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Fetal Speciators: The Neurogenetic Feedback Hypothesis

Brent Logan

Prenatal Institute, Seattle, USA

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Abstract: This paper is a slightly modified chapter from *Our Replacement Species: How Neurogenetic Technology is Improving Humans*, a forthcoming companion volume to *Learning Before Birth: Every Child Deserves Giftedness*. The latter describes the history, theory, development, application, and outcomes of prenatal enrichment from curricularized sonic variants in the maternal bloodpulse – which through auditory driving of protoalpha rhythm indicating nascent dataprocessing stimulates the earliest neural growth – benefitting over 100,000 children born worldwide since 1987 by mitigation in normatively massive brain cell death concluding full-term gestation. The antiapoptotic thesis posits a macroevolutionary mechanism induced through substantial ontogenetic cognitive and behavioral gains recoding genetic instructions, thus reflecting the neoLamarckian dynamic whereby a phylogene adapts generationally to extreme environmental morphosis, in this instance both demographic as well as memetic forces countered by a unique cultural intervention.

Zusammenfassung: *Fötale Artendifferenzierung: Die neurogene Feedback-Hypothese.* Dieser Beitrag ist eine wenig veränderte Fassung eines Kapitels aus einem kommenden Buch „Our Replacement Species: How Neurogenetic Technology is Improving Humans", das gemeinsam mit dem Buch „Learning Before Birth: Every Child Deserves Giftedness" erscheinen soll. Das letztere beschreibt die Geschichte, die Theorie, die Entwicklung, die Anwendung und die Ergebnisse der vorgeburtlichen Förderung durch kurrikulare akustische Variation der mütterlichen Herztöne. Ein komplexer werdendes Programm stimuliert die Entwicklung des Nervensystems von Anfang an. Hiervon profitierten 100 000 Kinder, die weltweit nach 1987 geboren waren. Der wesentliche Wirkfaktor war dabei die Abschwächung des normaler Weise massiven Zelltodes am Ende der Schwangerschaft. Die These, daß es möglich ist, diesen Zelltod zu unterbinden, behauptet einen makroevolutionären Mechanismus, der durch substantielle Fortschritte der ontogenetischen, kognitiven und verhaltensmäßigen Entwicklung die genetischen Informationen in einer neuen Weise kodiert. Das würde einen neolamarckischen Vorgang bedeuten, wodurch sich das

Correspondence to: Brent Logan, Ph.D., Director, Prenatal Institute, P.0. Box 77345, Seattle, Washington 98177, USA, email brentlogan@springmail.com, www.brentlogan.net

Genom an eine extreme Veränderung der Umweltbedingungen adaptieren müßte. Demographische Kräfte und tradierte Prägungen würden mit einer einzigartigen kulturellen Intervention zusammentreffen.

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... modification of already existing developmental processes provide the most readily available route for evolutionary change. Once a modification becomes established, it in turn makes acceptance of changes in certain directions more feasible than others. But if existing developmental patterns constrain, they also provide opportunities for rapid evolutionary departures when selection pressures on morphology change because of their dissociability and apparently simple genetic controls.

Rudolf Raff and Thomas Kaufman
Embryos, Genes, and Evolution:
The Developmental-Genetic Basis of Evolutionary Change, 1983

When proposing several years ago a process capable of urgently reshaping the human phylogene, I realized it could only commence through culturally acquired characteristics at the ontogenetic level – with individuals – my *macroevolution theory* diagrammed in Fig. 1. Any speciational recasting, primarily mutation among the higher taxa producing an offshoot or overhaul, has for not quite a century been identified with some hyperDarwinian label, but the exact means for saltational or major metamorphosis remains even among academic gatherings in less than decorous dispute (despite D'Arcy Thompson's transformed coordinates theory anticipating much, and his 1917 morphological exegisis prefigured – though densely – by Descartes). Rudolph Raff, in *The Shapes of Life*, has succinctly stated the challenge:

The central problem is finding the mechanisms that connect genes and developmental processes to morphological evolution.

Moreover, for a Lamarckian interpretation the particulars were wholly lacking, as Arthur Koestler recounts in Paul Kammerer's tragic tale, *The Case of the Midwife Toad*:

... to all appearances, Darwinism offered a 'modern' mechanistic explanation of evolution, which Lamarckism was unable to do. The discovery of Mendel's Laws, the statistical approach to genetics, and finally the breaking of the 'genetic code' imprinted on the chromosomes, seemed to be as many confirmations of Darwin's prophetic foresight. The mechanism of evolution which he had proposed may have been crude, in need of modifications and refinements; but the Lamarckians could offer no mechanism at all which would be in keeping with modern biochemistry. Random mutations in the chromosomes, triggered by radioactivity, cosmic rays, excessive heat or noxious chemicals, were scientifically acceptable as a basis on which natural selection could operate. But no acceptable hypothesis was forthcoming to explain how an acquired bodily or mental feature could cause an alteration in the genetic blueprint, contained in the micro-structure of the chromosomes in the germ-cells. That evolution could operate through a process which permits the offspring to benefit from useful changes in its forbears was an idea that might appeal to common sense, but to the scientist at his microscope it was technically unimaginable and had to be rejected.

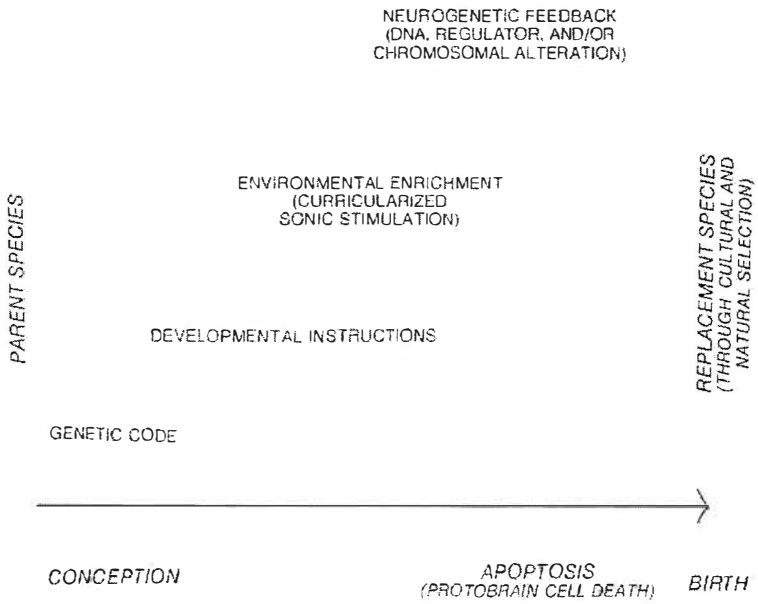

Fig. 1. Macroevolution schema.

At least it is agreed that group revision would have to commence more modestly than the whole, and a few punctuational equilibrists believe the cause singularly so: One substantially advantaged individual could transform its generic peer, a lone pebble setting the whole pond in motion – an audacious but not entirely unprecedented promulgation by Richard Goldschmidt:

> . . . the potentialities of individual development are among the decisive factors for heredity change and therefore for evolution.

With caution, Richard Dawkins broaches the possibility of emplacing potential:

> It is undeniable that some acquired characteristics are improvements, and it is theoretically conceivable that the inheritance mechanism might somehow discriminate the improvements from the injuries.

Eva Jablonka and Marion J. Lamb go further, stating that molecular biology now reveals how earliest influences prove heritable through *epigenesis*, the developmental implementation of DNA directives which during neurogenesis remain open to overt suggestion: "The importance of epigenetic inheritance is beyond doubt." Edinburgh University embryologist and geneticist, Conrad Waddington, introduced the term *canalization* to describe the means whereby an environmental pressure upon the individual becomes a naturally selected feature by way of its *phenocopy*, optimizing the particular organismic niche response for genetic successors:

> . . . developmental reactions, as they occur in organisms submitted to natural selection, are in general canalized. That is to say, they are adjusted so as to bring about one definite end-result regardless of minor variations in conditions during the course of the reaction.

This "buffering of the genotype" is a direct response to altered conditions, establishing a new homeostatic or symbiotic dynamism:

> ... canalization is a feature of the system which is built up by natural selection; and it is not difficult to see its advantages, since it ensures the production of the normal, that is, optimal, type in the face of the unavoidable hazards of existence.
>
> The particular application of this general thesis which we require in connexion with the "inheritance of acquired characteristics" is that a similar canalization will occur when natural selection favours some characteristic in the development of which the environment plays an important part.

Hints like these irresistably apply science by exorcising the academic inertia which afflicts pure theory, spurring researchers with evidentiary pursuits, and invigorating engineers to utilitarian translation; but an explanatory means must underlie each aspect of the investigation: Since apoptosis, notably fetal brain cell death, constitutes in our cornerstone code an adjustable instruction for fulfilling new ecological niche requirements – therefore adapting those cerebral faculties which facilitate function, capacitance, and character – would its early countermand send a looped message through what could be termed *neurogenetic feedback* to subtly yet, from benefit's perspective, substantially revise the recipe (no matter its original ingredients, in turn overriding that present defect of the relatively retarded norm as well as anomalous further faults) ... alternatively effecting this vital redirection even though some mapped features were designed to engage slightly later, delayed for particular developmental significance? Examine William Clark's vivid characterization of the immolative mechanism:

> Virtually every aspect of a cell's life is regulated by its DNA, including its death. Once a cell commits itself to death by suicide, it copies off one last set of instructions from the DNA in the nucleus and sends them to the machinery located out in the cytoplasm. These are the instructions for the cell's own death.

However, should exceptional events have signalled recognizable organismic advantage to the lesson plan – *an expected stimulatory lack being the contradicted cue* – might such revision include excuse from the apoptotic axe, a last-minute stay of genetic execution, pardoning for life neural material instead deemed valuable ... particularly when in its putative plastic state "over 80% of human DNA has no apparent function" (R. M. Brady's "Optimization Strategies Gleaned from Biological Evolution")?

In that distinctly mutable creature (British geneticist David Rubinsztein at Addenbrooke's Hospital, Cambridge, proposes a genetic receptor having evolved for *Homo sapiens* which miltantly solicits further alteration, whence elevating advantageous odds), the critical locus need not be large; merely a single percent DNA difference distinguishes us from chimpanzees,[1] with the cause for catalysis an iota of that – producing about one-fourth more cortical neurons – incidental chemistry responsible for every mortal artifact (thought and thing), adz to actuarial table, Sistine Chapel, supercollider, cosmic wormhole theory, this text. Potential modi-

[1] As Arnold B. Scheibel and J. William Schopf explain, this miniscule figure and the intuitive implications therefrom tend to aggravate geneticists, who though accepting its accuracy point out (with almost antisimian fervor) how much information that scintilla conveys – 10 megabytes, enough for a virtual remodeling ... exactly my point.

fications sample how collectively implicative so apt an enterprise might become: Were the just-identified gene behind novelty-seeking boosted beyond its personally gratuitous level to a quest after this species' generic growth, the pedestrian slope charting inhumanity versus its antithesis should veer straight up; also, like the *fosB* source specified of late ("Does Nature Drive Nurture?" by Jon Cohen) for maternal upkeep in offspring, and possibly that positivism which defies circumstance, similar alteration might touch upon new constitutional responses awaiting triggers from more insistent environments – niches encountered or devised.

Whether the key genes themselves (see Jeffery H. Schwartz's brilliant exposition of homeobox theory, *Sudden Origins*), double helix linkages, regulators, mitochondria, or chromosomes, would their malleability before birth permit positive and permanent alteration, recoding for the bloodline, just as certain fetal deficits fix heritability? In the 1997 announcement of successful mammalian cloning from a single cell – under Ian Wilmut's team at the Roslin Institute, Midlothian, Scotland – the near-death status in which chemical strictures on genetic reprogramming are removed suggestively resembles protobrain apoptosis. Another possibility, raised by Marian Diamond, is that neurogenesis could substantially profit if from stimulation sex steroid hormones might more ably breach the placental barrier, potentially a powerful chemical resource. Indisputably, genetic defects or assets were at some point insinuated through accident – unless today elected by design – into a vulnerable legacy; every organismic feature and faculty bears an ancestral stamp as well as assembly therefrom, perfectly parallel with precedents no longer accompanying peers yet open to developmental contingencies most always conferring flaws but on rarest occasion gifts commanding the norm's attention for enhancing survivability. Conrad Waddington proposed that an innate opportunity in the ontogene and thence its successors remains receptive during the formative period to appropriate influence, beyond some trigger-point a *canalization threshold* for genetically embedding nascent advantage:

> . . . the development does become canalized, to a greater or lesser extent. In that case, the magnitude of the response would not be proportional to that of the stimulus; there would be a threshold of stimulus, above which the optimum (that is, naturally selected) response would be formed. In so far as the response became canalized, the environment would be acting as a switch.

Richard Dawkins, despite *The Blind Watchmaker* amply lambasting classic Lamarckism, intimates just such a loophole for beneficial mutation should the lucky entity effectively recognize resulting value and register choice:[2]

> It is undeniable that some acquired characteristics are improvements, and it is theoretically conceivable that the inheritance mechanism might somehow discriminate the improvements from the injuries.

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[2] Which, by extension, could become speciationally adopted, an occupation institutionalizing the Baldwin effect, undertaken through human developmental engineering, a term for early intervention from René Van de Carr; if in general supplementing or eventually supplanting the martial law of sociobiology, cultural selection – substitute for its natural counterpart in the above Waddington excerpts and the present context – might be offered, with prenatal practice as *neurogenetic enrichment*.

Daniel Dennett's relevant interpretation can also serve to invite enterprise, an exploratory rationale:

I restrict Lamarckism to inheritance of acquired characteristics *through the genetic apparatus*. If we relax the definition, then Lamarckism is not clearly a fallacy.

Waddington's canalization or "genetic assimilation" infers as much, a perspective reinforced by Geoffrey E. Hinton and Steven J. Nowlan; beyond cultural optimization in the ontogene, Lamarckian conveyance of collective memes winnowed through competition on the ideational landscape could be considered *phylogenetic selection*. And Dennett duly notes the rapidity with which alteration can arise, the ashen plain of quantitative progress stretching distantly behind an innovative phoenix instantly forgotten because the replacement terrain requires constant scanning for further adjustment should novel threats to existence arise:

Although it is important to remember how slowly evolution works in general, we should never forget that there is no inertia at all in selection pressure. Pressures that have been dominant for millions of years can vanish overnight; and, of course, new selection pressures can come into existence with a single volcanic eruption . . . .

Louis Halle on the same:

. . . in accordance with the rule of acceleration, the evolution of the biosphere can manifest sudden developments that, on the evolutionary scale of time are nothing less than explosions.

From enlargement in cortical capacity expressing the momentum of marathon organismic growth which capitalizes upon successive value, our accruing neural stockpile, might its signal be selfishly interpreted – during gestation – as an axiomatic gain . . . since the chance for cerebral license must await invitation, once biologic but now cultural? If through imprintable stimulation protobrain activity is now being engaged earlier than that which formerly met the survival requirements of a narrower niche's norm (the vestigial program restricting present choices), hence more susceptible to appropriate persuasion, and maternal chemistry alerts fetal sensors about a regularly repeated event, would the genetic command post – directing quite specific minions such as *fosB* nurturance regulators – welcome instructions for permanent incorporation of this empathic activity . . . passing on the advantage an environmental change insists upon? By this means could be built better genes to construct smarter memes. Gerald Edelman both deftly recapitulates evolution and explains the macroevolutionary instrument in his next to last paragraph of *Neural Darwinism*:

As one might expect in an evolutionary system, with time the complexity of operation of such systems increased: selection against complexity was undoubtedly considerable, but selection against simplicity was even greater. Out of the increase in complexity in evolutionary systems, more sophisticated somatic selection systems emerged. With the further increase in the complexity of somatic systems and their linkage to so many aspects of the phenotype, richly linked categorization and novel responses emerged. And finally, out of the interaction of individuals in species capable of social transmission . . . informational systems emerged. At this level of transcendence, Lamarckian characteristics are superimposed upon a fundamental Darwinian base.

Steven Stanley concurs:

> ... it is an inherent property of cultural evolution that it feeds back into biological evolution. To a shocking degree, we are capable of directing evolutionary change within the human species.

The same view appears in an essay of cosmic scope by Louis Halle, "A Hopeful Future for Humankind":

> ... the pace of evolution has been constantly accelerating, especially in the past 10,000 years, during which cultural evolution has come increasingly to supplement and set the pace for biological.

With every candid indicator lately portraying gross dysfunction for ourselves alone and together, the natural contract provides an escape clause, a revised Weltanschauung befitting clients who would instruct their attorney in the law: Opposing today's systemic cognitive and behavioral lapses – those personal as well as public atrocities attaining voyeuristic newsworthiness on the hour – our diminished niche whets an expansionist appetite for which we have become the planetary heavyweight ... but that incessant hunger has mastered some extremely creative culinary skills. If the above thesis merits attention (more substantial than metaphysical or vitalist doctrine), applicable to the cortically prolific vertebrate – though possibly fortunate also for preceding orders – by anomalously emending zygote encryption a retooled genetic template could result, perhaps verifiable through animal investigations ... an earliest feedback potentially altering apoptosis even at its elementary appearance in the nematode *Caenorhabditis elegans*; how experiments tempt!

As Marian Diamond and Sigehiro Kiyono et al. have separately though extensively reported, rats born to mothers who during pregnancy experienced sensorily attractive environments demonstrate substantially superior learning skills along with denser neurology; more tantalizing, it is at least plausible that their second-generation descendants – *less fetal intervention* – could reveal the same cognitive and structural gains: The brain's layering for successive generations might thicken, perhaps if appropriately taxed developing a first cortical fold ... with more sophisticated behavior to match. Such a result would meet Conrad Waddington's requirement for generational emplacement minus need for subsequent early reinforcement:

> ... once a developmental response to an environmental stimulus has become canalized, it should not be too difficult to switch development into that track by mechanisms other than the original external stimulus, for example, by the internal mechanism of a genetic factor; and, as the canalization will only have been built up by natural selection if there is an advantage in the regular production of the optimum response, there will always be a selective value in such a supersession of the environment by the even more regularly acting gene. Such a gene must always act before the normal time at which the environmental stimulus was applied, otherwise its work would already be done for it, and it could have no appreciable selective advantage.

While shatteringly radical to show instant effects from prenatal stimulation, any derivative registration on the genealogic blueprint would open those richly implicative vistas Teilhard de Chardin, Samuel Alexander, or Sri Aurobindo have

philosophically sketched (their idiosyncratic expression no impediment to a congruent mental morphology): *automatic* increase in capability for descendants – prompted by hitherto impossible postconception genetic rearrangement (save through fetal insult producing the opposite impact), lifetime sequelae. Again, that proposition raises the Lamarckian specter of added benefits altering bloodlines, a heresy whose funeral many decades ago the mainstream scientific community fully attended ... though not just witholding condolences but egregiously gleeful (prefiguring Trofim Lysenko's much deserved interment); yet despite however many merry wakes, resurrection of this controversy in one form or another renders its frequent obituaries premature.

One explanation for the persistent resiliance is that Lamarckism was not the *ad hominem* target many of its detractors intended, and Ernst Mayr rightly recognizes a broader argument: "... Lamarck received credit and blame for having originated a concept that was universally held at his time." But Mayr also identifies why the idea has never been scotched:

> By introducing the time factor, Lamarck had discovered the Achilles heel of natural theology, It would be possible for a creator to design a perfect organism in a static world of short duration. However, how could species have remained perfectly adapted to their environment if this environment was constantly changing, and sometimes quite drastically? How could design have foreseen all the changes of climate, of the physical structure of the earth, and of the changing composition of ecosystems (predators and competitors) if the earth was hundreds of millions years old? Adaptations under these circumstances can be maintained only if the organisms constantly adjust themselves to the new circumstances, that is, if they evolve.

Since heaven seemed less than apparent and need urgent, claims for survival – let alone paradise – required meeting every major alteration in the status quo with a minimal facility that could become durable, assuring first individual then group continuity; because death eventually visits each representative of the only comparable lifeform we have thus far observed, during our sorely restricted interim there was scant rationale not to meet change on its own terms: *Immortality resides in personal optimization of the future – improve offspring and the communal legacy gains immeasurable stature*. After millennia contemplating the matter, *Homo sapiens* had ascertained that among the cardinal rules governing this cosmos, evolution – inevitable at any level – is no less a constant than lightspeed, containing within the organism *an avenue for immediate transference of acquired advantage*.

Blasphemy upon mystery! Although Darwin entertained an inheritance element not terribly dissimilar from Lamarck's (and Daniel Dennett recognizes the cultural evolutionary force Teilhard espoused, though subtracting his Christocentric characterization), this perfectly explicable process – former magnet to metaphysicians – touches upon Joseph Chilton Pearce's notion of learning at the cellular level, James Lovelock's Earth goddess, Gaia, Arne Wyller's planetary mind, Rupert Sheldrake's morphogenetic field hypothesis, or Frank Tipler's deific physics ... enough to send inveterate materialists scurrying for empirical cover. Nonetheless, concrete confirmation that a *deliberate* act thereupon and favorably emends the primordial code (whether evolved before through grinding gradualism or erratic catapults, no conscious process involved) – that would constitute

an earthshaking research achievement: phylogenetic improvement upon demand, potential as well as its employment ... the Baldwin effect seminally embodied.

Fresh evidence inoffensive to neoDarwinians of hypermutability – pointblank speciation – occurring among bacteria like *Escherichia coli* might pertain to higher orders under those conditions which early cell death modification addresses. Were our genetic ground floor window closed excepting that its apoptosis directive for the protobrain remain ajar to imprinting, fortification against normative dieoff late in pregnancy could reverse engineer the baseline, thereby avoiding Lamarck's error that postnatal experience was directly heritable. Would this bequeathal before birth transmit the gift, with comparable exposure to progeny less or not even effective since redundant, their hard wiring already upgraded ... and perhaps unassistedly more so, some crossed boundary of compounding value? A 1795 comment by Condorcet echoes prophetically:

> May not our parents, who transmit to us the benefits or disadvantages of their constitution, and from whom we receive our shape and features, as well as our tendencies to certain physical affections, hand on to us also that part of the physical organization which determines the intellect, the power of the brain, the ardour of the soul or the moral sensibility? Is it not probable that education, in perfecting these qualities, will at the same time influence, modify and perfect the organization itself?

Thematically reweaving several previous strands: In *The Material Basis of Evolution*, Richard Goldschmidt takes a paradigmatic step, maintaining that speciational change can transpire over one generation through a quite narrow aperture:

> Species and the higher categories originate in single macroevolutionary steps as completely new genetic systems. The genetical process involved consists of a repatterning of the chromosomes, which results in a new genetic system. The theory of the genes and of the accumulation of micromutations by selection has to be ruled out of this picture. The new genetic system, which may evolve by successive steps of repatterning until a threshold for changed action is reached, produces a change in development which is termed a systemic mutation. Thus, selection is at once provided with the material needed for quick macroevolution. The facts of development, especially those furnished by experimental embryology, show that the potentialities, the mechanics of development, permit huge changes to take place in a single step. The facts of physiological genetics and their explanation in terms of coordinated rates of processes of differentiation furnish the insight into the possibilities of macroevolution by single steps. A considerable role is assigned to such genetic changes as affect early embryonic processes and automatically entail major deviations in the entire organization. The general picture of evolution resulting from such deliberations is in harmony with the facts of taxonomy, morphology, embryology, paleontology, and the new developments of genetics.

A rationale for genetic specificity in the individual affecting collective alteration is articulated with oracular effect by Ernst Mayr, the Human Genome Project potentially moving beyond its mapmakers' patchwork craft:

> ... the genes that control speciation seem to vary quite independently of enzyme genes. Here is a new frontier of evolutionary biochemistry which I rather suspect will produce major surprises in the near future. This much is evident already: that different groups of genes seem to answer different selection pressures and follow their own evolutionary pathways.

Rudolf Raff and Thomas Kaufman offer enticing clues as to how so monumental a metamorphosis might take place:

It is clear that mutations in genes directly controlling developmental pathways, particularly those functioning early in development, may have cataclysmic effect. However, there are also late-acting genes that, while affecting the overall morphology of the organism, often have no obvious deleterious effects. These include genes that control the growth characteristics of the organism subsequent to the production of basic morphology and organogenesis . . . .

It is axiomatic that any change in morphology requires a commensurate change in the course of development . . . .

. . . the evolution of structural genes can have little to do with morphological evolution. It is the genes that regulate the developmental program that count . . . .

Of all the modes by which ontogeny is modified in the course of evolution, changes in timing have received the most attention. The whole of embryonic development presents a sweep of changes of movements and structural elaboration in time. The process has an air of inevitability, the blossoming of an orchestrated program in which all events occur in precise temporal sequence. To a large extent this is true, but numerous cases of dissociation of timing of ontogenetic processes from one another exist, and a vast array of evolutionary examples show that heterochrony is indeed a very common agent in evolution. There is a sound mechanistic reason for this in view of the need to maintain an integrated developmental program. Heterochrony often results in nondisruptive modifications in a developmental path. Existing integrated processes are shifted with respect to each other, but overall functional integrity is maintained . . . .

Surprisingly, although a few mutations affecting timing have been identified, little research has been directed at understanding the genetic basis for temporal controls in development. This is part of a larger sphere of ignorance in biology spanning a range of temporal phenomena from the control of timing of DNA synthesis in cells to the control of circadian rhythms in animals. The small numbers of mutations so far detected that change timing of developmental events suggest that there are individual genes that specifically regulate timing . . . .

. . . morphogenesis appears to be governed by a relatively small number of regulatory genes . . . .

. . . it appears probable that whereas a large number of genes may be required for the aggregate of all of the subprograms for morphogenesis of structures . . . each structure may require only a few major commands . . . .

The chief significance of alterations in genes with regulatory functions may be to produce changes in ontogeny that provide the raw material for further changes in a new direction. Further changes and consolidation of the novel direction occur through mutational events in genes modifying the principal regulatory gene.

Steven Stanley's *Macroevolution* also emphasizes this point while indicating how minor change can induce major consequences, and – repeating what excerpts from other researchers have here noted – for dramatic departure suggests a timespan of near immediacy . . . particularly relevant to neurogenetic effect:

. . . the regulatory model can account for rapid appearance of evolutionary novelties by alteration of a miniscule portion of the genome . . . .

The point here is not that all species differ considerably from their parent species, but that those that do differ markedly usually develop their distinctive features rapidly, in the process of budding off from the ancestral species.

Nor is its precise locus, at least under certain conditions, ignored:

> We do, in fact, have evidence that some clades have been founded by single individuals.

Or might fetal sonic stimulation by engaging the protobrain with appropriately curricularized information critically *defer* the greatest incidence of apoptosis (excepting the necrotic cascade at life's end) past its typical first appointment so that multisensory postnatal experience further strengthens resistance to delayed cell death? This macroevolution theory variant would target a body of regulatory genes controlling when – therefore to what degree – cerebral dieoff has figured among the *Hominidae*, switches retimed for ontogenetic gain and evolutionanly interpreted as having phylogenetic merit ... the same altruistic biochemistry bacteria evince under extreme shifts in ecological niches. The alternative vehicle whereby extensive individual recoding then assists its species could be through chromosomal modification, Richard Goldschmidt's mechanism identified above. Dramatic empirical validation for genetic rearrangement with immunities has been compiled in 1998 by Edward J. Steele, Robyn A. Lindley, and Robert V. Blanden as *Lamarck's Signature: How Retrogenes Are Changing Darwin's Natural Selection Paradigm.*

By whatever precise process – probably among those noted – a generic upheaval in consciousness has in fact commenced. The opinion that more complex organisms are impossibly resistant to qualitative transformation need but reference our geologically recent – and speciationally rapid – departure from primate genealogy, perhaps so current we miss its importance for a being whose nature is defensively assumed static: Born there, extrapolated mind now flees nichebound conservatism as if the worst pestilence. However, under an esoteric cloak, this subject of evolutionary dynamics instrumental to our future – and that for all other earthly creatures – has much too long been scholarly property, whereas Goldschmidt dared speak (like a sage Shakespearean fool, risking and receiving peer disdain for doing so) with stark lucidity about its operational mode, thereby covertly soliciting mortal enterprise to further speed the process:

> ... rather simple principles govern the most complicated phenomena of matter .... If life phenomena were not based on very simple principles, no organism could exist; if embryonic development were not controlled by a few simple basic properties and laws of matter, an organism could never be developed in a series of processes unrolling with the precision of clockwork. If evolution had not been made possible by relatively simple features inherent in the material basis of organization, it would never have occurred.

The convergentist argument has been trenchantly mounted (quite damaging the fortuitousness position of Stephen Jay Gould) by Simon Conway Morris in *The Crucible of Creation: The Burgess Shale and the Rise of Animals.*

Admittedly these speculations venture into less than gridded territory, yet detailed explanation from easily designed mammalian trials should afford rapid answers – providing less cortical complexity than ours is open to similar if rarified response. Indeed, unpublished remarks by leading investigators confide that rodent validations for neurogenetic feedback resulting from deliberately enhanced surroundings may have already taken place, with fear of contentious notoriety – the reputational threat to tenure which tailors political rectitude – constraining them to sit on their combustible data; nervous Nobel candidates need not apply!

Unlike traditional prodigiousness experiencing little or no sequenced prenatal enrichment, should an elevated EEG, PET, or MRI standard appear, perhaps the brain's faster frequency, intensified processing, or more global interaction will become heritable if DNA upgrading has occurred (animal studies aside, in another decade nonstimulated issuance from the first generation of consistently gifted mortal parents – paired or not – should allow testing for any Lamarckian legacy).

Stepping back from that hypothetical edge antedating (though occasionally reconstructing) discovery or disappointment, my endeavor also sought to ground abstraction by advancing a formulaic argument for how species taxonomically aspire – the *law of phylogenetic potential*;[3] its holophrastic vantage along with proactive inference could find reinforcement in Stuart Kauffman's exhortation for distant but directional vision. Amply convinced by brainfood prompting legwork, I recognized those prospects from theory and other than human assessments as literally pregnant with promise: Reacting to extreme environmental pressure, an organism in mounting command of its own destiny might have discovered how collectively responsible evolution could be achieved in an individual lifespan – by initiating advantageous fetal novelty through significant numbers, hence faster and more fortuitous natural selection would transpire.

While from civil distance lacking desperation – Paleolithic fear not less chronologically appropriate a motivator than medieval guilt – we inherited an essential impetus, as dryly explained by Murray Laver:

> Evolution for survival has given us senses that respond to changes and are not excited by stasis . . . .

Constructive revolution rewards with interim success a thrillseeking hunger of the heart as much as its anarchic converse starves every soul's yearning for the serene, and from this contesting adventurism our world has ever widened, alternating between the two states in arousal or slumber; earlier than Thomas Kuhn, Alfred North Whitehead (like Samuel Alexander or Sri Aurobindo, a believer in emergent deity) knew both that "It is the business of the future to be dangerous . . . " and – contrast Richard Goldschmidt's individual development view – what results:

> The major advances in civilization all but wreck the societies in which they occur . . . .

Yet if we have throughout fitful histories repeatedly awakened only to sleep – punctuating developmental spurts with languid cultural plateaus like that biologic waveform preceding – the cumulative dream which over time enhances speciation odds is approaching its paradigmatic instant, the qualitative changepoint.[4]

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[3] A species performs relative to the conglomerate prospect of its constituents – through natural or cultural selection – in proportion with their number, an average ontogenetic praxis for the biomass; if this value substantially exceeds the former norm, achieving a critical state, displacement generates collective metamorphosis: $P_p = \frac{\sum_{i-1}^{N} P_{o_i}}{B}$

[4] Despite morphological mastery, because focusing upon recurrent themes in discrete civilizations Spengler missed the mechanism permitting tribal cyclicality to stutter, eventually racheting upwards as a planetary dynamic – with Prussian concision he dismissed Darwinism as "the British disease."

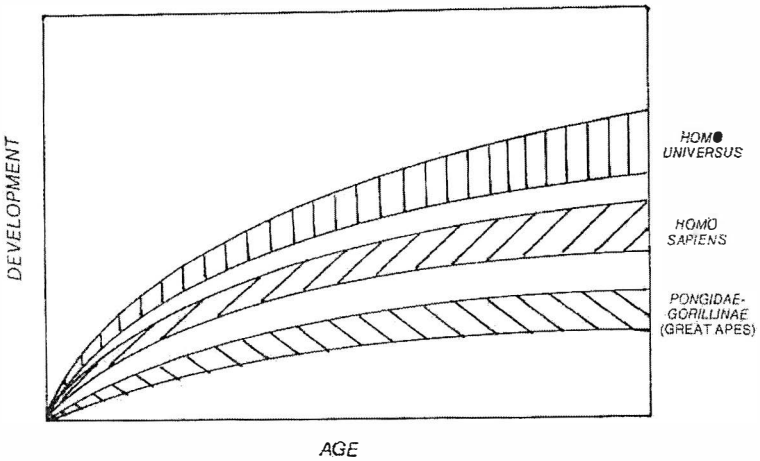

Fig. 2. Phylogenetic comparisons.

Figure 2 translates these ontogenetic differences to groups, depicting speciation zones: Our primate ancestry as remotely distinguishes us as the displacing breed surpasses present human performance. Of all descriptions, this image dramatically illuminates both immediate and implicative messages signalled by the fetal enrichment revolution, an effectively doubled output embracing the whole operational range identifying *Homo sapiens*; once entertained, its resonant importance can but alter succeeding perception – that grasp constituting the paramount parallel readers not prenatally gifted may enjoy with those who are... comparative apotheosis in action, the birth of *Homo universus*.

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