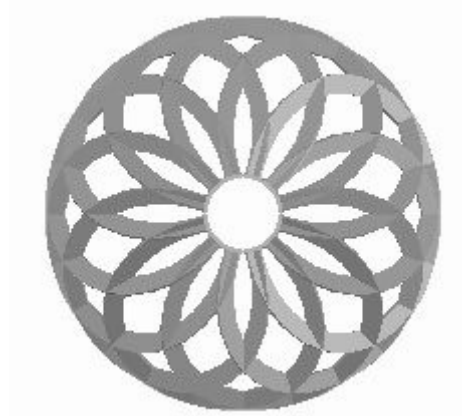


# SWARM

## 2.1

They're baa-ack...

# SWARM



**A KINETIC LARGE SCALE ART  
INSTALLATION FOR BURNING MAN 2008**

**Primary Contact: Michael Prados**

**email: [mprados@gmail.com](mailto:mprados@gmail.com) phone: (650)823-3724**

**630 Connecticut Street, San Francisco, CA 94107**

**project web site: [www.orbswarm.com](http://www.orbswarm.com)**



wtf?



“A motion and a spirit, that impels  
All thinking things,  
all objects of all thought  
And rolls through all things.”

Wordsworth

**Orbs roll**

**Orbs flock**

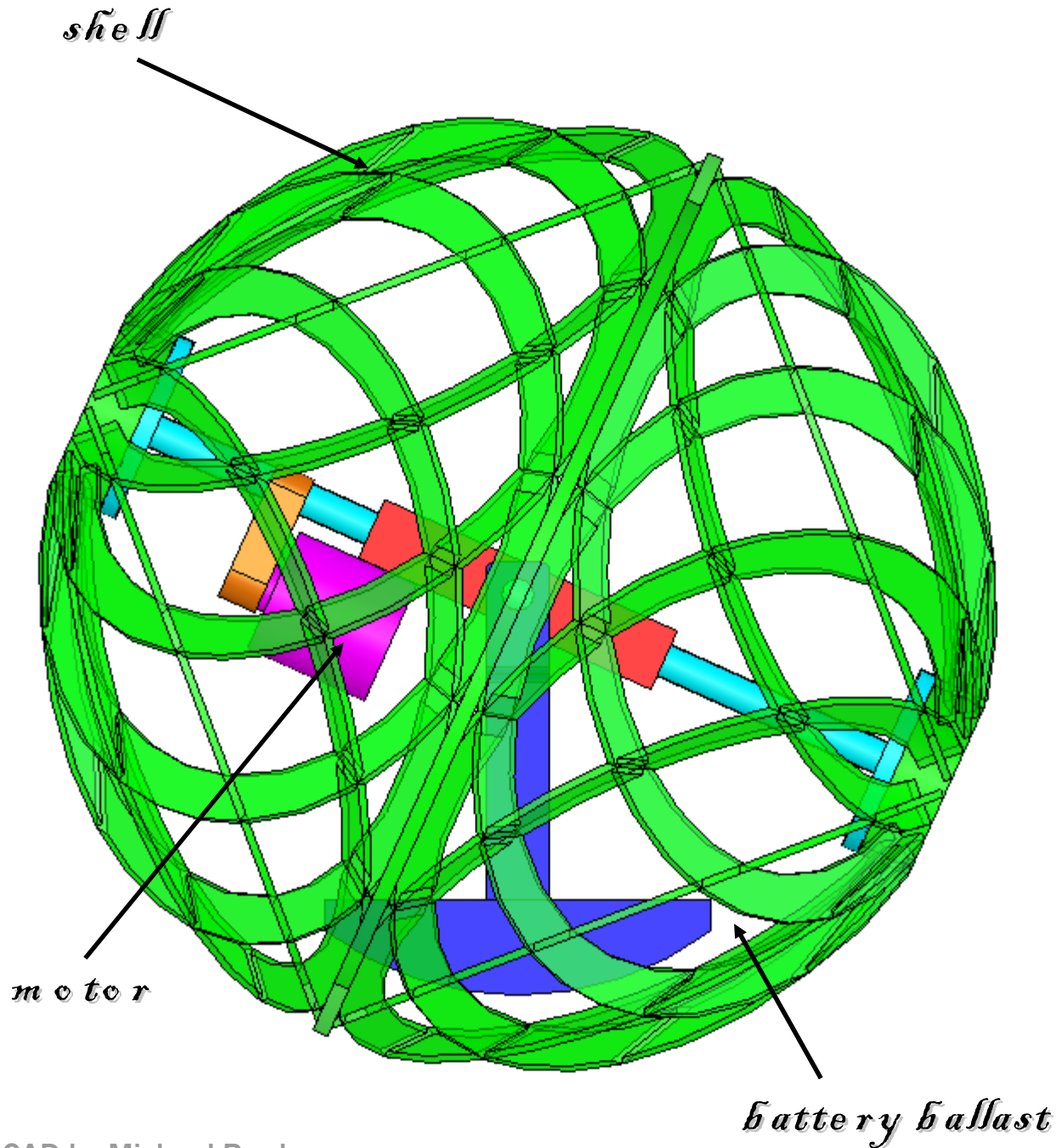
**Orbs play sound and  
music**

**Orbs light colors in  
response to the  
environment**

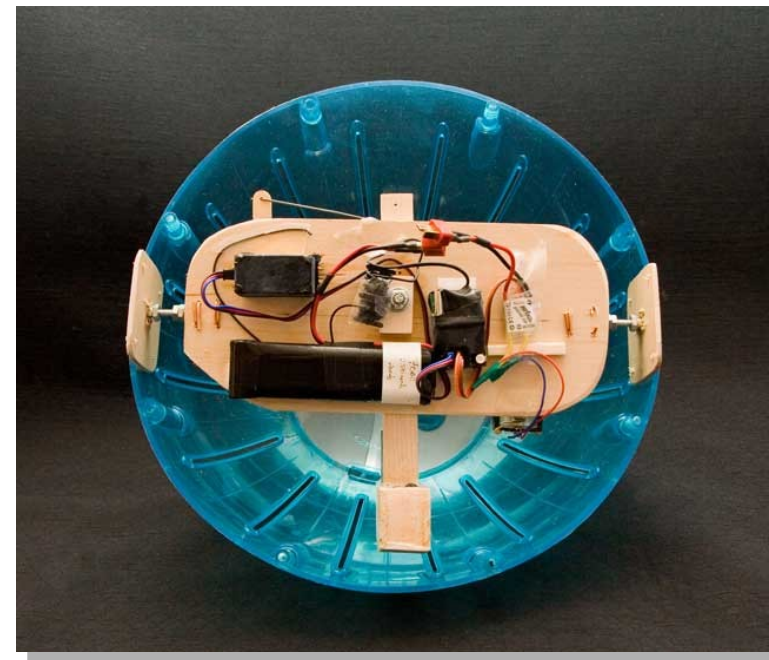
**A SWARM of rolling robot ORBS**

**evolving complex dances of LIGHT and PATTERN.**

# how they work



CAD by Michael Prados



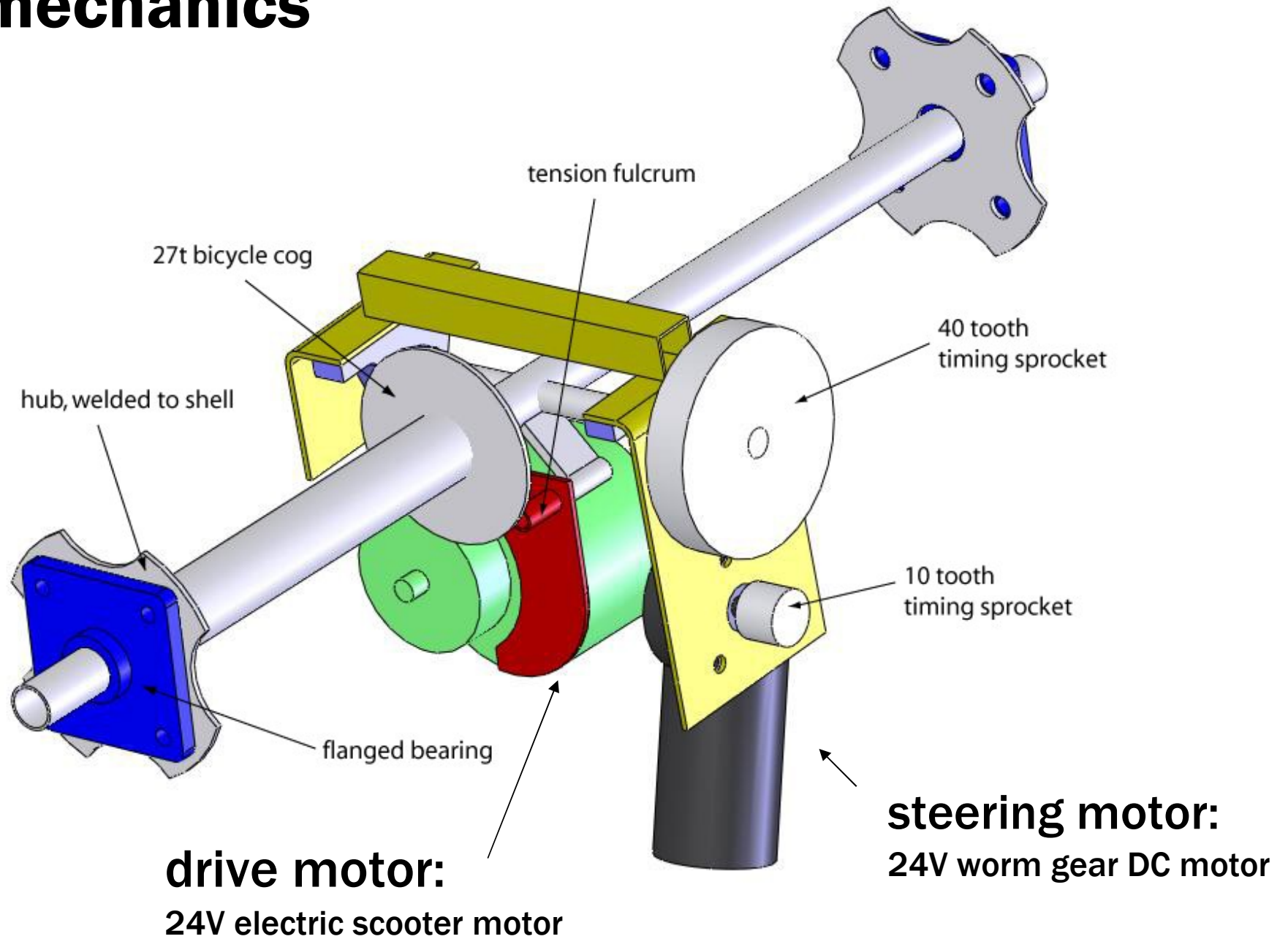
hamster ball prototype  
by Pete Burnight

A heavy battery pack provides  
a reactive ballast.

A drive motor spins the shell  
against the ballast, causing the  
orb to roll

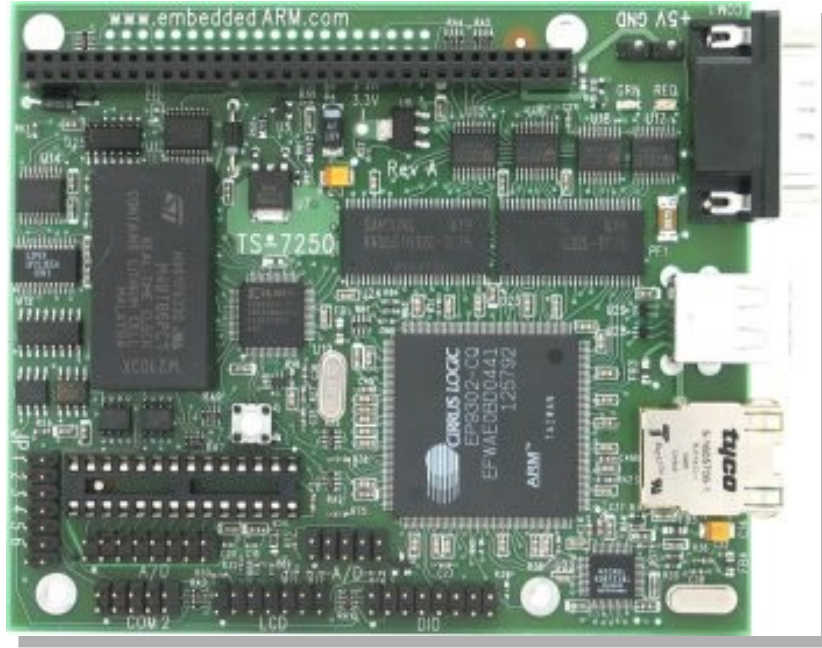
A steering motor tilts the  
ballast, allowing the orb to  
steer

# drive mechanics



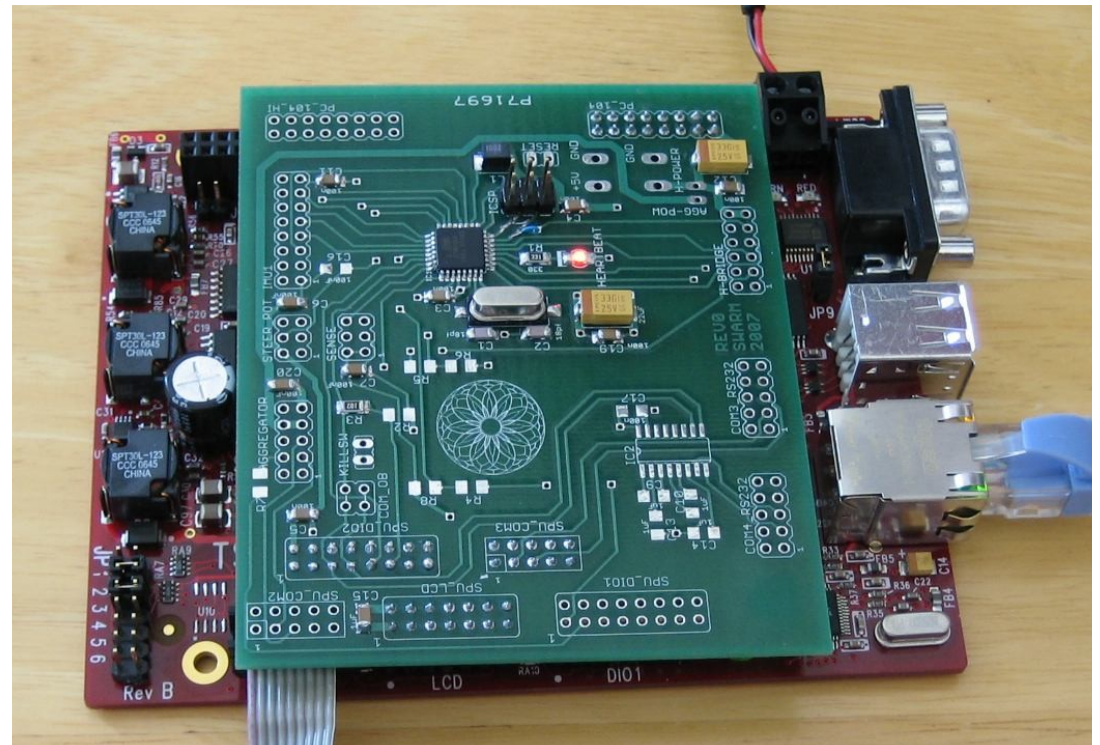


# the brains of the operation



**SPU – Swarm Processing Unit**  
**200 MIPS Linux ARM processor**  
**less than 1 watt power consumption**  
**[embeddedarm.com](http://embeddedarm.com)**

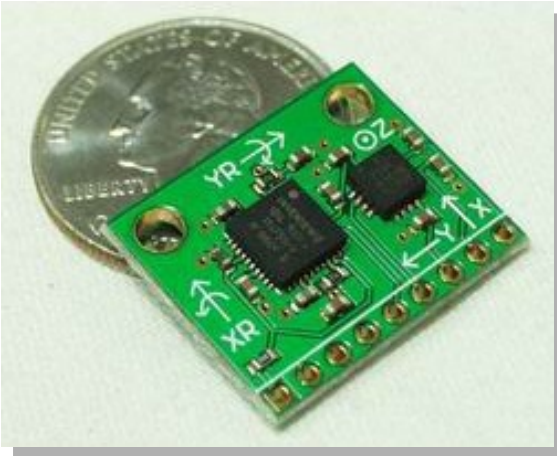
**Custom AVR daughterboard  
for motor control, plus custom  
H-bridge motor drivers**



***P.S. All our software is open source: [www.orbswarm.com](http://www.orbswarm.com)***

# sensors working overtime

Global Positioning System (GPS)  
modules



Micro Electromechanical (MEMS)  
accelerometers and yaw rate gyros  
([sparkfun.com](http://sparkfun.com))

Zigbee radio for serial digital  
communication  
[xbec.com](http://xbec.com)



# What's New in 2008:

- ◇ **More and better lighting**

*(twice as many light pods, individually addressable)*

- ◇ **Enhanced sound**

*(new enclosure and algorithms, higher fidelity)*

- ◇ **More powerful on-board computer**

*(more capabilities, better navigation)*

- ◇ **Enhanced algorithms**

*(more responsive to location and proximity)*

- ◇ **Enhanced controls**

*(Individual controls for untethered operation)*

- ◇ **Enhanced reliability and rollability**

*(More Orbs, more often, more places)*



# Why you should fund us again:



- ◇ *We are still working towards fully autonomous SWARM behavior. This is an extremely challenging project, and support from Burning Man was critical to the initial project as well as our continuing progress.*
- ◇ *We will use our time on the playa to capture data and benchmark algorithms towards autonomy.*
- ◇ *Getting operational high technology to the playa is not easy. We were proud to deliver last year, and we will do so again.*
- ◇ *You understand our vision like few other organizations. Whether our application is successful or not, we thank you for that!*

# vision: interactivity



**The Magic Wand allows participants to control SWARM and direct formations like a sorcerer.**

# Budget:

## Six Orbs based at Illumination Village

transportation (box truck and gas): **\$1500**

consumables (power, tools, shop rent, etc.): **\$500**

[Should we mention crew here?]

**total \$2000**

## Six Orbs with Hive (playa installation) and Mothership

**Transportation: \$2000**

**Consumables: \$750**

**Total: \$2750**



# Timeline [not updated for 2008]

Proposal



Approval



Design



Prototype



Design review



Manufacturing



Transportation



Installation



Leave No Trace



Burning Man

sep

# **Clean Up**

**Most elements of our installation are mobile. Playa impact is negligible beyond area demarcation and nighttime anti-collision lights. Nothing is burned. Clean-up is therefore straightforward:**

**Monday XXrd:**

**All Orbs are collected and packed for transport.**

**Mothership is broken down for loading.**

**Tuesday XXth:**

**Truck loaded. Any playa impact (stake holes, etc.) is remediated.**

**Installation area and surrounding area swept for MOOP.**

**Artery staff inspect area and check off Swarm project.**

**No trace will be left. We will Leave No Trace.**

# Our gang

**SWARM is a collaborative project featuring members of the Flaming Lotus Girls, the Sunflower Robots Project, members of the robotics, kinetic art, and Linux/open source communities. We are particularly proud of our unhierarchical collaboration style, and we were pleased to introduce several new burners to the playa last year. All SWARM designs and code is open-source and freely available to help or inspire other artists. We hope to continue our tradition of bringing high technology to the playa, on time, on budget, and operational.**



**We have an experienced, diverse, and technically sophisticated crew featuring many veteran Burning Man artists and engineers. In past years, crew members have made major contributions to the following Burning Man artworks:**

***A Field of Sunflower Robots (2006)***

***The Flaming Lotus Girls' Serpent Mother (2006), Angel of the Apocalypse (2005), Seven Sisters (2004), Hand of God (2003)***

***The Mad Scientist's L3K (2006) and STS (2004)***

***Al Honig's Hope/Fear Gauge (2006)***



# **SWARM Crew**

Aerin Heinemeyer  
Charlotte Sanford  
Chris Gerbik  
Corey McGuire  
Dawn Ryan  
'Dillo Okay  
Erik Swedberg  
Jonathan Foote  
Jesse Zbikowski  
Lee Sonko  
Lisa Schile  
Marc Hertlein  
Mark Alexander  
Marnia Johnston  
Melissa Mayer  
Michael Prados  
Niladri Bora  
Ray Sykes  
Robert Harris  
Rick Taylor  
Rick Lellinger  
Simran Gleason  
Stefano Corazza  
Tad Rollow

## **With special thanks to:**

Aimee E	Michelle Palmer
Anne Geluardi	Naemi Frey
Baba Frey	Nate
Barry Cogbill	Olivia G. Sawi
Ben Thompson	Olivier Bonin
Caroline Miller	Olya Myhaylovska
Charlie Gaden	Paul Rowan Walker
Dan Sandberg	Pete Burnight
David Fine	Peter Luka
Drago Anguelov	Phil Spitler
James Stauffer	Pouneh Mortazavi
Jessica Hobbs	Rebecca Anders
Jill Manthei	Rich Humphrey
John Humphrey	Sameer Al-Sakran
Josh Hunter	Stella Rubenstein
Lee Chubb	Steven Nelson
Lemuel	Tasha Berg
Liam McNamara	Tom Kennedy
Mark Farrier	Vanessa Montiel
Matthew Cline	

**thank you**

**[www.orbswarm.com](http://www.orbswarm.com)**

