

SUBSCRIBE TO NEW SCIENTIST

Select a country

Subscribe

NewScientist

Life

search New Scientist

Go

Log in

My New Scientist

Home News In-Depth Articles Blogs Opinion TV Galleries Topic Guides Last Word Subscribe Dating
Look for Science Jobs

SPACE TECH ENVIRONMENT HEALTH LIFE PHYSICS&MATH SCIENCE IN
SOCIETY

Home | Life | News

Black Queen tells microbes to be lazy

15:58 27 March 2012 by [Michael Marshall](#)

For similar stories, visit the [Micro-organisms](#) and [Evolution](#) Topic Guides

Confronted by a deadly threat, most bacteria let someone else handle it.

According to the Black Queen hypothesis, evolution pushes microorganisms to lose essential functions when there is another species around to perform them. The idea could explain why microbes are so dependent on each other.

[Jeffrey Morris](#) of Michigan State University in East Lansing got the idea from an ocean-dwelling bacterium called *Prochlorococcus*. "It is the most common photosynthetic organism on Earth," he says, but for decades no one could grow it.

That's because *Prochlorococcus* relies on other bacteria to break down toxic hydrogen peroxide. This led Morris to the Black Queen hypothesis, named after the card game Hearts, in which players try to discard the costly queen of spades.

For microorganisms every ability is costly – carrying genes and making proteins uses up energy – so they benefit from [losing genes](#) if possible.

As long as one microbe breaks down hydrogen peroxide all bacteria in the area benefit, so it is in the microbes' interests to discard the associated genes quickly.

Morris acknowledges that this kind of outsourcing is a dangerous game to play, though. In theory, all of the microbes may lose the genes at the same time, leaving none to deal with hydrogen peroxide.

Unpublished experiments support the Black Queen hypothesis. Morgan created *Escherichia coli* vulnerable to hydrogen peroxide, then gave them a resistance gene. Many, but not all, of the bacteria promptly lost the gene.

[William Costerton](#) of the Center for Genomic Sciences in

PRINT SEND SHARE



Microbes discard extra genes in the same way that card players try to ditch the queen of spades in the game Hearts (Image: [Monkey Business Images/Rex Features](#))

This week's
issue

Subscribe



31 March 2012

More Latest news

Pesticides cause bees to lose their bearings



19:00 29 March 2012

A group of widely used pesticides subtly affect the insects' behaviour, and may be partly to blame for their falling populations

Dolphin social networks are unusually open

00:01 28 March 2012

Male dolphins don't live in tribes, but they form complex alliances with each other

Out of Peru, the plant that tackles toothache

Pittsburgh, Pennsylvania, thinks the idea makes sense. "Some species may be 'donkey engines' for whole consortia [that] are unable to grow in the absence of the donkey."

Morris says the "donkey" microorganisms that do the community's dirty work would ultimately become [keystone species](#). That is, they would be extremely important to the ecosystem – even essential for its survival – despite being relatively rare.

The Black Queen hypothesis explains how evolution can produce helpers and beneficiaries without the two having to interact or cooperate, says [Martin Hahn](#) of the Austrian Academy of Sciences in Mondsee.

But microorganisms do lose abilities for other reasons. Hahn studies bacteria called *Polynucleobacter*, which cannot move or detect signals from their neighbours (*PLoS One*, DOI: [10.1371/journal.pone.0032772](https://doi.org/10.1371/journal.pone.0032772)). These abilities are not Black Queens because they cannot be outsourced.

Journal reference: *mBio*, DOI: [10.1128/mBio.00036-12](https://doi.org/10.1128/mBio.00036-12)

11
tweets



If you would like **to reuse any content** from New Scientist, either in print or online, please [contact the syndication](#) department first for permission. New Scientist does not own rights to photos, but there are a [variety of licensing options](#) available for use of articles and graphics we own the copyright to.

Have your say

Only subscribers may leave comments on this article. Please log in.

email:

password:

Remember me

Only personal subscribers may leave comments on this article

[Subscribe now to comment.](#)

All comments should respect the [New Scientist House Rules](#). If you think a particular comment breaks these rules then please use the "Report" link in that comment to report it to us.

If you are having a technical problem posting a comment, please [contact technical support](#).



16:44 27 March 2012

After having her painful molars treated by Amazonian villagers,

anthropologist **Françoise Barbira Freedman** is bringing their painkilling plant to the masses

A question of intelligence

13:40 26 March 2012

Why are humans the smartest animals on Earth?

[see all related stories](#)

Most read Most commented

[Entering the world's premier antimatter factory](#)

[New search tool to unlock Wikipedia](#)

[Age of oldest rocks off by millions of years](#)

[Bacteria could be significant cause of OCD](#)

[US scepticism – it's been a long time coming](#)

TWITTER

New Scientist is on Twitter



Get the latest from New Scientist: sign up to our Twitter feed

LATEST JOBS

[Paramount Recruitment: Biostatistician - London - Statistics](#)

[Meet Recruitment: Account Manager - Healthcare Advertising Agency - London - Excellent Package](#)

[Meet Recruitment: Director of Editorial Operations - Unique opportunity - Medical Communications Agency in London - Excellent Package](#)

[Paramount Recruitment: Business Development Manager - Medical Devices](#)

[SLS Services: Clinical Supplies Project Manager - Home Based](#)

[Login](#)**About us**

[New Scientist](#)
[Syndication](#)
[Recruitment](#)
[Advertising](#)
[Staff at New Scientist](#)
[Advertise](#)
[RBI Jobs](#)

User Help

[Contact Us](#)
[FAQ / Help](#)
[Disclaimer](#)
[Ts & Cs](#)
[Cookies](#)
[Privacy Policy](#)

Subscriptions

[Subscribe](#)
[Renew](#)
[Gift subscription](#)
[My account](#)
[Back issues](#)
[Customer Service](#)

Links

[Site Map](#)
[Browse all articles](#)
[Magazine archive](#)
[NewScientistJobs](#)
[The LastWord](#)
[RSS Feeds](#)
[Online Store](#)
[Android App](#)
[Mobile site home](#)

Science Jobs

[Biology Jobs](#)
[Chemistry Jobs](#)
[Clinical Jobs](#)
[Sales Jobs](#)
[Earth &](#)
[Environment Jobs](#)
[Engineering Jobs](#)
[Maths & IT Jobs](#)
[Graduate Jobs](#)

© Copyright Reed Business Information Ltd.