

Systems, Cycles, and Developmental Pathways

Alan Fogel

University of Utah, Salt Lake City, Utah, USA

Key Words

Bifurcation · Biological rhythms · Butterfly effect · Developmental systems · Dynamic systems · Feedback · Transition

The painting 'Nighthawks' (1942) shows three people sitting at the counter of a city diner. It must be late at night because no one is on the street except the viewers. We look into the diner at the subjects, incased in plate glass tinted green and yellow. It was one of many paintings in which Edward Hopper probed human loneliness and alienation in postdepression American society. Normal folks would have been home in bed, finding the rest they needed to go to work early or get the kids off to school. Night people didn't belong in that daylight world. They resisted belonging. It was their choice.

The night is for rest and relaxation. Anything else is sinister. There was a time when the moon had evil powers that stirred the loins of animals and awakened animal-human vampires and werewolves. The moon was female. Everyone knew that witches came out at night.

In their paper on morningness and eveningness, Cofer, Grice, Sethre-Hofstad, Radi, Zimmerman, Palmer-Seal, and Santa-Maria, provide a convincing explanation for why night people are at odds with the mainstream. Work and school, those places where the First World measures the social worth of its citizens, begin in the early morning. Families often have to get their children awake, fed, dressed, and alert by 7 a.m.

Evening types (E-types), when asked to recall their childhood rituals of preparation for the day, reported more conflicts with parents than morning types (M-types). E-types were more likely to be disaffected from school, to engage in night activities that resulted in norm violations and health risks, and to have abused tobacco and alcohol. M-types reported a more propitious developmental trajectory because they fit better with socially normative daily rhythms. M-types were less flexible in their rest and work cycles,

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Alan Fogel, Department of Psychology
390 S. 1530 E., Room 502, University of Utah
Salt Lake City, UT 84112-0251 (USA)
Tel. +1 801 581 8560, Fax +1 801 581 5841
E-Mail alan.fogel@m.cc.utah.edu

however, so they suffered more when family and work schedules became erratic or if they had to do evening shift work.

I used to take credit for my success in school and for the work that brought me to a reasonably successful career as a researcher and university teacher of developmental psychology. After reading the paper by Cofer et al., I realize that at least some measure of that success can be explained by my fit to the norms of family, school, and work. I am and always have been a morning person. According to Cofer et al., I probably became an M-type while a womb resident, absorbing as much of my mom's adrenal-corticoids that my genetic rhythmical propensities could handle. After I was born, these fetal patterns sought as much daylight as possible – there was plenty of it in Miami where I was born – and my mother reports that by 6 months I would lie in the porch shade on sunny mornings listening to radio music.

This early start on my life's happy course was something that my genes and my melatonin-producing organs no doubt chose but it was long before anything like conscious choice or psychologically informed decision making was available to me. My ability to work hard in school was made possible by decisions my body had made long before I was a me, before I could take any responsibility, much less credit, for them.

My best friend during my childhood years was less fortunate. Joseph and I played endless hours of stickball, football, and basketball in the long tropical afternoons. I was left to myself in the mornings. He was at his most creative at night when he launched us into risky ventures like tipping over garbage cans in the alleys or peeping into the bathroom windows of neighborhood women. Our working class block had no street lights. On dark nights, my friends and I would hide in the bushes and watch Joseph run in front of oncoming cars whose drivers couldn't see him until the last minute and were forced to slam on their brakes yelling, angry.

Joseph would rather listen to the radio late at night than to study. I don't recall that he had any career ambitions. After my family moved out of the neighborhood, Joseph and I saw each other infrequently. He completed high school and enlisted in the army as a military policeman just as the Vietnam War was getting underway. I saw him only a few more times. He relished telling stories of the Saigon night scene, his involvement with prostitutes and drug deals, and I was never sure whether he was out there to enforce or to participate. I had no experience with these things but I felt superior. I chose to excel in school. He chose something darker. The last time I saw him was in the early 1970s. He was a park ranger at the fringes of the South Florida Everglades wilderness. There were violent dreams, he said, and I noticed the obsessive talk and behavior of some posttraumatic stress victims.

It is possible that Joseph was no more responsible for his life path than I. The early preferences for morningness-eveningness of our bodies attracted us to the light or the dark, allowed different aspects of our common lives to make inroads through our consciousness. We lived on the same block, shared similar interests, spent all our free time together, but eventually we diverged from each other. By high school it was apparent to both of us that we were going in completely separate directions.

The paper by Cofer et al. highlights historical trends in the field of human behavior. During the middle part of the 20th century, when Joseph and I were growing up, North American psychology was dominated by prevailing cultural beliefs about the 'self-made man' – that the individual could transcend biology with enough effort and determination. To be fair, this view of the individual was a reaction to late 19th and early 20th century models of biological determinism, the same models that led to slavery, the

KKK, and the Holocaust. Since the 1980s, however, many behavioral scientists have been trying to reintegrate biology with experience. There has been a gradual erosion of the nature-nurture dichotomy, indeed of all types of Cartesian dualism such as mind and body, thought and feeling.

My own particular pathway through this change has been influenced by the dynamic systems theory. The research of Cofer et al. is a beautiful example. According to dynamic systems thinking, behavior emerges when the individual enters into a relationship with the environment. Walking, for example, emerges when rhythmical movements of the legs encounter a particular type of surface in a gravitational field [Thelen and Smith, 1994]. Take away any part – the movements, the surface, or the gravity – and you won't get any walking. Emotions emerge when our relationships with the environment are facilitated or thwarted. Without those relationships, emotions are inconceivable [Fogel et al., 1997].

The dynamic systems perspective views developmental pathways as emergent from what happens when the individual-environment system is set in motion through time. At any point in time, an individual may have a particular way of engaging with the environment, like having a simple preference for morningness or eveningness early in infancy. The M-type will be around things that occur in the morning and these things will become part of that individual's pattern of relationship with the environment. My private musical mornings allowed my mother more free time so she was happier to engage me when I was ready. I didn't keep her up late at night. She read to me and I became interested in books, and so on.

This is an example of the so-called *butterfly effect* in which small propensities that occur early in the life of the system may become amplified over time, a process known as *positive feedback*, as one tiny thing leads to another tiny thing until a much bigger thing is created. At some point, two systems that looked very similar for a long period of time – Joseph and I until high school – suddenly diverge from each other. This is an example of a *bifurcation*, which occurs as developmental trajectories diversify during periods of developmental transition [Lewis, 1995]. Bifurcation often occurs in response to some change of the systems' condition, known as *control parameters*. In our case, the control parameter was going to high school, when we were required to work and study more in order to succeed. I did and he didn't. Earlier differences between us that had been less apparent became salient and shifted us rather suddenly into different life pathways. Sudden shifts of trajectories are known as *nonlinear transitions*.

In the dynamic systems perspective, causality is shifted from the individual to the system. Joseph didn't blow off high school because he was lazy, which I thought at the time, buying into the cultural worldview. That pattern of relationship between him and school emerged because of the amplification of positive feedback in the system, the inertial forces of the system dynamics. Causality is also taken away from the environment and from biological propensities. School officials dealt harshly with Joseph but that was partly related to what he brought with him and to that same cultural ethos of blaming the individual for 'failure'. In dynamic systems, no single element can be taken out of the system and given causal status. Even control parameters, which seem to have the causal effect of shifting the system into a bifurcation, are themselves part of the system and may not have that effect for another individual at another time.

Not everyone will have their life trajectories shaped significantly by morningness or eveningness. Only 32% of the sample of college students studied by Cofer et al. could be unambiguously classified as M- or E-types. This may mean that their early propensi-

ties either never stabilized in utero or that they were not amplified by any developmental process. The dynamic systems perspective takes us away from the study of population statistics that view cause and effect in terms of the proportion of variance explained. It focuses our attention instead on the local ontogenetic conditions under which early propensities become amplified, stabilized, or deleted from the system, what is known as a *developmental systems* or *developmental process* approach [Fogel, 1993; Oyama, 1985].

The work of Cofer et al. also brings us back to our roots in our bodies and the connection of our bodies to the earth. In their opening paragraph, they quote Terman and Hocking's [1913, p. 207] remark that biological rhythms are 'stamped into the organism by the movement of the planet'. This and other similar turn-of-the-century research was perhaps inspired by the growing science of ecology and also perhaps by a budding interest, found in some sectors of educated European and American societies, in ancient belief systems. Archeologists were uncovering cultures that thrived because of their close connection to the cycles of nature. Some people were turning to eastern mysticism, astrology, and other lost forms of spirituality, a trend taken as a serious psychological phenomenon by Jung [1950].

These beliefs are having a renaissance once again at the turn of the millennium, as ecology, psychology, and spirituality enter the New Age. There is no denying that the work of Cofer et al. is a product of this cultural revolution and they ought to be encouraged to follow their intuitions, amplified by these cultural currents. We should take seriously their suggestion, for example, to give children more flexibility in their choice of morning or afternoon schooling as a simple way to reduce conflict in the family and open successful developmental pathways to everyone.

Perhaps we may come back to a view, substantiated by the power of a science of developmental process, that the sun and moon matter to our lives. Maybe the orbs of the planets and the pulsing of the stars matter too but their effects are more complex, more subject to bifurcations, their history less easy to trace through developmental time. The earth and her cosmos imprints us early so that we may live in harmony with her cycles. Most of us live in cities. We no longer plant and harvest. We have come to take winter and summer less seriously in our climate-controlled dwellings. But the earth insists that we pay attention. We dare not defy gravity without danger. We kill off native species and defile the air and water at our own risk. We threaten our health and our sanity by ignoring when our bodies cry out for rest. The research by Cofer et al. is an important step towards locating developing persons in their terrestrial home.

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