

# Growing Spaceships?

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# Synthetic Biology

NASA currently has a program called the Space Synthetic Biology Project\*\*.

**Synthetic Biology or SynBio is the design and construction of new biological functions and systems not found in nature.**

Four NASA field centers, along with experts from industry and academia, have been partnering on the Space Synthetic Biology Project and are working on new breakthroughs in this increasingly useful pursuit, which is part a science discipline and part engineering. Led by researchers at NASA's Ames Research Center, the team is studying how this powerful new tool can help NASA now and in the future.

The project was created to harness biology in reliable, robust, engineered systems to support the agency's exploration and science missions, to improve life on Earth and to help shape NASA's future. The program also is intended to contribute foundational tools to the synthetic biology research community.

\*\* <http://2011.igem.org/NASA>

# Drew Endy Defining Synthetic Biology

<http://blip.tv/igem-headquarters/igem-explainer-01-drew-endy-defining-synthetic-biology-258600>

(~5 minutes)



# Synthetic Biology

## REFERENCES

- For more information about the Synthetic Biology, visit

<http://syntheticbiology.arc.nasa.gov/>.

- To read more about the potentials of synthetic biology in space, see: *Workshop Report on What are the Potential Roles for Synthetic Biology in NASA's Mission?*

[http://event.arc.nasa.gov/main/home/reports/CP-2011-216430\\_Synthetic\\_Bio.v6.pdf](http://event.arc.nasa.gov/main/home/reports/CP-2011-216430_Synthetic_Bio.v6.pdf).

- For more information about the Presidential Commission for the Study of Bioethical Issues, see: NEW DIRECTIONS: The Ethics of Synthetic Biology and Emerging Technologies,

<http://www.bioethics.gov/documents/synthetic-biology/PCSBI-Synthetic-Biology-Report-12.16.10.pdf>

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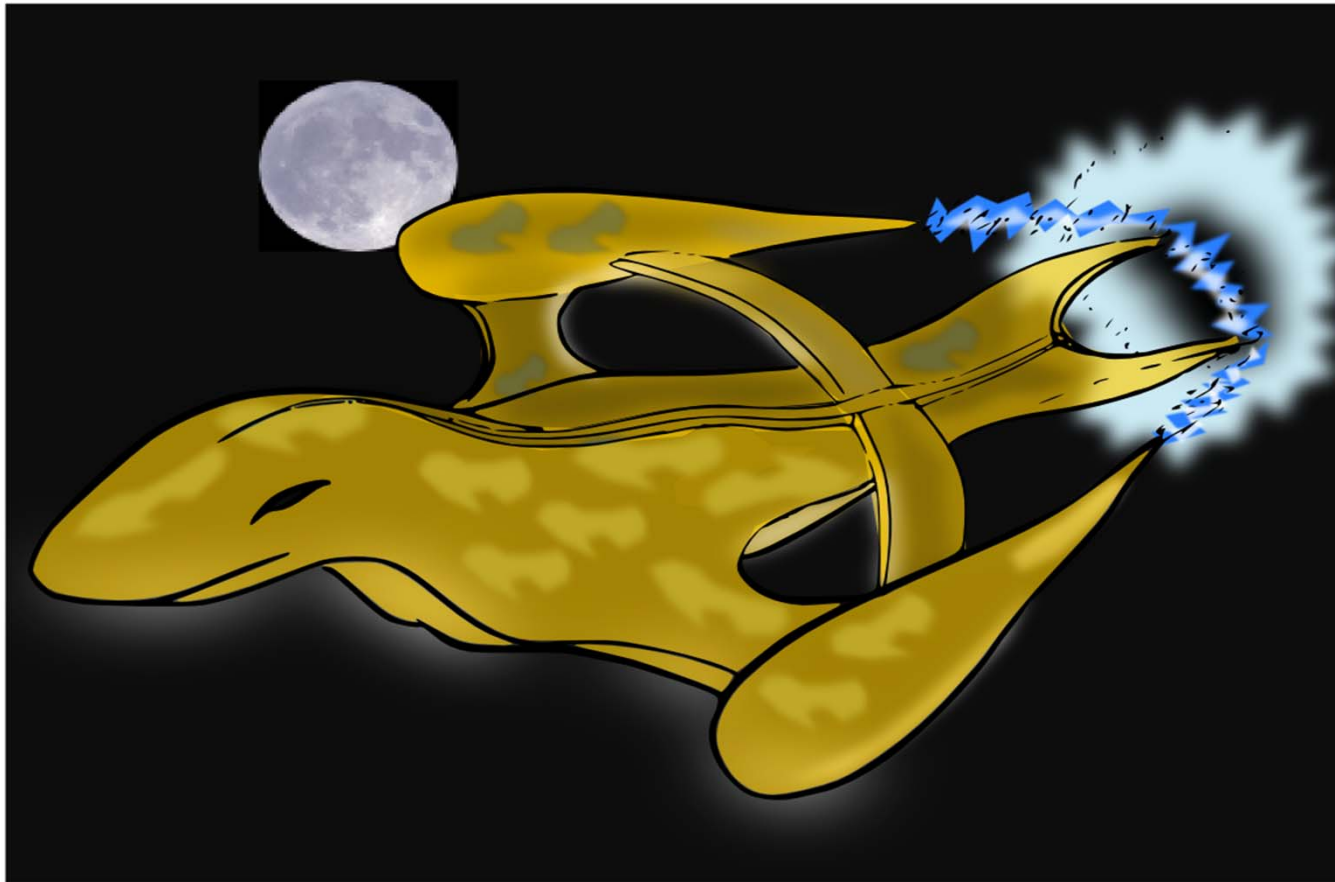
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**The role of synthetic biology for *in situ* resource utilization (ISRU)**, Montague, M., McArthur, G.H, Cockell C.S, Held, J., Marshall, W., Sherman, L.A, Wang, N., Nicholson, W.L, Tarjan, D.R., **Cumbers, J.** (*in press*), *Astrobiology* (2012)

**What is the role of synthetic biology in NASA's mission?** Langhoff, S., Cumbers, J, Paavola, C, Rothschild, L.J. (2011), NASA Technical Report.

# Growing Spaceships?

From a manufacturing standpoint SynBio technology could eventually lead to a form of spaceship not unlike the Bioships found in science fiction literature and movies.



A cartoon of a futuristic SynBio engineered concept of a grown spaceship (Courtesy of Dan Oniel, MSFC).

# Potential SynBio Grown Spaceship

Although theoretically the concept of growing a spaceship could someday in the far future become a reality, let us not focus on it here.

Our assumption is that a “Living Spaceship” produced in the next century has to be made in pieces using current or proposed *biotechnology techniques* with the materials coming from space, and the fabrication and assembly done in space

Verbal discussion on chart 3  
“The potential of Synthetic Biology in Space”  
From draft paper “Growing a Spaceship”

## Decoding Synthetic Biology - KQED QUEST

<http://www.youtube.com/watch?v=EtADBcxWpVg>  
(12 minutes)