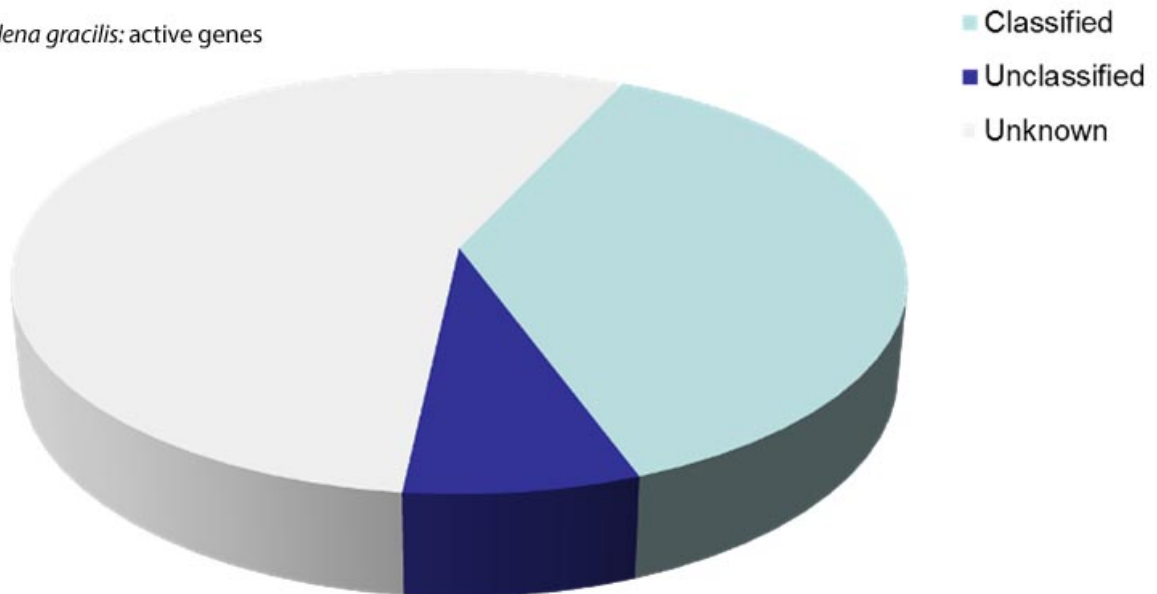


The potential in your pond

August 14 2015

Euglena gracilis: active genes



Euglena genes have been classified by comparison with genes that have already been studied in other organisms. With the classified genes we have a good idea what aspect of biology they are involved in. 'Unclassified' genes are those that have been seen in other organisms, but we don't know what they do, while the 'Unknown' genes in *Euglena* don't match genes from any other species studies to date – truly novel.

Analysis of *Euglena* transcriptome

Scientists at the John Innes Centre have discovered that *Euglena gracilis*, the single cell algae which inhabits most garden ponds, has a whole host of new, unclassified genes which can make new forms of carbohydrates and natural products.

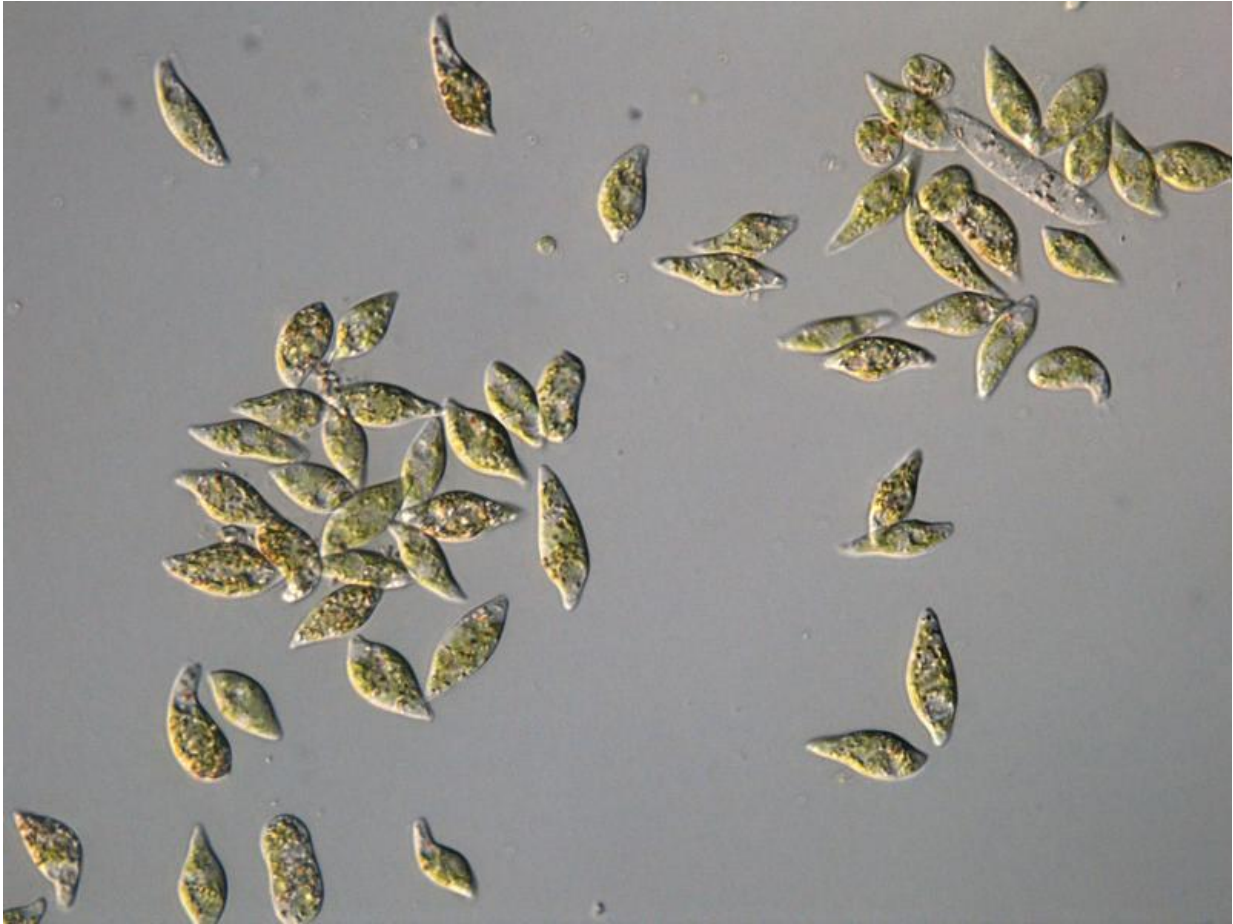
Even with the latest technologies, sequencing all the DNA in *Euglena*

remains a complex and longwinded undertaking. Dr Ellis O'Neill and Professor Rob Field from the John Innes Centre in Norwich have therefore sequenced the transcriptome of *Euglena gracilis*, which provides information about all of the [genes](#) that the organism is actively using. From this analysis of its RNA molecules, Professor Field and his team projected that *Euglena* has at least 32,000 active, protein encoding genes, significantly more than humans who have approximately 21,000.

They discovered that *Euglena* has the [genetic information](#) to make many different natural compounds: we simply don't yet know what they are or what they can do. Nearly 60% of the active genes don't match those found in any other organism studied to date, suggesting that there is much to learn about the biology of *Euglena*.

The team also found that different sets of genes become active when *Euglena* is grown in the dark to when it is grown in the light. This indicates that *Euglena* can dramatically shift its metabolism depending on its environment, which reflects its' ability to live successfully in very varied environments.

Euglena creates many well-known, valuable [natural products](#) including vitamins, essential amino acids and a sugar polymer which is reported to have anti-HIV effects. Given the usefulness of the compounds we know about, these findings have the potential, with further research, to lead to the discovery of new medicines including new antibiotics, nutrients and new forms of biofuel - amongst other products.



Euglena gracilis

The genetic information in what we think of as simple algae is in fact enormous, which complicates definition of what these organism are capable of and has prompted the science community to largely focus of simpler microorganisms (bacteria, fungi, viruses).

Undeterred by this challenge, the JIC team identified candidate genes in the *Euglena* transcriptome for all the pathways and metabolic processes that one would expect in a motile, photosynthetic organism. They also discovered unexpected capacity for producing and modifying

carbohydrate polymers and the generation of as-yet unknown natural products. Professor Field and his team now look to the scientific community to help classify these new products and determine how they may be used.

Professor Field said:

"We know there are many products made from Euglena which are already on the market – beauty and nutritional supplements, foods and even fuel for cars – all popular in Japan and the Far East. What we didn't realise is that there is so much more that Euglena is capable of producing which could give us new treatments, cures and industrial capabilities. We hope this landmark research will encourage other scientists to build on our findings with Euglena, and other algae, to work out exactly what compounds they make and how we can use them."

Provided by John Innes Centre

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