

The Construction Method of the periscope-type DVD spectroscope

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(1) A full-size paper pattern

The full-size paper pattern of the periscope-type DVD spectroscope is attached at the end of this file. This paper pattern should be copied to a scale that the length indicated by an arrow becomes 50 mm.

(2) Construction Method

This spectroscope can be made using a sheet of card stock which is impenetrable to light as is the case of the previous one (1). It is desirable that the inside of the spectroscope be black, which can be accomplished by pasting black construction paper onto a manila file folder. As a mirror, we used a thin mirror sheet made of aluminum-evaporated film. The sheet was cut to ca. 15 mm×15 mm square pieces and one of the pieces was glued inside the spectroscope. Any small mirror that is thinner than ca. 2 mm with a similar dimension, such as an acrylic mirror, can be used. Aluminized front-surface mirror on a plastic backing, which can be obtained as a repair part of broken rear-view mirror at most of auto-parts stores, is also a cheap and convenient alternative. As a DVD, you can use single-sided (4.7GB) or double-sided (9.4 GB) single-layer-type DVD-ROM or DVD±R/RW (2). A double-layer-type DVD cannot be used because it does not act as a simple grating. A DVD-RAM cannot be used because its line pitch is as half as that of other DVDs. The DVD was cut to eighth parts with scissors or a cutter for plastics. A higher-speed band-saw for woodworking is also applicable. **Please be cautious not to be injured by the debris of the DVD when you cut the DVD. You should wear safety glasses to protect your eyes.** Sometimes, it is difficult to cut DVD properly. Please try

several times to find a disk or a tool that is easy to handle. One part in good condition was attached to the inside of the spectroscope with the recording surface up. A slit should be cut narrowly and sharply: the slit width of ca. 0.5 mm is sufficient to resolve two yellow lines of mercury at 577 and 579 nm. However, narrower and sharper slit are required to obtain high resolution enough to resolve Na D lines as described in the text.

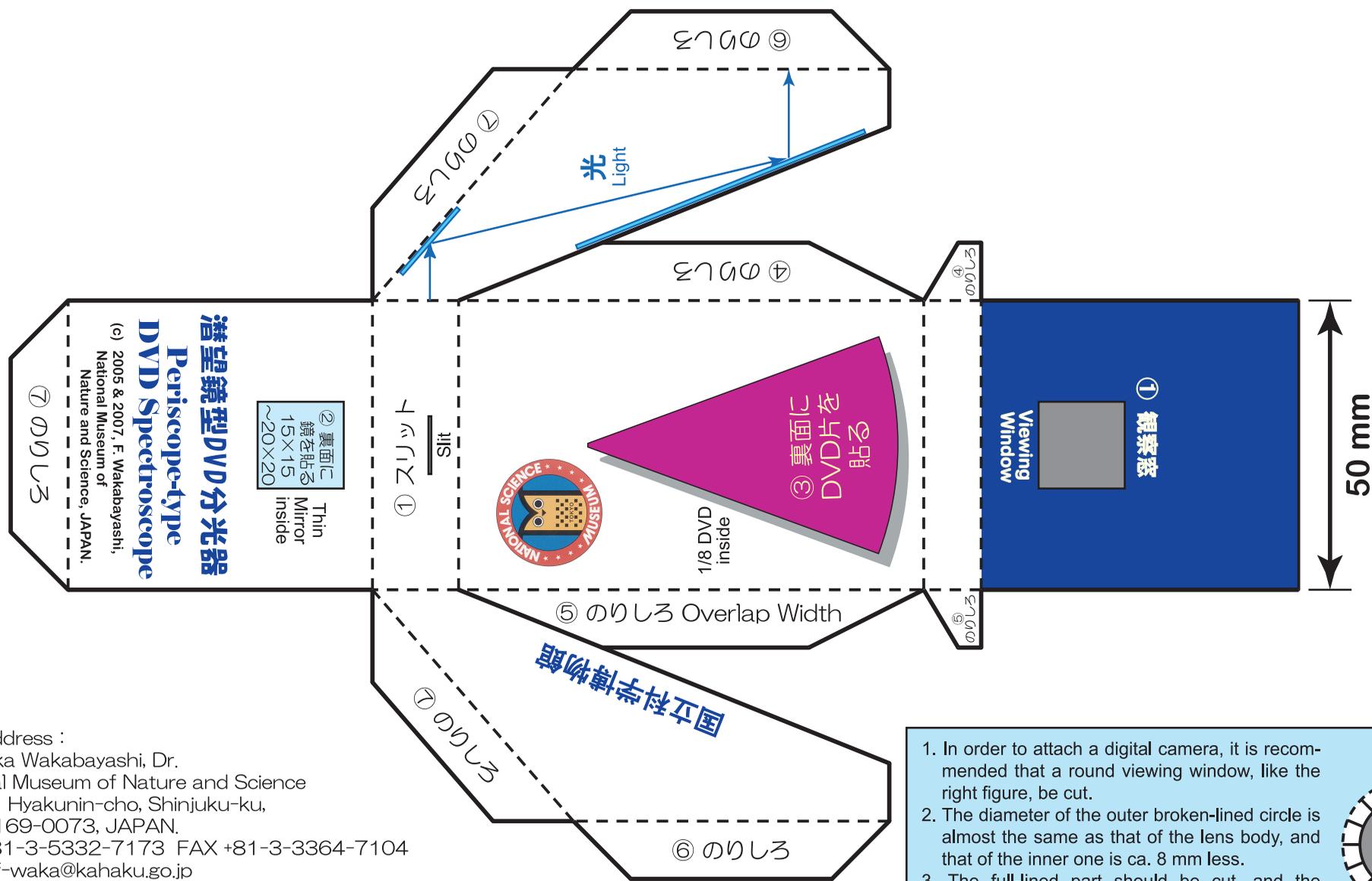
If you want to take photographs of the observed spectra, it is recommended that a round viewing window of diameter slightly less than the lens body be cut. The lens body was inserted to the window and the spectroscope can be supported by the tension of the card stock. In this design, the diameter of the lens body that can be inserted is restricted to less than 30 mm.

References

1. Wakabayashi, F.; Hamada, K. *J. Chem. Educ.* **2006**, *83*, 56-58.
2. Birkett, D. *J. Chem. Educ.* **2002**, *79*, 1081-1087, and referenced cited therein.

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Full-size Paper Pattern of the Periscope-type DVD Spectroscope



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1. In order to attach a digital camera, it is recommended that a round viewing window, like the right figure, be cut.
2. The diameter of the outer broken-lined circle is almost the same as that of the lens body, and that of the inner one is ca. 8 mm less.
3. The full-lined part should be cut, and the broken-lined part should be folded inside slightly. The spectroscope can be supported by the tension of the card stock.