SCIENCE & TECHNOLOGY

Why Sex?

THE SOURCE: "On the Origin of Sexual Reproduction" by Carl Zimmer, in ***Science***, June 5, 2009.

There are so many simpler ways to reproduce than sex. Consider bacteria. They just divide. Or aspen trees. They just send out runners. So how did such an inefficient system—requiring cell division, finding a mate, hooking up, and producing a new, unique combination—triumph over other reproductive methods? Carl Zimmer, a science writer whose most recent book is *Microcosm: E. coli and the New Science of Life* (2008), says new evidence from a colony of New Zealand snails explains how sex simply improves the fitness of a population more reliably than asexual reproduction.

Some species, he notes, can multiply either way, sexually or asexually. Yeast and many plants have this ability. During good times—for example, when the yeast equivalent of the stock market looks solid at 14,000—yeast reproduces asexually. But when times are tough in the yeast world, it reproduces sexually. Over millions of years, the sexual activities of plants with either/or capabilities increased. "By triggering organisms to reproduce sexually, [the sexually produced] genes could become combined with new sets of genes that were better able to withstand the crisis, leading to the greater proliferation of the 'sexual' individuals," according to Zimmer.

As evolution proceeded, sexual reproduction moved from optional to mandatory in many species. Mathematical researcher Lilach Hadany of Tel Aviv University thinks the triumph has to do with sexiness. Sexy individuals, such as male guppies with bright spots or male frogs with loud croaks, can attract large numbers of mates, and they produce many more offspring than would be possible through asexual reproduction.

Theories fall into "good," "bad" and "ugly" categories, Zimmer says. Sexually produced genes can adapt faster than asexual ones. If an individual in an asexual species develops a beneficial mutation, it can pass it on only to its immediate offspring. Sexual reproduction, by contrast, splits up genes that can then recombine with other "good" mutations present in the mate to produce even better progeny. Asexual reproduction can easily pass on marginally bad mutations for generation after generation until the accumulation of "bad" genes leaves the organism completely outclassed in the evolutionary rat race.

"Ugly" mutations—such as parasites—grow in a boom-and-bust cycle on a host organism. They can multiply until they destroy the most common strain of host and move on to the next victim. This "Red Queen" effect—named after the *Alice in Wonderland* character who takes Alice on a run without ever getting anywhere—is, like other theories about reproduction, hard to test in nature. But researchers studying a species of New Zealand snail that sometimes reproduces sexually and sometimes asexually have recently found evidence that the Red Queen effect exists. As asexual snails became increasingly affected by a parasite that made them unable to reproduce, the most common asexual strain of *Potamopyrgus antipodarum* almost disappeared. Eventually a rare asexual strain resistant to the parasite began to take over, illustrating the boom-and-bust cycle in a mere 15 years. The "Red Queen" problem so affected the asexual snails that it gave the sexy variant of *Potamopyrgus antipodarum* an edge: The asexuals increased and then almost died out, but the sexual snails reproduced reliably, multiplying at a steady pace.

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From Foraging to Farming

THE SOURCE: "Evidence for Food Storage and Predomestication Granaries 11,000 Years Ago in the Jordan Valley" by Ian Kuijt and Bill Finlayson, in ***Proceedings of the National Academy of Sciences***, July 7, 2009.

It took thousands of years for humans to transition from on-the-go foraging bands to settled