

# Public Invention Annual Report, 2021

-- Robert L. Read, 1/6/2022

This is the Annual report of Public Invention for 2021.

## Executive Summary

We are hosting a conference, [RespiraCon II](#), on January 29th and 30th. We have 190 registrants so far.

Audrey Rusing has joined us as a social media coordinator and has kept a steady stream of biweekly posts going, although it has not yet created huge growth in our social media accounts. Miriam Castillo has joined as a volunteer coordinator and has recruited several great candidates, and is talking to UNIVA University in Mexico about creating a Public Invention and Humanitarian Engineering club as Auburn University in the US has initiated this year.

PolyVent switched to working on a proportional valve system. We are making good progress, but losing our main engineer this month (he is in high school and going to college.)

Veronica Stuckey made a breakthrough on the Ferrofluid Check Valve project. We have submitted this as a short paper to a physics journal.

It remains challenging to find volunteers more skilled than recent college graduates. Many of our projects are stalled. We continue to produce publishable work but our upward momentum has somewhat stalled.

Nina Bianchi completed her board term and has become a Public Invention Advisor.

## Financial Position

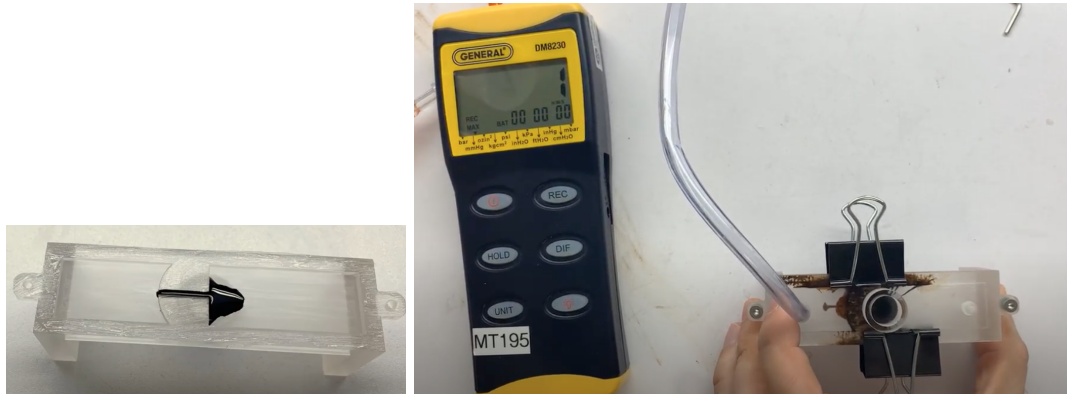
We have approximately more than \$20,000.

## Projects (Non-Freespireco)

A majority of Public Invention's work is organized into projects; our main mission is to invent things that help all people. These are our most active Public Invention projects:

## Passive Ferrofluid Check Valve

Veronica Stuckey, a new public inventor, has made tremendous rapid progress on our idea of creating a passive ferrofluid check (one-way) valve. This is a core invention which is the heart of making a pump-on-chip or a lab-on-a-chip. She has produced a working prototype based on Rob's idea already! Publishing this quickly is a high priority. Here's a [link to the video](#). This was submitted to one journal that rejected it because they do not publish short articles. It is currently in the review process at another journal.



Veronica is going to design an air pump based on the PFCV.

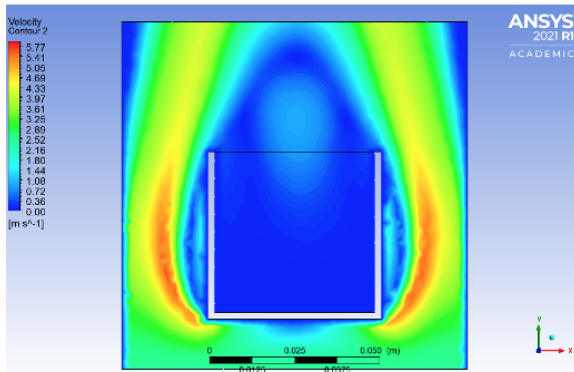
## Regulatory Sunlight

Marc Jones and Rob made considerable progress drafting "[Regulatory Device Approval Sunlight License Legal Text](#)", however we made little progress this semester.

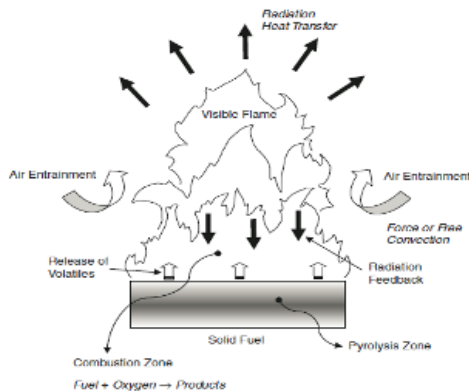
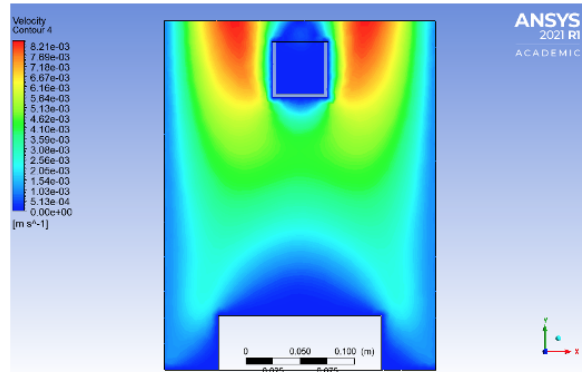
## EcoPot

Last semester, the Rice EcoPot team showed a very exciting 40% reduction in boil time based on our more efficient cooking pot design. A new graduate student of Dar-as-salaam, Tanzania with Rice 360 Global Health, Mr. Abdulmujahid Mustafa, has taken over the initial work done last semester by the Rice team. He has excellent knowledge of ANSYS/FLUENT for computational fluid dynamics. Rob will provide guidance for this project. Our goal is to design a functional pot that requires 50% less fuel on an open wood fire, to significantly reduce poverty and labor of the one billion people who still cook on open fires.

### Previous Velocity distribution



### Improved Velocity distribution



The current work with Mr. Mustafa is advancing slowly.

## Suspended Projects (non-Freespireco)

This recent 6 months has been a time of low energy for many of our projects for reasons related to the pandemic and a confluence of personal mishaps.

### Moonrat: A Portable Incubator

Our volunteer got very sick and then quit. Finding a new volunteer for this is a major priority.

### Math Tablet / Euler Notebook

David Jeschke had to re-take the Executive Directorship for his non-profit XtraMath, which has put this work on hold until the summer. I suspect it will not resume with David as the leader.

# Freespireco Projects

We are in light conversations with funding agencies around the [Freespireco](#) grant we have written, which is asking for \$400,000. The projects below are all part of the Freespireco over-project.

## PolyVent

The [PolyVent Ventilator](#) is now our most active project. We are paying Nathaniel Bechard \$20CAD/hour to develop the next hardware version. He is making good progress. The PolyVent project runs the VentOS open source software. We plan to make 6 units to give to research hospitals and universities by January. With the help of Miriam Castillo, we have recruited Chad Estil to replace or augment Nathaniel.



The current prototype is making good progress. It may be demoable at RespiraCon II.

## Standards and VentOS

VentOS is a project of Helpful Engineering. However, it utilizes data standards and software created by Public Invention for the VentMon, including VentDisplay, PIRDS and PIRCS. We recently expanded PIRCS based on input from Erich Schulz, MD. These standards continue to evolve.

VentOS remains a very active project, and is now closely tied to PolyVent.

## Oxygen Concentrator Maintenance/Repair Project

“OSMS recently partnered with Public Invention to produce guidance around maintenance and operating considerations for oxygen concentrators. Our pamphlet covers the most basic recommendations for maintenance and operating considerations and is intended for distribution to any healthcare worker or medical personnel where oxygen concentrators are used in the treatment of patients.”

The RespiCon conference and the therapeutic oxygen crisis in India instigated the idea that we could help best by collecting and distributing information. Led by Christina Cole of OSMS, we began documenting maintenance practices for oxygen concentrators. OSMS has had success with “Guides” before. We intend to ask the Every Breath Counts Coalition run by Leith Greenslade to help publicize this when it is done. Christina Cole [completed this work \(printable here\)](#) at zero costs to Public Invention.

## Suspended Projects (Freespireco)

### VentMon

We are designing the VentMon T0.5. However, I don’t know if we will produce it. There does not seem to be much demand for it.

### The Ox: Public Invention Oxygen Concentrator

Public Invention has “[the Ox](#)”, a functional O2 concentrator, but it needs major design improvements before it is close to ready. This project is coached by Mr. Ben Coombs, and the physical prototype is in New Zealand currently. Unfortunately, progress on this project has been slow due to Ben also working on VentOS and the VentMon projects. Also, he and his wife had their first child in December. Ben has a prestigious job at RocketLabs which limits his time.

## Projects Mentored at Universities

### BVM Monitor

A second team from Rice, Team Breathe Easy, made considerable progress on making a small, robust Bag Valve Monitor that could improve first aid and emergency medical care. This work is now continued by the Rice InhaleEZ Rice Senior Capstone team. This team continues to work, although they have taken a direction I disagree with, but I will continue to mentor them.

## A Cooling Jacket

To address the likely increase in heat waves and the possible increase of catastrophic wet-bulb temperature rise, we proposed the “cooling jacket” idea --- the idea of electrically powered apparel to keep you cool. Such apparel exists for some purposes in the \$3000 price range, but cannot be deployed to a village suffering a devastating heat wave. A Freshman design team at Rice University is undertaking an initial design of this. Rob visited them one weekend.

This was investigated and reported on successfully by the Team. A professor at Rice thinks it is interesting enough to continue the work with Senior Undergraduates.

## Observations

The last quarter has been harder to sustain energy by all volunteers, everywhere, than previously.

## Partnerships

Public Invention continues to support other teams wherever possible.

## Outreach

Audrey Rushing has joined Public Invention as a social media coordinator, a difficult job that we definitely need. Miriam Castillo has joined as a volunteer coordinator and will also try to create Public Invention and Humanitarian Engineering clubs world-wide.

## Events

By (small) popular demand, Public Invention is planning to host [RespiraCon II](#) in January. This is being co-hosted with [Rice University's OEDK](#), [Sirius Global](#), and the [Every Breath Counts Coalition](#). We have 18 outstanding thought leaders as speakers+. There are 190 registrants so far.

Leith Greenslade is the keynote speaker. This will likely be an all-virtual event. It will take the place of the annual Public Invention conference, which will be held in June.

As part of this work we wrote the [Open Medical Technology Manifesto](#).

## Peer-reviewed Publications

Rob presented an important work at the [2nd IMA Robotics and Mathematics conference](#). This was a great success and has now been published. Publishing the long-form version of this in a Journal is a high-priority, as this is some of our most significant work.

A paper describing the “[Great Ventilator Rush of 2020](#)” has been accepted by the “Blue Book”, the Australian Journal of Respiratory Care/Anesthetics.

We have submitted a report on the [Ferrofluid Check Valve](#).

## Partnerships and Cooperation

Public Invention continues to actively cooperate with Rice University, Helpful Engineering, OSMS, JOGL, and the Every Breath Counts Coalition. In particular, all of these organizations are helping with RespiraCon II.

## VentOS and Helpful Engineering

Rob continues to devote significant time and energy to the VentOS project and Project Data projects of Helpful Engineering. Additionally, Rob is on the board of directors of Helpful Engineering. This is a fruitful collaboration and has been insightful in a number of ways.

## Slow Social Media Growth

Despite our efforts, our social media presence has seen about 5% quarterly growth, a slow down from last quarter:

1. Our [YouTube](#) channel has 200 (from 191) subscribers.
2. Our [Twitter](#) handle has 160 (from 138) followers.
3. Our [LinkedIn](#) page has 196 (from 160) followers.

## Strategy for the Coming Year

Our strategy for the coming year is centered around the Freespireco Project. Making progress on PolyVent, VentOS, Regulatory Sunlight, and other projects in Freespireco to position us to get a grant is the highest priority.

Freespireco is proposing something that has never been done before: building free-libre open source medical devices. This is technically, legally, and regulatorily complicated, but the payoff for the world will be huge.

Additionally, we need to improve our ability to use social media effectively. Hopefully Audrey Rushing will assist us with this. Our web presence and stature is growing, but not as quickly as it should be for the high-quality work we are doing.

## Balance Sheet

### Public Invention

#### Statement of Financial Position

As of December 31, 2021

|   | TOTAL              |
|---|--------------------|
| <b>ASSETS</b>                               |                    |
| Current Assets                              |                    |
| Bank Accounts                               |                    |
| PayPal                                      | 552.95             |
| PolyVentPayPal                              | -70.85             |
| Wells Fargo Simple Business Checking (7066) | 19,035.84          |
| <b>Total Bank Accounts</b>                  | <b>\$19,517.94</b> |
| Other Current Assets                        |                    |
| Petty Cash                                  | -0.90              |
| <b>Total Other Current Assets</b>           | <b>\$ -0.90</b>    |
| <b>Total Current Assets</b>                 | <b>\$19,517.04</b> |
| <b>TOTAL ASSETS</b>                         | <b>\$19,517.04</b> |
| <b>LIABILITIES AND EQUITY</b>               |                    |
| Liabilities                                 |                    |
| Current Liabilities                         |                    |
| Other Current Liabilities                   |                    |
| Robs personal contributions                 | 0.00               |
| <b>Total Other Current Liabilities</b>      | <b>\$0.00</b>      |
| <b>Total Current Liabilities</b>            | <b>\$0.00</b>      |
| <b>Total Liabilities</b>                    | <b>\$0.00</b>      |
| Equity                                      |                    |
| Retained Earnings                           | 44,519.28          |
| Net Revenue                                 | -25,002.24         |
| <b>Total Equity</b>                         | <b>\$19,517.04</b> |
| <b>TOTAL LIABILITIES AND EQUITY</b>         | <b>\$19,517.04</b> |



## Donations from 2021:

1. \$395 from "Network for Good"
2. \$25,000 anonymous donation
3. \$1000 from Phillip Schmaezel
4. \$500 from Andrew Lamb (head of FieldReady)
5. \$100 from R.R. Desai
6. \$1000 from Rui Coto (on PolyVent team)
7. \$50 from Stephanie Liu
8. \$54 from my Nancy Reed
9. ... and \$10/month from Marc Jones.
10. \$1000 from David Jeschke
11. \$3000 from Margaret R. Read

# Expenses thisYear:

## Public Invention

Statement of Activity  
January - December 2021

|  | TOTAL                |
|--|----------------------|
| Revenue                                  |                      |
| Donation                                 | 29,275.40            |
| <b>Total Revenue</b>                     | <b>\$29,275.40</b>   |
| GROSS PROFIT                             | <b>\$29,275.40</b>   |
| Expenditures                             |                      |
| Advertising & Marketing                  | 6,456.35             |
| Awards                                   | 70.36                |
| <b>Total Advertising &amp; Marketing</b> | <b>6,526.71</b>      |
| Bank Charges & Fees                      | 45.00                |
| Books                                    | 340.92               |
| Charitable Contributions                 | 3,065.00             |
| EcoPot                                   | 933.54               |
| Equipment                                | 0.00                 |
| Euler Notebook                           | 1,436.47             |
| Moonrat                                  | 362.26               |
| OxygenConcentrator                       | 793.76               |
| <b>Total Equipment</b>                   | <b>2,592.49</b>      |
| Ferrofluid Check Valve                   | 115.04               |
| Moonrat                                  | 1,456.25             |
| Office Supplies & Software               | 1,224.90             |
| Other Business Expenses                  | 293.15               |
| PolyVent                                 | 17,411.87            |
| Publication Fees                         | 1,395.89             |
| Research                                 | 206.41               |
| Shipping                                 | 1,094.91             |
| Taxes & Licenses                         | 60.85                |
| TheOx-O2 Concentrator                    | 0.00                 |
| Travel                                   | 789.50               |
| VentMon                                  | 16,725.21            |
| <b>Total Expenditures</b>                | <b>\$54,277.64</b>   |
| NET OPERATING REVENUE                    | <b>\$ -25,002.24</b> |
| NET REVENUE                              | <b>\$ -25,002.24</b> |