



# Biohacking as possible playground for genome editing

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# Search Queries for „Biohacking“



**nutrition trend**



**enhancement**



**citizen science**



**bioterrorism**

# Our Definition of Biohacking

„self motivated participation in life sciences/genetic engineering/research outside of academia/industry“



- publications

- online research



- personal experience



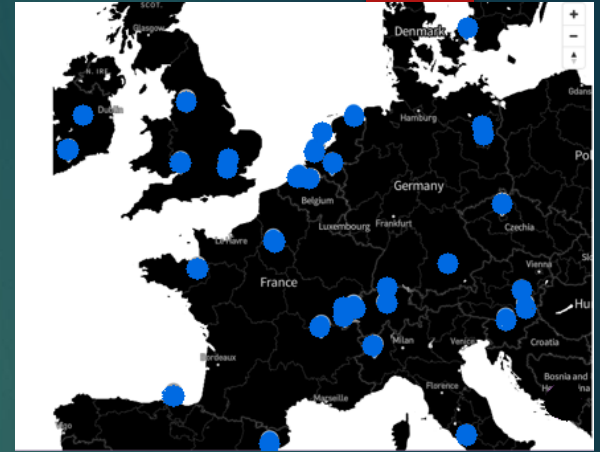
Umfrage im Rahmen des Studiums

The international Biohacking Community and its opinion on genome editing

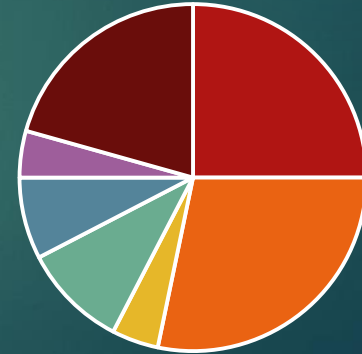
Survey with 27 single/multiple choice and open questions

# European Biohacker Community

- ▶ Network / Connections: DIYbio Sphere, Bio Summit 2018/19
- ▶ ~ 40 different Biohacker Groups in Europe
- ▶ Code of Ethics
- ▶ Characteristics of european biohackers
- ▶ Characteristics of hackerspaces
  - ▶ *Average: facilities with more than 20 members*
  - ▶ *Active biohackers: 1 – 10 people*
  - ▶ *Funding or Private money*



Where do you perform biohacking?



■ Community Lab ■ Hackerspace ■ FabLab ■ Academic Lab  
■ Company Lab ■ Private Lab ■ At home n= 52

# Biohacking activities

Gaudi labs



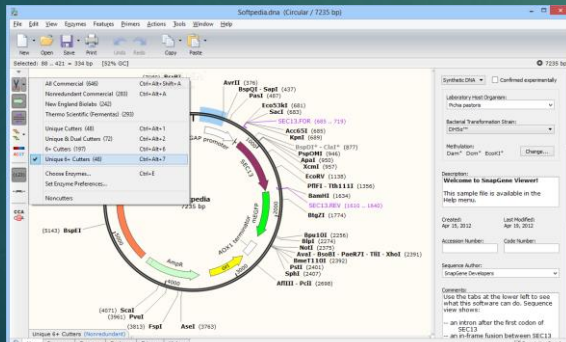
**building up**



**crafting**



**wet lab**



**bioinformatics**

softpedia.com

## Mini Workshop – Mikrobiologie Basics

Geschrieben am 2018-11-09 von salmonella

Eisef und Sanchez haben einen Mini-Workshop für Labor- und Mikrobiologie-Basics abgehalten. Darunter mischen, Agar-Platten gießen, Bakterien-Koinkulturen ausstreichen, pipettieren, mikroskopieren usw.

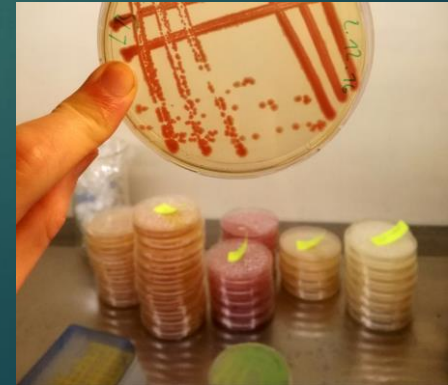
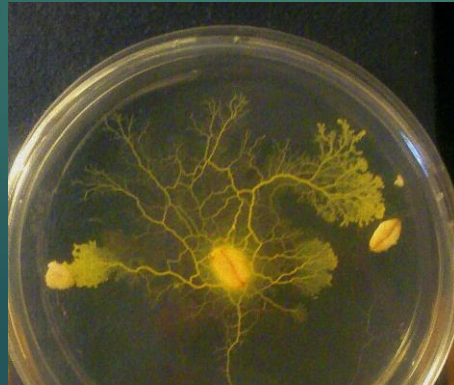


Über Nacht wurden die Kulturen dann bei 37°C inkubiert

**workshops**

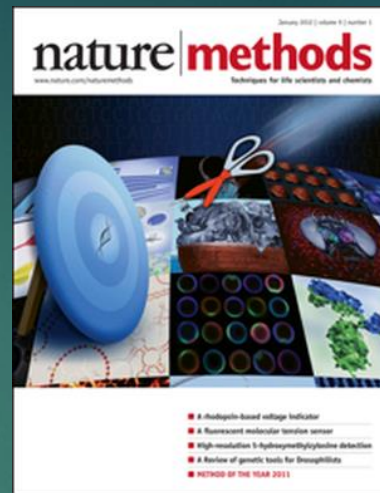
Realraum

# Open bioLab Graz Austria (OLGA)



Realraum

# Genome editing



- ▶ Nature Method of the year 2011
- ▶ „Biggest game changer to hit biology“ (H .Ledford, Nature)
- ▶ „Any idiot can do it“ (R. Jaenisch, MIT)
- ▶ Safe handling and regulation?





# Biohackers experiences with Genome editing

As a Biohacker do/did you use Genome Editing in experiments?



■ never ■ once ■ several times ■ very often

Bacteria and yeast  
Plants  
Eukaryotik cell lines

*Cool, hot topic*

*It is the future*

*More possibilities*

*Don't want to work with it (~20%)*

What are your intentions for using Genome Editing as a Biohacker?



■ learning the technique  
■ create an organism with new features  
■ produce a certain substance  
■ following a higher goal (curing diseases)  
■ just for fun  
■ other

# Do you expect Genome Editing methods such as CRISPR/Cas **to extend biohacking activities** ?

*Generates enthusiasm and interest*

*Saves time, resources*

*New, creative ideas will come up*

*Similar to genetic engineering – a lot was possible before*

*Needs more time, knowledge*

Do you expect Genome Editing methods if used in biohacking, to **result in increased risks** compared to classical genetic modification technology?

*Not if done correctly, by educated people*

*It requires enough learning and dedication to filter out jerks*

*Discussion can increase awareness*

*Specific targets for gene drives*

*More people = bigger risk*

*Caution and responsibility are needed*

# Biohackers opinions on genome editing

Would you welcome the idea of more people having access to Genome editing?



■ yes ■ no ■ no opinion ■ other

*It has to be regulated*

*Only if done correctly and supervised*

*Good education is needed*

*Caution, responsibility, accountability is necessary*

# Conclusion

- ▶ Big interest in new technologies
- ▶ Awareness of responsibility
- ▶ No big genome editing biohacking projects until now
  
- ▶ Genome editing adds possibilities, but does not radically change biohacking

**Does genome editing (method development, safety, discussion) profit from a broader spectrum of users as in biohacking?**

**Thank you**