of overcoming the difficulties. Perhaps then it will be possible to understand chromosome structure and to ask appropriate questions about the mechanism of crossing over.

The recent discovery that eukaryote chromosomes can be differentiated chemically along their length (metaphase) with resulting staining of "bands" has brought the prospect of being able to study vertebrate chromosomes in a kind of detail that could eventually approach that available in the fruit fly. This seems unlikely to contribute much directly to our concept of chromosome structure in general, but it is a crucial break in understanding general chromosomal organization in man and other vertebrates.

The general biology student should understand that recombination is the principal basis of our individuality, and that genetically based individual differences are the basis of natural selection and evolution.

Population genetics has explored the relative importance of selection and random processes (also known as sampling error or small number effects) with much attention to the possibilities of evolutionary change that does not appear to be adaptive. The issues are largely theoretical, of great enjoyment to the population geneticist, but of little real concern to our picture of the evolutionary process as a whole. It is clear that selection and random processes both play important roles in evolution.

The genetic bases of behavior have gradually become amenable to study in man and animals. The level of understanding yet attained is very low, the promise for understanding human differences in learning and skills of all kinds are great. The general biology student needs to realize that genes provide the foundation for behavior, and that the environment and experience may build in various ways on this foundation, but are circumscribed by it.

If the purpose of a general biology course is, at least in part, to help the future citizen to understand the living world and his part in it, then these points seem particularly germane. If the purpose of the course is to satisfy a philosophical "need to know" then they are fascinating. To me they make the general biology class more satisfying to teach.

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A TECHNIQUE FOR TISSUE CULTURE IN GENERAL BIOLOGY

Cameron L. Christensen
Iowa Central Community College, Webster City, IA 50595

The topic of tissue culture now comes up in our general biology course several times. It is discussed in relationship to diseases such as polio, the laboratory growth of virus and in tissue transplants. The technical nature of most tissue culture procedures has made it impractical to use them as a laboratory experience in a beginning course up to now. The development of the hanging drop method of slide tissue culture make it realistic to use for introductory purposes.

The hanging drop culture of bacteria has been a standard procedure for a long time. To use this same method in general biology courses you must obtain the deepest, most durable glass depression slides you can find. We have never found a really good method of sterilizing plastic deep-well slides. The best way to sterilize slides is to wrap them in paper toweling and put them through an autoclave or pressure cooker.
at 15 pounds of pressure for 20 minutes. Often we simply flame the slide but this is not advisable for student use. The cover slips must also be sterilized before use.

Using an old hypodermic syringe (10 ml) filled with vaseline, ring the edge of the slide well. Next, place a drop of sterile culture fluid on the center of the cover slip. Rapidly inoculate the culture fluid with a fragment of living tissue. Invert the cover slip and center it on the ring of vaseline. Press down slightly to seal the cover slip to the depression slide.

Sterile saline solutions, lymph, serum, blood or plasma can be used to culture animal cells. Plasma and nutrient broth have given us good results. Nutrient broth can be obtained from most biological supply houses or made up from the following formula: peptone - 5 g; beef extract - 3 g, in 1 liter of water. It must be sterilized in a pressure cooker for 15 minutes at 15 pounds of pressure. All culture media must be sterile and is best dispensed by drawing the material up into a sterilized syringe and then making many drops at one time.

Plant fluids and juices of many kinds can be used to culture plant tissues. The problem is obtaining raw juices that are sterile. Cooked plant media does not seem to work as well but can be used without too much trouble. Our answer has been to use coconut milk. It is easy to obtain and grows a wide spectrum of plant tissues. The method is as follows:

1. Obtain a coconut from your local market.
2. Wipe one of the three "eyes" with 70% alcohol.
3. Using a sterile syringe with a heavy duty needle jab it through the eye.
4. Draw coconut milk into the syringe and proceed to deposit drops of the fluid on cover slips.

The transfer of media and tissue should be done in as draft-free an area as possible to avoid contamination. Should you have forced air heat or ventilation in your laboratory a simple structure can be constructed to cut down air movement. We simply cut the top and one side from a pasteboard carton about the size to fit on a desk top and had the student work in it.

The smaller the bits of living tissue used the more exposed surface area is present and the better the chances of success. The living tissue can be aseptically macerated by running it in and out of a sterile syringe several times. Deposit only a few of these cells in each drop of culture medium.

Many problems can be avoided if the size of the drop is kept small. A small drop of culture medium is less likely to move on the cover slip or fall off during the inversion process. It also has less chance of becoming contaminated.

The cultures will have to be incubated from several days to a week at a temperature similar to their natural environment. Animal tissues should be placed in an incubator at a temperature close to that of the body temperature of species used. Being off one or two degrees does not seem to have as much effect as allowing rapid fluxuations in temperature. Plant tissue will grow at room temperature but does best when placed in an incubator where a constant temperature can be maintained. Plant cells tend to develop more slowly than animal cells. Students should check the progress daily as the amount of nutrient is very limited.

Microscopic observation should be done on low power with reduced light near the edge of the drop. Move the slide about until tissue cells are observed, then increase the light and focus down slightly. If good technique has been used thus far, it should be possible to switch to high power (43x) for tissue observation if the drop is not too thick.