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TESTING THE CAVEFISH MODEL:
AN ORGANISM-FOCUSED THEORY OF BIOLOGICAL DESIGN

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ABSTRACT
The Institute for Creation Research (ICR) is experimentally testing an engineering-based model of rapid biological adaptation: Continuous Environmental Tracking (CET). This model infers that organisms actively track conditions within specific environments to self-adjust through internal mechanisms and initiate adaptive functionality. The animal under investigation is Astyanax mexicanus (Mexican tetra), a freshwater fish with well-differentiated, interfertile morphotypes: eyed surface-dwelling fish (surface fish) with distinct pigmentation patterns, and eyeless cave-dwelling fish (cavefish) with minimal pigmentation. Aquaria within our newly established laboratory contain breeding pairs of cavefish exposed to either (A) cyclical light/dark patterns of full-spectrum high-intensity light, (B) minimal light combined with high CO$_2$ (low pH) levels or (C) deionized water. Preliminary results show that (1) cavefish rapidly increase pigmentation when exposed to high-intensity light, and (2) do not exhibit injurious behavior or physiology in low pH water; (3) surface fish lose pigmentation across their body in low pH or deionized water conditions; (4) adult cavefish and surface fish respond rapidly within weeks-to-months of experimental treatments. Thus far, preliminary results imply that high-intensity light may stimulate the induction of latent melanin synthesis pathways in adult cavefish. Second, pre-acclimation of cavefish to acidic water chemistry likely reflects conditions within their native cave environments. Third, comparative loss of pigmentation in adult surface fish exposed to darkness and low pH or deionized water suggests they actively self-adjust, and that adaptive traits are reversible. Fourth, in contrast to cavefish, surface fish indicate non-acclimation to a simulated cave environment. Lastly, all responses by A. mexicanus to experimental treatments occur without undergoing multigenerational cycles of death and survival. These implications do not support the conventional view that beneficial adaptations arise through random mutation, unregulated genomic recombination, or accumulation of unguided genetic variation — regardless of time scales. Therefore, organisms are the agents in control of adaptations and diversification. If correct, hypotheses attributing the exquisite fit of organisms to environments through the agency of nature are mistaken. We present a new direction in experimental science for the ICR, and Creation Science, that sees every organism as a divinely engineered creation with adaptive capacity across multiple environmental conditions.

KEYWORDS
Cavefish, CET, adaptation, environment, Astyanax mexicanus

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