in an apparently peaceful condition, seems worthy of note.

The colony in which the dual queens were found is colony 95 of the Massachusetts Agricultural College Bee Yard, and the data in regard to its history were given me by Dr. Gates, with whose permission these notes are published.

On May 23, 1918, Dr. Gates had inspected this hive and found only the old queen. No queen cells were present and the colony was of medium strength, occupying only one story of the hive. The queen was introduced to this colony on August 1, 1917, and was therefore not old, and came of strong stock which had been selected for four years to resist the European foulbrood.

Thirteen days later, on June 5, 1918, on opening the hive a large number of queen cells was first noted; there were seven in all, three cells containing eggs, one a larva about four days old, two with young pupæ, and one empty cell with its cap thrown back, showing that a queen had recently emerged. The varied ages of the developing queens in these cells was interpreted by Dr. Gates as indicative of a tendency towards "supersedure," that is, the replacement of the old queen by a new one.

After a short search, a young virgin queen was found on the comb, her appearance showing that she had only emerged a few hours before. On another comb the old queen was found laying. Her wings were slightly frayed, although she was less than a year old, and her abdomen was considerably larger than that of the virgin queen.

In normal cases of "supersedure" the parent queen is destroyed by the workers prior to the emergence of the virgin, and in swarming it is known that the parent queen leaves the hive on the day that the cell of the new queen is capped.

Such a case of "supersedure," with the survival of both parent and daughter queens in the same colony, suggests a return of the probable ancestral condition of multiple queens, the condition that prevails to-day among bumble bees in the late summer, among certain wasps, and in ants.

After the discovery of the dual queens in a single colony, the old queen with most of the brood was confined in the second story of the hive, with a "queen excluder" above the first story, in which the virgin queen was placed with one sheet of brood and nine empty combs. The subsequent history of the old or parent queen may explain why her workers attempted to supersede her.

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PARAMECIA WITH EXTRA CONTRACTILE VACUOLES

THREE years ago I found a race of *Paramecium caudatum* which possessed more than two contractile vacuoles. A preliminary note on the behavior of these vacuoles was published in this journal (1915, Vol. 42) and two years later an account of the morphology, physiology and genetics of this new race appeared in the *Journal of Experimental Zoology* (1917, Vol. 23). In this paper the following conclusions were presented:

1. The number of contractile vacuoles range from two to seven. Three- and four-vacuoled forms are most abundant.

2. Apparently any individual has the potentiality for higher numbers of vacuoles. The appearance of the vacuoles depends on two things —(*a*) the rapidity of division; rapid fission does not give time for the vacuoles to form, (*b*) the amount of catabolic waste in the environment. If the percentage of waste is relatively high the average number of contractile vacuoles in the paramecia of the culture is high. In new cultures made up with fresh hay infusion the average number of vacuoles is low. The effect of rapidity of division can be partially overcome, since old cultures in which the rate of fission has been increased through the addition of new food show an average vacuole number much higher than found in fresh infusions.

3. Although several generations may pass without the appearance of extra vacuoles the potentiality for these organs is inherited and merely waits for the proper (apparently environmental) conditions to call them forth.

4. The extra vacuoles are, in almost all

cases, located in the posterior half of the animals. In a few individuals one extra vacuole was found in the anterior end.

5. It was tentatively suggested that this new character might have been the result of heat, as the animals in the original culture had been used in temperature experiments.

The last statement now seems doubtful, for since the appearance of these papers I have heard from other investigators of similar paramecia being observed in widely separated parts of the country. They have been reported in Wisconsin, Indiana, Massachusetts and Connecticut. Those discovered in Indiana possessed either three or four vacuoles.

This note was prepared in hope that attention might be attracted to the vacuole numbers so that more data on this variation may be obtained. The possession of extra contractile vacuoles makes this race of paramecia exceedingly important, not only because it is a variation of the common type but because the sensitive response of the vacuole number to changes in the environment may make these individuals useful as indicators in certain classes of experiments.

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MATHEMATICAL INSTRUCTION AND THE WAR

In view of the evident desirability of establishing a central agency for the gathering and dissemination of information pertaining to mathematical instruction in relation to the war, the *American Mathematical Monthly* is opening a new department, entitled "Collegiate Mathematics for War Service." Any reader of Science in possession of suitable information is urged to send it in at once. If the information is of sufficient importance, and in the opinion of the editorial staff of the *Monthly*, delay in publication might greatly diminish its value, preprints will be made for the earliest possible distribution. Already preprints of several articles dealing, in the main, with mathematical training for naval service, are in the course of preparation. The chief consideration relative to the new department is maximum possible service in our war program; other considerations, such as ideals of accuracy, completeness and scholarship must be regarded as secondary. Suggestions for making the new department as useful as possible will be welcome from all quarters.

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QUOTATIONS

SCIENCE AND THE CIVIL SERVICE

The great technical developments of the nineteenth century, which were due in a large measure to the influence and progress of science, have undoubtedly introduced not only a great transformation in the internal affairs of the country, but also an altered outlook in the external relations of the state. In consequence, many and extensive have been the changes gradually brought about, during the past century, in the duties and responsibilities of the civil service. Every government department has been affected to some extent; in some of them there have come into existence innovations which are of a very far-reaching character. The outstanding feature of this evolution is that the work of government departments has to-day entirely ceased to be of a purely administrative order, whether it be in relation to legislative measures referred thereto for preparation, revision, or criticism, or to the operations conducted therein, or to the sphere of human activity superintended, controlled, or managed thereby. The business of every government department is to-day to some extent technical or scientific; in the case of some departments the administrative aspect predominates; in others it is the technical or scientific aspect that plays the more important rôle.

What, then, has the state done to ensure that the personnel of the civil service, through whom its responsibilities must be largely exercised, shall be properly qualified and equipped for dealing, under present-day conditions, with the social, industrial and commercial problems which must come before it for legislative, executive, or other action?