## **Challenge Exercises for Further Study**

- **B-1:** The Hale telescope at the Yerkes Observatory in Wisconsin has an objective lens with a focal length of 19 m. (For an object at infinity, the image distance equals the focal length.) If the telescope is used to observe Saturn that is  $1275 \times 10^9$  m from Earth, what will be the apparent diameter of the rings if their actual diameter is  $27 \times 10^7$  m?
- **B-2:** Dr. Kirwan is preparing a slide show that he will present to the executive board at tonight's committee meeting. He places a 3.50-cm slide behind a lens of 20.0 cm focal length in the slide projector. a) How far from the lens should the slide be placed in order to shine on a screen 6.00 m away? b) How wide must the screen be to accommodate the projected image?
- **B-3:** Madeline is working for the Eye-Spy Detective Agency and her assignment is to secretly photograph the pages of a journal. Madeline's tiny camera has the film located 2.10 cm behind the lens, and she must fill the entire piece of 1.00-cm film with the picture of the 25.0-cm-tall document. How close must Madeline be to the journal pages to get a clear image on the film?

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