Received: 7 September 2023 | Accepted: 25 September 2023
DOI: 10.1002/sres.2981

RESEARCH PAPER

SYSTEMS and BEHAVIORAL RESEARCH SCIENCE | WILEY

Emergent growth of system self-organization and self-control: Contextual system design, steering, and transformation

Jessie Lydia Henshaw

HDS Natural Systems Design Science, New York, New York, USA

Correspondence
Jessie Lydia Henshaw, HDS natural systems design science; research consultancy, 680 Ft Washington Ave, New York, NY, USA.
Email: sy@synapse9.com

Funding information
The work was self-funded.

Abstract

In physics, subjects not explained by formulas were often avoided, like how uncontrolled systems change form. Weather, businesses, societies, environments, communities, cultures, groups, relationships, lives, and livelihoods all change form by variations of "S" curve progressions. It is a slow-fast-slow process of self-animated contextual energy-system emergence of working designs. They also appear to develop by "find and connect" in three stages, starting small to first (a) grow designs of increasing power, then (b) diversify, adapt, respond, to harmonize internally and with others, and then (c) take on one or more roles in their climax environments. It starts as a long life-curve of increasing syntropic success that later ends with a continuity of entropic decline. Life is particularly risky for small startups, but many do succeed. Many powerful civilizations have emerged, some never growing up *but growing as endless startups*, only to become fragile, fail, and vanish. Here, we explore these systems with the premise that dynamic self-organization and adaptation are also inherently processes of self-direction.

KEYWORDS

context blindness, contexts, continuity, formation, growth, maturation, natural signals

1 | INTRODUCTION

Throughout our evolution, we learned from what was observable about the systems that mattered to us. We found languages to connect our meanings with what we noticed, saw, felt, and heard (Henshaw, 2022a). Growth gave us both our own lives and the wealth of nature, our good relationships, societies, and when overdone, the great conflicts and crises that beset us. It all comes about through continuities of emerging cumulative self-assembly of whole system designs, internal structures that grow by capture external resources. The working parts may often be observable from the outside but the system, working as a whole, makes its internal working relationships so self-referential to be quite hidden from view. Ways of understanding these coupled external/external structures to make some sense of them are in the author's earlier writings (Henshaw, 1985, 1995, 1999, 2007, 2010, 2018, 2019, 2021, 2022c) and, of course, also in everyone's successful experience of living with them. Here, the focus is on studying the natural designs produced by growth in context, keeping the requirements for energy continuity and conservation in mind.

The earliest term referring to the emergence of complexly organized systems by growth is the ancient Greek term *physis* (Henshaw, 2022b). That became the root of the new term *physics* as Greek science later became formalized, but instead referring to all the deterministic rather than creative processes of nature. That change seems to have been a demographic one, a branching of knowledge cultures going their separate ways. The term's original reference is to nature and its observed creative design processes, and still the current meaning in Greek. The newer, exceptionally powerful deterministic modern physics meaning, of course, dominates in modern the world. Its great power as a language for controlling events then naturally paralleled the use of its tools for empowered economic growth, becoming a metaphor for knowledge in general but without reference to contexts.

There is a great irony in how the resulting profitability of science, offering tools without context, without limits, for the users then projected limitless economic growth. So, it appears that that illusion could come directly from the separation of the tools from their contexts, making the tools so powerful. It would tend to hide what becomes of their use. In nature, growth is the means by which new systems emerge from their contexts, and remain coupled with their contexts as part of how they work. By decoupling systems from their contexts in theory and practice, would come to be central to the limitless economic demand for maximizing rates of growing profits. That started at the very dawn of science. The fame of the first Greek scientist, Thales, came from collecting all the mathematics of antiquity and making huge profits in trade from using it (Henshaw, 2022c), proving the great power of profiting from sound equations, allowing one to pay no attention to the other effects.

For Aristotle, Plato, and the scientific communities that followed, the great financial rewards for the profitable parts of science also enabled extraordinarily diverse kinds of learning of every kind. The concentrated essentials of the craft became what we now know as physics (Henshaw, 2022d). It also still seems to be the unusual profits of powerful abstract principles, detached from the contexts of their use, that drive today's economy. As that detachment of theory from context seems to be part of our problem, this work aims to help start a reconnection of our great abstract thinking with all the crucial relationships we have with nature.

Two of the scientists who offered the most useful observations on the creativity of growth were Boulding (1953) and his teacher Keynes (1935), both of whom took a diagnostic approach similar to the one used here. The early field studies that led to this work were on how air currents developed (Henshaw, 1978). Of course, the observations of many others were also foundational, such as Bogdonov, Bernalanffy, Ashby, Bateson, Troncale, Tainter, Klir, Miller, Varela, Maturana, Elsasser, and Bartlet, the architects Alexander and Kahn, paleontologist Gould, and zoologist D'Arcy Thompson, to name a few.

None but Keynes and Boulding seemed to notice the main question of how growth both animated and limited systems. That science focused on fixed rules in a world full of variously directed creative processes does seem to be what led to our basing our economic models on limitless growth. Casual observation tells one that growth is nature's most creative and self-limiting process, a contradiction of perceptions that even seems to go back millennia.

1.1 | The new model

In nature, growth is a pair of slow-fast-slow progressions, rising then declining. Five main stages of maturing self-organization may be visible, too. Figure 1 labels them: A, B, C, D, and E. They are all part of growth. Today, the term is used mostly for A, the takeoff period, for

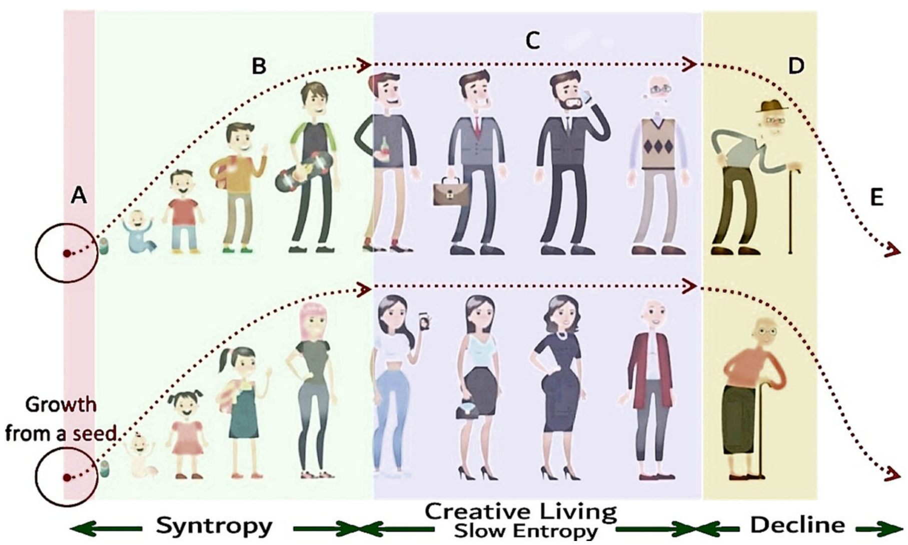

FIGURE 1 The normal life cycle is a general model for things that grow: stage (a) an explosion of new design expanding on a seed pattern in a protected place, (b) a period of growing up, maturing the immature form, learning about its new place, (c) a long life of creative engagement, (d) a mostly comfortable detachment from others, then decline, (e) weakening and approaching the end. Lifecycle Figures. Partial image credit: Getty Images ID:906819280 - paid use 2081946114 https://www.istockphoto.com/vector/life-stages-set-gm906819280-249892188. [Colour figure can be viewed at wileyonlinelibrary.com]

the economy, business startups, or the rapid formation of new lives in the egg or womb. The same slow-fast-slow pattern of emerging whole system design is also visible in the initial then maturing conceptual stages of creative imagination and the infatuations leading to lasting new relationships.

1.2 | The issues

This approach is a bit unsettling to scientists at first. It is about how uncontrolled systems work brilliantly by themselves. The view of "everything is connected" differs too. It is quite true that relationships have surprising remote connections that may be very meaningful. Still, "everything is connected" seems untrue if you consider the major separations of life. The concept of "homes" offers a model of how natural systems provide "separations with connections," as safe places with plentiful supplies gathered by venturing out. As for living cells, bodies, homes, institutions, and so forth, the openings are all regulated. So many connections with what is outside occur just once or are temporary or intermittent, and the only external continuity is with an environment, perhaps a multitude of systems and contexts, and some things become truly separated. That leads to gaps between internal and external relations and information and the great value of internal designs that retain lasting impressions of passing or intermittent environments. Of course, it also introduces potential hazards of internal designs being unresponsive to external change; our world suffers, making it unable to respond to environmental changes.

Given humanity's tremendous capability of making creative things, it is clear that humanity also misses things, such as leading to our current multiplying world crises (Henshaw, 2022d). Our ever-growing crises appear to come mostly from using our rules for profit to control previously self-controlled contexts, unaware of the disruptive impacts (Henshaw, 2020). Most valuable is how ironies help expose evidence of blindness to our contexts, pointing to valuable "gaps" in our information, many of which may be real openings to what lies hidden. The most important may be how the past 50 years of great effort to solve our world crises led to many of the biggest getting exponentially worse (Henshaw, 2019; Meadows et al., 1972, 2004; WEF, 2023).

The life curve of growth shows that our crises seem to come from our failure to move from stage A to B. Normal growth systems respond to signals of growing collisions with other lives and internal distress. Responsive systems would move to stage B, giving them the time to mature to care for their internal and external relationships and have rich lives.

Also important to notice is the many familiar examples from which to learn about these natural design patterns. In this short paper on general concepts, exploring examples needs to be the responsibility of the readers to use some of these ideas while thinking over their experiences and daily life. Everyone has had multiple startup successes and failures; they are great examples of what to respond to in creating things that work. For example, ironically designed to respond to maximize profit-making, our world economy also seems unresponsive to the needs of its survival. Why is that? The world economy is led mostly by well-educated, caring moms and dads who care about the future!

2 | ORIGINS

The trail of discoveries that led to these insights really came from the strangeness of humanity's moment of greatest achievement, it's pride in brilliant creativity becoming a mortal threat. The start of discovering that was noticing that the flows of natural change were creative design processes that mostly had no such difficulties, were not composed of numerical relations but of organizational designs.

Natural designs often seem as distinct as equations. However, they are animated by energy and organized using the emergent properties of the working organizations of their parts. So, one cannot specify their designs, and worst of all for current habits of science, it is no longer possible to trust natural systems not to change form, internally and externally, as they change contexts. It seems to call for reviving some of the language of nature that we already find very useful, like the most ancient roots of language and reliable nonverbal reading of circumstances that people still use many times a day. We learned those, still current, necessities of life as we evolved our unique evolutionary branch of the tree over the last million or more years.

What follows is a sampling of short "deep dives" into selected discovery methods that led to the work reported in this article on some very simple physics with remarkable uses for revealing complex processes, then discussions of illustrative cases.

3 | MATERIALS AND METHODS

3.1 | The physics

The physics for natural systems in context began with algorithms for reconstructing the continuities of time series data to help expose the organizational processes

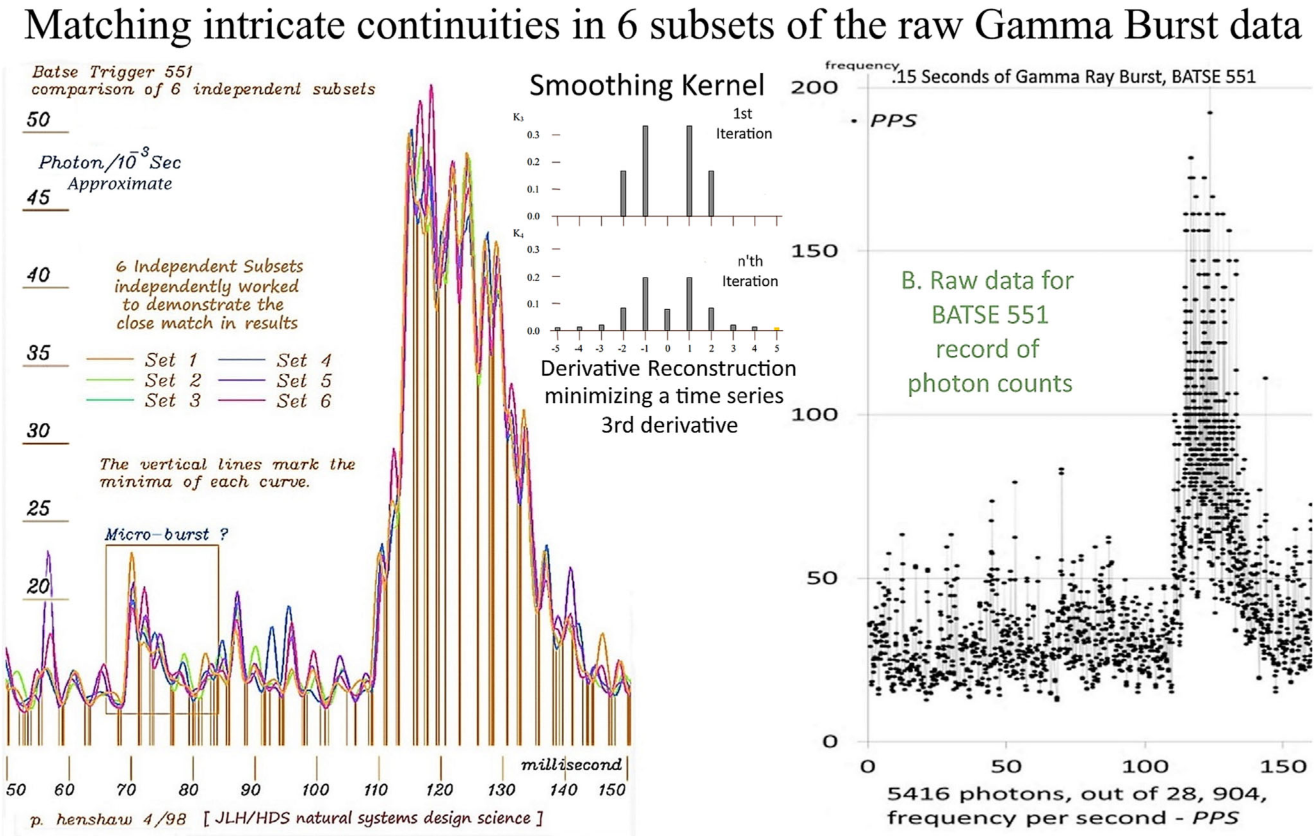

FIGURE 2 Dynamic details of the Gamma-Ray Burst BATSE-551: six divisions of the raw photomultiplier photon frequency data on the right into partitions of every 6th point, with derivative reconstruction for each, are on the left. The DR smoothing kernels (top centre) reduce the third derivative at the centre of five data point segments for each series (Henshaw, 2023). Gamma-ray burst photon rates—data from NASA: https://synapse9.com/pubData/Ba551.txt. [Colour figure can be viewed at wileyonlinelibrary.com]

and avoid representing nature using equations to fit data. Equations erase the natural dynamics and other evidence of the active systems. A spline curve is responsive to changing rates but in a more regulated way than nature. Figure 2 shows a derivative reconstruction (DR) for finding and verifying detailed shapes of a gamma-ray burst (Henshaw, 1995, 1999).[1]

On the left in Figure 2 is the DR reconstruction of the implied continuities, and on the right the sequential photomultiplier data . The validity of the reconstructed dynamics on the left varies with the coincidence of the shapes in the six subsets composed of every sixth point. The more coincident shapes indicate natural phenomena made possible to study with this presentation of the data. The DR works by scanning each data set and repeatedly adjusting the middle point of a series for continuity. The 3rd derivative (the "jerk") is set to zero at the midpoint of each 5-point segment to produce a "center-lightened" smoothing kernel with a hole in the middle rather than a "center-weighted" one. Repeating ten times widens the effect to produce each of the six separate curves compared.

3.2 | Implications of continuity

Energy conservation implies continuity in all natural processes. A theorem and discussions (Henshaw, 1995, 2010) show that only assuming that change cannot be instantaneous implies change must follow a gap-free developmental process. The scientific method teaches a search for the formula that processes fit, but not where the fixed formulas come from nor how the material processes that produce natural behaviors work. Understanding those processes is the focus of this article.

Process continuity changes the normal assumption from systems operating by their measures to operating by their processes. For continuous change, processes need flowing organization connecting their working parts, as seen in growth and elsewhere. Growth is a continuous transition between states with periods of regular

[1]NASA report https://imagine.gsfc.nasa.gov/science/objects/bursts1.html.

proportional change as the change regularly doubles in scale. The process might be a flexible reproduction that multiplies, like cell or pattern replication, as seen in many kinds of systems that exhibit a variety of peak scales.

3.3 | A guide for observation

Figure 3 guides inquiries into how emerging systems develop internally organized and environmentally coupled relationships. Image depicts natural systems developing by a flowing contagion of energy and organization concentrating processes, life working by itself, developing structures and connections. Recognizing where trends of regular proportional change (regular feedback) start and end helps direct one's observations regarding what is happening. Causation in natural systems also "has many parents." A fertile environment is full of existing designs and resources that make foundations and leave openings for what animates the internal design rarely, if ever, directly seen, but as in life, leaving trails of different kinds recognized as signs or signals of what else is happening.

That certainly does not open the worlds of self-contained systems but exposes just enough to see what others are dealing with and when responses are needed. What we all know best are changes in response, pressures, stability, and regularity in things we rely on. Those

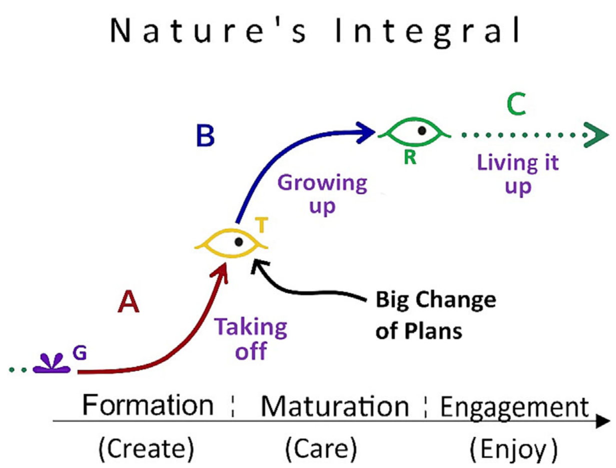

FIGURE 3 The typical S curve stages of natural organizational change: the stages of normal lives all begin with transformative events to start characteristic forms of organizational development, types: (a) formation, (b) preparation, and (c) engagement; begun respectively by events: G—germination, T—turn-forward, C—connection. The names suggest what to be ready for or to look for evidence of. In common use, there are other names for them. In turn, later events of decline generally follow (Henshaw, 2021, 2023). Nature's Integral—author's drawing. [Colour figure can be viewed at wileyonlinelibrary.com]

signals of system change can communicate volumes about what is happening. For example, finding connections between system transformations and diagnostic signs of system needs would often prompt supportive interventions. The exponential shapes of change, in particular, help identify opportunistic feedback processes certain to change form ahead and focus attention on contextual hints of progressively changing deterministic influences that preparations for which preparations need to be made (Henshaw, 1985, 2021). How any person, community, relationship, or economy responds to opportunity will be characteristically different from one another and from one situation to another. What one can expect to be the same is that all the transitions will occur by some path of continuity.

It is not a focus here, but it is also useful to give attention to the attraction of opportunities and the action of taking them, relating to the Yin and Yang of receptive/assertive and passive/active relations. The view here is that those become quite complex, and the passive can often dominate, such as with advertising, pheromones, or special offers. So, one should assume that initiating emergent changes might require both pushes and pulls. The best resource is either changes you can closely and repeatedly study or the familiar or special experiences one can recall graphically to repeatedly study and look for the kinds of situations and causations.

4 | RESULTS

4.1 | Centres

Growth starts with an animating central design for capturing local resources to expand as a central culture of relationships, forming an external world of connections. "Centres with connections" is nature's main design. The most useful analogy is a home with a family coming and going to make their lives. We all know many kinds of families and understand neighborhoods, groups of friends, businesses, and nations as families. The uniqueness of the cultures within homes comes partly from their independence. It may also come from each part incorporating the seed design of its origin, as in how a body's cells all contain the genome of the whole. Speakers of any language need images of how the whole works. Social and work groups also develop private languages, with each member carrying the group's unique way of connecting (Henshaw, 2021, 2022c). These unifying features of whole systems hint at their possible genuine holographic design, giving them their holistic properties, seeming to imply active molecular orders of kinds to perhaps explore.

Startups without a protected place to start generally do not survive. Hence, the first job of growth systems that will survive is to find safe ways of finding new resources as they grow in strength and can better care for themselves. Most survivors come from resourced and protected places they can freely colonize. The big change in plans comes when the contextual limits of that free-growth period run out. To survive, a radical change in direction comes from the pushes and pulls of holding the emergent life system together as its external resources dramatically change, such as at birth, upon graduation, or other radical changes of context. Such "coming of age" points of readiness for new challenges are then seen, as in "calms before the great storms" and new species punctuating the equilibria from hidden places (Gould, 2007).

4.2 | A plankton speciation curve

Figure 4 shows a roughly S-shaped curve of a plankton evolution, stable before and after, connected by dramatic fluctuations. In this case, it is an unbroken million-year event, the bumpy plankton developing from the smaller, smooth one. One could photograph the original samples studied by Malmgren et al. (1983) or collect new ones from the deep-sea cores to show the changes in great living detail with an animated film.

The slow-fast-slow trend between levels of stability is clear, but what explains the remarkable irregularity? Successful smooth growth also starts by destabilizing and restoring a stable state with a new form. However, the extreme data variation hides the periods of regular progression between the exposed peaks by reducing the data's local irregularity. That implies that the growth pattern is probably more "trial and error" of accumulative innovations rather than random error.

That seems likely to apply to evolution because growth is necessarily an energetic exploratory process, its germ of design having no resources and to develop needing to selectively use what comes its way or move in ways to find it. That is also why the growth of organisms would replicate the germinal parts of their whole evolution, adapting as they extend the original germ of their animating design. That process also seems to characterize very often the eventually successful struggles, such as for people, businesses, social movements, and communities, making intermittent breakthroughs that fill the remaining needs of the whole as it evolves its design (Henshaw, 2019, 2021), competitive struggles of the type being of the "try, try, again" variety.

This kind of "goal-directed struggle" seems at least remotely plausible as successive adjustments to a new design. To adaptively develop improving designs, growth

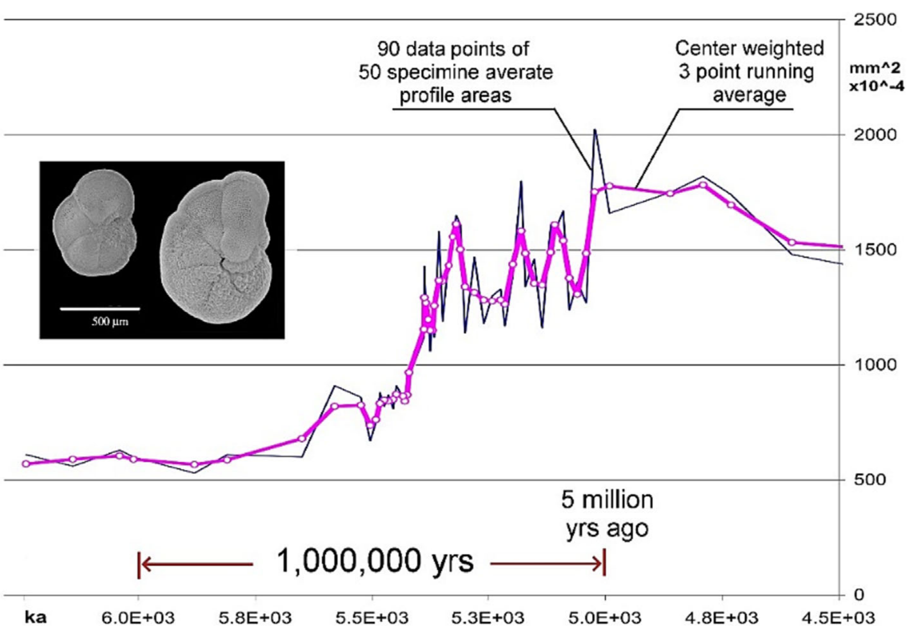

FIGURE 4 Evolution of the small *Globorotalia pleisotumida* plankton to larger *Globorotalia tumida*: (Henshaw, 2007, 2021; Malmgren et al., 1983). The evidence of large-scale continuity (rather than random walk) is from light smoothing reducing the double reversals (flip-flops in direction) by ~75% for the *G. tumida* data. The strong effect shows that it was mainly local noise removed, not global, validating the light smoothing trends. For random series, fluctuations are little reduced. Each of the 58 data points represents the average of the profile areas of about 50 specimens from an Indian Ocean deep-sea sediment core (Henshaw, 2021, 2023). *G. tumida* plankton dimensions, Data from B. Malmgren: https://synapse9.com/pubData/Malmgren%20Data.xlsx. [Colour figure can be viewed at wileyonlinelibrary.com]

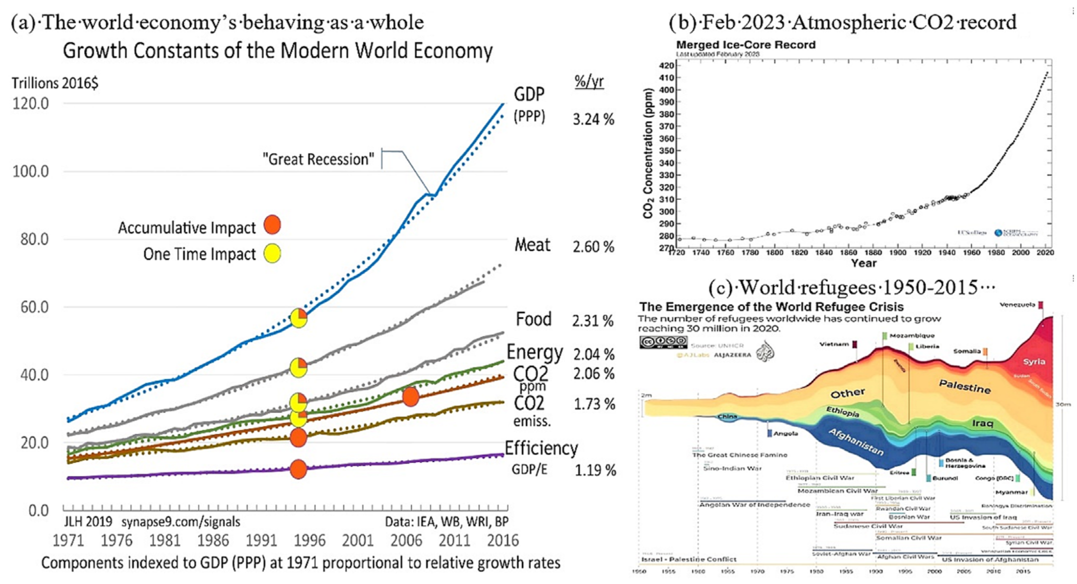

FIGURE 5 A broad view of the state of the world: (a) the constant growth coupling of world economic factors, (b) the *unwavering* compound growth of atmospheric CO_2 that drives climate change, and (c) the similarly explosive world refugee crisis (Henshaw, 2021, 2023). a.1—Coupled World Economy Impacts GDP. GDP (PPP) 1971–2016 IEA PPP data extended with recent World Bank data: https://data.worldbank.org/indicator/NY.GDP.MKTP.PP.CD?end=2016&start=1990. a.2—World economic energy use 1965–2017 from BP: https://www.bp.com/en/global/corporate/energy-economics/statistical-review-of-world-energy/downloads.html. a.3—Modern CO_2 Emissions—1971–2016: IEA CO_2 data & WRI CO_2 emissions: https://www.wri.org/resources/data-sets/cait-historical-emissions-data-countries-us-states-unfccc. a.4—Historical CO_2 Emissions 1751–2013: US DOE DOE CDIAC data: https://cdiac.ess-dive.lbl.gov/ftp/ndp030/global.1751_2014. a.5—World Meat Production—1961–2016: Rosner—OurWorldInData: https://ourworldindata.org/meat-and-seafood-production-consumption. a.6—GDP World Food Production—1961–2016: FAO: http://www.fao.org/faostat/en/#data/QI. b.1—Atmospheric CO_2 Record. Scripps Institute combined ice core CO_2 ppm to1958, and average Mauna Loa and Antarctica mountain top from 1958. http://scrippsco2.ucsd.edu/data/atmospheric_co2/icecore_merged_products. c—World Refugee data. Al Jazeera: https://www.aljazeera.com/news/longform/2022/6/16/visualising-the-fastest-growing-refugee-crises-around-the-world based on UNHCR data from: https://www.unhcr.org/global-trends. [Colour figure can be viewed at wileyonlinelibrary.com]

would need to explore resources to use and adjust their process for capturing more, using exploratory abilities to find the combinations that work. That has to occur both at first, as new systems emerge, and later, as systems mature their stable advanced designs. Skillful search then appears to be a general property of life.

4.3 | An economy unable to respond to change

In Figure 5, we see three different ways the world economy behaves as a whole;

a. The economy's GDP-related impacts and resource demands move in constant proportion.
b. The 240-year atmospheric CO_2 growth curve, starting in 1780, accelerated its exponential growth rate after WWII, especially as efforts began to slow it down.
c. The still-growing world refugee and failed nation crisis that started in 1960

What we have understood and increasingly hear about humanity's ever-accelerating environmental disruptions and damage to earth's resources is clear. Still, there is relatively little said of why people would do things so much in our disinterest. Life and growth are always risky, like growth with its invariable explosive startup to something new. We then just do not seem to know what to do. So, the homework is to ask why we seem to be the third highly successful civilization in a row that might end in collapse. The first was the late Bronze Age east-Mediterranean regional collapse, ending the apparent first true "regional league of prosperity."[2] Then came Rome's rise and fall,[3] and now our current world civilization. The key step towards understanding these enormous uncontrolled systems is to carefully survey growth's various kinds, processes, and outcomes. Because energy conservation does not allow instantaneous change, all energy uses need to be developmental,

[2]https://en.m.wikipedia.org/wiki/Late_Bronze_Age_collapse.
[3]https://en.wikipedia.org/wiki/Ancient_Rome.

implying the need for flowing organizational growth. Experience shows evidence of them is generally observable except at extremely small and large scales.

4.4 | A city regenerated by a change of heart

One of the more remarkable examples of how growth works is how New York City recovered from the 40-year drug addiction/crime wave from the 1960s to the 90s. Figure 6 shows the carefully smoothed crime rates for the four counties (boroughs) of New York. You can see how the colored curves thread neatly through the irregular data points plot and the times when the curves turn and move together.

The highest peak is in the summer of 1990 when the trends all abruptly turned down, signaling the end of the raging crack culture that had caused New York to become such a fearful place and then became a free and open place for maybe the first time. The main interest here is (1) how the varied curves became unified after 1990 and (2) that no one noticed it. Instead, nearly every agency and community active in overthrowing the scourge later claimed primary credit for the lasting transformation that did happen!

One particular good fortune was the emergence of Hip Hop as a separate culture of DJs, dancers, graffiti artists, muralists, and storytellers that only matured as ending the crack epidemic became a common cause. So, in the end, the epidemic was overcome by the care and commitment of the whole city, which transformed it as a whole, too, from its long period of being a dangerous place to become fun, open, and free, remaining largely so now 30 years later, no wars! So, it does seem horrible; entrenched fixations can be changed if you work hard and have your feet on the ground.

5 | DISCUSSION

5.1 | Context blindness

Understanding observation is important to a new science based on observing things in context. There is so much we cannot know. Our long survival on earth means we know *something*, which proves there *are* things to know. But we have also separated many things we think we know from the meanings of their contexts. It is reconnecting abstract rules with their contexts that are needed to unblind our use of them. Contexts are how local environments work and where their systems of locally material relationships come from, each a hidden world of local and remote relationships. A "newcomer" is blind to local customs, and so is a student entering a new year in school. We are also blind to the mental contexts of others and are often "out of the loop" among friends or colleagues. Humans are generally blind to how they are perceived and who others are. So, they and their social groups are free to make up "tall tales" about themselves and others. That they adopt these conflicting stories as real is very unreal, though, a double blindness. Many of

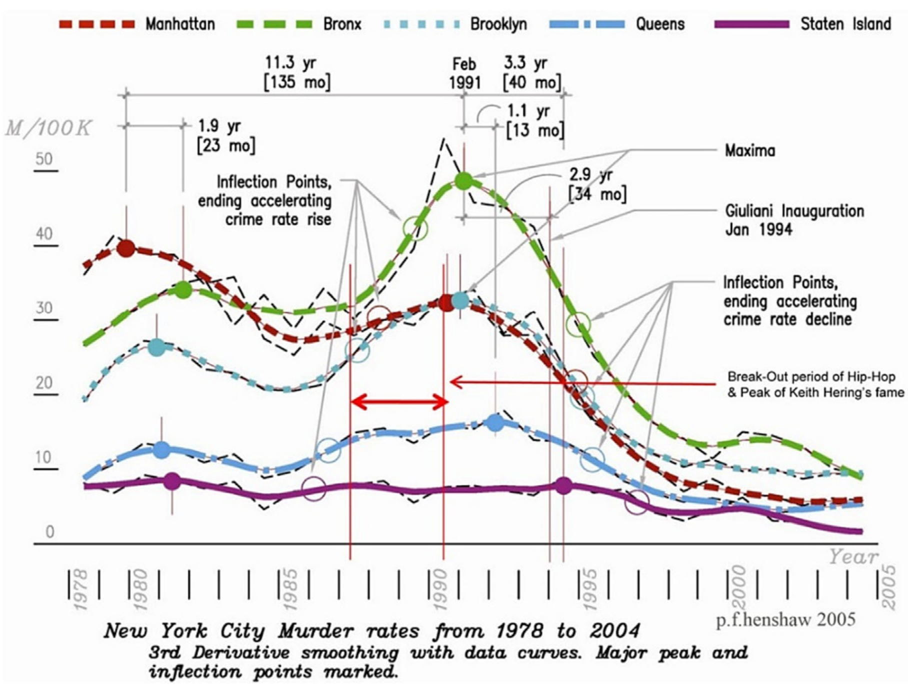

FIGURE 6 Ending of the 40-year new York City drug & crime cultures wave: the simple story is of an almost operatic drug dealing "gang banging" show-off ghetto youth-gang crime wave that got the whole city to join in doing everything possible to end it in the end cured it seems by love (Henshaw, 2021, 2023). A City Regenerated by A Change Of Heart. NYC murder rates by borough from NY State murder rates by county. https://synapse9.com/pubData/NYS-murder_county.xls. [Colour figure can be viewed at wileyonlinelibrary.com]

today's extremely misleading stories that people make up and circulate about each other seem driven by the common source and also connected to everyone's escalating struggles, pressures, and disruptions today. People blind to the source are deservedly fearful and angry, seeing no direct threat to respond to. The apparent common cause is the whole economic system's push beyond the disruptive limits of both human and natural systems. Usually, responding to symptoms allows things to heal, but despite great global efforts, they are not healing but still growing for us.

How natural systems develop by growth from a small start is usually not well understood. Growth gives them internalized designs separate from the outside world, coordinated as a whole, only existing in the whole, and so not possible to view. How our bodies grow from a cell, or businesses from an idea creates their individuality too. Those exclusive interiors create private homes for their cultures, like those for any family home, with both the great advantages and liabilities of a universal separation of interior worlds (Figure 7).

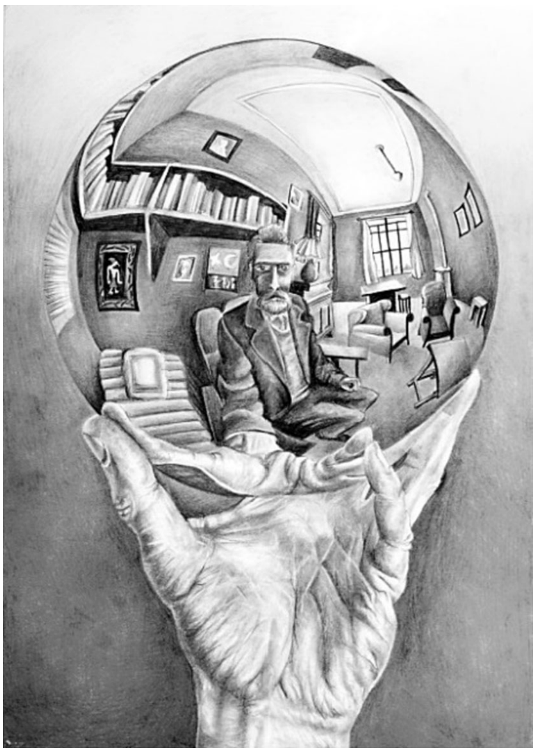

FIGURE 7 Escher's hand with reflecting sphere: the irony expressed in the image seems to be that however one tries to look at the insides of something else, all you often can find are reflections of one's self, as the interiors of nature are remarkably well hidden. That the effect may be due to something simple, like the internal relationships referring to themselves, should not detract from the mysterious and amazing things they do (Henshaw, 2021, 2023).

6 | CONCLUSION

The preceding deep dive into a few new ways to study how nature's hidden designs work independently of our models. Hopefully, it's also the beginning of how science can compare our rules for nature with how nature creates her own, but an important start. When these confusing conflicts of meaning and reality arise, they are often curable by exposure to the contexts people are dealing with. In 2007, Elinor Ostrom shared the Nobel Prize in Economics (Ostrom, 2009) for defining ways to introduce people to how things work in the local worlds they need to care for. We need major global efforts to learn enough about how our worlds work to manage ourselves for survival. The profit and loss statements show accelerating profit from a rapidly accelerating global environmental collapse. So, where to invest that could help counter that is in removing our blinders, something we can all do.

Hopefully, this work will help others continue well-grounded studies of how exploratory natural systems behave. They do make lots of rapid changes of direction, for example. The greatest difficulty will likely be finding a comfortable language for discussing it. Languages grow like branching trees with good roots. This work, too, has only been successful because the earliest versions from the 70s and the technical methods developed in the 80s and 90s held up. That provided a solid footing for returning to study the roots of meaning and associations from which all languages developed, the shared root word meanings, really syllable meanings, shared by the wide community of Indo-European languages. Those came from the Stone and Bronze Ages, well before writing, language seen only in the commonality of roots of all the many daughter languages that spread from that origin (Henshaw, 2021, 2022a).

ACKNOWLEDGEMENTS

The chance to contribute to solving great puzzles is a privilege that comes from lucky discovery, great exposure to the contexts in which they arise, and finding oneself in a responsive community. So, I am first grateful for the multi-generation family of caring scientists and their contributions to the sensibility of the 19th and 20th-century professional worlds. To discover departures takes a clear view of the continuities. Having a free 40 years or so to play with it, moving from one side to another, is another rare privilege to be very grateful for. The rarest gift was the chance to blend physics and from St Lawrence with unique architecture and landscape at Penn, in long discussion with good friends in an exciting, unquestionably historic time, and the ISSS for being interested.

DATA AVAILABILITY STATEMENT

See web page (Henshaw, 2023) https://synapse9.com/_ISSS-23/Henshaw-2023-EGS-SOSC-source-refs.htm.

ORCID

Jessie Lydia Henshaw https://orcid.org/0000-0001-6341-5367

REFERENCES

Boulding, K. E. (1953). Toward a general theory of growth. *The Canadian Journal of Economics and Political Science/Revue Canadienne d'Economique et de Science Politique*, *19*(3), 326–340. https://doi.org/10.2307/138345, https://www.jstor.org/stable/138345?seq=1

Gould, S. J. (2007). *Punctuated equilibrium*. Harvard University Press.

Henshaw, J. L. (1978). Natural orders in convection and direct observation skills for natural climate design. Author field study report. https://www.synapse9.com/pub/1978_NatOrdersConv-Henshaw.pdf

Henshaw, J. L. (1985). Directed opportunity, directed impetus: new tools for investigating autonomous causation. In *Proceedings of the Society for General Systems Research*. Intersystems Publications. http://www.synapse9.com/pub/1985_DirOpp.pdf

Henshaw, J. L. (1995). Reconstructing the physical continuity of events. An author research report on analytical methods developed. https://synapse9.com/pub/ContPrinciple95.pdf

Henshaw, J. L. (1999). Features of derivative continuity in shape, International Journal of Pattern Recognition and Artificial Intelligence (IJPRAI link to article), for a special issue on invariants in pattern recognition, V13 No 8 1999 1181–1199. Online - http://www.synapse9.com/fdcs-ph99-1.pdf

Henshaw, J. L. (2007). Flowing processes in a punctuated species change, G. *pleisotumida* to *G. tumida*, displaying feedback-driven evolution, pending resubmission. https://www.synapse9.com/pub/GTRevis-2007.pdf

Henshaw, J. L. (2010). The energy physics of continuity in change—draft pending revision. https://www.synapse9.com/pub/2010_drtheo.pdf

Henshaw, J. L. (2018). Systems-thinking for systems-making: Joining systems thought and action. *Systemic Practice and Action Research*, *32*(1), 63–91. https://doi.org/10.1007/s11213-018-9450-2

Henshaw, J. L. (2019). Growth Constant Fingerprints of Economically Driven Climate Change: From 1780 origin to post-WWII great acceleration. Draft pending revision. https://synapse9.com/drafts/2019_12-GrowthConstFingerprintsOfCC-preprint.pdf

Henshaw, J. L. (2020). Top 100 world crises growing with growth. Author experimental list. https://www.synapse9.com/_r3ref/100CrisesTable.pdf Accessed 04/13/2021

Henshaw, J. L. (2021). Understanding Nature's Purpose in Starting all New Lives with Compound Growth - New Science for Individual Systems. *ISSS 2021 Proceedings*. https://journals.isss.org/index.php/jisss/article/view/3911

Henshaw, J. L. (2022a). Language as a knowledge tree for systems in context. YouTube recording of ISSS talk by the author. https://www.youtube.com/watch?v=Xd3aLWMztR0

Henshaw, J. L. (2022b). Etymology of 'physis.' Etymonline. The ancient Greek term for nature, from the Greek noun φύσις, 'phusis,' meaning 'growing,' 'becoming itself,' from φύω, 'to grow,' 'to appear,' all clearly at odds with the derivative term we know for science, 'physics.' https://www.etymonline.com/search?q=physis

Henshaw, J. L. (2022c). Holistic Natural Systems - Design & Steering: Guiding New Science for Transformation. *International Society for the Systems Sciences* July 2022 Jul 09.

Henshaw, J. L. (2022d). The Top 100+ World Crises Growing with Growth. JL Author 2021 science report. https://synapse9.com/_r3ref/100CrisesTable.pdf

Henshaw, J. L. (2023). Figure and Data Source References. https://synapse9.com/_ISSS-23/Author, 2021-2023-EGS-SOSC-source-refs.htm

Keynes, J. M. (1935). The general theory of employment, interest, and money. Harcourt Brace Jovanovich. http://synapse9.com/ref/Keynes-ebook-TheGeneralTheory.pdf

Malmgren, B. A., Berggren, W. A., & Lohmann, G. P. (1983). Evidence for punctuated gradualism in the Late Neogene Globorotalia tumida lineage of planktonic foraminifera. *Paleobiology*, *9*, 377–389. https://doi.org/10.1017/S0094837300007843

Meadows, D. H., Meadows, D. L., Randers, J., & Behrens, W. W. (1972). The limits to growth: A report for the Club of Rome's project on the predicament of humankind. A Potomac Associates Book. https://doi.org/10.1349/ddlp.1

Meadows, D. H., Randers, J., & Meadows, D. L. (2004). *Limits to growth: The 30-year update*. Chelsea Green Publishing.

Ostrom, E. (2009). A general framework for analyzing sustainability of social-ecological systems. *Science*, *325*(5939), 419–422. https://doi.org/10.1126/science.1172133

WEF. (2023). The Global Risks Report 2023. World Economic Forum. https://www.weforum.org/reports/global-risks-report-2023/

How to cite this article: Henshaw, J. L. (2023). Emergent growth of system self-organization and self-control: Contextual system design, steering, and transformation. *Systems Research and Behavioral Science*, 1–10. https://doi.org/10.1002/sres.2981