

## **An Entirely Synthetic Fish: How Rainbow Trout Beguiled America and Overran the World**

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experiences. The ability to have such experiences emerges out of the interactions among brains (p. 133). And this ability facilitates social interaction, learning, and survival.

This is all very reassuring, but at times in the book, Gazzaniga sells our mental life short. For example, he writes, “When we set out to explain our actions, they are all post hoc explanations, using post hoc observations with no access to nonconscious processing” (p. 77). Is it true that we *never* succeed in explaining our actions at least partly in terms of *conscious* processing that preceded them? Consider selecting an exit row seat for extra leg room when booking a long airplane flight. I have a conscious preference for extra leg room, especially on long flights. If I were to explain why I chose a particular seat—or why I might be sitting in a particular seat on a flight—I could offer an answer in terms of that conscious preference, and this explanation would not invoke a nonphysical mind any more than Gazzaniga’s position on emergent mental properties invokes one.

Gazzaniga may be overly impressed by some of the experiments he discusses—well-known investigations by Benjamin Libet and the more recent work by Chun Siong Soon and colleagues. On the basis of brain activity as measured by blood flow, Soon and colleagues were able to predict with 60-percent accuracy about seven seconds in advance of the action itself whether a person would press a left button or a right button. Each person was supposed to decide on a button and then immediately press it. What does this early brain activity signify? Perhaps it signifies just an unconscious bias toward a particular button. In any case, there is no reason to prefer either button over the other, and because there is no place in the experiment for conscious reflection, there is no place for an explanation of the action in terms of conscious reasoning. The same general point applies to Libet’s studies, whose subjects arbitrarily choose a moment to begin flexing their wrists. I discussed experiments of this kind at length in my book *Effective Intentions* (2009).

When it comes to my selecting an exit row seat, things are very different. I know I have a reason—a good one—to select such a seat rather than an ordinary seat in coach. Because I do, I consciously look online for an open seat in an exit row. (I don’t know how to do this unconsciously.) By the way, given what I have told you, you can predict with close to 100 percent accuracy what I will try to do next time I buy a coach seat on a long flight, and you have achieved this degree of accuracy for free, just by consciously attending to what I wrote.

I feel compelled to make one last point. Many people think that what they call “free will” is required for personal (and legal) responsibility. If Gazzaniga’s own conception of free will as a magical power is out of line with mainstream conceptions of it, then, in defending the existence of personal responsibility, he may also unwittingly be defending the existence of free will.

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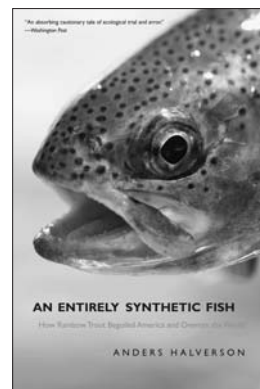
### THE RISE AND FALL OF AN AMERICAN IDEA

**An Entirely Synthetic Fish: How Rainbow Trout Beguiled America and Overran the World.** Anders Halverson. Yale University Press, 2011. 288 pp., illus. \$17.00 (ISBN 9780300140880 paper).

**A**n *Entirely Synthetic Fish: How Rainbow Trout Beguiled America and Overran the World* is not just a thorough account of rainbow trout propagation in the United States. As the subtitle insinuates, the book explains how this fish became the darling of anglers and management agencies alike and reports on the

consequences that followed. Author Anders Halverson weaves a rainbow of colorful characters into a historically rich narrative and provides some powerful insights that will interest a wide readership—beyond just those in fisheries management.

Halverson holds a PhD in ecology from Yale University and is an accomplished journalist. Although the book is well researched and provides a summary of aquatic ecology as it relates to the story, Halverson has produced a volume with more historic and political relevance than scientific weight. His most compelling writing pulls together interesting tidbits of history, starting in the mid-1800s, to focus on the men (literally—no women were implicated) who made the rainbow trout the iconic fish that it is today.



This story begins in nineteenth-century North America but has a familiar theme: Overharvesting, dams, logging, and pollution had depleted fish populations, primarily along the eastern United States. Hunting and fishing regulations were not reasonably in place at the time. Fish culture was the answer. The book continues with Livingston Stone and his compatriots establishing early hatcheries on the McCloud River in California after observing the traditional indigenous peoples’ Pacific salmon fisheries. The story unfolds with the discovery of the benefits of *Oncorhynchus mykiss*, a species that offered a lucrative combination of high productivity under

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cultivation along with a sporting fight. Then came the airdrops of thousands of shimmering juveniles into alpine lakes in order to support the panacea of recreational fishing. Rainbow trout was established as the artificial freshwater fish of choice.

Although it is clear that the popularity of rainbow trout (and its artificial propagation) spread around the globe as the species was introduced, *An Entirely Synthetic Fish* focuses heavily on just the American story. Short anecdotes are provided regarding Western Europe, but the widespread appearance of the species as a recreational target, to the extent of global dominance, does not receive the coverage in the book that it could. Special attention is paid, instead, to those states that initiated—and to those individuals who developed—the practice and to those who are now most affected by the consequences of the artificial introduction. An interesting account is given of the successful efforts to come full circle and remove introduced rainbow trout from alpine lakes in the Sierra Nevada mountains.

Throughout the book, Halverson reveals his personal interest in angling, but he does not hesitate to point out the apparent conflict of interest that can develop between a government agency and the fishery it manages. He states that “there is little question where self-interest lies if an agency’s budget and the employee[s’] paychecks depend on the number of people who go fishing.” We also glimpse Halverson’s conservation ethic as he describes the return of a functional ecosystem, such as the proliferation of the native mountain yellow-legged frog on the fringes of a trout-free Sierra Nevada lake after the successful eradication of the introduced rainbows.

The ecological impacts of rainbow trout propagation and its consequences of artificial enhancement and invasive species are thoroughly covered, from competitive interactions and genetic effects to pathogen threats exacerbated by climate change. Halverson even includes an efficient retelling of the confusion of

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the names *trout* and *salmon*, applying his knack for digging out the interesting story within the overall history while still providing adequate coverage of the science.

Perhaps the greatest contribution that *An Entirely Synthetic Fish* offers its readers is in the informative and entertaining example of the rainbow trout itself. For those interested in the interplay of science and politics, particularly as they relate to natural resources and ecosystem management, this fish serves as the focal point along the arched trajectory from idea through experiment and proliferation to realization and restoration, since readers will witness the transition from the early stages of rainbow trout aquaculture to examples of active eradication.

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**Arthropod Brains: Evolution, Functional Elegance, and Historical Significance.** Nicholas James Strausfeld. Harvard University Press, 2012. 848 pp., illus. \$65.00 (ISBN 9780674046337 cloth).

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