



ICTP Scientific Fabrication Laboratory

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What is a FabLab?

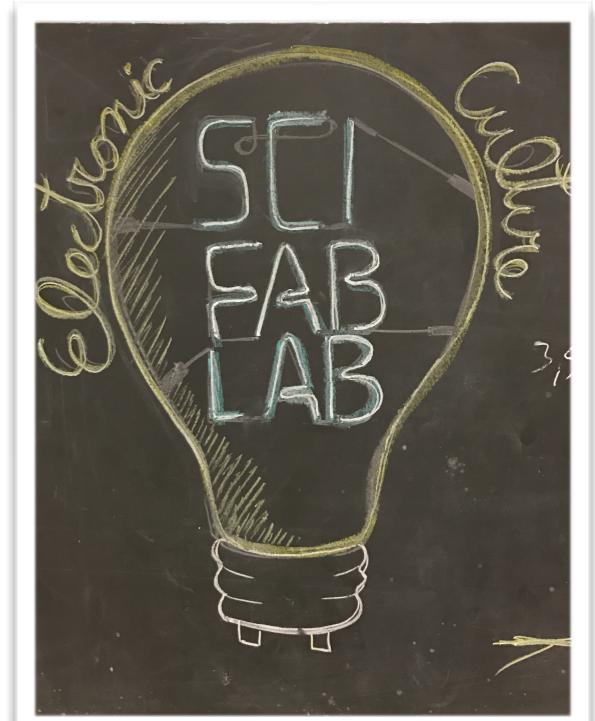
A *fab lab* (*fabrication laboratory*) is a small-scale workshop offering (personal) digital fabrication facilities.

A FabLab is generally equipped with an array of *flexible computer-controlled tools* that cover several different length scales and various materials, with the aim to *make "almost anything"*.



It's an academic idea...

- The concept of a FabLab was first imagined at the Center for Bits and Atoms (CBA) at the Media Lab in the Massachusetts Institute of Technology, in 2001.
- The paradigm was established in 2005 with The famous book by Neil Gershenfeld "Fab: the coming revolution on your desktop—from personal computers to personal fabrication".



CENTER FOR BITS AND ATOMS

MIT MEDIA LAB

E15-001

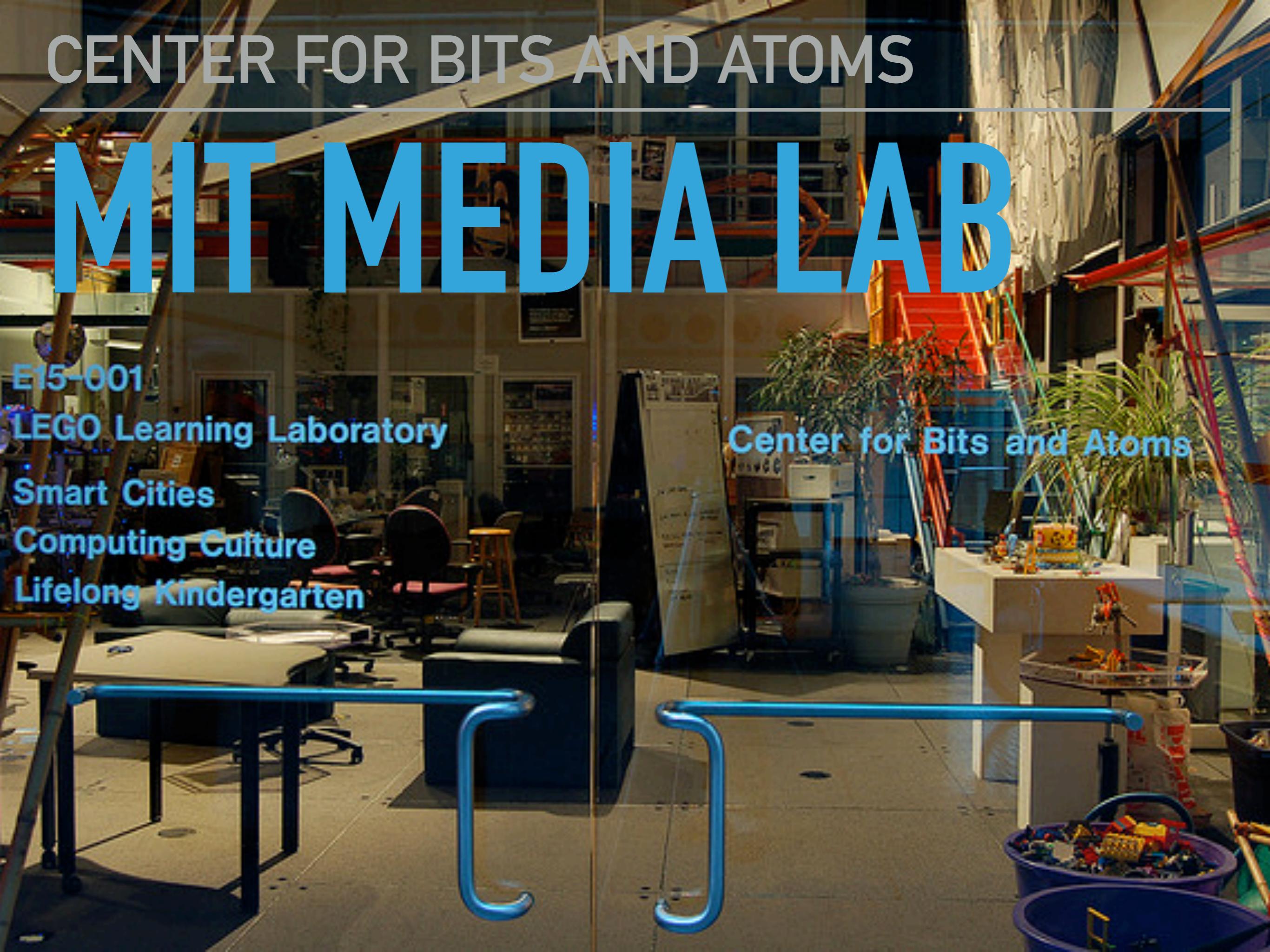
LEGO Learning Laboratory

Smart Cities

Computing Culture

Lifelong Kindergarten

Center for Bits and Atoms



Neil Gershenfeld:

Unleash your creativity in a Fab Lab

TED2006 · 17:18 · Filmed Feb 2006

17 subtitle languages ?

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MIT professor Neil Gershenfeld talks about his Fab Lab — a low-cost lab that lets people build things they need using digital and analog tools. It's a simple idea with powerful results.

"Gershenfeld's account of the technology's evolution is delicious. A star physicist at MIT with a knack for technical explanation, he has written an accessible book that even non-technophiles will love." —*BUSINESSWEEK* (Best Book of the Year selection)



THE COMING REVOLUTION ON YOUR DESKTOP—FROM
PERSONAL COMPUTERS TO PERSONAL FABRICATION

NEIL GERSHENFELD

AUTHOR OF
WHEN THINGS START TO THINK

FAB: THE COMING REVOLUTION ON YOUR DESKTOP —FROM PERSONAL COMPUTERS TO PERSONAL FABRICATION

Neil Gershenfeld, 2005

FAB, PAG. 14:

In 1998 we tried teaching “How To Make (almost) Anything” for the first time. The course was aimed at the small group of advanced students who would be using these tools in their research. Imagine our surprise, then, when a hundred or so students showed up for a class that could hold only ten. They weren’t the ones we expected, either; there were as many artists and architects as engineers. And student after student said something along the lines of “All my life I’ve been waiting to take a class like this,” or “I’ll do anything to get into this class.” Then they’d quietly ask, “This seems to be too useful for a place like MIT —are you really allowed to teach it here?”

Students don’t usually behave that way. Something had to be wrong with this class, or with all the other classes I taught. I began to suspect the latter.

FAB, PAG. 23:

This thought led to the launch of a project to create field “fab labs” for exploring the implications and applications of personal fabrication in those parts of the planet that don’t get to go to MIT. As you wish, “fab lab” can mean a lab for fabrication, or simply a fabulous laboratory. Just as a minicomputer combined components—the processor, the tape drive, the keypunch, and so forth—that were originally housed in separate cabinets, a fab lab is a collection of commercially available machines and parts linked by software and processes we developed for making things. The first fab labs have a laser cutter to cut out two-dimensional shapes that can be assembled into three-dimensional structures, a sign cutter that uses a computer-controlled knife to plot flexible electrical connections and antennas, a milling machine that moves a rotating cutting tool in three dimensions to make circuit boards and preci-



FABULOUS LABORATORY

FAB LAB



FABRICATION LABORATORY

FAB LAB



DIGITAL FABRICATION LABORATORY

FAB LAB



FABLAB (DEFINITION)

A Fab Lab is a **technical prototyping platform for innovation and invention**, providing stimulus for local entrepreneurship. A Fab Lab is also a **platform for learning and innovation**: a **place to play, to create, to learn, to mentor, to invent**. To be a Fab Lab means **connecting to a global community** of learners, educators, technologists, researchers, makers and innovators- -a knowledge sharing network that spans 30 countries and 24 time zones. Because all Fab Labs share common tools and processes, the program is building a global network, a distributed laboratory for research and invention.

A Fab Lab is comprised of off-the-shelf, industrial-grade fabrication and electronics tools, wrapped in open source software and programs written by researchers at MIT's Center for Bits & Atoms. Currently Fab Labs include a laser cutter that makes 2D and 3D structures, a sign cutter that plots in copper to make antennas and flex circuits, a high-resolution NC milling machine that makes circuit boards and precision parts, a large wood router for building furniture and housing, and a suite of electronic components and programming tools for low-cost, high-speed microcontrollers for on-site rapid circuit prototyping. Originally designed for communities as prototyping platforms for local entrepreneurship, Fab Labs are increasingly being adopted by schools as platforms for project-based, hands-on STEM education. Users learn by designing and creating objects of personal interest or import. Empowered by the experience of making something themselves, they both learn and mentor each other, gaining deep knowledge about the machines, the materials, the design process, and the engineering that goes into invention and innovation. In educational settings, rather than relying on a fixed curriculum, learning happens in an authentic, engaging, personal context, one in which students go through a cycle of imagination, design, prototyping, reflection, and iteration as they find solutions to challenges or bring their ideas to life.





IL FAB CHARTER

What is a fab lab?

Fab labs are a global network of local labs, enabling invention by providing access to tools for digital fabrication

What's in a fab lab?

Fab labs share an evolving inventory of core capabilities to make (almost) anything, allowing people and projects to be shared

What does the fab lab network provide?

Operational, educational, technical, financial, and logistical assistance beyond what's available within one lab

Who can use a fab lab?

Fab labs are available as a community resource, offering open access for individuals as well as scheduled access for programs

What are your responsibilities?

safety: not hurting people or machines

operations: assisting with cleaning, maintaining, and improving the lab

knowledge: contributing to documentation and instruction

Who owns fab lab inventions?

Designs and processes developed in fab labs can be protected and sold however an inventor chooses, but should remain available for individuals to use and learn from

How can businesses use a fab lab?

Commercial activities can be prototyped and incubated in a fab lab, but they must not conflict with other uses, they should grow beyond rather than within the lab, and they are expected to benefit the inventors, labs, and networks that contribute to their success

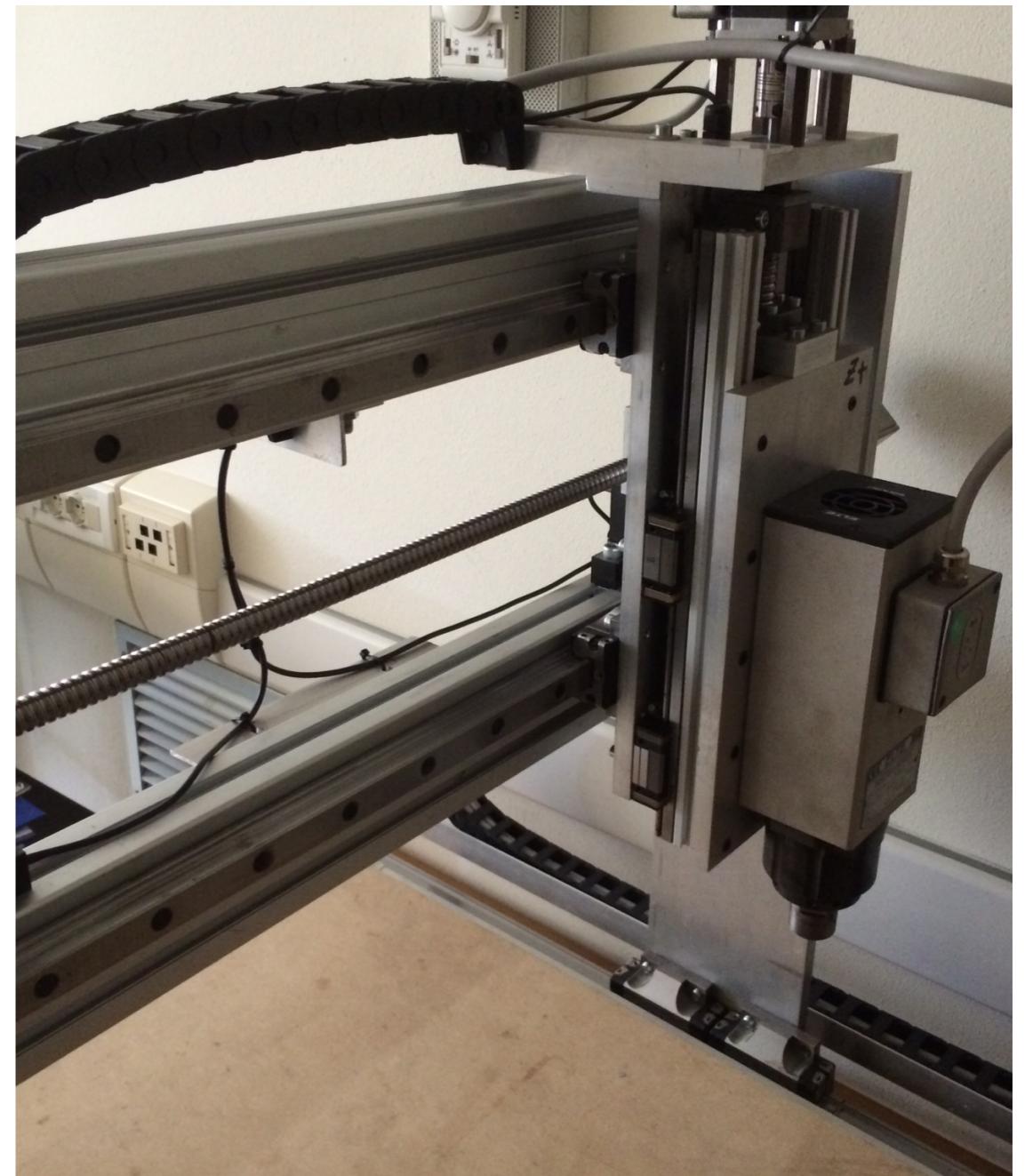
draft: October 20, 2012

PEOPLE, TOOLS & MACHINES



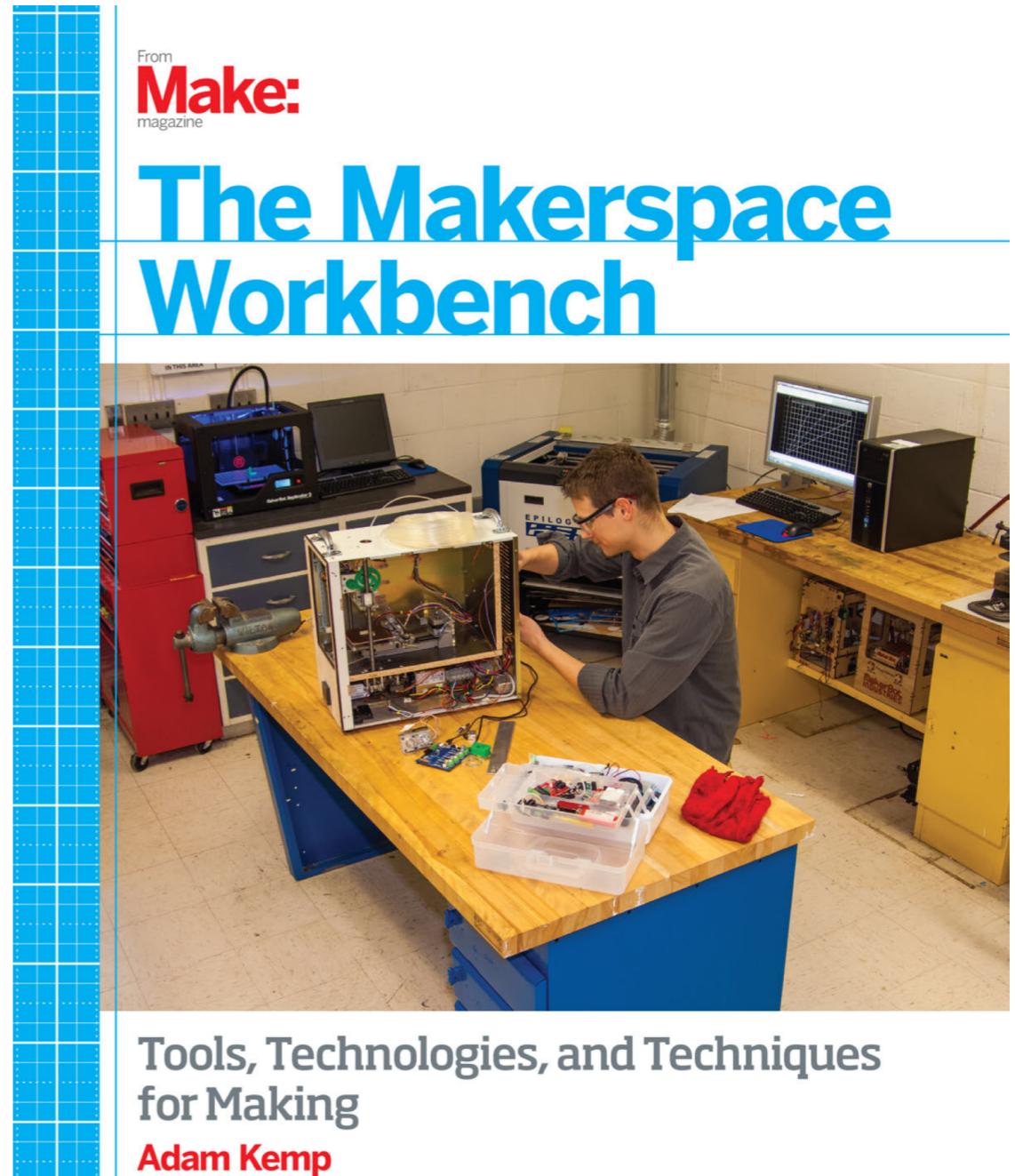
(DIGITAL) TOOLS

- A computer-controlled lasercutter, for press-fit assembly of 3D structures from 2D parts
- A larger (120x240cm) numerically-controlled milling machine, for making furniture- (and house-) sized parts
- A signcutter, to produce printing masks, flexible circuits, and antennas
- A precision (micron resolution) milling machine to make three-dimensional molds and surface-mount circuit boards
- Programming tools for low-cost high-speed embedded processors



ACTIVITIES

- **Prototyping:** make *often*, make *quickly*, do *iterate*
- **Digital technologies:** digital files with open standards are easy to share on the Internet
- **Sharing:** to allow derivative works, natural evolution of idea, and "cascade effect"
- **Collaboration:** a shared working environment facilitates the exchange of experiences and knowledge



NETWORK

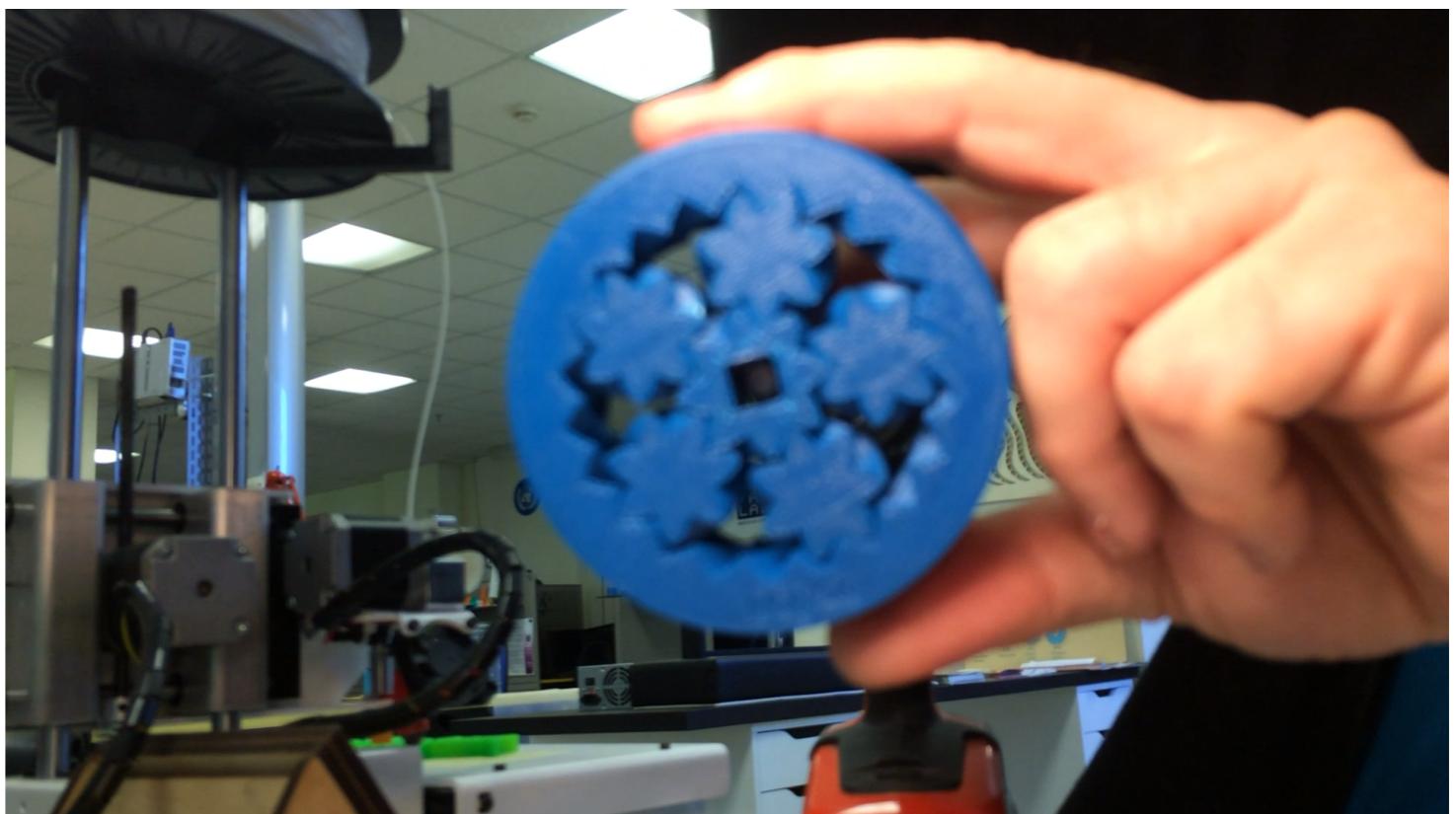
- **Fab Labs have to share a common set of tools and processes.** A prototyping facility is not the equivalent of a Fab Lab. A 3D printer is not a Fab Lab. The idea is that all the labs can share knowledge, designs, and collaborate across international borders. If I make something here in Boston and send you the files and documentation, you should be able to reproduce it there, fairly painlessly. If I walk into a Fab Lab in Russia, I should be able to do the same things that I can do in Nairobi, Cape Town, Delhi, Amsterdam or Boston Fab Labs



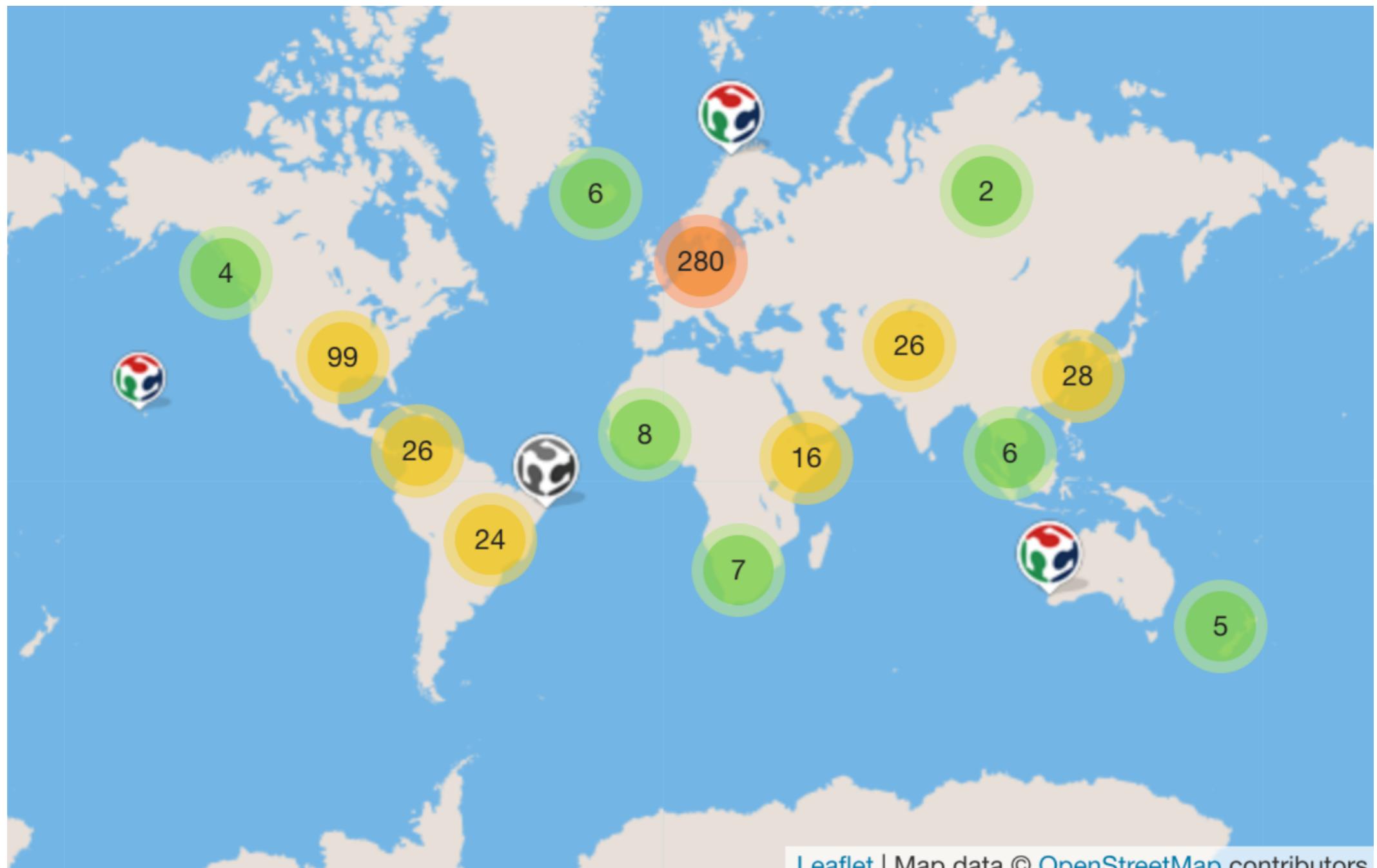
$$\text{FabLab} = (D + p)^S$$

Three components:

- (personal) **digital** fabrication technologies
- aimed to rapid **prototyping**
- all experiences are **shared** on the Internet



FABLABS IN THE WORLD

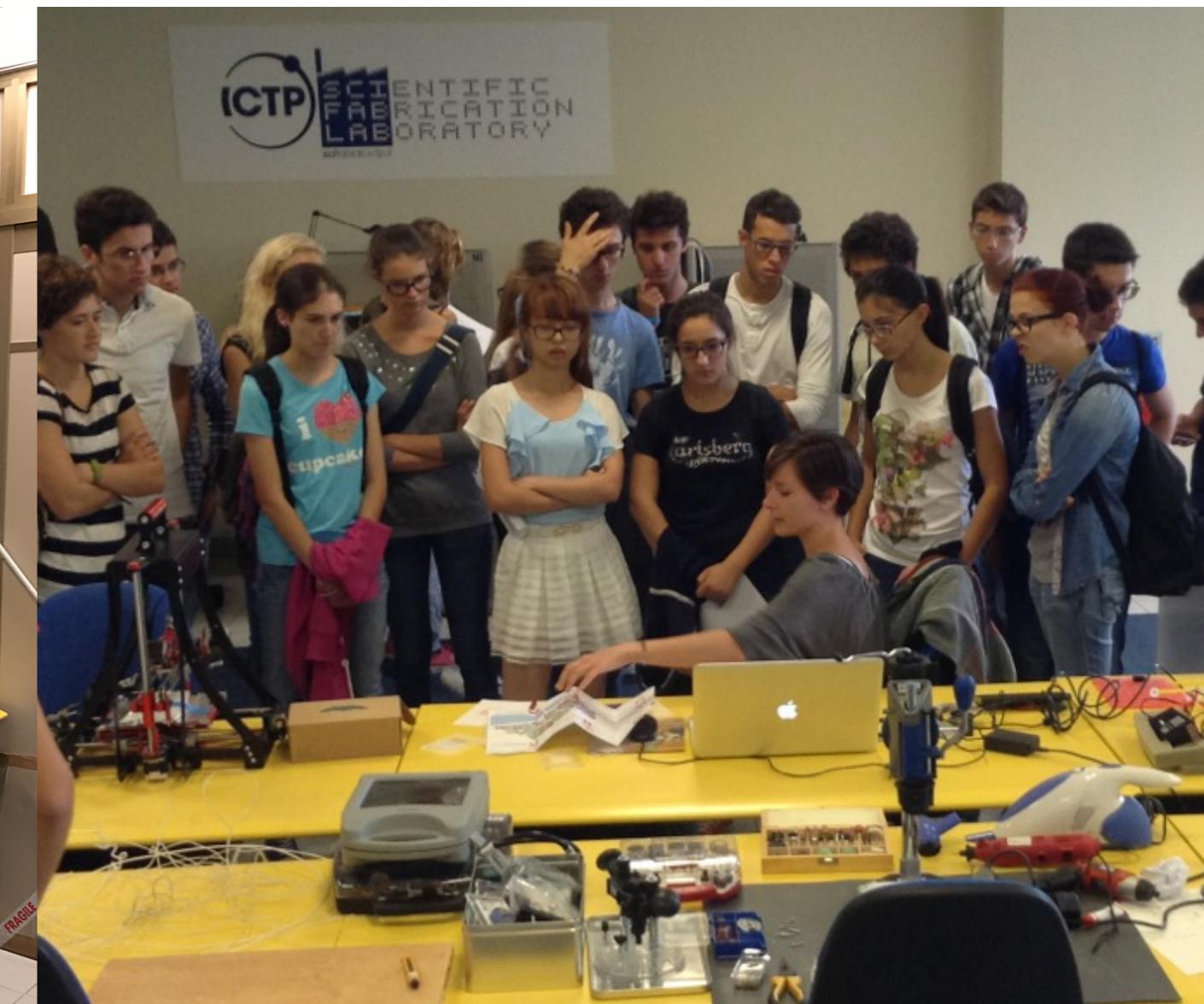


<http://www.fabfoundation.org/fab-labs/>

<https://www.fablabs.io/labs>



scifablab.ictp.it



<http://scifablab.ictp.it>

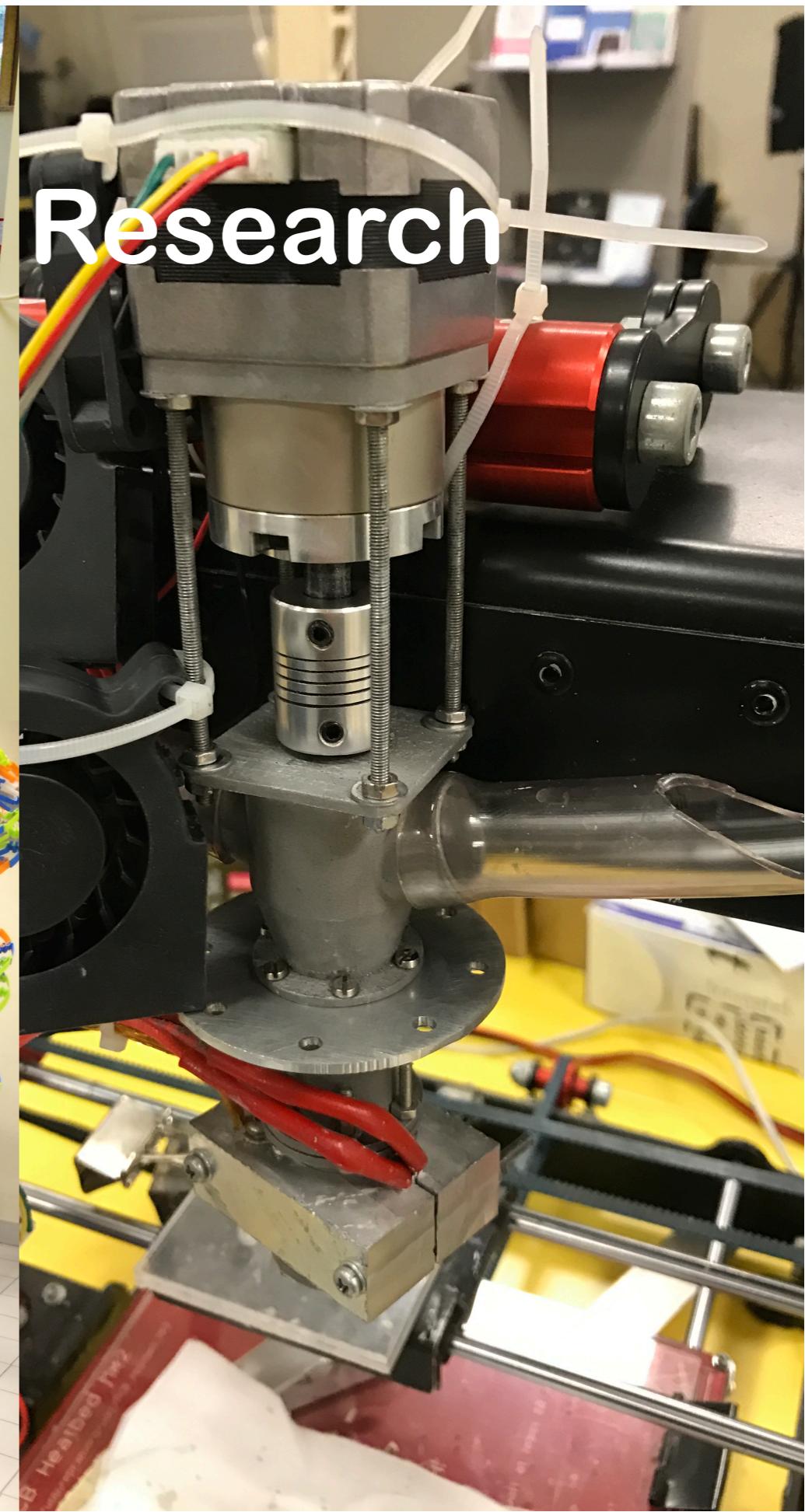
Projects



Training

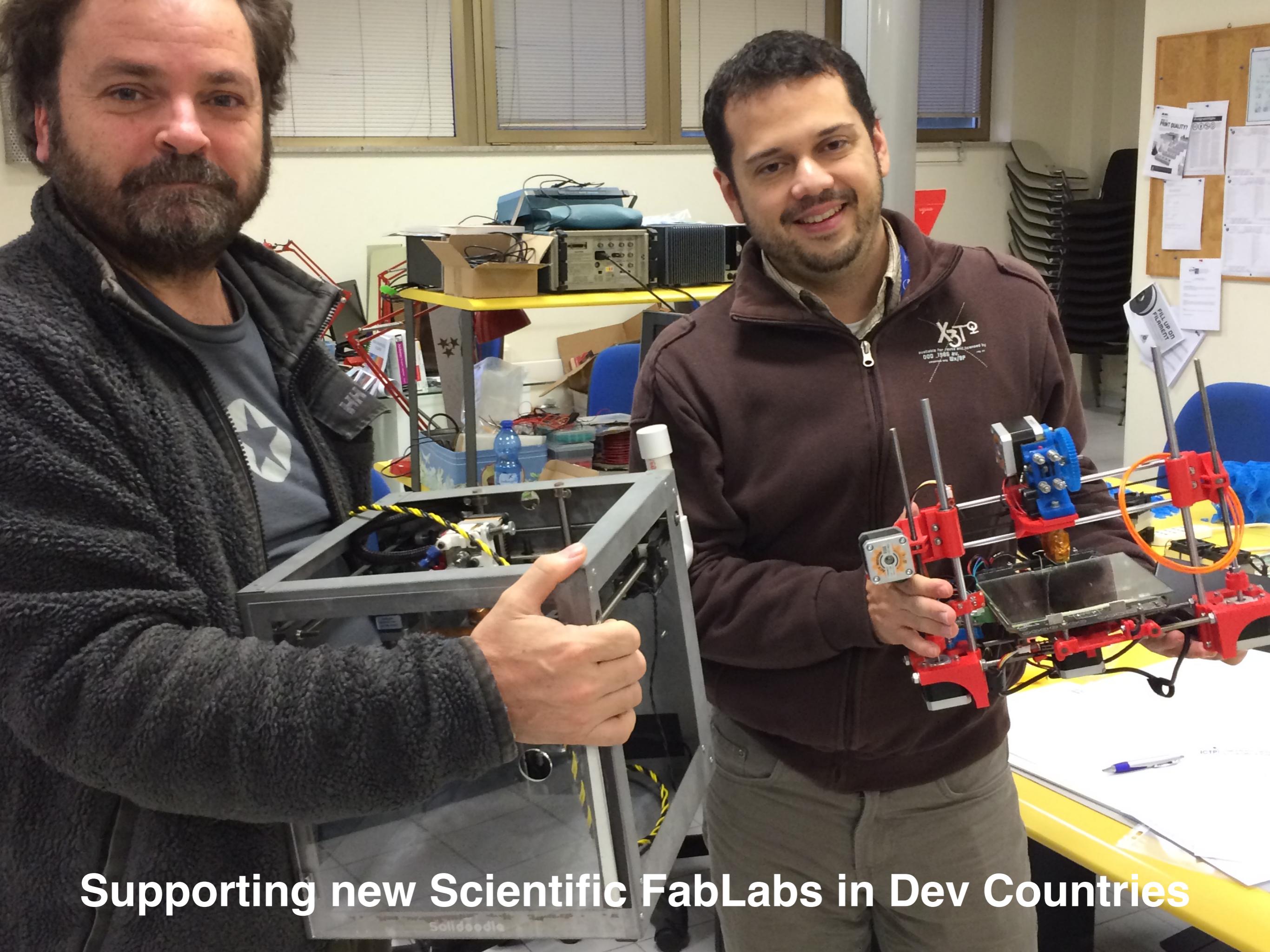


Research





At ICTP the FabLab was established for Outreach, Research and Development activities



Supporting new Scientific FabLabs in Dev Countries

Open to the public: why?

- Engagement of the **local community** of makers
- Our mandate is to **share and disseminate knowledge**
- We are also working to attract **young** curious people to science
- Our FabLab aims to attract both **scientists** (have problems to solve, and little time/money to learn new skills) and **makers** (passionate people looking for problems to solve, often with valuable technical skills)



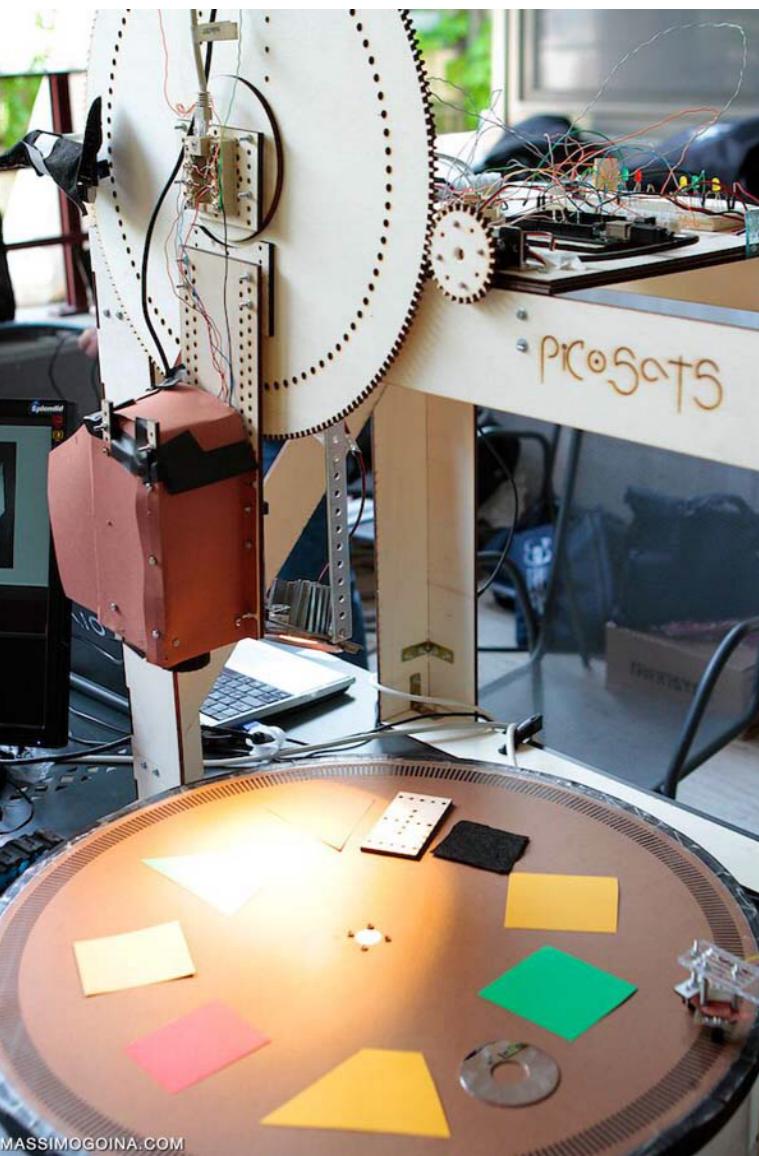


Sponsorship

- The ICTP SciFabLab has received a contribution by the **Comune di Trieste** of 20.000€ for the year 2015, in order to offer its facilities to the local community for projects related to Trieste and its area. With half of this sponsorship we have been able to hire two young assistants to keep the lab open on evenings and all Saturdays (22hrs/week). The other half has been used for the TSMMF.
- In 2016 the contribution has been increased to 30.000€, of which 20K have been spent for the Trieste Mini Maker Faire and Science Picnic, and 10K for the SciFabLab.
- The following administration of the Comune di Trieste has renewed the contribution of 30.000€ for 2017, with the same modality, and increased it to 40.000€ for 2018.

Trieste Mini Maker Faire

- A MakerFaire is a unique occasion to exchange ideas between a lot of creative **makers** (with new tools and original solutions) and our **scientists** (they need to use such tools to solve research problems)



16.000 visitors!!!

- In 2014, we organized a 1-day event on Saturday, May 17, and we had 110 projects shown and ~6.000 visitors (cost: 25K€)
- On May weekend from 2015 to 2016 (and September in 2017) we had more than 16.000 visitors for ~300 makers exhibiting their projects during a free 2-days event (cost: 50K€). Live web streaming: 6.000 viewers.
- We have been helped by ~100 volunteers

2014



2015



2016



Trieste Mini Maker Faire è un evento organizzato indipendentemente dietro licenza diretta di Maker Media, Inc.

Trieste Mini Maker Faire®

CAMPUS ICTP MIRAMARE

SABATO 21 - DOMENICA 22
MAGGIO 2016

SABATO ore 11-21 • DOMENICA ore 10-18

conoscerai i maker e i fablab dell'Alpe Adria e i loro incredibili progetti • scoprirai robot, droni, stampanti 3D, invenzioni curiose e tantissimo altro • vedrai opere d'arte e d'ingegno, autoprodotte, riciclate, personalizzate • parteciperai a corsi, seminari, esperimenti e giochi per curiosi di ogni età

www.makerfairetrieste.it

ORGANIZZATORI

Make:
makezine.com

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PRENDI UN TRENO
(TUTTI I REGIONALI
FERMERANNO A
MIRAMARE*) O SCEGLI
LA BICICLETTA!

*SABATO ORE 10-22 • DOMENICA ORE 9-19

Thank you very much for your attention

by the ICTP SciFabLab team