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BEAGx

Le « Do It Yourself » dans l'Open-Science : introduction, obstacles et application à la spectrophotométrie

ULiège Open Science Day

27-10-2023

Edouard Salingros

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Citizen Science & Do-It-Yourself

Citizen Science

JRC SCIENCE AND POLICY REPORTS

From Citizen Science to
Do It Yourself Science

Citizen Science

"a movement of coexisting initiatives where citizens get involved in science and technology producing knowledge in different fields traditionally dealt with by science."

- « ***Citizen as sensor*** » Involvement of citizens in data collection
  - ✓ Gather data that are difficult/impossible to gather
- « ***Community empowerment***»
  - ✓ Serve Community interest

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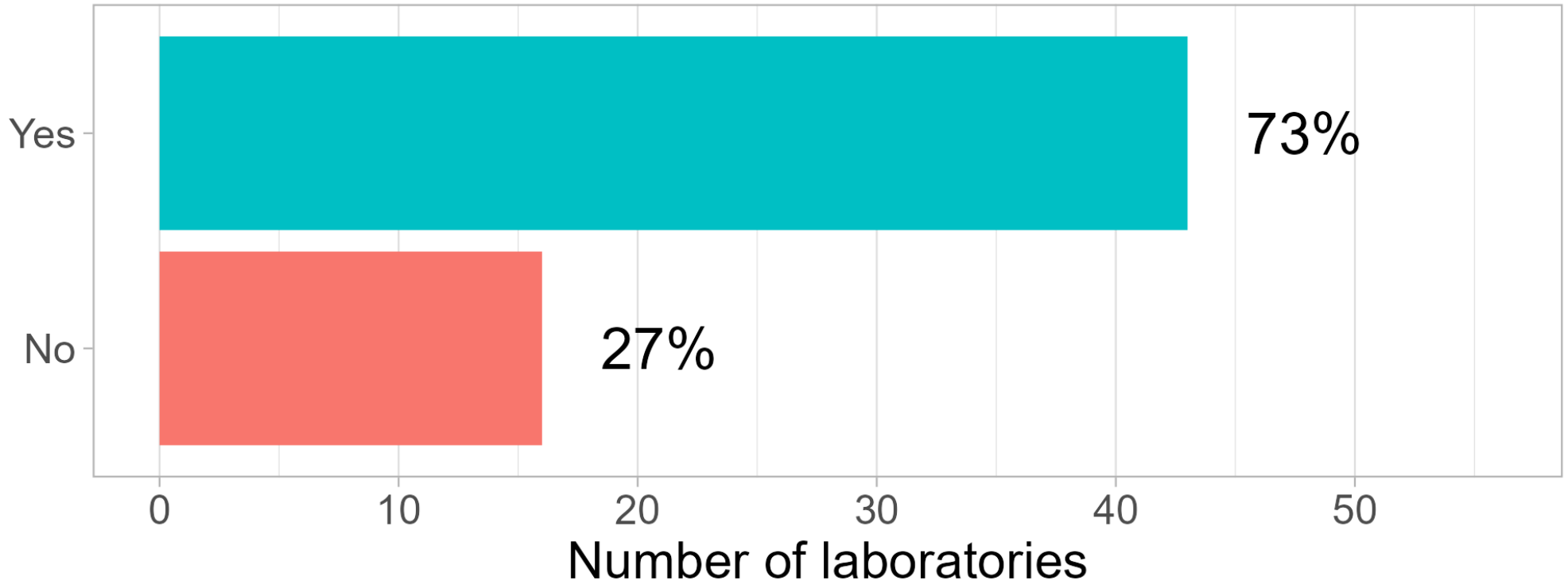
Survey on DIY practices in laboratories

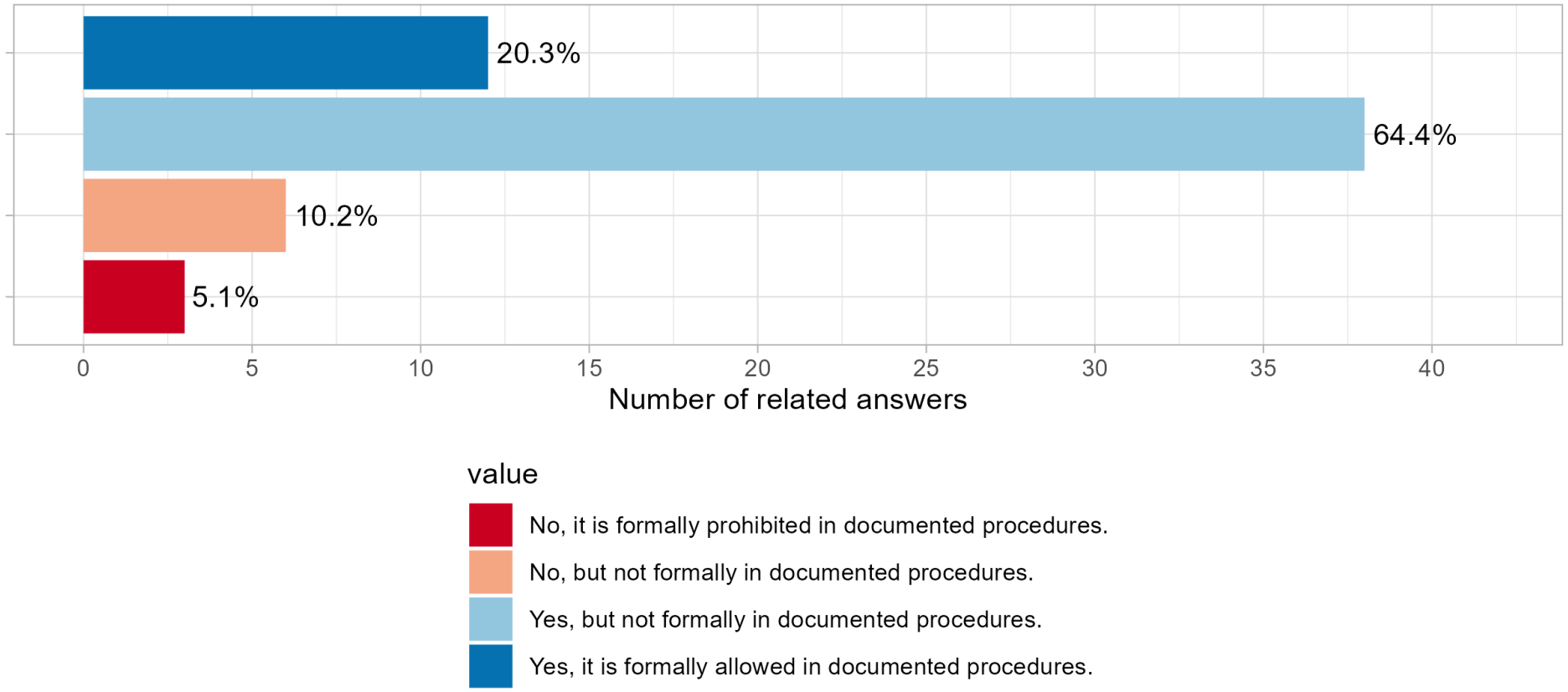
In-house repair

"Has your laboratory ever repaired any equipment in-house?"



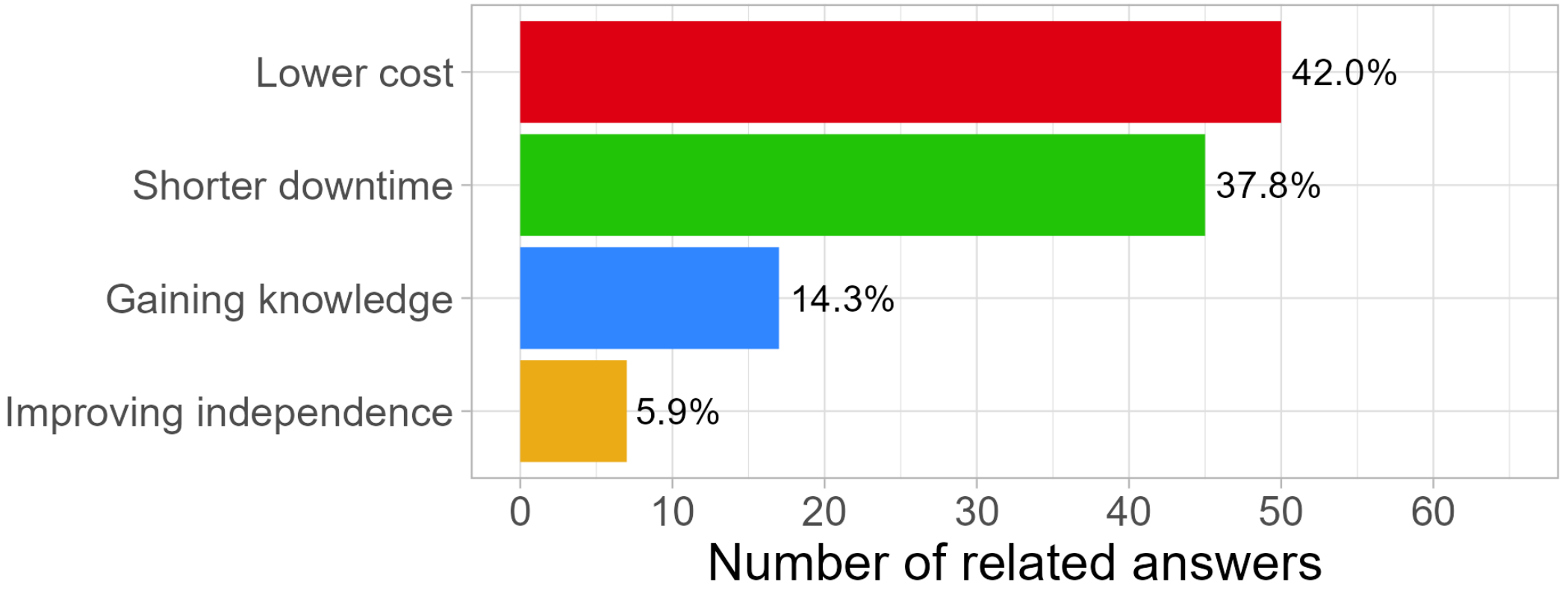
In-house repair

"Is in-house repair allowed in your laboratory?"



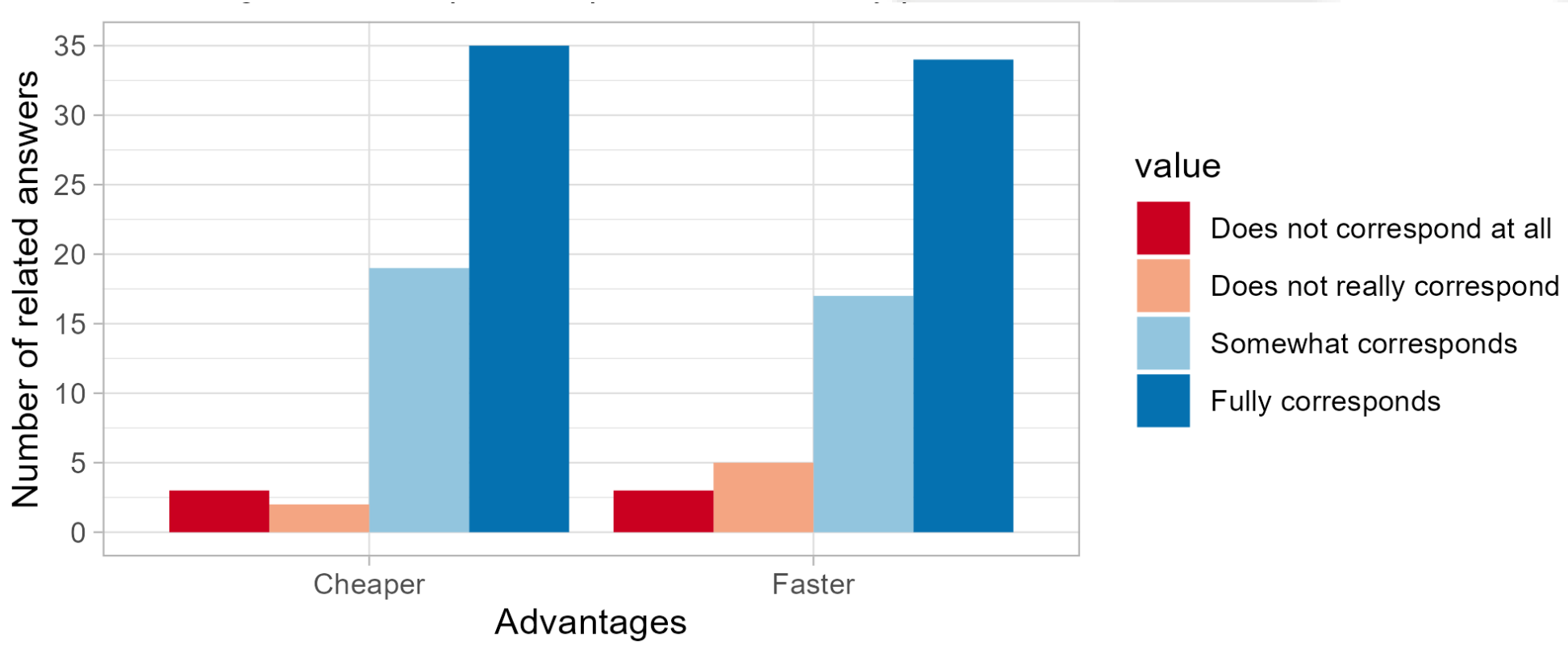
In-house repair

"What benefits can in-house repair of equipment bring to your laboratory?"



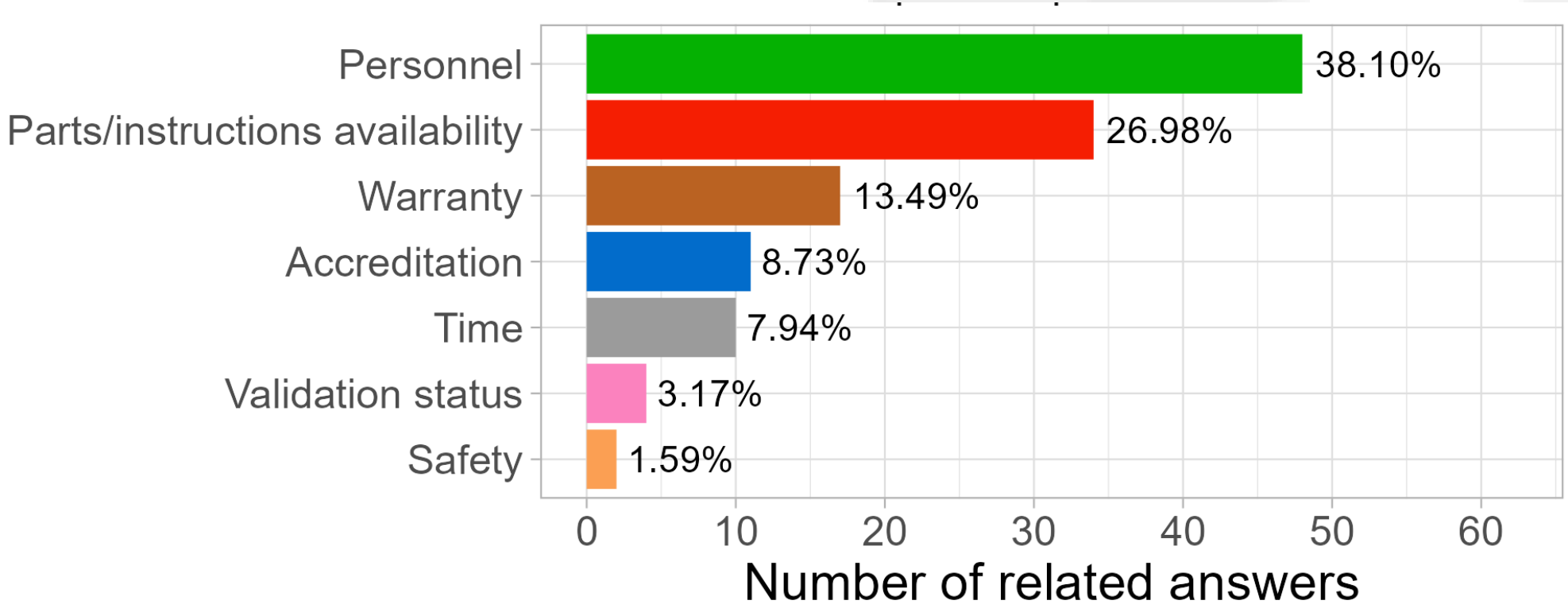
In-house repair

"To what extent the following benefits promote the implementation of in-house repair in your laboratory?"



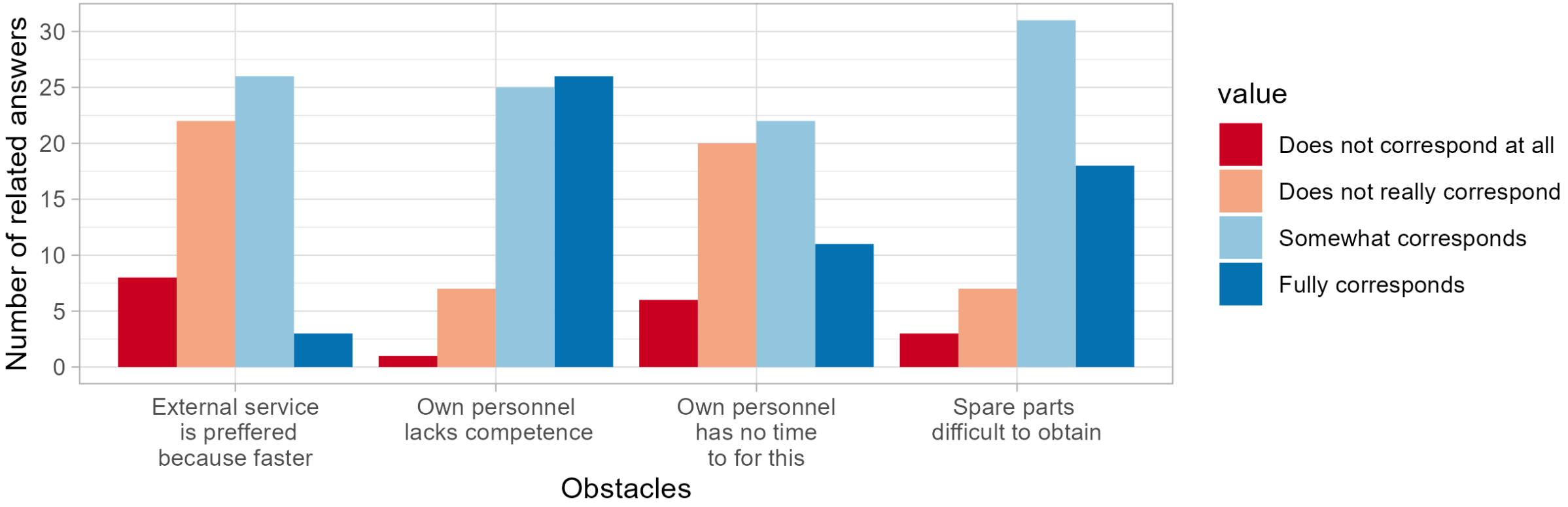
In-house repair

"What are the obstacles to the implementationof in-house repair in your laboratory?"



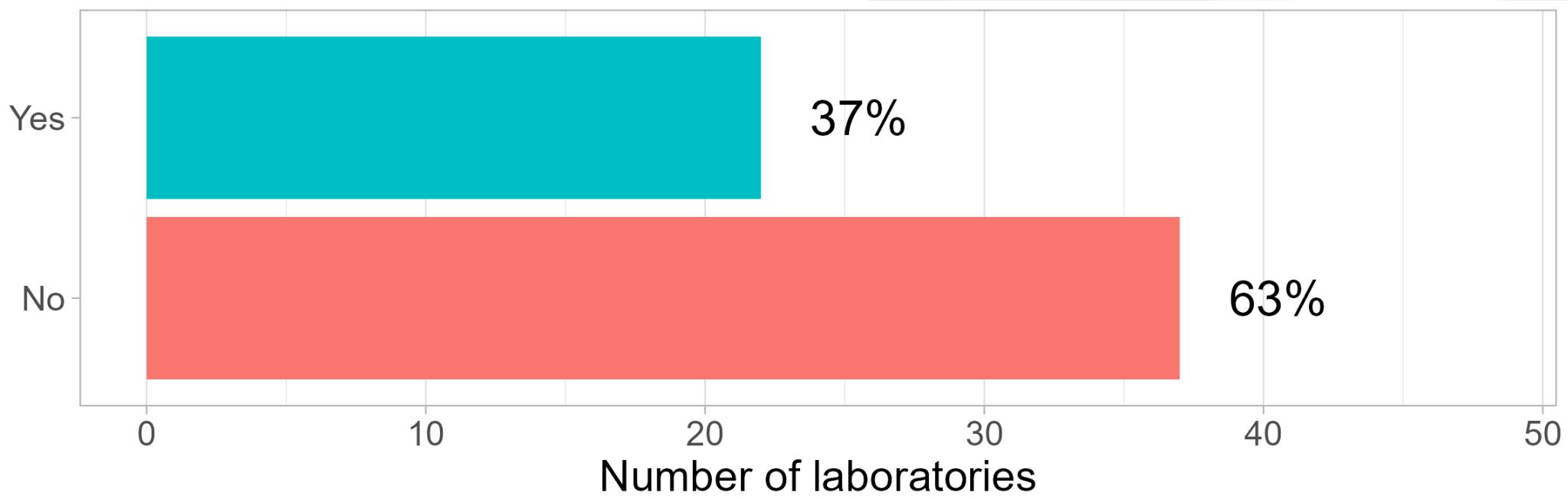
In-house repair

"To what extent the following obstacles prevent the implementation of in-house repair in your laboratory?"



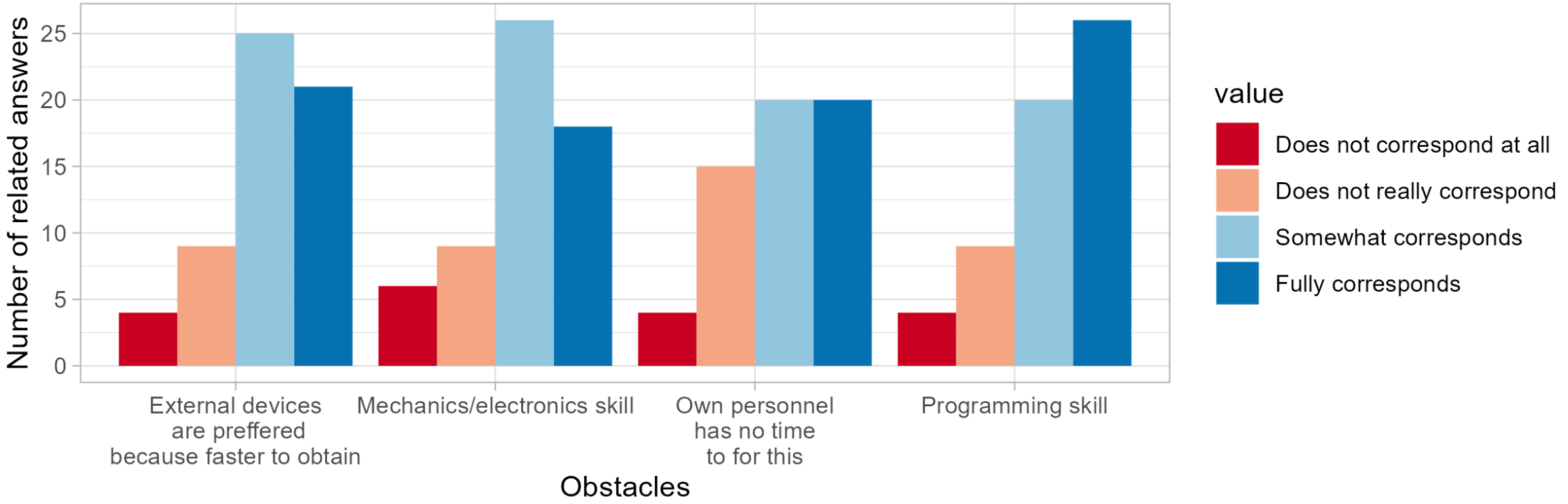
Home-built equipment

"Has your laboratory ever built and used any home-built equipment for laboratory purpose?"



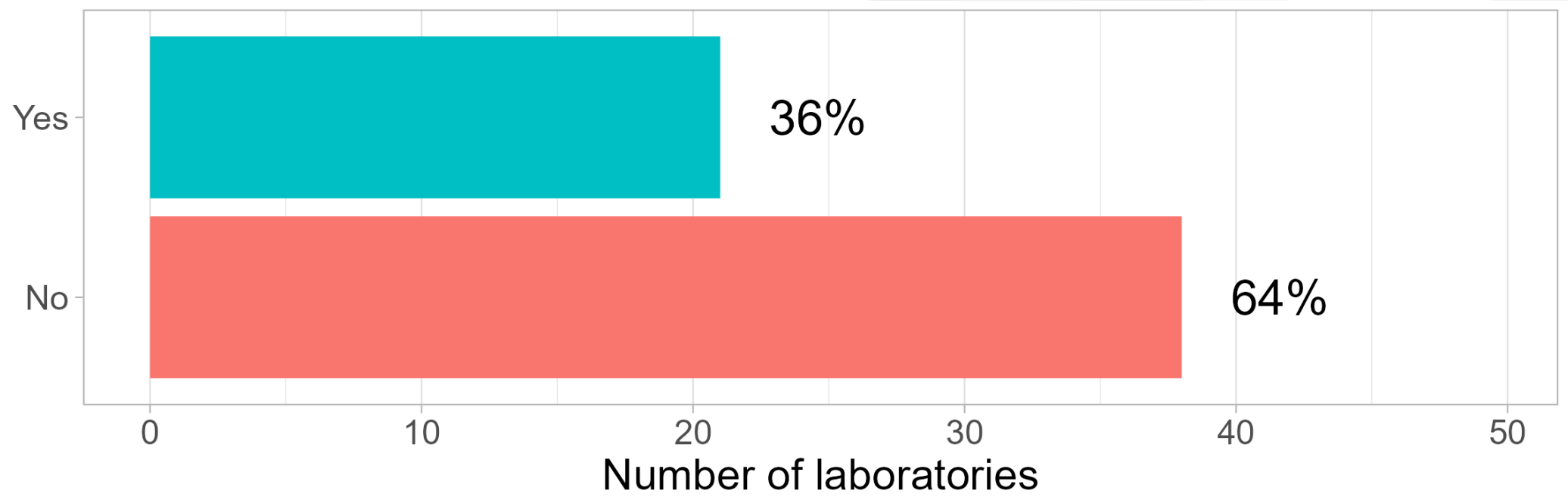
Home-built equipment

"To what extent these obstacles prevent the development of home-built equipment in your laboratory?"



Home-built equipment

"Is your laboratory interested in the future development of home-built equipment?"



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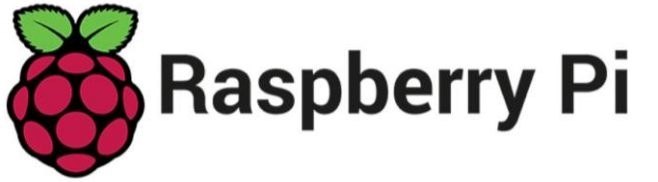
Open Hardware

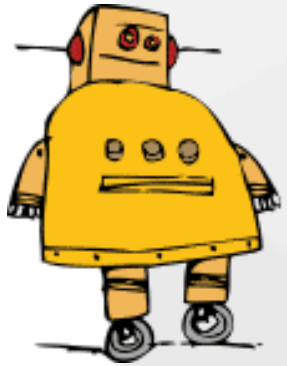
Materials

- 3D Printing
- E-commerce
  - ✓ Amazon, AlliExpress…
  - ✓ Adafruits, Arduino, Raspberry Pi…



Community – "Popular" sources

HACKADAY



instructables

Thingiverse

GitHub

Community – "Academic" sources

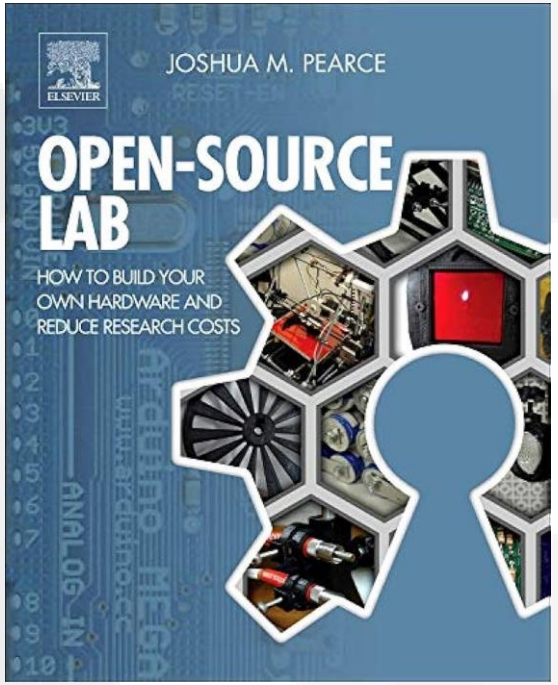
Peer-reviewed journals

International organization

Open Source Hardware Association
OSHWA

Open Hardware Creators in Academia Fellowship

Funding



Books

Within LIÈGE université

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- **Repair café**
  - ✓ Open to all
  - ○ Domestic devices

- **Electromechanical workshop** (Sciences Faculty)
  - ✓ Scientific devices and instruments
  - ✓ Expertise
  - ✓ Tools
  - ○ Limited capacity

Within LIÈGE université

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- **Open Workshop ?**
  - Dedicated space
  - Dedicated tools (including 3D printer)

Where members of the University/CHU can

- ✓ **Meet** with other people having similar problems/goals to **collaborate**
- ✓ **Learn** and **share** experience / knowledge
- ✓ Repair / build devices and solve their problems

- ❑ Trainings / seminars
- ❑ Hackathon

➡ **Connect people with capabilities with the people that need help**

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Examples of home-built laboratory devices

Examples – Magnetic stirrer

Examples – Concentrator

Click Image for Gallery

Product Code: BT1607
Reward Points: 168

~~$1,684.00~~ $1,431.40

Price in reward points: 1684

* Voltage

110V 220V

* Plug Type More info

Type B-USA, Canada, and Mexico Type E-Europe Ty

Type I-Australia

- 1 + ADD

Examples – Agitators

Shakers Hei-MIX series UNIMAX 1010 orbital shaker

From Heidolph

Art. No. H834.1

€1,766.00 / 1 unit(s)

Shakers Hei-MIX series PROMAX 1020 back and forward shaker

From Heidolph

Art. No. H835.1

€1,825.00 / 1 unit(s)

Shakers H DUOMAX 1 sh

From

Art.

€1,799.00 / 1 unit(s)

Examples - Centrifuge

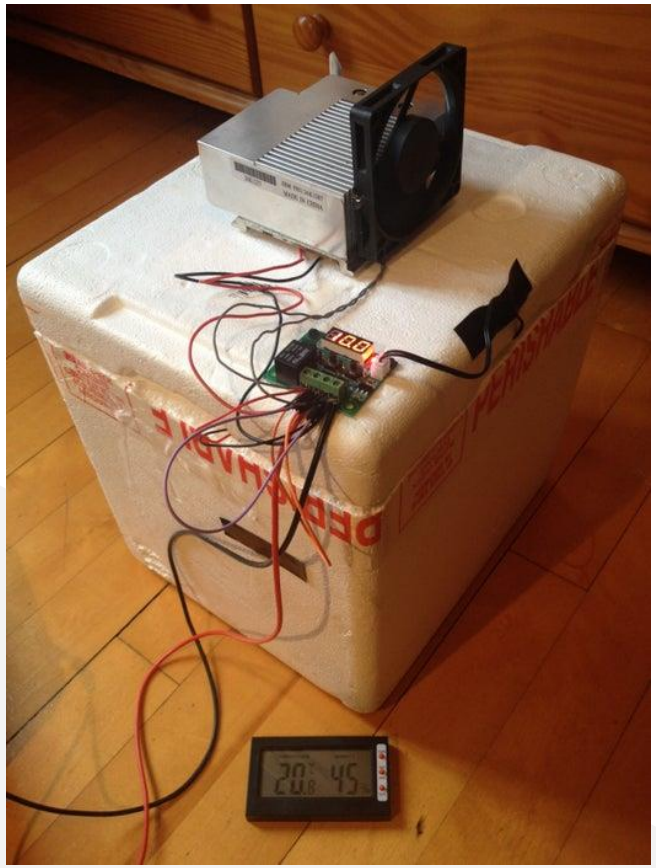
Mini centrifuge Sprout® Plus, Green Sprout

From Heathrow Scientific

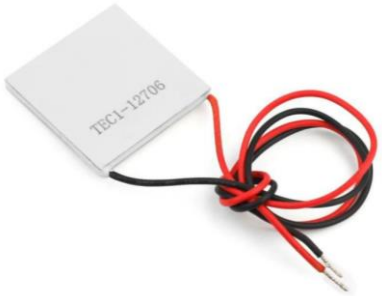
Art. No. 1HAC.1

€292.40 / 1 unit(s)

Examples – Thermostatic chambers



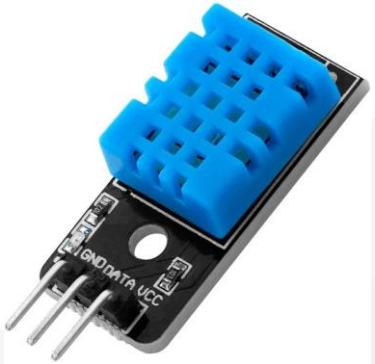
Refrigerators



Heating éléments
(resistance, Peltier, induction)

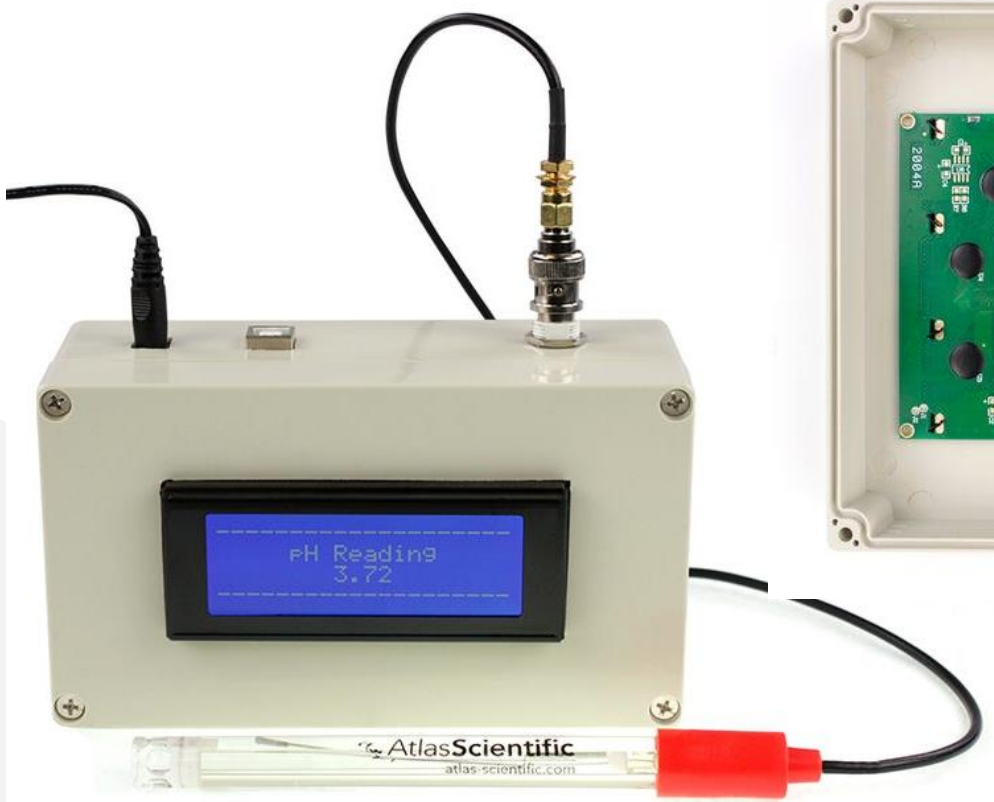
Heat sinks

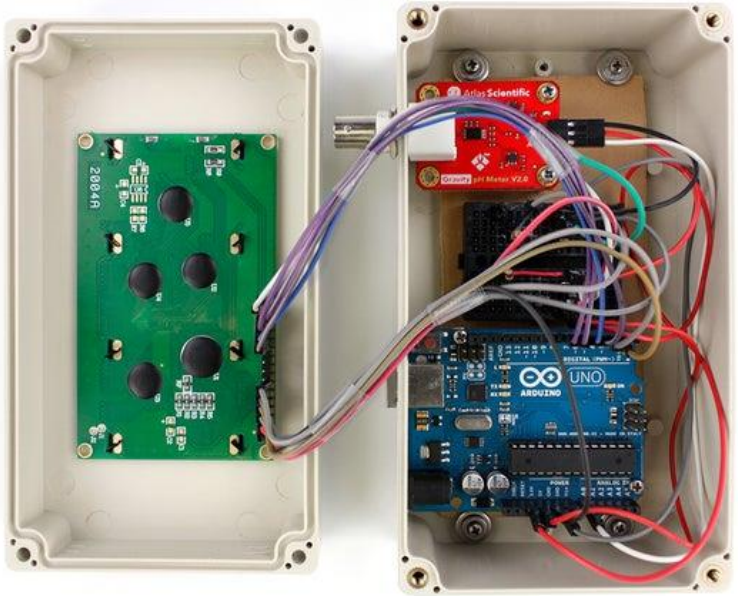
Fans

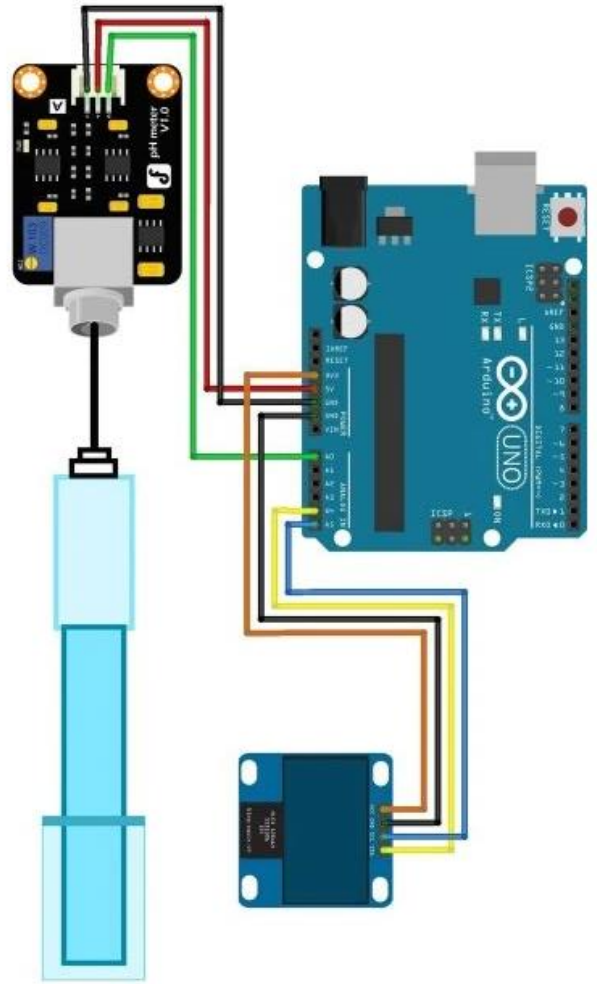


Temperature sensor

Examples – pH-meter, conductivity…







Examples – UV-digester

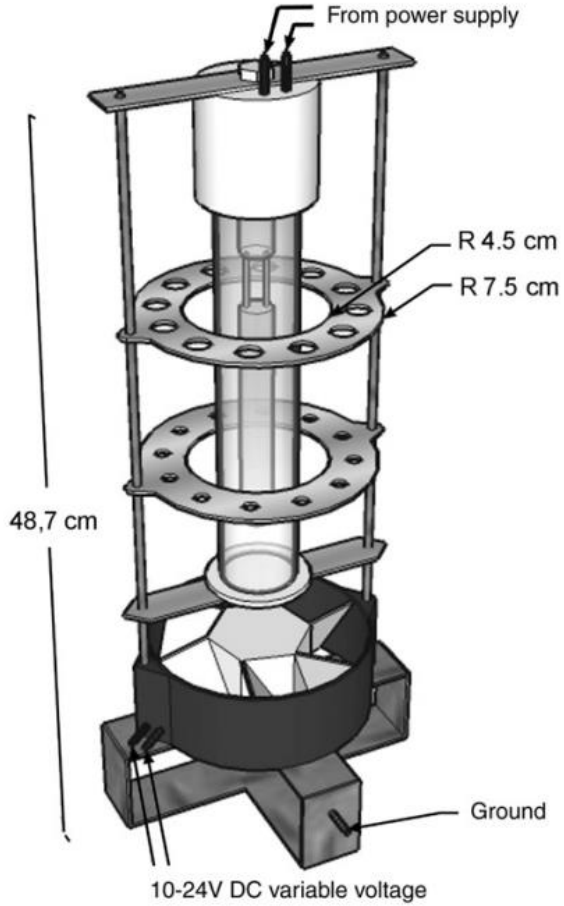
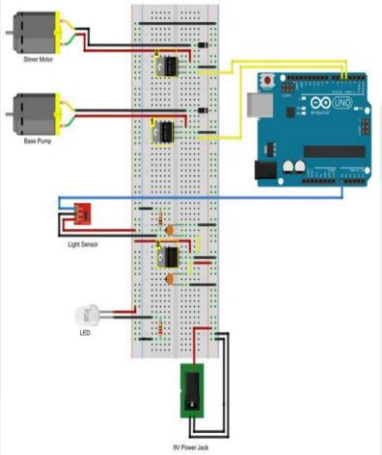
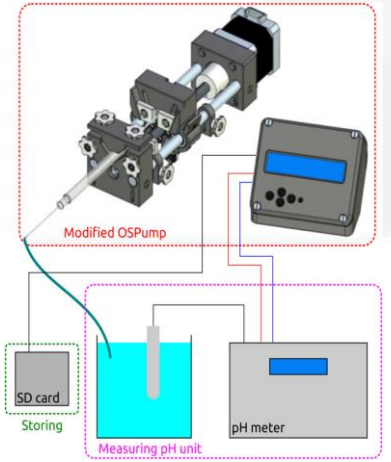


Fig. 2. 3D schematic representation of the UV digester device.

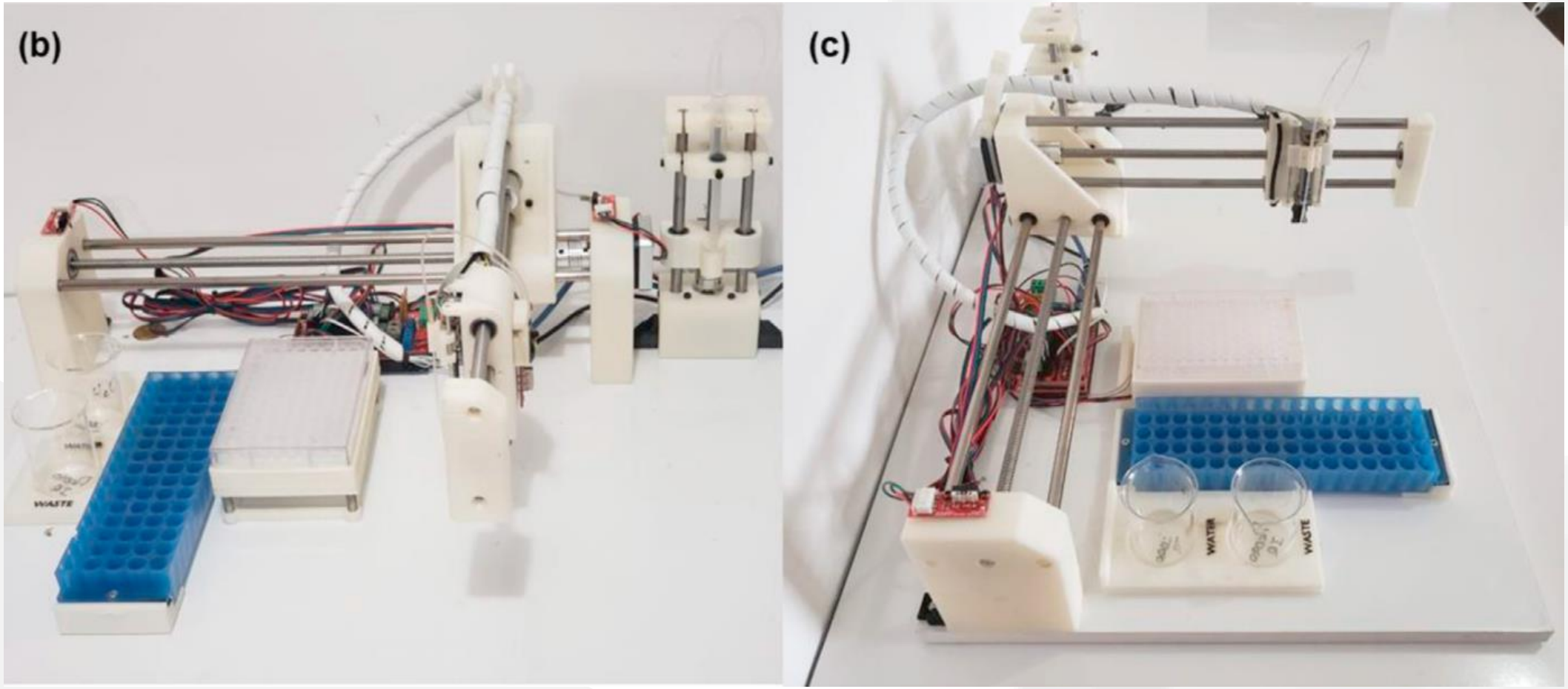
Examples - Titrator



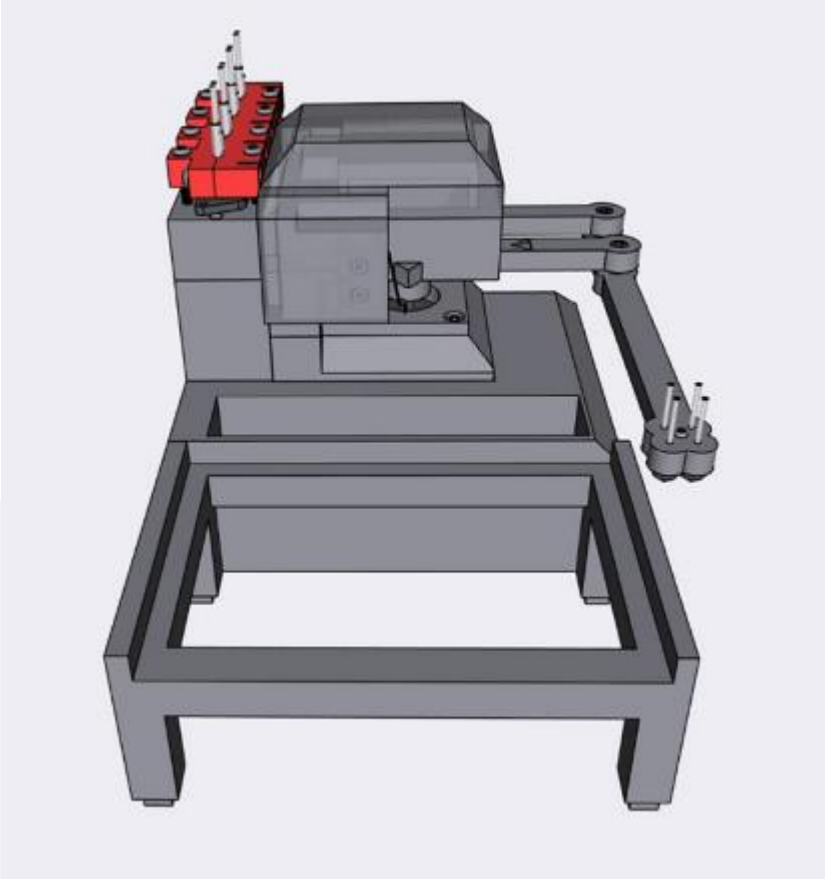


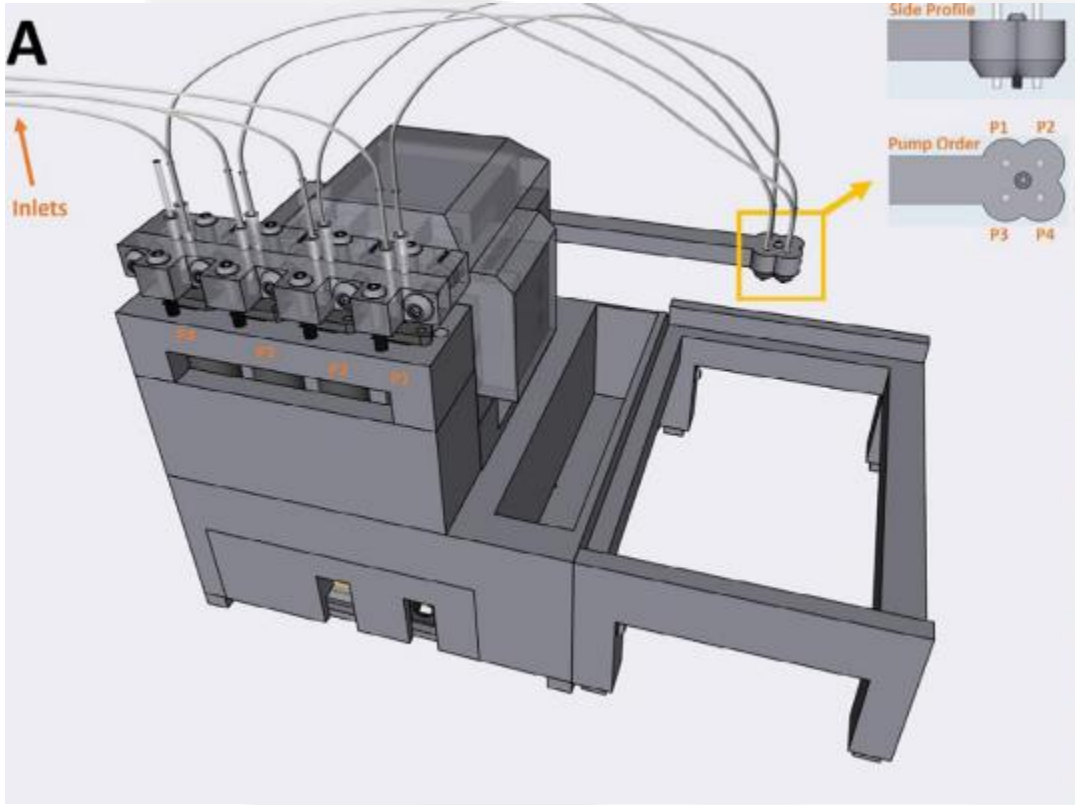
Dispensing	Piston + Syringe	Peristaltic pump	Piston + Syringe	Piston + Syringe
Endpoint detection	Electrode	Electrode	Colorimetric indicator	Electrode

Examples - Robotics



Examples - Robotics





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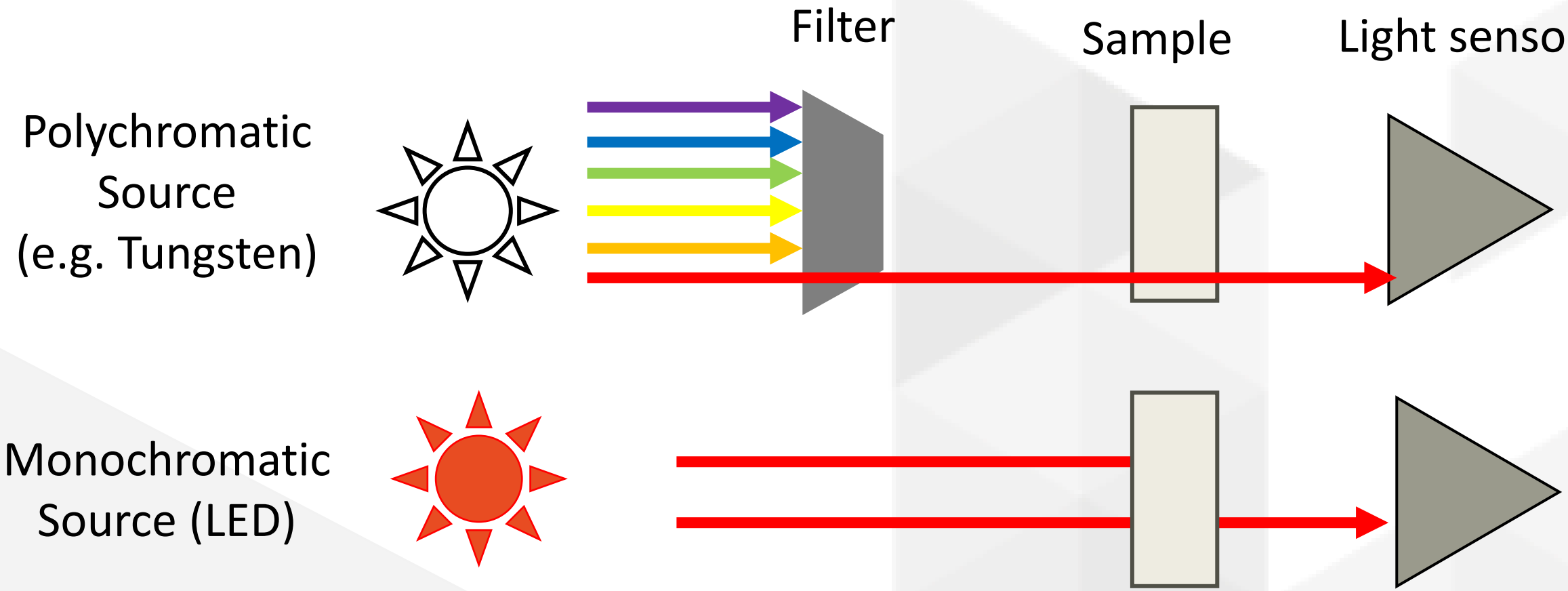
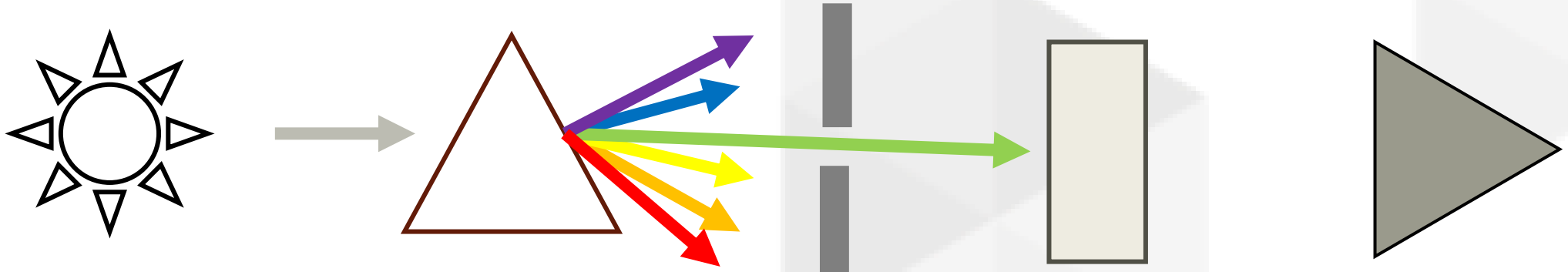
Application to colorimetry and spectrophotometry

Colorimeter



Spectrophotometer



Polychromatic Source (e.g. Tungsten)

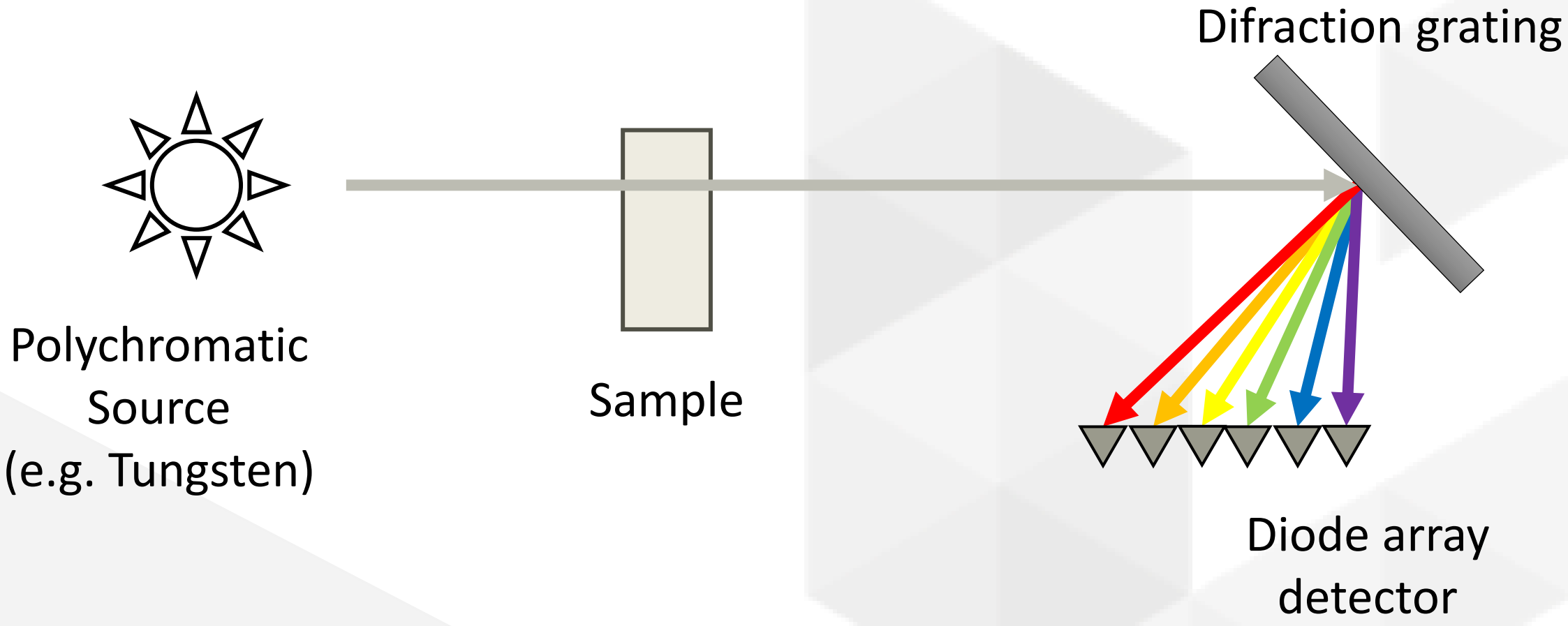
Prism

Slit

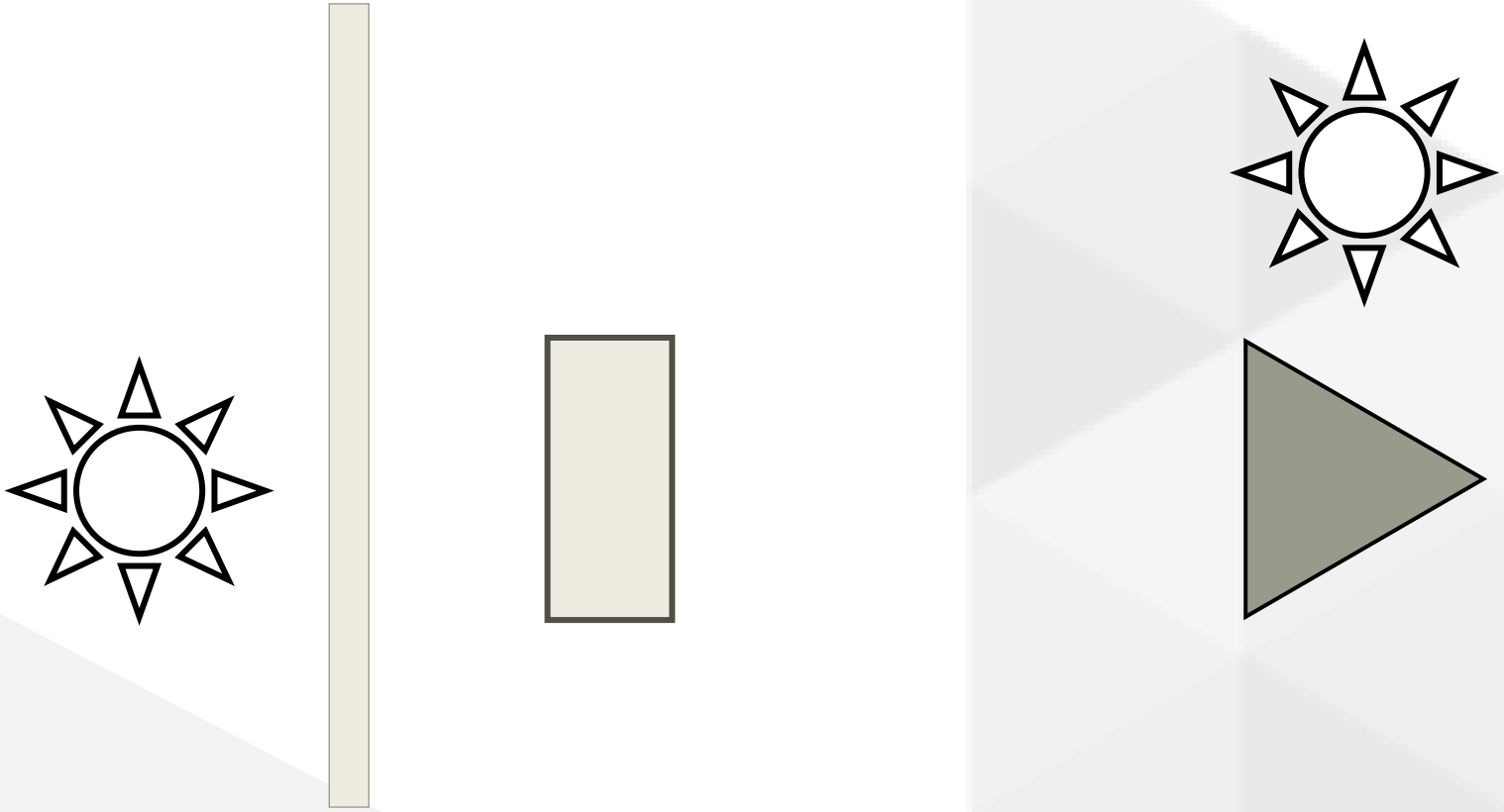
Sample

Light sensor

Spectrophotometer



Digital image analysis



Exemples

Nitrates (NO_3^-)

Nitrates (NO_2^-)

Ammonium (NH_4^+)