

TORCH Light Box

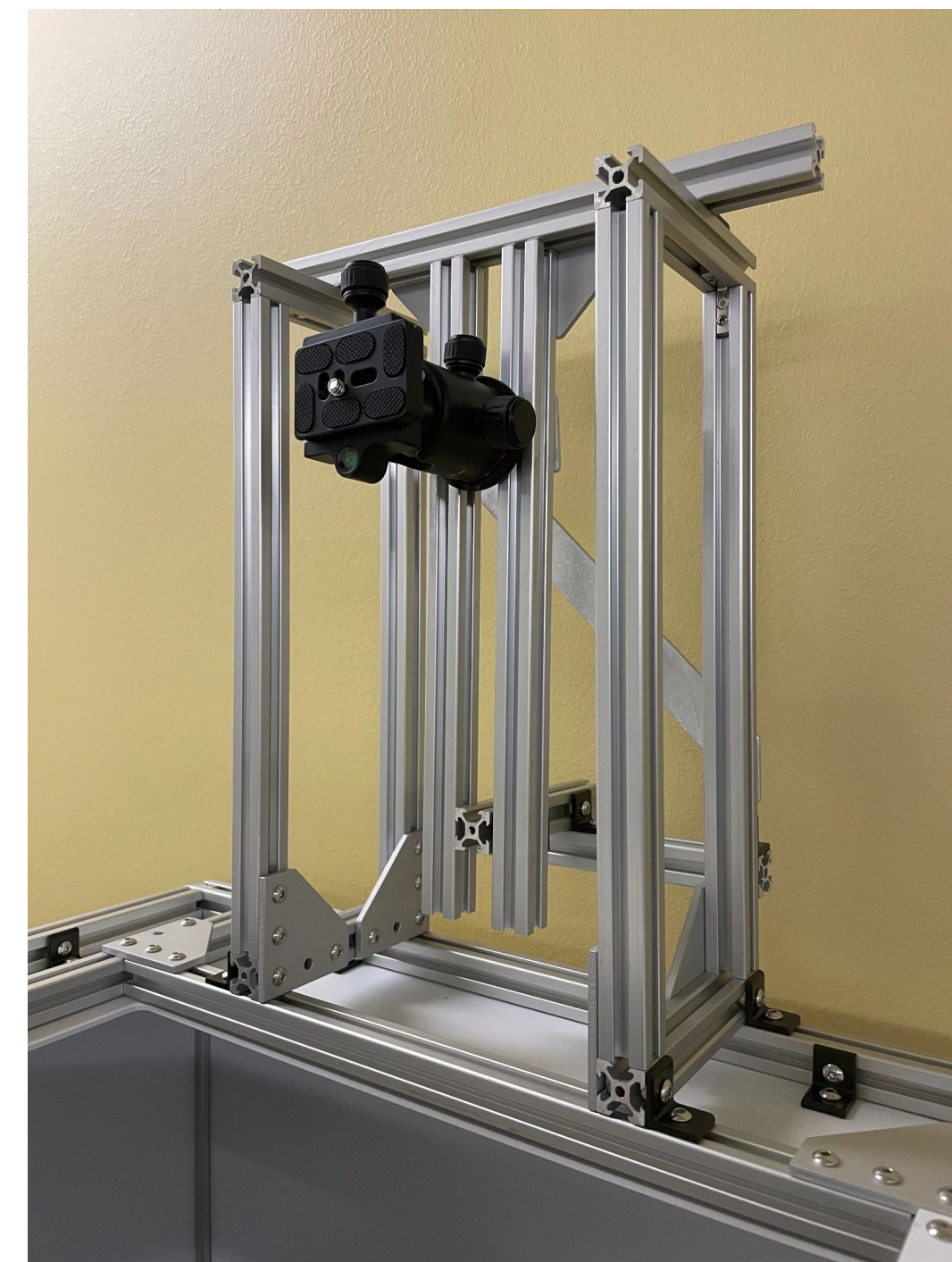
An Open Source Light Box Design for Herbarium Specimen Imaging

Jason Best - Botanical Research Institute of Texas - jbest@brit.org



Constructed of extruded aluminum tubing and plastic panels The tubing provides a rigid box structure with white plastic panels and a white fabric curtain to contain and reflect internal LED light sources.

The Texas Oklahoma Regional Consortium of Herbaria (TORCH) Thematic Collections Network (TCN) faced a challenge when the project got underway in 2019: the light boxes specified by many participants were no longer available because the manufacturer went out of business. Other options were too expensive and not ideal for herbarium specimens. To address these challenges, the author designed a custom light box which combines time-tested features of previous designs and new features based on experience and input from the herbarium community. Eight of these light boxes have been built and delivered to TORCH participants and are in active use for specimen digitization.



Integrated camera stand The camera stand connects directly to the light box and the position can be adjusted to accommodate different cameras and lenses.

Design and Features

The primary goals of the design were to create a light box that matched existing basic designs and features but could be built at a low cost, with parts and materials that were readily available using basic tools and skills to fabricate. Secondary goals of the design were to facilitate rapid prototyping with components that were easy to adapt, reconfigure, and customize and a design that can be assembled and disassembled for shipping to other herbaria using roving imaging stations. The specimen platform measures 23" x 17" and includes an integrated plastic guide to facilitate positioning of the specimen for imaging and an integrated camera stand allows a digital camera to be mounted and aimed through a hole in the top panel of the box.

Construction and Cost

The light box is constructed using T-slot aluminum tubing for the frame with white plastic panels to provide an enclosed space which excludes exterior light and reflects internal light from two LED light bars mounted to the underside of the top panel. The light bars each have three strips of LED lights which are powered by an external 24-volt power supply. The top of the box has an opening through which a DSLR camera can capture images of specimens placed on the bottom platform of the box. The box design includes an integrated light stand which supports the camera. A white fabric curtain covers the front opening of the box and allows the operator to raise the curtain to place a specimen and lower it to block exterior light from entering. The materials for the current box design cost approximately US \$750 but could be reduced further with some easy modifications. Alternative light boxes, including the original light box no longer available, cost US \$1,800 or more.

Documentation of the open source hardware design, including material lists, fabrication instructions, assembly instructions, and photographs, is provided at

https://github.com/TORCH-TCN/torch_light_box.



Next Steps

A prototype modification using sliding doors has been built and will be tested to compare imaging efficiency to the current curtain design. An improved camera stand has been designed and built to be more easily assembled and to use less material. It is hoped that the collections community will find the design and documentation of value and will continue to iterate, expand, and evolve the design options.



MK-Direct/ORTECH light box customized to NYBG specs This discontinued light box served as inspiration for the TORCH Light Box.



LED Light Source Two integrated light panels, each with three rows of LED lights. The strips include 36 LED lights per foot and are rated with a 90+ Color Rendering Index (CRI) with a 5000K color temperature. LEDs are powered by an external 24 volt power supply.



Disassembled for shipping The complete box, camera stand, and power supply can be disassembled and packed to dimensions of 18" x 24" x 6" for shipping.



The TORCH TCN is an herbarium specimen digitization project co-led by five institutions in Texas and Oklahoma: the Botanical Research Institute of Texas, the University of Texas at Austin, Texas A&M University, the University of Oklahoma, and Oklahoma State University. This four-year project brings together 46 collaborating herbaria to digitize and mobilize the data from nearly two million plant specimens collected in the states of Oklahoma and Texas. Now in its third year, the TORCH TCN was funded by NSF under Award Numbers 1902078 (BRIT), 1901993 (TEX), 1902064 (TAES), 1902080 (OKL), and 1902085 (OKLA).