

EVOLUTION

Male Rivalry Extends to Sperm in Female Reproductive Tract

For males of some species, mating is just the first step toward winning the battle to pass on their genes. Females sometimes mate more than once in quick succession, filling their reproductive tract with rival sperm that must compete for access to the unfertilized eggs. Two groups now show details of what life must be like for those sperm, with one offering unprecedented movies of this sperm competition. On page 1506, Susanne P. A. den Boer of the University of Copenhagen demonstrates that such rivalries in some ants and bees have led to the evolution of seminal fluids containing toxins that impede rival sperm and to female fluids that counter these toxins. Another team, reporting online in *Science* (www.sciencemag.org/cgi/content/abstract/science.1187096), followed red or green-glowing sperm as they jockeyed their way through the reproductive tracts of fruit flies. Both papers drive home the point that “the competition between males continues in a very fierce way” inside the female, says Tommaso Pizzari, an evolutionary biologist at the University of Oxford in the United Kingdom.

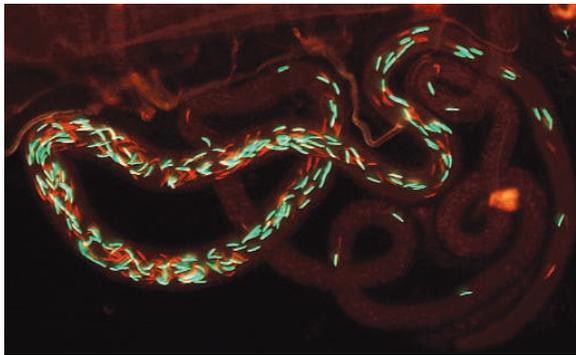
The papers provide a glimpse of where evolutionary biology research is going: The female reproductive tract is “one of the great, unexplored frontiers for the fields of sexual selection and speciation,” says Scott Pitnick, an evolutionary biologist at Syracuse University in New York state.

Pitnick’s Syracuse colleague John Belote entered this frontier by developing two fruit fly lines that produce different fluorescent proteins in the sperm head, one green and the other red. After allowing female fruit flies to mate with one strain and then the other a few days later, Pitnick’s postdoctoral fellow Mollie Manier videotaped the streams of red and green sperm, tracking their interactions in real time. The first sperm in the reproductive tract swim to the fly’s sperm-storage organ, but many are displaced by the second wave of sperm, she found. However, once both males’ sperm were settled, they all seemed to have an equal chance of fertilizing an egg.

“This is one of the most exciting developments in evolutionary and reproductive

biology—and will revolutionize the field,” says Tim Birkhead, an evolutionary biologist at the University of Sheffield, United Kingdom. “After seeing these videos, researchers will now think of sperm competition in a new way.”

Den Boer, University of Copenhagen colleague Jacobus Boomsma, and Boris Baer, now at the University of Perth in Australia, find sperm in some bees and ants do more than physically displace rivals. The team compared sperm dynamics within ant and bee queens that mate only once with ones in which females mate multiple times during a single courtship flight and store sperm for years. For the multiple mating species stud-



Close quarters. Rival sperm, labeled red and green, jostle one another in the *Drosophila* female’s seminal receptacle.

ied, two leafcutter ants and the honey bee, seminal fluid from a given male enhanced the survival time of its own sperm in a lab dish but damaged unrelated sperm and even sperm from a brother. Adding spermathecal fluid that ant queens make within their reproductive tract countered these effects, says Boomsma. In contrast, seminal fluids from singly mated bumble bees and ants showed none of these negative effects.

Sperm facing competition have evolved some as-yet-to-be-defined seminal fluid components that somehow recognize and thwart rivals, says Boomsma. But once the sperm reach their destination for long-term storage, the female apparently wants to keep all the sperm healthy and has evolved ways to counter the seminal fluid. This study “beautifully reveals just how nuanced reproduction can be,” says Pitnick. “There will be much to gain from combining our respective approaches.”

—ELIZABETH PENNISI

ScienceInsider

From the *Science* Policy Blog



Congressional supporters of stem cell research have introduced legislation to codify President Barack Obama’s 2009 executive order, which lifted restrictions on the number of **human embryonic stem cell lines** available to federally funded researchers. <http://bit.ly/bdk85n>

A University of Michigan, Ann Arbor, anthropologist has criticized the U.S. government for not making better use of **social scientists in fighting terrorism**. <http://bit.ly/bZ6zRP>

The InterAcademy Council, comprised of national science academies, will lead a 6-month review of procedures of the **Intergovernmental Panel on Climate Change**. The review will look at transparency, conflicts of interest, and rules pertaining to the quality of data. <http://bit.ly/9LLZgj>

The Israeli government has launched a \$350 million effort to **lure back Israeli scientists working abroad**. The effort will involve 30 new centers of academic excellence, funded by the government, academic institutions, and charities. <http://bit.ly/ctAuVV>

A veteran undersea robot operated by the Woods Hole Oceanographic Institution was **lost during a research expedition off the Chilean coast**. The Autonomous Benthic Explorer (ABE) had reached a depth of 3 kilometers in the first stages of its 222nd dive. <http://bit.ly/9pTYBo>

A long-running battle between the U.S. government and a group of 29 scientists and engineers of the Jet Propulsion Laboratory (JPL) over **privacy rights has now reached the Supreme Court**. <http://bit.ly/b6H3GT>

The Royal Society has released a report on the future of **scientific research in the United Kingdom** that calls for broad funding increases in line with those of other countries that have included scientific research in their economic stimulus packages. <http://bit.ly/cGD92r>

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