Resource Collection from BINA Builders Working Group

General note:

This document is accessible from the Builders working group resources website. If you wish to contribute resources to any section of this document please email contact@bioimagingna.org with the subject "BINA Builders WG Resource Collection".

Repositories

These are links to repositories or forums that contain builders- or adopter-related materials. Of these sites, **MicroscopyDB** is the primary repository for all things 'microscopy' and we strongly encourage everyone to submit their material to it!

Microscopy-related repositories:

Site	Description
MicroscopyDB	Community-driven database for microscopy-related topics (events, job announcement, resources such as hardware, software, protocols, …). Browse and search the database through the Community Microscopy Tools site. Submit entries for inclusion through the submission form.
Open Know-How Database	Site centered around open hardware. Microscopy-related hardware can be browsed and searched here.
µList	Microscopy-related tools (see µForum in the Communities/Discussion section)

General-purpose repositories:

Site	Description
Thingiverse	Heavily focused on 3d printable parts
Hackster.io	Predominantly electronics projects
Instructables	Tutorial-style projects of a wide range of projects (from pastries to microscopes)

Microscopy builds and tools

MicroscopyDB is our central repository for microscopy related tools. In this section we want to highlight some developments (which may or may not be in the database already) that we believe to be examples ready for broader dissemination.

Lists:

Site	Description
Hohlbein Lab OpenMicroscopy	Great collection of microscopy-related hardware and tools, software, labs, people

Microscopes

Project	Description	Resources	Adopters
Lattice Lightsheet	Bessel beam light sheet microscope for 3D, high-speed cell biological applications. Developed in the Betzig group at HHMI Janelia.	Chen2014, AIC site	CBMF@Harvard, ALIS@Duke
MOSAIC	Multimodal Optical Scope (including lattice light sheet) with Adaptive Imaging Correction	Liu2018, AIC site	ABC@Berkeley, Legant@UNC
OpenSPIM	Open Access light sheet microscope (SPIM - Selective Plane Illumination Microscopy)	Pitrone2013, https://openspim.org	
diSPIM	Dual-view SPIM, switchable role of excitation/detection	Kumar2014, http://dispim.org/	
Snouty Lightsheet	SPIM with excitation and detection through the same objective. Eases sample access, and allows rapid acquisition of 3D stack through galvo scanning only. A custom tertiary objective increases light-light-throughput and resolution.	Snouty Project	Fiolka lab UTSW York lab, Calico James Manton, MRC Brandon Scott, SDSMT
MesoSPIM	Open source SPIM for large samples. Leverages axially swept light-sheet technology to provide isotropic 3D resolution over large volumes.	Voigt2019, https://mesospim.org/	
ASLM	3D imaging with isotropic resolution over large volumes. Main adoption for cleared tissue imaging. Developed by Reto Fiolka and Kevin Dean at UTSW	Dean2022	Dean Lab
UC2	3d printed cube microscope that can accommodate multiple techniques/modalities.	Diederich2020 openUC2	Heintzmann lab

Strobe Stage	Simple 3d printed and laser cut microscopy stage for fast strobe illumination imaging, especially for microscopy with fast liquid flow	Step-by-step documentation Repository with design files	Wenzel Lab Several labs that participated in the related LIBRE hub workshops

Tools and Accessories

Project	Description	Resources	Adopters
Navigate	Python based microscope control software that allows on the fly processing and integration of hardware and functionalities via plugins	https://github.com/TheDeanLab/navigate	Dean Lab Fiolka lab UTSW

Methods and Protocols

Project	Description	Resources	Adopters

Communities/Discussion sites

Places that offer enough info to builders and adopters to make a visit (or subscription) worth their time.

Name	Description
GOSH	"Gathering for Open Science Hardware" community with lots of resources, especially a very active forum.
µForum	Very active forum for all things microscopy related. Will soon have a "Builders" tag (link once established).
NIH3D	NIH hosted community driven platform for all sorts of 3D printable tools in biomedical research.

Build-related journals

Name	Description
JOH	Journal of Open Hardware. Peer reviewed open access publication for open hardware research and development.
HardwareX	Open access, peer-reviewed journal which publishes articles that describe the design, construction and customization of scientific devices and equipment. An Elsevier journal.

RSI	Review of Scientific Instruments publishes novel advancements in scientific instrumentation, apparatuses, techniques of experimental measurement, and related mathematical analysis.

Events/Meetings

The reference list for events and meetings is the BINA Events Page. If you want to list a new event, please add it here. Bina could then create pages for meetings that lists talks, posters, etc. of BINA members (e.g. SPIE Photonics West, OSA Frontiers in Optics (FiO), OSA Novel Techniques in Microscopy (NTM)).

Event	BINA participation
SPIE PW 2024	BINA@Photonics West 2024

Training/Tutorials

The reference list for events and meetings is the BINA Training and Education Resources Page. If you want to list a new resource, please add it here.
Some resources that are useful particularly for builders:

Books

Name	Description
Building Scientific Apparatus, by Moore, Davis, & Coplan	A bit dated, but has a good collection of topics for instrument building. ISBN 9780511609794
Practical Electronics for Inventors, by Scherz & Monk	Good all-around intro book for most electronics-related topics. ISBN 9781259587542
Fundamentals of Photonics, Saleh, Teich	Fantastic text for those that want to study photonics and a staple in Biomedical, optical, -engineering.

Online training

Name	Description
Molecular Expression Microscopy Primer	Reference site with lots of interactive content by Michael W. Davidson

Standards & Best Practices

Guidelines for making a resource/tool available to the public.
This section is still in the works!!

We are collecting some information from the community on what the pain points are for developing, adopting, and using custom microscopes and tools. We would like to hear from you!! Please send us (see contact in red at the top of this document) with your thoughts on what resources need to be included for dissemination, where (and how) do you post it and advertise it, how do you provide instructions and/or support for builders, or how do you deal with IP/licensing issues? We would like to also assemble a list of resources in different tiers:

- Tier 3 - Need to have (minimum for a viable ‘product’)
- Tier 2 - Nice to have (intermediate level ask that makes resource a ‘step above’)
- Tier 1 - Great to have (very best practice, ultimately what would be needed)

If you have thoughts you’d like to share, have examples from your lab, or even help us develop this material, please contact us!