

come to mind; only a few will be raised here. We hope they stimulate your thinking.

How can you explain the slight differences, if any, in body temperature? How does the human body use these differences?

What is the optimum temperature for the development and maturation of an ovum? How is this regulated? What is the optimum temperature for the development and maturation of spermatozoa? How is this regulated?

The above constitutes the presentation to the class. I will conclude with remarks addressed to the present reader.

Exercises of this nature have several advantages. They provide the students with an opportunity to perform "hands on" science. The students handle and manipulate the instruments and materials, and they experience what occurs in actual laboratory situations. The students collect data and evaluate them. Within limits, this exercise allows the student to construct his own experiments for further study; this may be the most valuable aspect of the exercise.

The equipment used in this exercise is reliable, inexpensive, and reusable. Transmitters made in the lab (Mackay 1968) should be coated with epoxy, then paraffin, then silicone, to keep body fluids away from the components. Commercially made transmitters (I have used those of the Mini-Mitter Co., P.O. Box 88210-G, Indianapolis, Ind. 46208) usually come embedded in epoxy and inserted in a plastic capsule, ready for paraffin-silicone coating and use.

The batteries used in the transmitter are small hearing-aid batteries. In transmitters such as those described above, battery life is several months in continuous use. When not in use, transmitters may be stored in a refrigerator or a freezer; this extends the life of the battery considerably.

References

- MACKAY, R. S. 1968. *Bio-medical telemetry: sensing and transmitting information from animals to man*. John Wiley & Sons, New York.
- _____. 1969. Bio-medical telemetry. *Ward's Bulletin* 8(59).

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For Trail Riders

If you can't persuade trail-bikers to become hikers, you might at least get them to read *Trail Riders' Guide to the Environment*, by Shaun Bennett, a consultant to the American Motorcycle Association. The booklet, which the National Wildlife Federation says is "responsibly written," can be ordered from the Motorcycle Industry Council, Inc., 1001 Connecticut Ave., N.W., Washington, D.C. 20036.

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After about 96 hours, 5-mm sections from the coleoptiles (1–1.5 cm long) are isolated 3 mm below the tips in yellowish-green light (a fluorescent lamp covered with one sheet, each, of green and amber Plexiglas "G" or other suitable plastic sheet). All sections are collected in distilled water before an experiment is started. 20 coleoptile sections are floated in a 5-cm Petri dish containing 15 ml of the test solution and are incubated at 23 °C in the dark. Length of the coleoptile sections is measured to the nearest 1 mm with a ruler.

Summary

These investigations illustrate induction of growth by gibberellic acid. The students gain a keener insight into the nature of the growth process and how it is regulated by a hormone and by sugar. They develop skill in experimenting with the plant tissue in vivo—observing and measuring the growth of the segments or sections and interpreting the data.

This investigation can be extended to the study of the hormonal regulation of growth by hormone interaction, the requirement of key metabolites for hormone-induced growth, and the regulation of growth by protein synthesis.

REFERENCES

- GALBRAITH, D. I. 1968. Lab manual for *Biological science: principles and patterns of life*. Holt, Rinehart & Winston of Canada, Ltd., Toronto.
- MORHOLT, E., et al. 1966. *A sourcebook for the biological sciences*. Harcourt, Brace & World, Inc., New York.

The Educated Man

That man, I think, has had a liberal education who has been so trained in youth that his body is the ready servant of his will, and does with ease and pleasure all the work that, as a mechanism, it is capable of; whose intellect is a clear, cold, logic engine, with all its parts of equal strength, and in smooth working order; ready like a steam engine, to be turned to any kind of work, and spin the gossamers as well as forge the anchors of the mind; whose mind is stored with knowledge of the great and fundamental truths of Nature, and of the laws of her operations; and who, no stunted ascetic, is full of life and fire, but whose passions are trained to come to heel by a vigorous will, the servant of a tender conscience; who has learned to love all beauty, whether of Nature or of art, to hate all villainess, and to respect others as himself.

Thomas Henry Huxley (1825–95),
"A Liberal Education and Where to Find It"