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Orbiting Round Nothingness across Communication Space

Possibility of an "Inter-other Transition Network"

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Introduction

This exploration follows from the arguments developed separately (*Way Round Cognitive Ground Zero and Pointlessness: embodying the geometry of fundamental cognitive dynamics*, 2012; see alternative table of contents) and especially in its conclusion (*¿ Embodying a Way Round Pointlessness?*, 2012). The latter drew attention to the significance of the Euler spiral -- otherwise known as a clothoid or Cornu spiral -- as having valuable implications in relation to the consideration of fundamental geometrical metaphors such as point, line, circle, sphere and torus (*Experience of Cognitive Implication in Fundamental Geometry: unexamined metaphoric framing of strategic discourse*, 2012).

A related case has also been made for the role of "technomimicry" as an analogue to that more commonly made for biomimicry (*Engendering a Psychopter through Biomimicry and Technomimicry*, 2011). The exploration of geometrical metaphors may be understood in those terms. The following argument endeavours to benefit from the thinking developed within the discipline of orbital mechanics, especially with respect to interplanetary travel.

The question is whether the sense in which "orbit" is commonly used to describe the manner in which adherents "orbit" around a charismatic leader, for example, can benefit from insight into the variety of orbital patterns and possibilities identified in the case of space travel. The concern is whether such insights might be of relevance to the challenge of navigating a psychosocial space readily experienced as characterized by pointlessness and nothingness, as separately discussed (*Configuring the Varieties of Experiential Nothingness*, 2012). Given the appeal to the imagination of space travel in a period in which the need for "change" is widely stressed -- if only in response to a widely-felt sense of despair -- also of interest is whether the recognized technicalities of achieving orbit and travelling to distant planets offers insights into new ways of framing psychosocial change (*Implication of Personal Despair in Planetary Despair*, 2010).

Orbital mechanics as a source of psychosocial insight

Orbital mechanics or astrodynamics is the application of ballistics and celestial mechanics to the practical problems concerning the motion of rockets and other spacecraft. Orbital mechanics focuses on spacecraft trajectories, including orbital maneuvers, orbit plane changes, and interplanetary transfers, and is used by mission planners to predict the results of propulsive maneuvers.

The arguments regarding use of the geometric concept of a "line" as a metaphor highlighted its problematic reinforcement of what is now widely challenged as "linear" thinking -- in contrast with what might be more fruitfully associated with curve, circle and sphere (*Metaphorical Geometry in Quest of Globality*, 2009; *Geometry of Thinking for Sustainable Global Governance*, 2009). It can also be argued that there is an unfortunate dependency on "ballistics" to resolve global challenges (*Cognitive Ballistics vs. Derivative Correlation in Memetic Warfare*, 2009).

With respect to "projects" of many kinds, there is a degree of recognition of the challenge of getting them to "fly". This metaphor is readily extended into the need for such projects to acquire "escape velocity" and to reach stable "orbit". Of interest is the contrast between the "linear" insights relating to "launching" a project -- as with a rocket -- and the necessary transition from that mode of thinking to that required to ensure a viable circular orbit around the globe.

Of related interest is the curvilinear nature of the trajectory required for successful travel from one orbit to that around some other body elsewhere in "space". How might the insights relating to this preoccupation clarify those of psychosocial change requiring movement from one "place" to another -- effectively from one "centre of gravity", metaphorically understood, to another?

Recognizing the variety of psychosocial orbits

The question is whether the detailed articulation of "orbits" by orbital mechanics can be related to understandings of "orbits" of a psychosocial nature -- or used imaginatively to elicit such recognition. A summary of the range of orbits is presented by *Wikipedia* (*List of Orbits*) under the following headings:

- Centric classifications (galactocentric orbit, heliocentric orbit, geocentric orbit, areocentric orbit, lunar orbit)
- Altitude classifications for geocentric orbits
- Inclination classifications (inclined orbit, polar orbit, Sun-synchronous orbit, non-inclined orbit -- ecliptical orbit, equatorial orbit, near equatorial orbit)
- Eccentricity classifications
    - circular orbit
    - elliptic orbit (geostationary or Geosynchronous transfer orbit, Hohmann transfer orbit)
    - parabolic orbit (escape orbit, capture orbit)
    - hyperbolic orbit
    - radial orbit (radial elliptic orbit, radial parabolic orbit, radial hyperbolic orbit)
- Synchronous classifications
- Orbits in galaxies or galaxy models
- Special classifications
- Pseudo-orbit classifications (horseshoe orbit, exo-orbit, lunar transfer orbit, prograde orbit, retrograde orbit, halo orbits, Lissajous orbits)

Potentially of particular relevance to psychosocial dynamics is the articulation of:

- Transfer orbits (including Hohmann transfer orbit and Bi-elliptic transfer), typically elliptical orbits that allow space vehicles to move from one (usually substantially circular) orbit to another.
- Gravity assist, in which a space vehicle swings by a planet and leaves in a different direction, at a different speed.
- Interplanetary Transport Network (as discussed below)

Distant planet as metaphor of archetypal other

Understood in psychosocial terms, as suggested above, "orbit" can be understood in terms of the dynamics of adherents in relation to a leader as a local "centre of gravity". However it might also be understood as a belief system or pattern of behaviour, notably one deprecated or considered to be inappropriate, from which some consider it desirable to move. Framed in this way, a distant "planet" is then to be understood as an alternative envisaged as desirable -- a different "place" or "condition", as is typically presented.

The sense of "otherness" associated with any unfamiliar pattern of behaviour can then be usefully related to the challenges of encountering its embodiment in an "other". This is well-recognized in relation to those of other cultures and persuasions, but more particularly in inter-personal encounters.

Using orbit as a metaphor, any cognitive encounter with otherness implies the different stages of:

- achieving "escape velocity" from an habitual pattern,
- ensuring a "stable orbit" in relation to that habitual pattern, perhaps to be understood in terms of the form of the "detached" objectivity associated with global satellite observation of the planetary surface
- achieving another form of "escape velocity", enabling movement towards the "other" elsewhere, as a desired alternative
- entering a stable orbit around the other, after reaching its proximity

Within the framework of orbital mechanics, these stages are understood and articulated in very great detail in terms of change of orbit and orbital transfer. In the case of psychosocial change, the possibility and nature of such change is a matter of continuing reflection and experiment.

Clothoid as a psychosocial transition curve: from linear to circular

Of particular relevance to this argument is the form known as clothoid an Euler spiral (also known as Euler spiral, Cornu spiral, or spiro). These are curves whose curvature changes linearly with the curve length, namely the curve has a variable radius along its length -- with the curvature of a circular curve being equal to the reciprocal of the radius.

Of potential relevance to their implications to psychosocial dynamics are the applications for which the clothoid is best known:

- ***transportation tracks***: Clothoids are widely used in transition curve design in railroad and highway engineering for **connecting and transiting the geometry between a tangent and a circular curve**. Design standards for modern highways and railways require a smooth transition between straight line segments and circles. Related research in this area can be found in numerous resources. The centrifugal force actually varies in proportion to the time, at a constant rate, from zero value (along the straight portion) to the maximum value (along the curve) and back again.

This is highly suggestive of potential implications for the cognitive transition between "linear" and "non-linear" modes of understanding (*¿ Embodying a Way Round Pointlessness?*, 2012). There are potentially profound implications to the fact that movement in a straight line (of zero curvature) cannot instantaneously enter into an arc with a certain curvature. Although the clothoid curve is an obscure feature of design, there is necessarily considerable popular experience of it by drivers of automobiles -- they know how it "feels".

- ***amusement parks roller coaster tracks***: Earlier designs of purely circular loops allowed vehicles to enter them at speeds that were too high, building up too much force, and resulting in injuries for riders. Notably for reasons of safety, the track design now makes use of clothoid loops with a much smaller radius at the top than at the bottom -- with the clothoid form varying the acceleration to minimize the stress on riders. Typically only those segments of the track which mark the end of one portion of ride and the beginning of another are "linear" -- straight and flat. The rest of the track is generally composed of dips and hills, banked turns, and clothoid loops (Steve Alcorn, *Theme Park Design: behind the scenes with an engineer*, 2010).

  As clarified by the "amusement park physics" sponsored by NASA, within the clothoid loop, moving up, over and down, position and speed are constantly changing. On the way up the vehicle slows due to a decrease in its kinetic energy. At the top of the loop, when the kinetic energy is zero, the vehicle has gained a great deal of potential energy due to its position. On its way down it rapidly gains kinetic energy once again. The force on the rider depends on two factors: the curvature of the track, and the speed of motion. Gravity slows down the ride as it rises higher, but at the same time the ride also speeds up where the track curves more sharply, because of the preservation of angular momentum. This is an effect similar to that experienced when rotating a weight attached to a rope: its rotation will slow down if a greater length is let out, and will speed up if the rope is shortened.

  Again the experience of the clothoid -- and the thrills it is designed to elicit -- are widely shared (Robert Coker, *Roller Coasters: a thrill seeker's guide to the ultimate scream machines*, 2006). It useful to relate the dynamics and the experience to the tendency to describe life metaphorically as a "roller coaster" (*10 Reasons Why Life Is Like A Roller Coaster*, 2008), to the extent of featuring as a song (*Life is a Rollercoaster*, 2000). Frequent use is made of the metaphor in descriptions of political processes (Arthur S. Brisbane, *Riding the Republican Roller Coaster*, *New York Times*, 3 December 2011; Stuart Rothenberg, *Republican Roller Coaster Ride Continues*, *Roll Call*, March 2012; *Berlusconi's Roller Coaster Ride Through Politics*, *Reuters*, November 2011; S. Akbar Zaidi, *Pakistan's Roller-Coaster Economy: tax evasion stifles growth*, *Policy Brief of Carnegie Endowment for International Peace*, September 2010).

- ***robotics and locomotor trajectories***: Clothoids are used for trajectory smoothening in robotics on motion control for autonomous robots. Clothoid arcs are a good approximation of locomotor trajectories (Gustavo Arechavaleta, et al. *An Optimality Principle Governing Human Walking*, *IEEE Transactions on Robotics*, 24, 1 February 2008).

  This suggests that, in the process of walking itself, humans have an intuitive understanding of the dynamics associated with the clothoid form. The invites exploration of the implication with respect to interesting metaphorical use of walking (*Transdisplinarity-3 as the Emergence of Patterned Experience Transcending duality as the conceptual equivalent of learning to walk*, 1994).

- ***flight path trajectories***: Clothoids play a significant role in planning flight paths, most notably of drones and especially with respect to their use as a swarm -- in land, sea, or space-borne. As noted by Antonios Tsourdos, et al. (*Cooperative Path Planning of Unmanned Aerial Vehicles*, 2011), it is then vital that swarm UAVs/MAVs can cooperate together in a coordinated manner, obeying a pre-planned course but able to react to their environment by communicating and cooperating. An optimized path is necessary in order to ensure a UAV completes its mission efficiently, safely, and successfully. Focussing on the path planning of multiple UAVs for simultaneous arrival on target. The study includes a section on producing flyable clothoid paths. See also Ran Dai, et al. (*Path planning for multiple unmanned aerial vehicles by parameterized Cornu-Spirals*, *Proceedings of the 2009 conference on American Control Conference*, 2009).

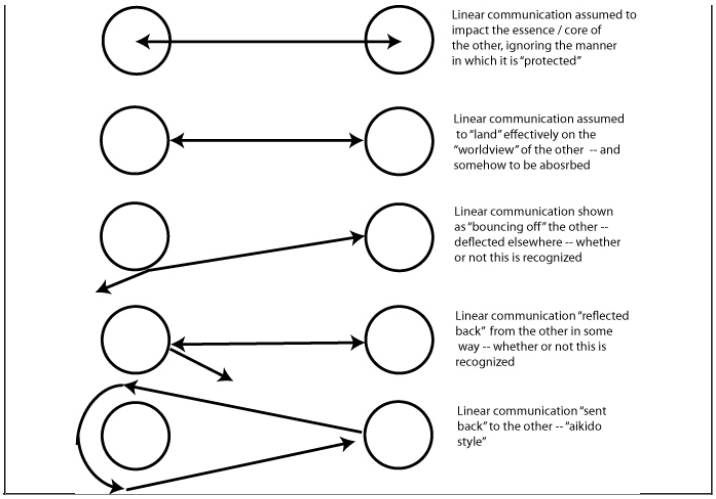
  Of more general concern is the more comprehensible display of trajectories (J. Brandse, et al., *Clothoid-Augmented Trajectories for Perspective Flight-Path Displays*, *The International Journal of Aviation Psychology*, 17, 1, 2007).

Reframing communication relationships

There is a widely evident assumption that communication is an essentially "linear" process. This is strongly reinforced by schematic representations of relationship networks of every kind, including social networks, kinship networks, and organization system charts. It is even more strongly reinforced by telecommunication schematics in which "lines" are shown as linking communicants. Similar implications are associated with hyperlinks on web pages -- seemingly offering a direct link to another site. The pattern is also evident in marketing -- with its focus on "targets" on which impact is to be achieved by a "linear" dispatch (or dissemination) of some form of information. More subtle variants of the pattern are evident in concept maps in which the relationship between concepts is typically depicted by "straight" lines (whether or not they are curved to fit conveniently into the space available).

Such "linearity" is well-challenged by the experience of a close relationship in which conventional forms of "verbal tennis" are called into question. The same is true of complex negotiations, most notably in a bargaining culture.

Schematic of relatively unfruitful modes of communication from an orbital perspective

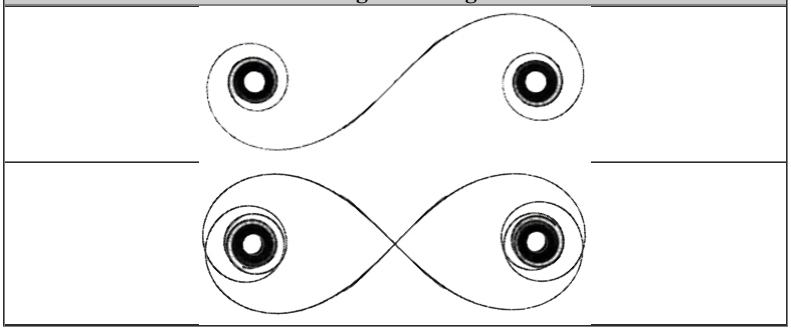


In contrast to the above, of interest in the case of the clothoid curve, or Euler spiral, is the possibility of holding a communication pattern of greater subtlety. Communication in "linear" terms is indeed evident -- but only in the intermediary space at distance from both potential communicants. This may be understood as "centred" on an equilibrial position between both -- an "origin" in abstract terms, with which neither are engaged but through which the communication passes.

As the distance from that median position increases, a degree of "curvature" becomes apparent. The communication is no longer "straight" -- or mistakenly endeavours to be so (in the light of the illustrations above). The clothoid is defined as the curve whose curvature is equal to its length -- the greater the distance the greater the curvature. The closer to either participant, the more curved it becomes -- spiralling into a circle in each case.

This appropriately suggests the manner in which it might be expected to "engage" with the belief system of each -- orbiting "around" with the circular patterns and processes with which the coherence of that identity is felt to be associated. With one as a sender, the communication has to be structured such as to be accelerated out of that local cognitive "gravity well", in order to "escape" towards the other. For the intended recipient the reverse is necessary, in order that the content of the communication can "land" through engagement with the sustaining circularity of the local patterns and processes -- effectively to entrain them and to be entrained by them, a process of entering into phase. Of particular interest is that the sense of "otherness" of each with respect to the other is evident in the change in the different directions of the spiral for sender and recipient. This is also suggestive of the sense in which the other worldview is sensed to be "contrary".

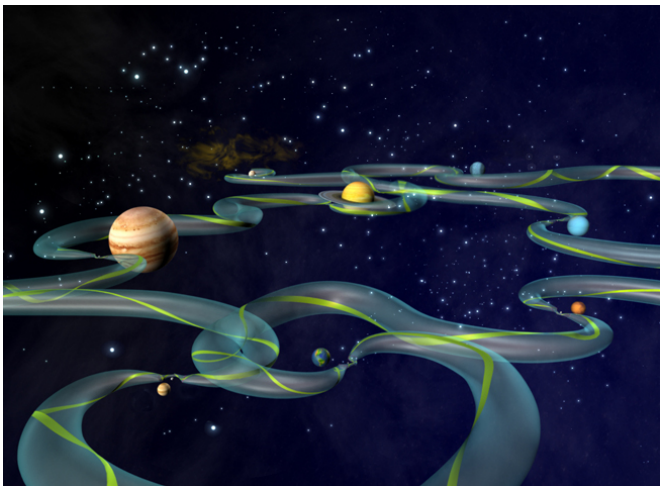
Clothoid curve indicative of a more fruitful mode of communicative encounter through "orbiting"



Whilst the first image is a conventional representation of the clothoid, the second has a superimposition of a reversed variant -- perhaps better to suggest the nature of dialogue in which both participants act as sender and recipient. The media cross-over is then the "origin" of the pattern, itself reminiscent of traditional Celtic knot work.

From an "Interplanetary Transport Network" to an "Inter-other Transition Network"?

Understanding of the little-known Interplanetary Transport Network (ITN) offers powerful insights for communication and organization throughout psychosocial space, whether at the macro-level of global society or the micro-level of the individual. NASA enabled an early description of it following the work of Martin Lo which led to a simplification of the conceptualization and design of space missions (*Interplanetary Superhighway Makes Space Travel Simpler*, Jet Propulsion Laboratory, 17 July 2002) offering the following artist's impression (NASA image reproduced from *Wikipedia*).



The "network" is a modality whereby nonlinearities in the gravity of the planets and moons of the solar system enable a trajectory to be determined of a highly perturbative, even chaotic, nature -- but possibly without any propulsion requirement, other than for course correction (Shane D. Ross, *The Interplanetary Transport Network*, *American Scientist*, 94, May-June, 2006; Ian Stewart, *Ride the celestial subway*, *New Scientist*, 27 March 2006). The "network" is a collection of gravitationally determined pathways through the solar system that require very little energy for a vehicle to follow. The ITN is based around a series of orbital paths predicted by chaos theory and the restricted three-body problem leading to and from the unstable orbits around the Lagrangian points -- points in space where the gravity between various bodies balances with the centrifugal force of an object there.

These points are locations where trajectories through space are redirected using little or no energy. They are the five (invisible) positions in an orbital configuration where a small object affected only by gravity can theoretically be stationary relative to two larger objects (such as a satellite with respect to the Earth and Moon). The points mark positions where the combined gravitational pull of the two large masses provides precisely the centripetal force required to rotate with them. The points are the stationary solutions of the circular restricted three-body problem (see *Wikipedia List of objects at Lagrangian points*).

The question is **how can such thinking be used to reframe the possibilities of psychosocial relations and communications** -- if only as exemplified by that enabled and enhanced by social networking facilities. Are inappropriate and unfruitful assumptions made about their nature of communication in such contexts? In the interplanetary case, as explained by Shane Ross:

> Drop a rock or spacecraft somewhere close to the Sun, and the object should plummet into the huge solar mass; release it somewhere near our planet, and it ought to drift, perhaps more slowly, back to Earth. Nature, alas, is not so simple. The underlying complication, of course, is that the Earth is orbiting the Sun, not just hovering fixed in space. As a result, some very unintuitive things can happen. A rock let go near our planet could find itself following a complex and chaotic path, perhaps orbiting first the Earth, then the Sun, and back again, over and over for years. Add in the tugging of all the other planets and moons, and the possible routes through space can get enormously complicated -- and quite interesting.

In his remarkable description Ross notes that investigators from a variety of fields have revealed the existence of a complex set of allowable trajectories for such objects -- the interplanetary network of crisscrossing pathways:

> These invisible highway lanes, originating near a planet or moon, guide traffic through the solar system. But unlike the thoroughfares one finds on the ground, the space highways and their interchanges are dynamic, with lanes moving past one another according to the varying geometrical relations between planets and moons. Staggering through this tangled web, comets and asteroids find themselves jumping from one lane to another willynilly, getting handed off between planets -- or sometimes running into them. For such pieces of cosmic flotsam, the solar system turns out to be more like a turbulent sea than a clockwork.

Efforts are being made to map the network (Shane D. Ross, *Chaotic Motion in the Solar System: Mapping the Interplanetary Transport Network*, 2003). Arguments and speculations, inspired by science fiction writers, have extended to the possibility of an interstellar equivalent (*The Exoplanetary Transport Network (ETN) and The Interstellar Route Map (IRM)*, *Exoplanetology*, 2010; Paul Gilster, *Cyclers: Transportation Network Among the Stars?* *Centauri Dreams*, 1 January 2010)

Inter-other communication with minimum effort?

At whatever scale within psychosocial space, there are "bodies" exerting a force on others which is analogous to gravitation -- if only to be described as "influence". A remarkably relevant mathematical description of these is offered by Ron Atkin (*Multidimensional Man; can man live in 3-dimensional space?* 1981) of what are ambiguously sensed as "holes" or "objects" in the geometry of that space, as summarized separately (*Comprehension: Social organization determined by incommunicability of insights*, 1995).

Following Ross, it could be readily -- but mistakenly -- assumed that this could be understood as a "clockwork" situation. A more counterintuitive understanding, which many naturally appreciate, offers a sense of a "transportation network" through which they are able to move in relation to others. For those most skilled, and possibly recognized to be so by others, this may involve very little

"energy". It may be described as an "art of living", the sailing metaphor of "knowing the ropes", or even epitomized by such as the Artful Dodger.

The sense implied by travel through the ITN with minimal energy is well-recognized in the psychosocial case by being "in the zone" and the associated sense of being "in the flow", as articulated by Mihály Csíkszentmihályi (*Creativity: Flow and the Psychology of Discovery and Invention*, 1996). This may be understood as corresponding with the understanding in Taoism, Chinese Buddhism and Confucianism of "effortless action'" (*Wu wei*) -- understood as following from the harmonising of one's will with that of Nature. The relevance of this seemingly abstruse insight into the strategy of governance was explored in terms of its practice in the game of go (*weiqi*) by Scott Boorman (*The Protracted Game: a wei ch'i approach to Mao's revolutionary strategy*, 1971). *Wu wei* is represented by Zen calligraphers as a circle. In game terms, *weiqi* is therefore understood as the "encirclement board game". Boorman has since developed his strategic argument with respect to "alternatives to rational choice".

In this light, what might in future be understood by an "Inter-Other Transition Network" by which communication with others becomes relatively effortless? This would then contrast with the intense application of "energy", inspired by military metaphors, currently devoted to achieving information "impact" on "targets" (*Enhancing Sustainable Development Strategies through Avoidance of Military Metaphors*, 1998). In the light of the clothoid curve, **communication and fruitful relationships then merit consideration in the light of a non-linear "curving around the other**". The art of doing so would seem to depend on the transition between linear and circular embodied in the clothoid. This is readily recognized in the martial arts of indirection, mnemonically suggested by "empty hand" skills (*Ensuring Strategic Resilience through Haiku Patterns: reframing the scope of the "martial arts" in response to strategic threats*, 2006). More generally it suggests the reframing of linear understanding of "link" (notably through cyberspace), "bond" and "contact".

Ironically it is the attitude and philosophy of some of the Eastern martial arts which offer insights into a sense of "nothingness" and "pointlessness" consistent with the insights regarding the nature and possibilities of the complex orbits of interplanetary space -- "around" points which have a purely notional existence as a focus of interacting forces, as with the Langrangian points. It may be related to liminality (*Living as an Imaginal Bridge between Worlds: Global implications of "betwixt and between" and liminality*, 2011). Also of relevance is the manner in which "negative space" may impede or enable transition between worldviews, the significance of which are variously negated (*Guidelines for Critical Dialogue between Worldviews*, 2006).

More fruitful navigation around psychosocial space would therefore seem to call for a new appreciation of both nothingness and pointlessness. This may be especially provocative with respect to current evolution of the attitudes of both unemployed "youth" and the aging "unemployed". More intriguing is the possibility that such understanding may be the key to communication with hypothetical extraterrestrials (*Self-reflective Embodiment of Transdisciplinary Integration (SETI): the universal criteria of species maturity?* 2008).