

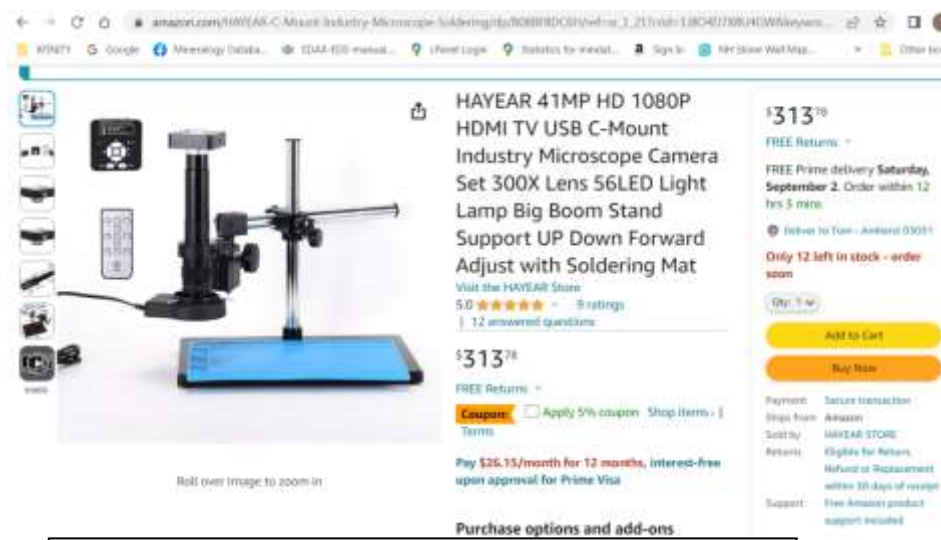
# Hayear Digital Camera for Mineral Photography

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At the May 2023 New England Mineral Symposium in Bethel Maine I had an opportunity to visit the Maine Mineral and Gem Museum (MMGM) lab with Al Falster. The lab has a most impressive collection of mineral analysis instruments, including a new SEM EDS and a PXRD unit. Al also showed me a Hayear digital camera setup connected to a large screen TV-monitor. I was most impressed with it, especially when I learned of the price tag, about \$300, (not including the large screen monitor).

Returning home, I investigated a purchase and found it available on Amazon, Figure 1. It is hard to beat Amazon..... the camera arrived on my door step two days later! Amazon link, (8/2023):

[https://www.amazon.com/HAYEAR-C-Mount-Industry-Microscope-Soldering/dp/B08BF8DC6H/ref=sr\\_1\\_21?crid=1J8O4D7X8U4GW&keywords=Hayear&qid=1693238150&srefix=hayar%2Ccaps%2C275&sr=8-21&ufe=app\\_do%3Aamazon.fos.c3015c4a-46bb-44b9-81a4-dc28e6d374b3](https://www.amazon.com/HAYEAR-C-Mount-Industry-Microscope-Soldering/dp/B08BF8DC6H/ref=sr_1_21?crid=1J8O4D7X8U4GW&keywords=Hayear&qid=1693238150&srefix=hayar%2Ccaps%2C275&sr=8-21&ufe=app_do%3Aamazon.fos.c3015c4a-46bb-44b9-81a4-dc28e6d374b3)



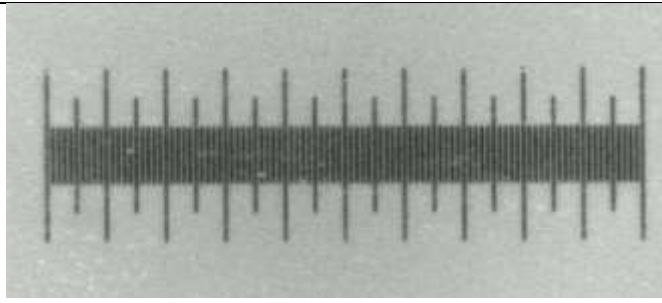
Amazon Hayear Camera offering screen shot

This article reports my experience with this camera.

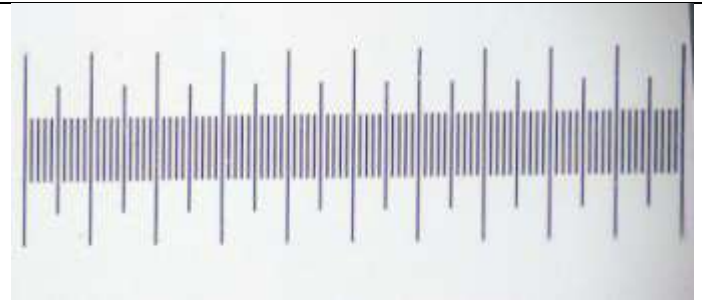
First I would say the unit, particularly the boom stand assembly, is most solid and substantial. Nothing cheap here. A second big plus is the working distance between the bottom of the camera and the table base: about 10 cm. This large working distance gives great flexibility in positioning specimen lighting. Also impressive is the zoom magnification range, non vignetted, 1.5 to 20 mm. A small remote is included that allows shutter snap without need to contact the camera, critical for eliminating vibration. Rounding out the goodies with this Hayear package is a ring-style, dimmable, light that attaches to the base of the lens assembly. This works well.

The camera provides two options for digital image capture: a USB direct to PC cable and a micro SD card slot to save to on-camera memory. The SD card is not included. To transfer photos to a PC, the micro SD card must be removed and adapted to your PC. Now for a few caveats... The photo resolution available from the USB to PC connection is low, (1920 x 1080 pixels). The photo resolution for the image storage to micro SD card is much higher, 7440 x 4176 pixels. However the Hayear design only permits photo storage to the micro SD card when the camera is connected via a HDMI cable to a TV-monitor. It is unknown to me why this is the case and took me some time to figure this out. Fortunately I had a spare 24 inch HDMI input TV available for wall mount close to my setup. The USB to PC operation does provide a nice GUI (Graphical User Interface), Figure 3, that allows camera control from your computer. The best use of this connection option may be for easy medium-resolution photos to document your specimens.

As a resolution comparison, figures 1 and 2, show the Hayear and my Canon SL3 camera with Nikon Plan 10 objective, both at maximum magnification, focused on a one mm graduated reticule slide. The pitch between the finest vertical reticule lines is 0.01 mm. The Hayear is quite good, but the Canon-Nikon combination is better. (But the Canon SL3 + 55-250 macro lens + Nikon Plan 10 objective cost about \$1,500)

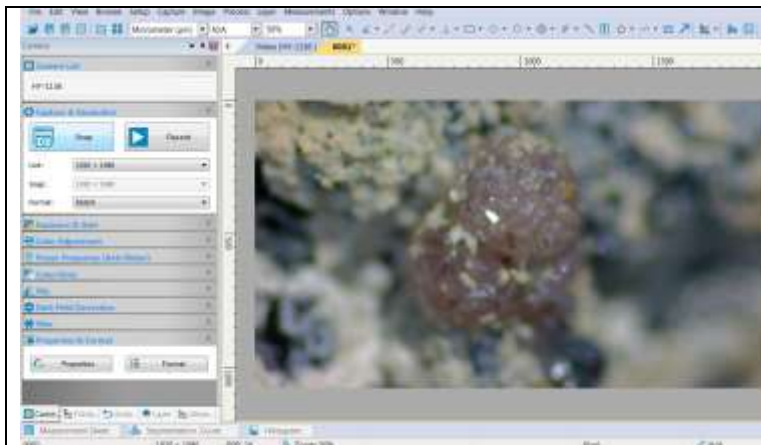


**Figure 1:** Hayear camera photo of 1 mm reticule. (Micro SD card image capture)

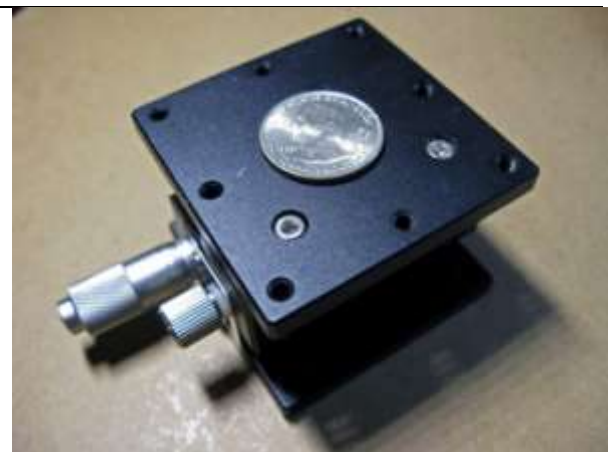


**Figure 2:** Canon SL3 camera with Nikon Plan 10 objective; photo of 1 mm reticule.

Sharp photos of tiny crystals require image stacking; the software combining of many photos taken at incremental focal points. Helicon Focus and Zerene are two of the popular products for this task. To perform image stacking of mm sized crystals you will need a platform to finely increment the distance between the camera lens and the specimen. (The focus knob on the Hayear camera boom is much too coarse for this.) I found on Amazon (some years ago) a small, micrometer adjustable, vertical stage, Figure 4, for about \$50.



**Figure 3:** Hayear PC Graphical User Interface (Screen shot)



**Figure 4.** Micrometer vertical stage. US quarter for size.

One rotation of the micrometer knob changes the stage height by 0.5 mm, so it is easy to adjust the stage height in 0.05 mm steps. Figure 5 shows my Hayear camera with this micrometer stage below the lens. The boom assembly allows the camera to be positioned horizontally, Figure 6. This configuration allowed the use of my preferred single axis translation table (easily adjusted in 0.01 increments).

Figures 7 and 8 are two Hayear camera photos, one at minimum magnification and one at maximum magnification. Photoshop post processing was applied to both photos to optimize the images.

### **Some Comments:**

The camera sensor appears to be color matched to the included LED ring light. A red tint is observed on photos when an incandescent light source is used.

The length of the included USB cable is ten feet, a generous allowance for separation between a PC and the camera unit.

A micro SD card adaptor may be needed if your PC/laptop does not have a slot for these tiny items.

The micrometer vertical stage needs to be firmly affixed to the Hayear base plate to prevent movement when stepping the vertical position. A thin strip of Geotack works well.

### **Conclusion:**

This Hayear camera is an amazing value. It is a good entry point for a micromounter to explore digital photography. Some additional costs should be anticipated: a micro SD card, a HDMI cable, a fine increment vertical stage for photo stacking, photo stacking software, and photo editing software.

Taking satisfactory photos of micro-minerals has a moderate learning curve. Be prepared for your initial attempts to disappoint. Good lighting and specimen orientation take practice.



**Figure 5**, Hayear camera with micrometer vertical stage for image stacking.



**Figure 6**: Hayear camera set horizontally to work with my ultra fine pitch single axis translation table.



**Figure 7**. Hayear camera minimum magnification 16:9 HDMI monitor aspect ratio. Heulandite, Thomaston Dam, Thomaston, CT 20 mm field of view.



**Figure 8**: Hayear camera maximum magnification Cropped to 5;4 monitor aspect ratio. Anatase, Audley Quarry, Merrimack, NH Largest crystal 0.9 mm.