

## IN SHORT

'Inspired by a toy, Stanford bioengineers have developed an inexpensive, human-powered blood centrifuge that will enable precise diagnosis and treatment of diseases like malaria, African sleeping sickness and tuberculosis in the poor, off-the-grid regions where these diseases are most prevalent.'<sup>1</sup>

## STORY



**PAPERFUGE**  
A playful 20-cent blood centrifuge

## IN FOCUS



OPPORTUNITIES & CHALLENGES

GENERATING IDEAS

DEVELOPING & TESTING

IMPLEMENTING & FINANCING

GROWING & SCALING

CHANGING SYSTEMS



**Frugal science is about democratizing scientific tools to get them out to people around the world**

MANU PRAKASH, STANFORD ASSOCIATE PROFESSOR

'Of the approximately 50 million people who die in the world every year, 10% are killed by the so-called "Big Three" highly infectious diseases: Malaria, HIV, and Tuberculosis. At the same time, one billion people live their lives with no infrastructure, no roads, no electricity.'<sup>2</sup> **This paper device, which only costs 20 cents to make, can help scientists and doctors diagnose diseases like malaria and HIV within minutes — no electricity required.**<sup>3</sup>

'The Paperfuge was inspired by a 5,000-year-old toy, a spinning button on a string (a *whirligig*). Working like a button on a string, and made of simple household items like paper, string, and plastic, the Paperfuge is a hand-powered centrifuge that spins blood samples in at 125,000 rpm. That's enough speed and power to separate plasma from a blood sample (a standard diagnostic procedure) in just 90 seconds (...) 'Paperfuge empowers local healthcare forces to work better, smarter, faster, and – most importantly – cheaper.'<sup>2</sup>

'Paperfuge is the third invention from the Prakash lab (...). The first was the foldscope, a fully functional, under-a-dollar paper microscope that can be used for diagnosing blood-borne diseases such as malaria, African sleeping sickness and Chagas. To date there are 50,000 foldscopes in the hands of people around the world, and a spinoff company recently launched a Kickstarter campaign to ship 1 million more.

The second was a \$5 programmable kid's chemistry set, inspired by hand-crank music boxes, which enables the execution of precise chemical assays in the field.

Prakash's dream is that these tools will enable health workers, field ecologists and children in the most remote areas of the world to carry a complete laboratory in a backpack.'<sup>1</sup>

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Inspiration, sources, credits:

- 1) <https://news.stanford.edu/2017/01/10/whirligig-toy-bioengineers-develop-20-cent-hand-powered-blood-centrifuge/>
  - 2) <https://designtoimprovelife.dk/paperfuge/>
  - 3) <https://mashable.com/2017/12/23/social-good-innovations-2017/#9P60pEiuFmqg>
- Photo: <https://designtoimprovelife.dk/paperfuge/>