Public Invention Annual Report, 2019

-- Robert L. Read, 1/11/2020

This is the annual report of Public Invention for the year 2019.

Summary of Organization Actions

Public Invention was incorporated in the State of Texas as a non-profit corporation in the year 2019. A board consisting of 10 persons was installed. The first official board meeting occurred on Feb. 15th, 2019. Our EIN is 83-4036254. On October 28th, 2019, Public Invention was granted 501c3 tax-exempt status by the IRS as a public charity.

There were a number of working meetings throughout the year. On Dec. 7th, we had a combination demo-day/workshop and official board meeting. This was attended by 8 board members. One board member was ill and one resigned ahead of the meeting due to lack of time.

Board Members at the time of this Writing

Many thanks to our board members:

- Robert L. Read, PhD, President and Treasurer
- Stephanie Liu, Vice President
- Marc Jones, Attorney at Law
- Keeshan Patel, Student Representative
- Lea Shanley, PhD
- Martin Smith, PhD
- Adam Riggs
- Nina Bianchi
- John K. Gibbons

Treasurer's Summary

In the course of 2019, Public Invention received gifts from five persons:

1. Robert L. Read donated $17,000 ($15,000 in cash and $2000 in legal fees.)
2. Margaret Robinson Read donated $2,000.
3. David Jeschke donated $1,000.
4. Avinash Baskaran donated $100.
5. Marc Jones donated $10.

All of these people have been given official thank you letters to use in support of the tax-deductible nature of their gift.

As of Dec. 31st, 2019, Public Invention has approximately $6,000 in cash. Below is a categorization of our expenses. Most of the equipment expenses were for the TetRobot Project (~$6000), with a smaller amount (~$2000) spent on the Rapid E. coli detection project.

Income	
Donation	18,000.00
Total Income	$18,000.00
GROSS PROFIT	$18,000.00
Expenses	
Advertising & Marketing	571.05
Bank Charges & Fees	66.23
Books	197.64
Equipment	8,579.39
Job Supplies	122.38
Legal & Professional Services	57.06
Meals & Entertainment	993.15
Office Supplies & Software	184.03
Other Business Expenses	133.25
Reimbursable Expenses	52.25
Travel	521.47
Uncategorized Expense	100
Total Expenses	$11,577.90
NET INCOME	$6,422.10

At the time of this writing we have already encumbered approximately $4500 for a new website and for additional graphic art work.

Public Invention Projects

Public Invention organizes its activities around specific projects.

Math Tablet

Math Tablet is a software project coached by David Jeschke. Throughout 2019 Rob collaborated with David approximately one day a week and is likely to continue. In this space of time significant progress has been made. Although all Public Invention project are free-libre open source from the first day, we have not yet attempted to recruit other volunteers to work on this project, but we feel that within a few months we may reach a level of functionality worth announcing. Right after the board meeting, we got the production of a PDF, including images and plots, working, a major advance in some ways.

TetRobot

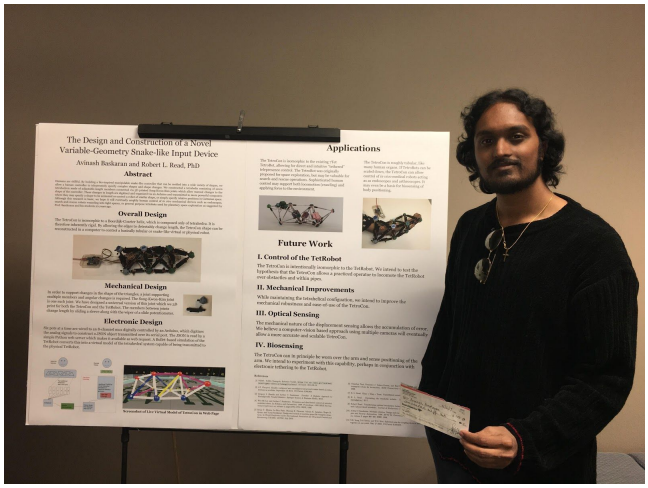
The TetRobot Project is Public Invention's longest running project. It is hoped to be revolutionary basic research, in is particularly applicable to search-and-rescue type robotics and space exploration. In 2019 significant improvements were made to the jointing system and and the robustness of the connections. This was driven by work with Public Invention's Avinash Baskaran on the TetroCon controller, which is isomorphic to the TetRobot. Avinash is particularly interested in using the TetRobot for therapeutic purposes or possibly human augmentation or for prostheses. Both the TeRobot and TetroCon now use the same universal Song-Kwon-Kim joint, but at different scales. Recent work has gotten (slow) locomotion and turning of the Tetrobot working. We believe coming weeks will make this work publishable. We are aiming to submit this work to Robotics: Science And Systems, an A-level conference.

TetroCon

Avinash Baskaran, an undergraduate at the University of Texas in biomechanics hoping to attend graduate school in robotics, has been the lead volunteer acting on the TetroCon project, with Rob serving as Invention Coach. This project was begun by Rob, Joshua Hannon, and Evan Bartilson. However, Avinash has made significant improvements:

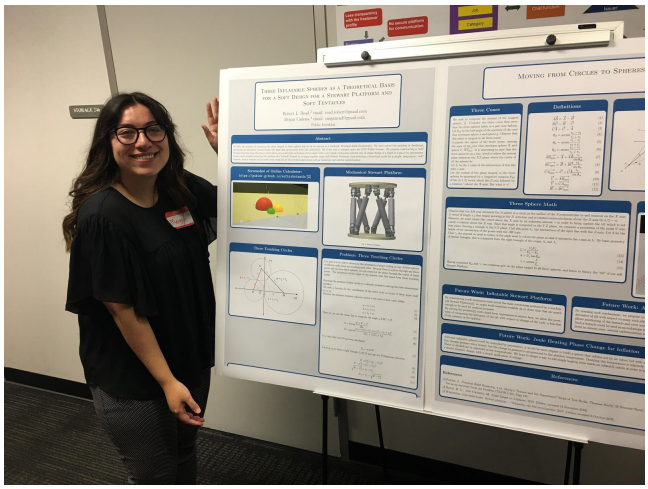
- The sleeves have been redesigned to support the universal jointing system,
- The controller has been expanded to 7 (instead of 2) tetrahedra,
- The system now uses several 8-channel mulitplexers and an Arduino as its base input,

Avinash won a $100 prize for best poster at an IEEE poster session at the University of Houstion, Clear Lake, in November.



Soft Robot Math

Megan Cadena, also an undergraduate in biomechanics at UT, competed in the same poster session with her work Soft Robot Math coached by Rob. Megan has learned LaTeX on this project and has done a great job presenting the work and catching some of Rob's math errors. In keeping with our principle of making our work as accessible as possible, this math is embodied an online interactive 3D calculator. Additionally, a team of three Public Invention volunteers, Megan, Avinash, and Kesshan, intend to build a Stewart Platform based on her math as their entry into the UT CreateAThon competition.



Number Spectra

Eric Goff is the Invention Coach of the Number Spectra project. Eric and Rob continue to work on the "Number Spectra" project but have put little time into it and have not made much progress. It is possible this project will be closed in coming months in 2020.

Segmented Helix

Rob completed the "Segmented Helix" project including a browser-enabled interactive 3D demo which grew out of the 2018 Mathathon and paper. Rob intends to submit this work to the 2nd IMA Conference on Mathematics of Robotics. This work of applied math grew out of the 2018 Public Invention Mathathon that was executed before Public Invention was incorporated. It is an example of very "applied" math that could let robotocists as well as chemist design better structures.

Rapid E. coli Detection

"Rapid E. coli detection" is one of the most directly humanitarian of our active projects in 2019: it could save lives by allow fecal contamination of drinking water be detected more quickly. The goal is to allow detection in the field without a laboratory as rapidly as possible. Currently this takes 48 hours; we hope to reduce this 6 hours or less. We had a summer volunteer for this but they quit before much was accomplished. We have purchased some microscopes for the project and it remains one of our highest priorities for 2020.

Social Tetrahedrons

Social Tetrahedrons was done as an outreach effort at the request of Mark Frazier, a maven in some communities focused on new educational approaches. The project is completed.

Triad Balance

Research tends to go on for other; every invention raises more questions than it answers. The Triad Balance project is perhaps a rare exception. This was a project begun in 2019 and now completed with no future effort planned. An essay introducing it was published in The UX Collective where it has been read 178 times. Like Segmented Helix, it was a spin-off project, in this case from Social Tetrahedrons.

Other Contributions

Public Inventions supports its own projects, but of course supports contributions to other free-libre open source projects. Rob made a pull request adding some functionality to vec-la-fp, a functional 2d linear algebra project. Rob and Avinash published a tiny OpenSCAD tool they created for their own work, SCAD-fillet-tools.

Additionally, Rob and Neil Martis have worked on GeoTagText, a fun project combining geotagging with open map technology that could be particularly useful in disaster relief

scenarios. More needs to be done with this project---it would make a fine essay explaining how easy it is to use these tools. However, writing the essay is a lower priority than the academic writing that Rob and the other volunteers are working on.

A Nascent Project

We expect to begin a project to develop a standard for the sanitizability of Earthen Floors in connection with EarthEnable. Earthen floor are engineered floors that create far less carbon emissions than concrete floors and are less expensive, but may significantly decrease the spread of livestock borne diseases. By developing a testing standard, it becomes easier for funding agency to trust their investment in healthy floors is well-spent.

Outreach and Communication Efforts

Conferences and Events

Rob and Marc jointly submitted a “session” to LibrePlanet 2020. This is a large conference which will give us exposure. They have already written the complete slides for the talk, based on work instigated by Stephanie to produce a lightning talk.

Rob and Stephanie had intended to speak at Hacker Dojo in San Francisco. Unfortunately, Rob was hit by a car on his bicycle and had to have urgent surgery, which disrupted our plans.

The IEEE poster session promoted Public Invention to a small number of professors and students. It was a valuable experience for our volunteers.

We have been invited to present a session NomCon (Nation of Makers Con) in June. We intend to assist them in the documentation effort.

Writings

A number of essays were published at Medium.

Date	Reads	Read ratio	Fans
A UX widget for expressing balance: Triad Balance In UX CollectiveView storyDetails	178	46%	4

How to Graduate from Maker to Public Inventor In HackerNoon.comView storyDetails	38	30%	5
The Joy of Collaboration In HackerNoon.comView storyDetails	56	25%	6
Public Invention Project #40: A Wheel for Painting Very Thin Lines In HackerNoon.comView storyDetails	49	54%	3
43 Public Invention Projects That Need You In HackerNoon.comView storyDetails	400	61%	8

Awards

Because Public Invention is a movement based on altruism and non-monetary rewards, recognizing contributions is incredibly important. At the physical mini-conference on Dec. 7th, 2019, the following award were officially presented.

- Best Public Inventor of 2018: Keeshan Patel
- Best Public Inventor of 2019: Avinash Baskaran
- Best Mathematical Contribution of 2019: Megan Cadena
- Best Public Invention Coach of 2019: David Jeschke
- Public Invention Coach, Honorable Mention, 2019: Eric Goff
- Most Active Board Member, 2019: Stephanie Liu

University Outreach

Our volunteers Megan, Avinash and Keeshan have drafted a constitution for a formal club at the University of Texas called “Public Invention and Humanitarian Engineering”. This club may be a way for us to recruit more volunteers and promote Public Invention. We may hope it serves as a model for other clubs at other Universities as well.

Board Recruitment

Several students have expressed a desire to be on the board. We may fill this need by creating a Volunteer Advisory Council rather than expanding the formal board, which is somewhat fixed by the bylaws and the laws of the State of Texas.

There will be an ongoing need to recruit exceptional board members, but at the moment we have an acute need to recruit two women to maintain our gender balance due to the resignation due to lack of time of Kaitlin Devine and the fact that Dr. Lea Shanley does not intend to serve

an additional term once her term is up February 15th. We are actively discussing this possibility with excellent candidates.

Strategy and Plan for 2020

The full breadth of strategy discussions which the board discussed can only be summarized here. We choose the following priorities:
Highest priority:

1. External Funding
2. Promote Rapid E. coli Detection (Wet Poop)

Other priorities in order:

1. Increase contributors (volunteers)
2. Build a better website
3. Attend conferences and events
4. Create Communications strategy
5. Impact Metric Space

We have created the following task groups, two of which have already met at least once as of this writing:

1. Fundraising: Lea to kick off. Include Steph, Nina, Marc, Rob
    a. Grants
    b. Big donors
    c. Crowdfunding/small donors
    d. Industry: corp sponsorships and in-kind donations
    e. Recruit fund-raising board members
2. Engagement: Steph to kick off. Include Keeshan, Megan, Avinash.
    a. User interviews
    b. Partnerships
    c. Event series
    d. Lea to connect to Citizen Science
3. Website/Content/Comms: Rob to lead. Include Nina, John, Adam.
    a. Website
    b. Materials for Events
    c. Resources/docs

We have taken the following actions to address this:

- We have begun exploring partnership with Nation of Makers
- We have begun creating a club at UT
- We have hired and kicked-off professional website design (https://trisummitsolutions.com/)

- We have engaged a professional artist to create a Public Invention-branded Infographic around the “fuller”, our metric of humanitarian impact.

Additionally, we can identify goals which are continuations of last years goals and work:

- Progress the Math Tablet project to the point of being able to announce and possibly attract new recruits.
- Submit the Segmented Helices paper to an academic conference.
- Submit the TetroCon work to an academic conference.
- Participate in LibrePlanet (conditional on acceptance of our submission).
- Participate in “Nation of Maker Con”.
- Contribute to decreased carbon emissions by assisting EarthEnable in developing a sanitizablity standard test for Earthen Floors.

The major goal of gaining external funding is being discussed. The goal of prioritizing the Rapid E. coli Detection project has been addressed by improving the project description. Rob intends to actively attempt to recruit for this project in the coming quarter.

Conclusion

2019 was the first year of formal operation for Public Invention, and much has been accomplished. We invite you to assist us in this effort in 2020 by joining us with your energy, time, talent, or money.

-- Robert L. Read, President and Treasurer