

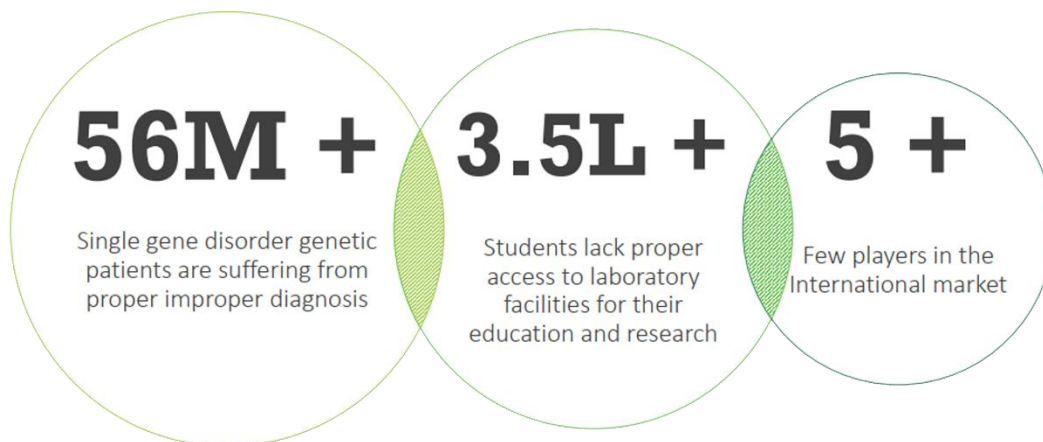
# ALL-IN-ONE MOLECULAR LABORATORY

From the market research made in the existing portable laboratories, Bento labs are the only ones who are doing it commercially and rest of the other players are focused on either education or miniature PCR models but never a molecular laboratory as a whole.

## What purpose do we serve?

- An affordable research tool for every curious biologist
- An easy and inexpensive DNA analysis tool in various sectors of science from medicine, agriculture to fish farming with real-time monitoring
- A robust educational tool for students and educators to take biology beyond the walls of laboratories

## The Need?

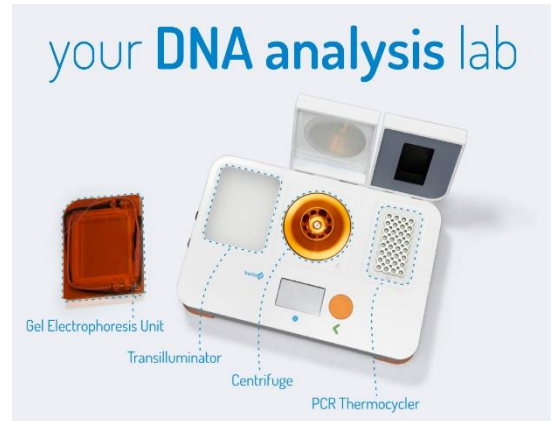
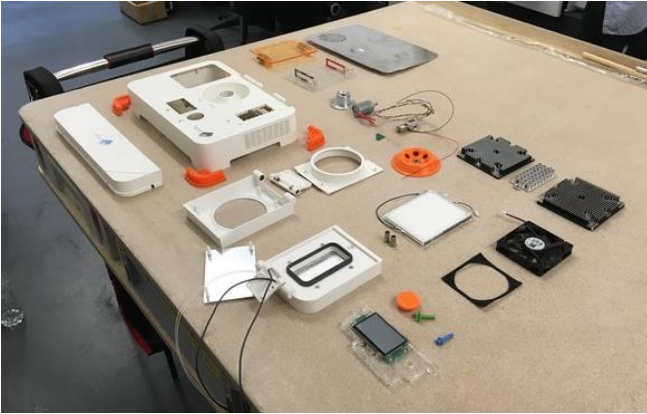


## THE EXISTING PLAYERS

### Bento labs

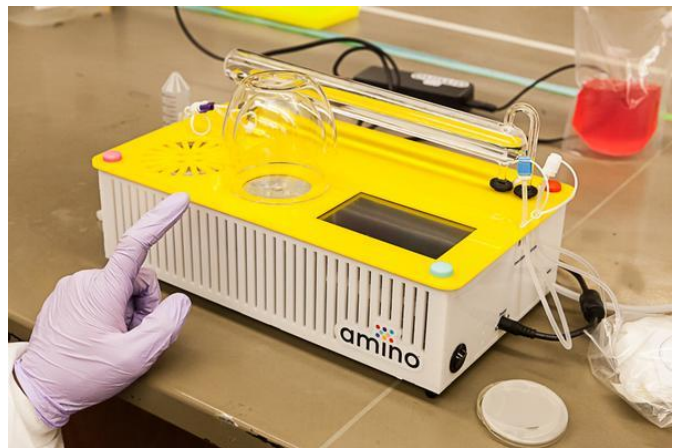
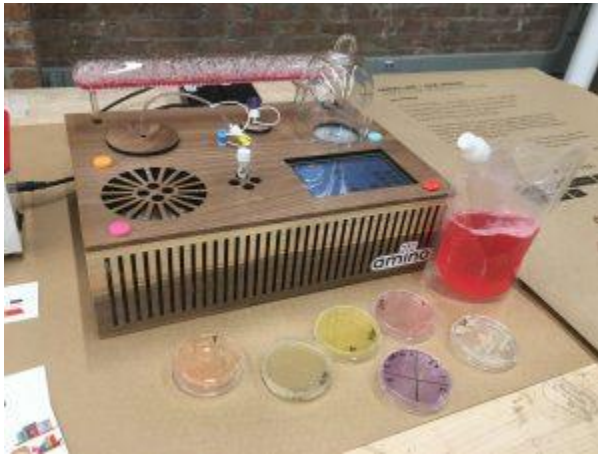
<https://www.bento.bio/>

- **Bento labs** based upon UK focuses on portable DNA analysis lab that contains the following – PCR, Centrifuge, trans-illuminator and an electrophoresis unit.
- They are the only commercial player in the market that focuses on the portable wet lab as a whole.
- They lack an incubator in the model which restricts all the microbial and storage problems.
- They are still in the pre-market phase and yet to reach the global customers.



### Amino labs

<https://amino.bio/>



- Amino labs are based upon MIT-Media lab, USA where they focus on microbial work.
- It is used as an incubator to grow and culture bacteria and transform them.
- They also sell a teaching kit for the schools to transform bacteria into bioluminescent ones.

### Gaudi labs

[http://www.gaudi.ch/GaudiLabs/?page\\_id=328](http://www.gaudi.ch/GaudiLabs/?page_id=328)

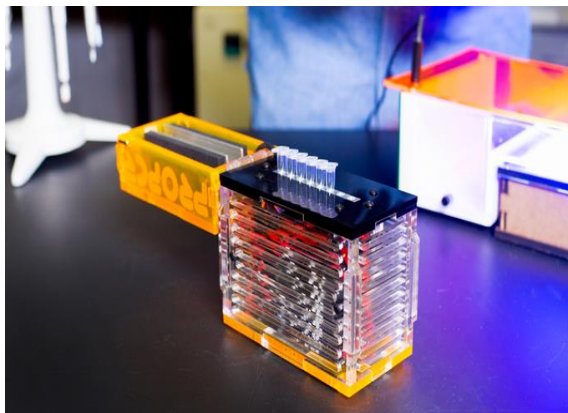
- Gaudi labs is an open source group of science communicators and DIY hackers who have published their model, designs and protocols to build their own individual instruments for the purpose of biological experiments.



## ProPCR

<https://www.kickstarter.com/projects/manifest-biology/propcr-democratizing-synthetic-biology?lang=de>

- They initially started as a Kickstarter project with the aim to make PCR available to a larger audience.
- They are still not in the market and they focus only on making miniature PCR and upgrading to mobile apps through which the process could be controlled.



## MiniPCR

<https://www.minipcr.com/>

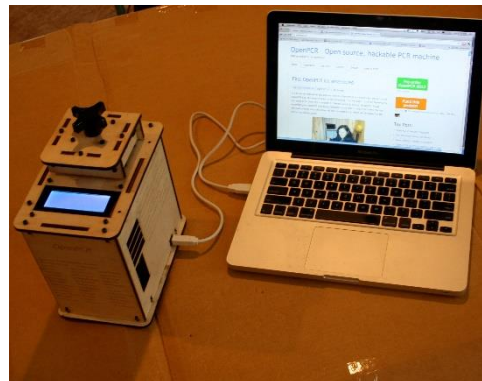
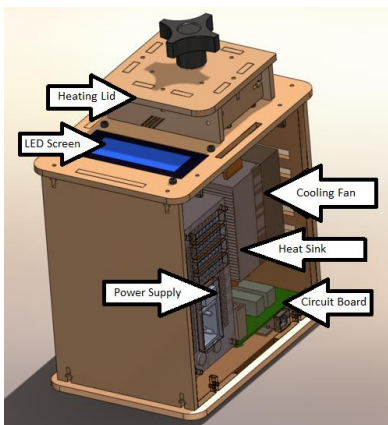


- MiniPCR is a commercial company whose focus is PCR and related miniature products.
- They are commercially very expensive.

## OpenPCR

<https://openpcr.org/>

- OpenPCR sells DIY PCR kit from their programmed boards,
- The kit is made out of cardboard and it is removable.



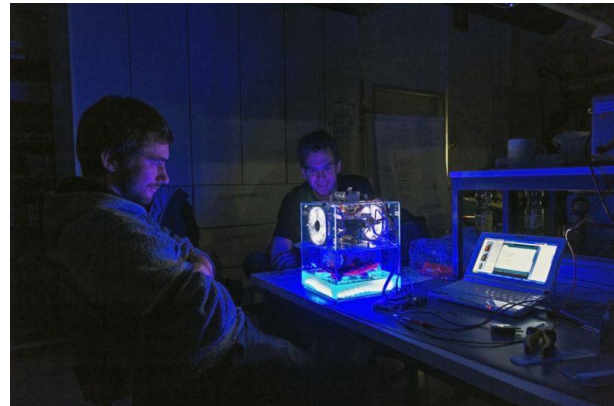
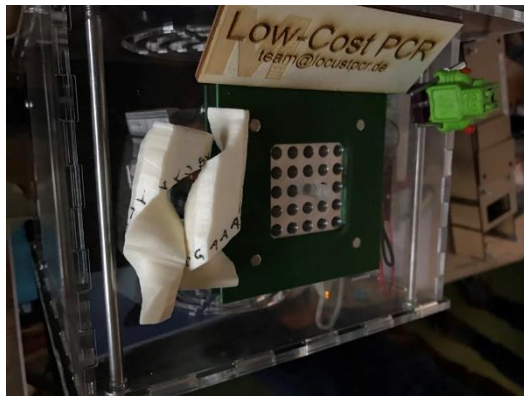


## LocustPCR

<https://locustpcr.de/teaser>

- LocustPCR was started as a project in Heidelberg at the Science Alumni center where a simple PCR is built from DIY materials for the purpose of open-science projects and for the Maker's lab in Heidelberg.
- It uses Arduino controlled processors with aluminium blocks to hold the sample for differential heating.

<https://www.instructables.com/id/Arduino-PCR-thermal-cycler-for-under-85/>



### Other related links:

<https://hackaday.io/project/27623-coffee-cup-polymerase-chain-reaction-machine>

<https://hackaday.io/project/9974-opensource-3d-printed-diybio-centrifuge-v2>

<https://hackaday.io/project/145830-low-cost-bacteriological-incubator>

<https://www.hackster.io/kemfic/developing-a-low-cost-microcentrifuge-using-e-waste-04b525>

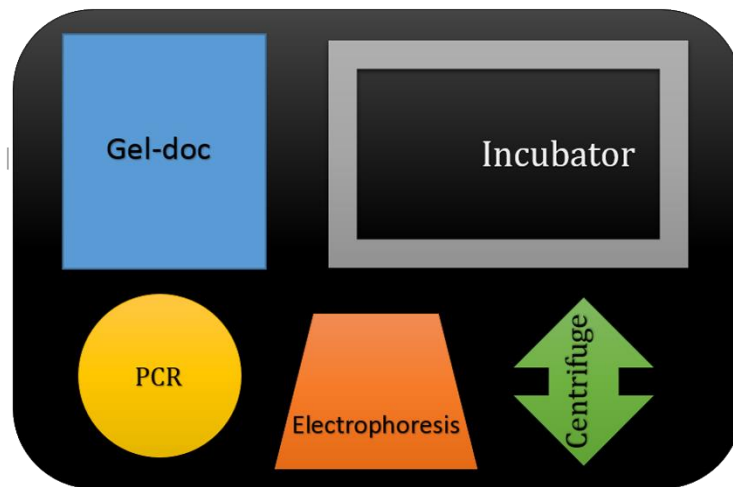
## THE PLAN

We had a plan to build all-in-one molecular laboratory which one in the world is doing other than Bento labs but they lack an incubator in their product.

The product will include,

- PCR
- Centrifuge
- Trans illuminator
- Incubator

Most of the DIY websites and teams work upon Arduino coding and locally available materials in the market that makes it inexpensive and scalable to a larger population.



Based on analyzing the specifications we need for each for the instruments, I have listed them below.

- **PCR**
  - Temperature range:  $20^{\circ}\text{C} - 105^{\circ}\text{C}$
  - Ramp rate:  $1-2^{\circ}\text{C per second}$
  - Block wells: Initially 3-6 is needed
- **Centrifuge**
  - Maximum speed: 20000 rpm
  - Sample wells: Initially 3-6 is needed
- **Trans-illuminator**
  - Lighting source: BLUE LED lights
  - Wavelength: 468 nm
- **Incubator**
  - Able to hold 1-2 petri plates for incubation
  - Temperature range:  $10^{\circ}\text{C} - 40^{\circ}\text{C}$