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Supporting information for article:

Inexpensive robotic system for standard and fluorescent imaging of protein crystals

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All of the code and 3D printed models used in this project can be found at the following website: https://github.com/dakota0064/Fluorescent_Robotic_Imager

Table S1 Cost of Parts (October 2019)

Component	**Price**	**Source**
Panowin F1 3D printer	$289.82	https://www.amazon.com/Panowin-F1-3Axis-SelfAssembled-Printer/dp/B06ZXWHFRG/ref=asc_df_B06ZXWHFRG/?tag=hyprod-20&linkCode=df0&hvadid=198096596114&hvpos=1o1&hvnetw=g&hvrand=9692127162421959791&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9005494&hvtargid=pla-354169679881&psc=1
180x zoom stereo microscope	$552.99	https://www.amscope.com/3-5x-180x-stereo-zoom-microscope-with-single-arm-boom-stand.html
MU1803 camera	$415.99	https://www.amscope.com/accessories/camera/18mp-usb3-0-real-time-live-video-microscope-digital-camera.html
525 nm filter	$29.50	https://www.ecrater.com/p/29227007/optical-filter-525eflp-25mm-green?gps=1&id=81021690619&gclid=Cj0KCQjwjtLZBRDLARIsAKT6fXz8-DHcddm17G3L_3bBzL6OL5JruzFUEqbC4uYfR-lkP2nmIapG9SwaAgzpEALw_wcB
488 nm laser diode	$100.00	https://www.ebay.com/itm/Sharp-488nm-GH04850B2G-55mW-12mm-Copper-Laser-Module-W-Driver-and-Lens-Options-/173612588140?var=&hash=item286c1ddc6c
Electroluminescent sheet	$15.51	https://www.ebay.com/itm/White-A5-EL-Panel-Electroluminescent-Cuttable-Sheet-Neon-Paper-12V-Actuator-US/362404815900?epid=23023475997&hash=item546102a41c:g:VP4AAOSwjLtbZEbk&frcectupt=true
3-pin connector cables (1 pack)	$5.99	https://www.amazon.com/HKBAYI%C2%AE-10Pair-10sets-Connector-WS2812B/dp/B00NBSF724
2-pin connector cables (1 pack)	$7.29	https://www.amazon.com/eBoot-Female-Connector-Adapter-Electrical/dp/B06WGN56V2
12 V, 2 A AC power adapter	$8.98	https://www.amazon.com/RGBZONE-100-240V-Charger-Switching-Adapter/dp/B06XWXR9XT

Barrel jack adapter	$3.84	https://www.amazon.com/JacobsParts-Adapter-Female-Pigtails-Security/dp/B00QJAW9F4
TIP120 transistors (x10)	$9.28	https://www.amazon.com/Major-Brands-TIP120-Transistor-Darlington/dp/B00B888622
5V cooling fan (x2)	$23.98	https://www.amazon.com/GDSTIME-50x10mm-Small-Brushless-Cooling/dp/B00N1Y3XP6
Servo motors (x6)	$11.99	https://www.amazon.com/IDEASPARK-Helicopter-Airplane-Raspberry-Included/dp/B07BBQ5DXR
Arduino Uno	$15.81	https://www.amazon.com/RoboGets-Compatible-ATmega328P-Microcontroller-Electronics/dp/B01N4LP86I/ref=sr_1_15_sspa?keywords=arduino+uno&qid=1552243966&s=toys-and-games&sr=1-15-spons&psc=1
Arduino compatible motor shield	$8.99	https://www.amazon.com/Compatible-Arduino-Duemilanove-Atomic-Market/dp/B00TMA4YSS/ref=asc_df_B00TMA4YSS/?tag=hyprod-20&linkCode=df0&hvadid=194019628201&hvpos=1o1&hvnetw=g&hvrand=13682676765161587204&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=1022968&hvtargid=pla-340551339284&psc=1
Diffusion gels (1 pack)	$31.19	https://www.amazon.com/10-Diffusion-Filter-Lighting-Pack/dp/B001NPC9SM
Acrylic sheets (0.46 m x 0.61 m x 3.175 mm) (x5)	$60.00	Any hardware store, such as Lowe's Hardware - https://www.lowes.com/pd/optix-18-in-x-24-in-clear-acrylic-sheet/3143523?cm_mmc=shp-_-c-_-prd-_-hdw-_-google-_-lia-_-145-_-screenandglass-_-3143523-_-0&kpid&store_code=1883&gclsrc=aw.ds&&k_clickID=go_1737082938_70609811729_338469060383_pla-444984875441_c_9005550&gclid=EAIaIQobChMImKDSIP_Q4wIVCb7ACh233gYAEAQYAyABEgKO9PD_BwE
3.175 mm angle iron (x4 1.83 m lengths)	$60.00	Any hardware store, such as Grainger - https://www.grainger.com/product/2AUR7?gclid=EAIaIQobChMI0LnjwP_Q4wIV0cDACh2APQKrEAQYASABEgJv7fD_BwE&cm_mmc=PPC:+Google+PLA&ef_id=EAIaIQobChMI0LnjwP_Q4wIV0cDACh2APQKrEAQYASABEgJv7fD_BwE:G:s&s_kwcid=AL!2966!3!284618243487!!!g!476751934971!
PLA 3D printer filament (x2 1 kg rolls)	$41.90	https://www.amazon.com/Gizmo-Dorks-2-85mm-Filament-Printers/dp/B00GU2EBXY/ref=sr_1_4?keywords=black+3mm+pla+filament&qid=1552244401&s=electronics&sr=1-4-catcorr
Black craft foam	$1.00	Any craft store, such as Michaels - https://www.michaels.com/creatology-foam-sheet-

(300 mm x 200 mm x 2 mm)		6mm/10390268.html?cm_mmc=PLASearch-_-google-_-MICH_Shopping_US_N_Kids_N_N_N_N-_-Kids&&cm_mmc=PLASearch-_-google-_-MICH_Shopping_US_N_Kids_N_N_N_N-_-Kids&gclid=EAIaIQobChMI2e6f1__Q4wIVTtbACh1jxAMzEAQYASABEgLXOvD_BwE&gclsrc=aw.ds
Male pin headers (1 pack)	$6.75	https://www.amazon.com/Hotop-Pack-Single-Header-Connector/dp/B06XR8CV8P/ref=asc_df_B06XR8CV8P/?tag=hyprod-20&linkCode=df0&hvadid=241899520269&hvpos=1o1&hvnetw=g&hvrand=5160291454855199572&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9005550&hvtargid=pla-378641509623&psc=1
Female pin headers (1 pack)	$7.49	https://www.amazon.com/Single-Headers-Machine-Female-2-54mm/dp/B0187LTEX2/ref=asc_df_B0187LTEX2/?tag=hyprod-20&linkCode=df0&hvadid=193994910693&hvpos=1o3&hvnetw=g&hvrand=11020839051445565103&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9005550&hvtargid=pla-310821570600&psc=1
Adhesive heat shrink tubing (1 pack)	$17.99	https://www.amazon.com/RockDIG-104Pcs-Double-Wall-Adhesive-Assortment/dp/B07MW49H3F/ref=asc_df_B07MW49H3F/?tag=hyprod-20&linkCode=df0&hvadid=344041610585&hvpos=1o8&hvnetw=g&hvrand=15765698772607728 02&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9005550&hvtargid=pla-744676383506&psc=1&tag=&ref=&adgrpid=70729709993&hvpone=&hvptwo=&hvadid=344041610585&hvpos=1o8&hvnetw=g&hvrand=15765698772607728 02&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9005550&hvtargid=pla-744676383506
22 Gauge wire kit	$15.99	https://www.amazon.com/Stranded-different-colored-spools-included/dp/B00B4ZQ3L0/ref=sr_1_1?keywords=electronix+express+22+wire+kit&qid=1572202376&sr=8-1
Arctic Silver thermal paste	$7.79	https://www.amazon.com/Arctic-Silver-High-Density-Polysynthetic-Compound/dp/B07NV27PDX/ref=sr_1_3?crid=D2HT5ZPCGSUY&keywords=arctic+silver+thermal+paste&qid=1572207518&sprefix=arctic+s%2Caps%2C146&sr=8-3
Total cost of parts	**$1750.06**	

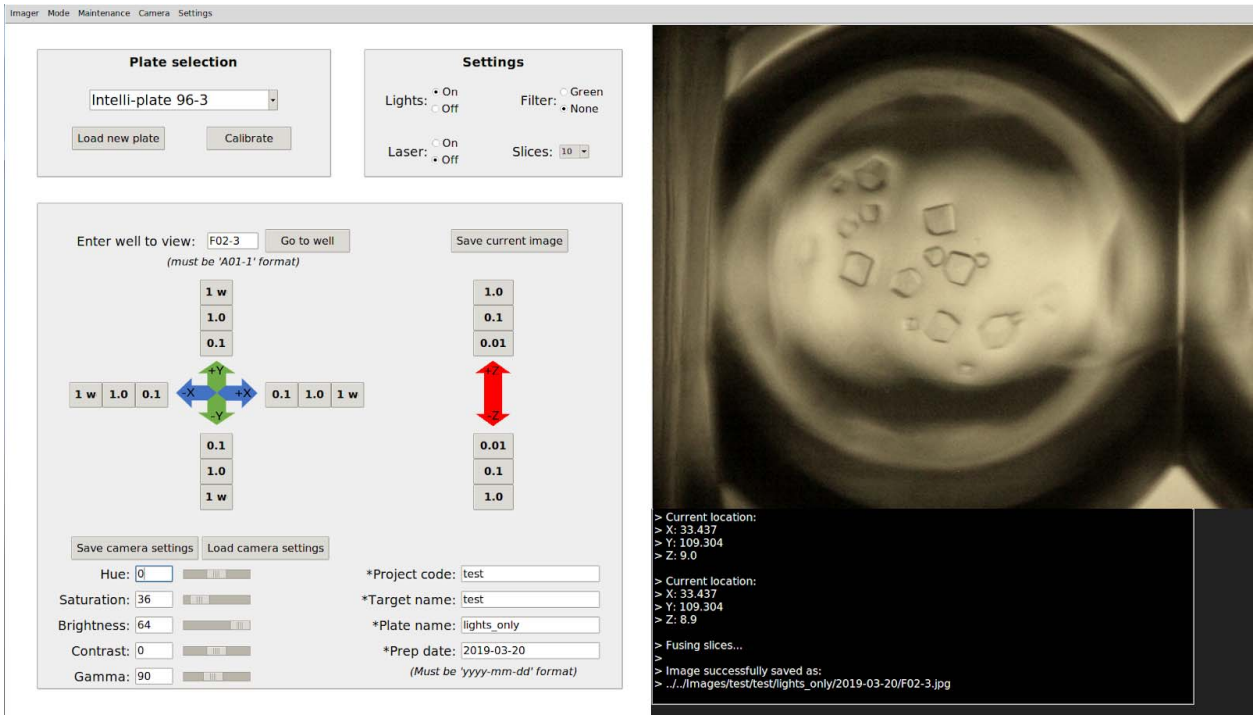

Figure S1 Screenshot of manual mode. Buttons allow movement in the XY plane by either 0.1 mm or 1.0 mm increments, or the user can jump directly to the next well in that cardinal direction. Movement along the z-axis has a finer scale, allowing for 0.01 mm, 0.1 mm, or 1.0 mm increments. Individual images can be captured and saved after the directory inputs (lower right boxes) have been completed. All options in this mode, except for camera settings, are disabled during an automatic imaging run. The camera view is shown on the right, currently displaying a 1.0 mm diameter sitting drop in a 1.0 µl well. This drop contains lysozyme crystals, and is composed of 300 nl protein solution and 300 nl reservoir solution. There is also a status box underneath the camera view which displays feedback messages during normal operations.

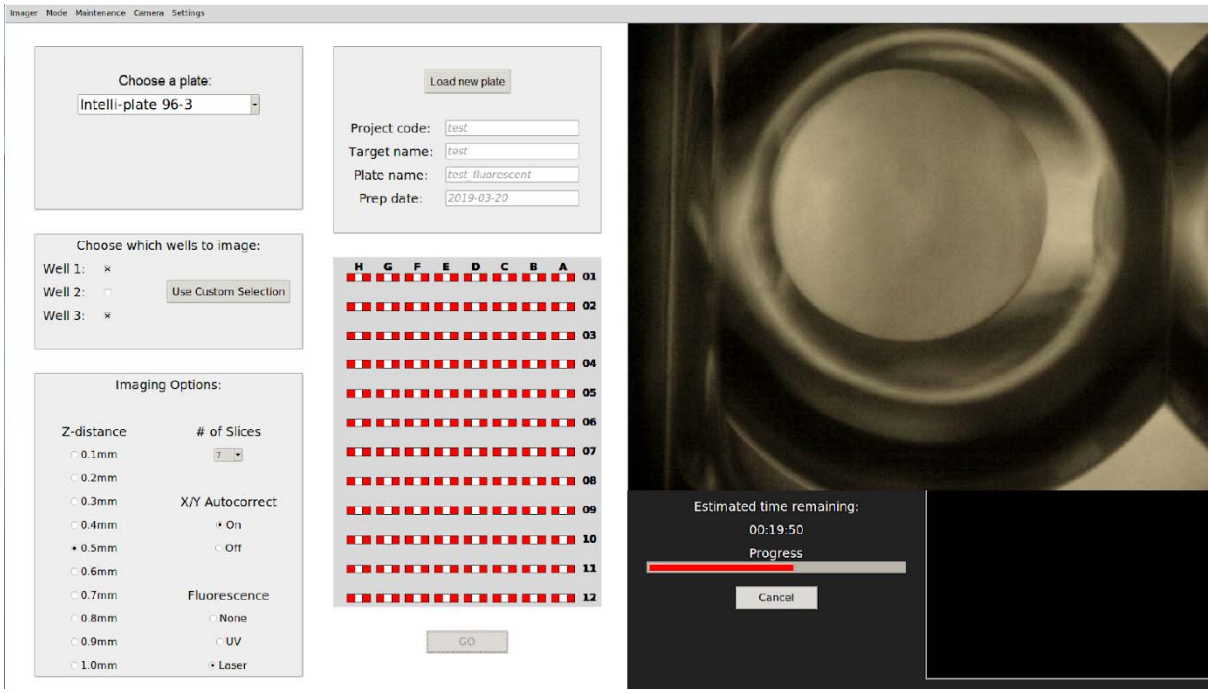

Figure S2 Screenshot of automatic mode. The upper right button panel shows the directory input, which must be completed before imaging can begin. Below that is a custom well selection panel, allowing individual wells to be toggled. This panel also displays selections made through editing mode or the well selection pop-up window. Panels on the left allow for plate selection, well selection by sub-row, and imaging options. Similar to manual mode, the camera view is shown on the right half of the screen, currently displaying a 1.0 mm diameter sitting drop in a 1.0 µl well. This is a clear drop composed of 300 nl protein solution and 300 nl reservoir solution. There is also a progress bar and status window (currently blank) underneath the camera view.

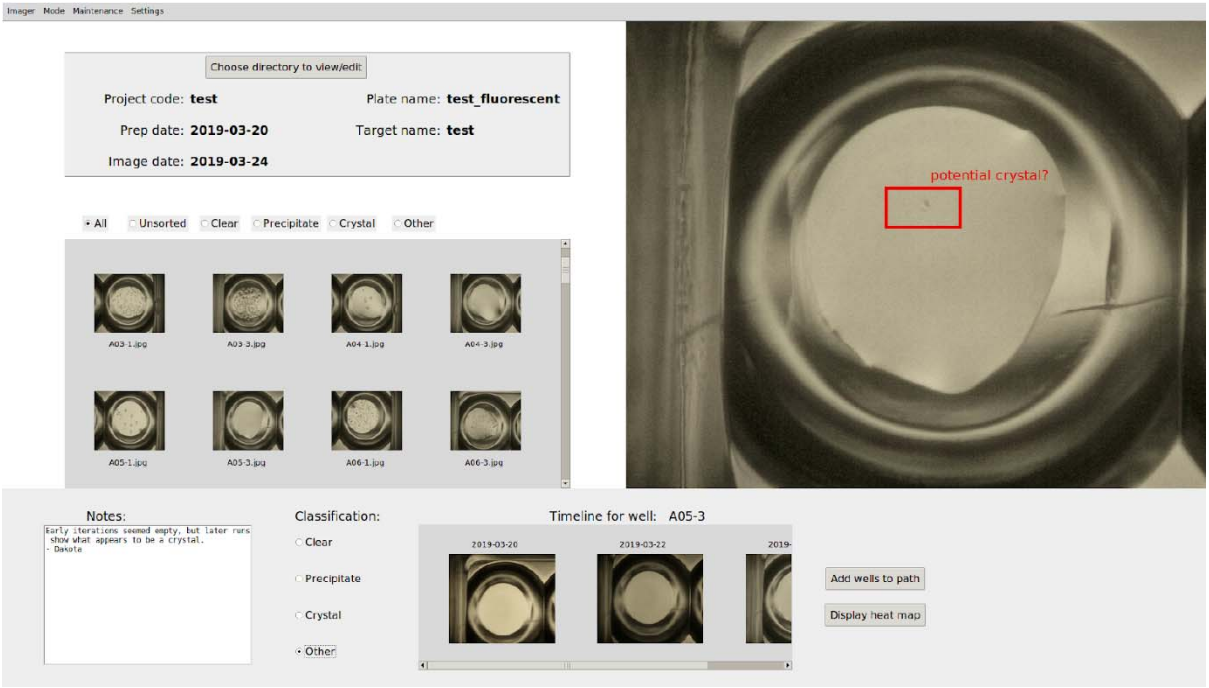

Figure S3 Screenshot of editing mode. A directory must first be selected using the "Choose directory to view/edit" button. The bold fields will then fill to reflect the selection, and the corresponding images will be displayed in the middle left panel. Clicking an image displays a larger copy on the right, and allows the user to edit, classify, and take notes on the specific well. These notes carry over to future imaging iterations of the same well. A timeline shows these different iterations side by side to easily track developments. All images contained within this screenshot display various 1.0 mm diameter sitting drops in 1.0 µl wells. Each drop is composed of 300 nl protein solution and 300 nl reservoir solution.