued that this last movement past Enzian *is* a change-enabling crossing for Tchitcherine, and that to have "passed his brother by, at the edge of evening [...] without knowing it" (*GR* 735) is analogous to Slothrop's unknowing movement past/through the rocket launch site. This would be endorsed by the similarity between our last reported action of Tchitcherine going "back to his young girl beside the stream." (*GR* 735) and the kind of outwardly directed compassion (again, see Michael Harris's paper in this collection) enacted by Slothrop after his turn.

¹⁰ Hite's consideration of Holy Center as a figure only of revelation (22) is interesting for this topic. Again focusing on structure as innately teleological, she does not

consider that Holy Center may be a boundary between inward and outward movement, essentially a point of change that is less important as revelation in itself than the future its change makes possible.

¹¹ There are numerous conceptions of vortex in different scientific fields where all that is meant is a spiral with depth and motion. Toroidal vortices, on the other hand, which are commonly studied in aerodynamics, operate on the lines I am describing here. Certain quasi-mystical conceptions of energy and aether, of the sort that Pynchon seems to have been interested in throughout his career, rely on the same vortical model.

¹² It is worth bearing in mind that electrons are often considered to be vortices. Given the preponderance of electrical flow imagery in *Gravity's Rainbow*, this notion of the vortex as the vehicle of constant electrical flow between positive and negative charge—the vehicle that makes electrical circuit possible—resonates with the ideas of vortical structure I discuss here. I omit a full consideration of those resonances because they are not directly contingent upon the circular geometries of the novel.

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