Example 2. Find the reciprocal of 333667. The whole work is here given: —

```
 33366|7                     |7
233567                  163496|9
                       2102103
                        226559|9
                       2102103
                       232866|2
                       467134
                       700000
```

Answer, $.\dot{0}0000299\dot{7}$.

Example 3. Find the reciprocal of 41.

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Solution. —  4|1              |9
            37|9             33|3
                            111
                             14|4
                            148
                            16|2
                            74
                            90
```

Answer, $.\dot{0}243\dot{9}$.

C. S. PEIRCE.

URNATELLA GRACILIS, A FRESH-WATER POLYZOAN.

A PAPER on this polyzoan, by Professor Joseph Leidy, has been recently published, with illustrations, in the *Journal of the Academy of natural sciences of Philadelphia.* Urnatella was originally discovered in 1851, and briefly noticed in the Proceedings of the academy the same year, and also subsequently in 1854, 1858, and 1870. It was found in the Schuylkill River at Philadelphia, but has not been seen elsewhere, except a dried but characteristic specimen on the shell of a Unio from Scioto River, Ohio.

Urnatella is an interesting and beautiful form, living in association with Plumatella and Paludicella, and having similar habits, but is very different from them or any other known fresh-water polyzoan, and is most nearly related with the marine genus Pedicellina. It is found attached to the under side of stones beneath which the water can flow. As commonly observed, it consists of a pair of stems divergent in straight lines, or rather gentle curves, from a common disk of attachment. The stems slightly taper, and are beaded in appearance, due to division into segments alternately expanded and contracted. The segments commonly range from two to a dozen, proportioned to the length of the stem, which, when longest, is about the eighth of an inch or a little more. The stems terminate in a bell-shaped polyp, with an expanded oval or nearly circular mouth slanting to one side, and furnished with about sixteen ciliated tentacles. The stems also usually give off a pair of lateral branches from the second segment succeeding the polyp, and frequently likewise from the first segment. The branches consist of a single segment or pedicle supporting a polyp, and usually also give off similar secondary branches. The first and second segments are cylindroid, highly flexible, and mostly striated and colorless, and appear mainly muscular in structure. The succeeding segments are urn-shaped; the body of the urn being commonly pale brown, ringed with lines, and marked with dots of darker brown. The neck and pedicle of the urns are black. The different colors give the stem a beaded and alternately brown and black appearance. Through the lighter colored body of the urns a central cord can be seen, extending through the length of the stem. The urn-shaped segments exhibit lateral pairs of cup-like processes, which correspond in position with the branches from the terminal pair of segments of the stem, and apparently indicate branches which have separated from the parent stem to establish themselves elsewhere as new polyp-stocks.

A series of specimens of Urnatella — from such as consist only of a simple cylindrical, flexible pedicle, supporting a polyp, to those with long stems, consisting of a dozen segments — indicates the urn-shaped segments to be formed successively through segmentation of the originally single simple pedicle. The segments, therefore, do not correspond with what were polyps; but the terminal polyp is permanent, and the segments originate by division from its neck, very much as the segments of the tape-worm arise from its head. After the destruction of the head, the segmented stem remains persistent; but what becomes of it ultimately has not been determined. Probably the segments may serve the purpose of the statoblasts of other fresh-water polyzoa, but the question has not

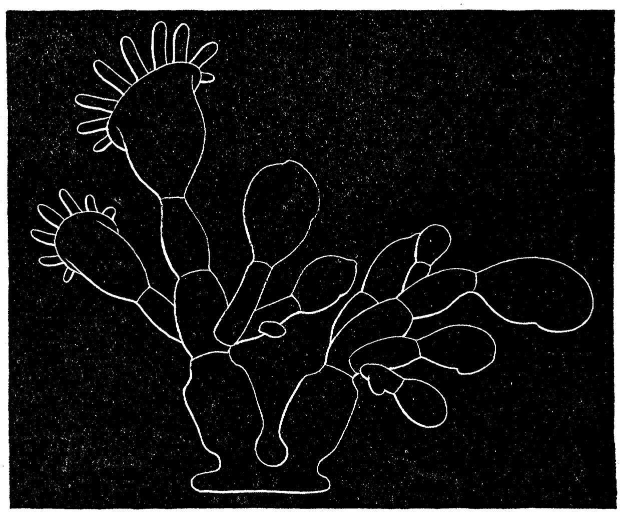

FIG. 1. — Urnatella gracilis. The one on the left with the polyps expanded; that on the right in the condition assumed when the animal is disturbed.

been ascertained. A common mode of propagation of Urnatella appears to be by budding, the formation of branches with their terminal polyps, and the detachment of these branches to establish stocks elsewhere. The different specimens apparently indicate this process, though it was not actually observed.

Though the stem of Urnatella is invested with a firm, chitinous integument, it still retains its flexibility; so that, when the polyp is disturbed, it not only closes its bell, and bends its head, but the entire stem bends, or even becomes revolute. Sometimes the polyps suddenly twist the stems from side to side, as

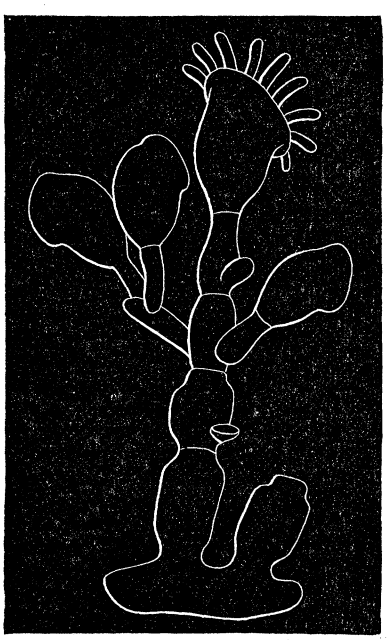

Fig. 2. — Urnatella gracilis, with the main stem of four segments, and a terminal expanded polyp. Branches are given off by the third segment, and a bud from the fourth.

if they had become wearied of remaining longer in the same position.

The interior of the polyp is mainly occupied by the alimentary apparatus. From the mouth of the bell a funnel converges as the pharynx; and the tube of the former, as the oesophagus, occupies the shorter side of the bell. At the bottom of the latter the oesophagus opens into a capacious retort-like stomach, which occupies two-thirds of the capacity of the polyp. The stomach towards the mouth of the bell has an alembic-like pylorus, from which a short intestine turns ventrally to expand in an oval colon. From this a short rectum opens about the centre of the mouth of the bell. The pharynx, oesophagus, and stomach are lined with ciliated epithelium. The ventral side of the stomach has the epithelium colored brown, indicating, as in other polyzoa, an hepatic function. The polyp feeds on vegetable particles mainly, including diatoms, desmids, etc.; and the food may be observed in an incessant whorl in the axis of the stomach, induced by the action of the cilia lining the latter. The polyp is almost constantly infested with parasites, often in large numbers, which mingle with the food, and accompany this in its movement. The parasite is a ciliated infusorian, distinguished with the name of Anoplophrya socialis. From time to time, remains of the food are passed into the colon, and here accumulated into an oval pellet, which is then quickly discharged from the mouth of the bell.

Generative organs, or provision of any kind for the production of ova, were not detected, nor were eggs observed.

Urnatella differs from the marine genus Pedicellina mainly in not having an attached and creeping rootstalk, and in having free, pendent, and jointed stems, instead of simple pedicles.

THE PHYLOGENY OF THE HIGHER CRUSTACEA.

The class Crustacea is one of the dominant groups of the animal kingdom, and it includes a very considerable proportion of our living animals. Its representatives are extremely diversified in structure; and a single order, such as the Decapoda, includes a much greater variety and diversity of forms than the whole class of insects. It is very rich in primitive and transitional forms; and when we add to this, that there is no group in which our embryological knowledge is more rich and varied, or in which the embryological history of the individual throws so much light upon the evolution of the race, its importance as a means for tracing the actual history of the evolution of species is obvious. In fact, most of the problems in the logic of morphological reasoning, are, in great part at least, problems in the morphology of the Crustacea.

Since the awakening in natural science which followed the publication of the Origin of species, many naturalists have attempted to disentangle the story of the phylogeny of the Crustacea. Some of these attempts, such as Müller's 'Für Darwin' and Huxley's 'Crayfish,' are familiar to all; while others, such as Claus' 'Crustaceen system,' are known to none except specialists. The latest attempt in this field ("Studien über die verwandtschaftsbeziehungen der Malakostraken," by Dr. J. E. V. Boas, *Morph. jahrb.*, viii. 4, 1883) is, to say the least, a very valuable addition to crustacean morphology, as well as an interesting study in scientific logic. Its results seem to be a close approximation to the true natural classification of the higher Crustacea, and it should therefore receive the careful attention of all naturalists, and of all who wish to be informed regarding the methods of thought in morphology; but as it is from necessity filled with minute details, which would be formidable to all except specialists, the general reader must be contented with a summary of the results.

The proof that the crabs are descended from long-tailed decapods is familiar to all naturalists; and no one can doubt, that, among these, the swimming dec-