

drying, then storing them. If the eggs were not fertilized, however, they will disintegrate. Several months later cultures may be started by putting approximately thirty cases into a pint container of fresh culturing medium. The young should be removed with an eye dropper as they hatch. If the majority are not hatched within fifteen days, aeration may increase the yield. Another method to hatch these eggs is alternate freezing and thawing of the cases (6). All young hatched from these cases will be females capable of producing male and female offspring. Even though they are capable of producing males, females are usually produced until conditions again become adverse.

Usefulness

When culturing *Daphnia* has been mastered many laboratory exercises and individual investigations may be devised or employed. *Daphnia*, under proper conditions, are transparent enough to allow observation of most of their physiological processes. The three BSCS texts and one of their lab blocks have exercises employing *Daphnia* (2). In addition to being utilized for lab exercises, *Daphnia* provide excellent subject matter for individual student projects. Some of the possibilities are listed below.

- 1) Effect of drugs and temperature on the rate of heartbeat.
- 2) Effect of variables on population growth and individual metabolic rates. Variables include: pH, food, oxygen, light, temperature, aeration, CO₂, chlorine, various minerals, and chemicals.
- 3) Peristalsis, digestion, and excretion.
- 4) Molting, and conditions favorable to molting.
- 5) Change in coloration of *Daphnia* due to food and oxygen.
- 6) Viability of ephippial eggs.
- 7) Rate of development of young in brood pouch and reproduction rates.
- 8) Individual longevity and growth rates.
- 9) Variations in type of locomotion.
- 10) Genetic variations within and between species.
- 11) Parthenogenesis as a means of rapid increases in populations.
- 12) Cyclomorphosis (change in head shape).
- 13) Reactions to various intensities and wave-

lengths of light (2).

Sustained Culturing of Other Organisms

Other aquatic organisms may be cultured by the above method. *Cypris*, an opaque shelled crustacean often mistaken for *Daphnia*, can be cultured in the same conditions as *Daphnia*. *Gammarus*, a fresh water shrimp, and *Cyclops*, an elongated crustacean, will grow and reproduce quite readily in this culture medium. Small organisms usually found with *Daphnia* in nature do not seem to disturb *Daphnia* cultures, unless they prey on *Daphnia*. Green *Hydra* may even be cultured by introducing them into thriving *Daphnia* cultures if a balance is maintained by occasionally adding the young of *Daphnia*, *Cypris*, or *Cyclops*.

Conclusion

Gathering food and *Daphnia* from local areas helps understand proper culture conditions and is more economical than ordering from a biological supply house. Equipment used in culturing these organisms is easily obtained, and time spent in maintaining cultures is minimal. Cultures survive vacation periods because of a satisfactorily low nutritional level of medium, which suppresses rapid growth, reproduction, heartbeat rate, and leads to increased longevity. The usual tendency to overfeed and ruin cultures is avoided. It is hoped that this article will lead more teachers to discover the ease of culturing *Daphnia* and other organisms when the amount of food is limited.

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A "STANDBY" HEART PACEMAKER

An electronic pacemaker that stands by when a patient's heart is working normally, but takes over when the beat falters, has been developed.

The standby pacemaker is designed to overcome one difficulty of electronic heart stimulators: the "competition" between the heart's regular pulse and the pulse induced by a pacemaker operating at

another rate.

This new pacemaker keeps a heart beating at a steady 69 beats a minute, give or take a beat or two. It goes into action only if the pulse becomes weak or irregular. The pacemaker shuts itself off when it senses that the heart is capable of maintaining its own rhythm. The pacemaker also lets the heart take over when the body needs a faster pulse rate.