in the manner of a skein of thread." I do not know of any explanation of the use of these threads. Can any of your readers suggest a purpose for them?

JOS. F. JAMES.

Cincinnati, O., Aug. 2, 1883.

Seeds of Lepidium.

I regret to observe, by your issue of July 27, that my employment of the expression 'mucilaginous threads' as to the seeds of Lepidium has led your reviewer to understand that I referred to something like the seed-fibres of Collomia. Spiral fibres embedded in mucilage are found on the seeds of Collomia; radiating processes consisting of mucilage, each tipped by a facet of cuticle, are emitted by the seeds of Lepidium virginicum. This is shown on the application of water with staining-fluid to ripe seeds. Other species of Lepidium (including L. ruderale) show the same phenomenon, though the experiment may fail with immature seeds or old herbarium specimens.

G. MACLOSKIE.

Princeton, N.J., Aug. 3, 1883.

["The exotest may bear long hairs (cotton) or spiral threads. . . . In Lepidium (pepper-grass), on being moistened, it darts out mucilaginous threads." It certainly may be gathered from this that the 'spiral threads' and the 'mucilaginous threads' are not the very same. But the darting-out of mucilaginous threads so well describes what one sees in Collomia-seeds and the like, and so poorly answers to what takes place in those of Lepidium, that the reviewer supposed there might be some mixing up of cases. But he simply asked whether the author was sure of the threads in Lepidium. We find nothing to which the name of 'mucilaginous threads' can with any exactness be applied; nor do we think that the term now used of 'radiating processes,' though not widely amiss, gives a clear idea of the case, which we should describe thus:—

A superficial pellicle of the seed-coat of Lepidium consists of a single and continuous layer of cells, the thick walls of which are at maturity converted into mucilage, or into an isomer of cellulose, which swells up into mucilage 'upon the application of water.' But the water acts so promptly in forming the *limbus* around the seed or its section, that we fail in that way to get an intelligible view of the structure and the nature of the process. To do this, however, we have only to soak thin sections of the seed in strong alcohol, examine in them the unaltered mucilage-cells, and then add a little water by degrees. The cells then swell up slowly, push outward radially (for mutual pressure prevents lateral expansion at the beginning), become wedge-shaped or pear-shaped as they farther protrude, and at length form the well-known mucilaginous *limbus*. Dr. Macloskie will be interested in repeating this experiment, and will accept our apology for partially misunderstanding him.]

KONKOLY'S ASTRONOMICAL INSTRUMENTS.

Praktische anleitung zur anstellung astronomischen beobachtungen, mit besonderen rücksicht auf die astrophysik, nebst einer modernen instrumentenkunde. Von NICOLAUS VON KONKOLY. Braunschweig, *Vieweg*, 1883. 912 p., 345 illustr. 8°.

THIS is an important but at the same time a disappointing work. It contains the description and representation of nearly all the principal modern astronomical instruments, and presents such a comprehensive summary as can be found in no other existing book. The numerous illustrations, largely derived from the business catalogues of leading instrument-makers, are generally excellent, and the mechanical execution and press-work are admirable. Undoubtedly the book is one which must have a place in every astronomical library.

At the same time, the work is far from exhaustive, omitting all mention of many of the latest and most useful improvements; and it is not always accurate in its description of those it does notice. Nor does it deal in any thorough or satisfactory manner with the theory of the instruments described. It is so full and so good, that it is a great pity that it is not still better and still more complete, as it easily might have been.

The first chapter, on time-keepers (*uhren*), describes, among clock-escapements, only the old Graham dead-beat and a duplex of Jürgensen's. There is no notice of Airy's detached escapement, now in use at Greenwich, nor of any of the numerous and excellent gravity-escapements now so common in England and this country. The account of electric make and break circuit apparatus is for this reason unsatisfactory, since only escapements of the detached class admit of a simple break-circuit which does not affect the pendulum. The author treats the subject rather extensively, describing no less than twelve different forms of contact apparatus, some of them very elaborate and complicated. The antiquated contrivances of Locke and Mitchell are described as if they continued to be in use.

The second chapter, a short one, deals with the different forms of levels and level-testers, and appears to be in all respects satisfactory.

The third chapter treats of instruments for the determination of time. Under this head are included not only transits and transit-circles, but all forms of theodolites, sextants, passage-prisms, etc. There is also a certain amount of information respecting the graduation of circles and the methods of testing their accuracy, i.e., the optical and mechanical arrangements; the mathematical theory remaining untouched.

The next chapter, the fourth, is by far the most extensive and full of any, occupying two hundred and forty-six pages. It treats of equatorials and their mounting, and describes and illustrates nearly all the important modern telescopes. For the most part, it is well done, especially the portion relating to driving-clocks,

It is evident, however, that the author does not fully grasp all the principles involved in these machines, or he would hardly have spoken so disparagingly of the 'spring-governor' of Bond, which is unquestionably, when properly adjusted, one of the most perfect of all. In so full a treatment of the subject, one would naturally expect to find some notice of the ingenious arrangement by which the clock-work of the Dun Echt equatorial is brought under the electric control of the standard time-piece; but it is missing, though Grubb's less perfect apparatus for the same purpose is fully described.

The fifth chapter, dealing with micrometers, calls for no special notice, beyond the remark that it strikes one as a curious classification which treats of *chronographs* in this connection.

The sixth chapter is a short one, describing the different forms of helioscopes and solar eye-pieces, and the most convenient arrangements for making drawings of sun-spots and determining their position.

The seventh chapter is intended to be a full and elaborate description of the different forms of astronomical spectroscopes, with their accessories. It does describe and figure a great many; but there are several mistakes (as, for instance, on p. 656, where the temporary device which Professor Young employed in observing the eclipse of 1869 is said to have been used with a heliostat, and is spoken of as if it were now used at Princeton), and there is the capital omission of failing even to mention the use of diffraction-gratings in spectroscopic work. It strikes one as very surprising that the author should not have learned that for solar observations the grating has almost entirely supplanted the prism in many if not most observatories. The remarkable apparatus of Thollon is alluded to, but not described with any fulness.

The remaining chapters of the book treat of apparatus for celestial photography, photometry, and the measure of solar radiation.

Similar remarks apply to these as to the preceding. There are many excellent descriptions and illustrations, many important omissions, and a few mistakes. We call special attention to the fine representation of the most ingenious mounting — devised by Hansen, and constructed by Repsold — for the photoheliographs employed by the German transit of Venus parties, — a contrivance which we have never seen described elsewhere. But in the chapter on photography, neither the name of H. Draper nor of Common appears; and Rutherford's photographs of the spectrum are said (on p. 827) to have been made with an apparatus he never even saw, the instrument figured being a spectroscope which was used at Dartmouth college in attempting to photograph the solar prominences, while the description given is incorrect in several particulars. In the chapter on the measurement of radiation the apparatus of Pouillet and Secchi appears, but nothing later, — none of the instruments of Violle or Crova, and, of course, not the bolometer of Langley. The chapter on photometers is much better brought up to date.

On the whole, the book is rather a provoking one. There is a great deal in it of real value, collected from various more or less inaccessible sources, and very neatly presented; but the *lacunae* are serious, and a few detected mistakes leave a sense of insecurity as to accuracy in other details.

BURNHAM'S LIMESTONES AND MARBLES.

History and uses of limestones and marbles. With forty-eight chromolithographs. By S. M. BURNHAM. Boston, *S. E. Cassino & Co.*, 1883. 15 + 392 p. 8°.

THE separate crystals of our rocks, when they lend themselves to decoration in the form of gems, afford a capital opportunity for the book-maker. Superstition, tradition, a host of human activities, have gathered about them, that, in the hands of writers of skill, have been worked into very readable books. But, when the author of 'Limestones and marbles' tries to take something of the same book-maker's way with the coarser though still beautiful marbles, he leaves the field of thoroughly humanized things, and finds himself in a dreary sea of unrelated facts. A writer thoroughly conversant with the architectural history of building and ornamental stones could probably give us a book which would, from its connection with the most economic of the fine arts, be very readable. A skilled lithologist who would furnish us a careful discussion of the nature of those changes which give beauty, strength, and endurance to rocks, would thereby furnish us with a needed essay; but in this book we have no trace of these capacities, but only the ordinary patience of the devoted compiler.

As a piece of unwearied compilation, unenlivened with any higher quality, this is a very remarkable book. In the list of limestones of the United States we have evidence of a most universal but most uncritical ransacking