

**OUTLINES OF NATURAL
SCIENCE FOR
THE COMMON
SCHOOLS; PP. 45-101**

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Outlines of Natural Science for the Common Schools; pp. 45-101 by Wilbur S. Jackman

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WILBUR S. JACKMAN

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Outlines of Natural Science

FOR THE

COMMON SCHOOLS.

BY

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Zoology.

There is hardly a more useful auxiliary to the science work which relates to animal life than an aquarium. If it be possible to have a strong metal-framed one connected with a steady water supply, it will save much trouble, but one may be managed very well without such conveniences. If no connection with pipes can be made, it is better to have several of medium size than to have one large one. Fish globes, eight or ten inches in diameter, are inexpensive and will be found very useful.

A small aquarium may be made thus: use an inch board one foot wide and one foot long for the bottom, and two boards of the same thickness and width, ten inches high for the ends. Three-eighths of an inch from the edge on either side, with a saw, make a groove one-quarter of an inch deep, and wide enough to receive loosely double strength glass. Groove the end boards and fasten them to the bottom with screws so that the grooves will exactly match. Partially fill the grooves with soft putty, or better, aquarium cement, and press into each side a pane of glass. By making the bottom board eleven and one-half inches long, an ordinary ten by twelve window pane will be the proper size. When the glass is pressed to the bottom of the groove, draw the two ends in at the top until the glass is held firmly and then fasten them in place by narrow strips of wood, one on each side of the tank, placed on top of the glass and screwed to the end pieces. These strips also protect the hands from injury while working with the specimens in the aquarium. Before filling with water, the inner surface of the bottom and ends should be well rubbed with oil or paraffine and the grooves inside the glass well packed with putty. The bottom should be covered with an inch or two of sand and coarse gravel.

Two or three of this size will enable one to preserve safely a large variety of specimens, and sufficient in amount to keep up an interesting study of animal life throughout the winter. Indeed, if the supply falls short, they may be restocked at any time of the year. By dragging the bottom or edges of a pond or ditch, which is covered with leaves

and grass, with a hand rake, using a net, one may usually in the midst of winter gather an abundance of minnows, tadpoles, snails, crawfish, frogs, water beetles, etc.

I. GENERAL OBSERVATIONS.

1. Are any birds to be found at this time?
2. Are they winter residents?
3. Have they been here all the year or have they come from some other locality?
4. What is their food? How do they find protection from storms?
5. Where do they stay at night?
6. Is their winter garb different from that of summer?
7. Are they mated, in flocks, or solitary?
8. Look for insects under stones, boards, leaves, etc. Have they lined their nests in any way as a protection against the cold?
9. If they are not active keep them for a short time in a warm room.
10. Do they show signs of life?
11. In the same way, search for earth worms.
12. What substitute have these animals for migration?
13. What do they do for food?
14. Animals lying through the winter in a dormant state are said to hibernate.
15. Put a common mud-turtle in a box of wet sand and cover loosely with a lid. Keep the sand wet.
16. Note the time when he disappears; he will probably not be seen again for months.
17. How do you think the chances for life of a hibernating animal compare with one that is migratory?
18. Why does the animal hibernate when kept in a warm room in winter time?

II. ANIMAL COVERINGS AND WARMTH.

1. What changes do we make in our clothing as winter approaches? In material? Color? Thickness? Texture?
2. How do the brute animals make similar preparation?
3. Is the winter plumage of birds the same as that of summer?
4. How do birds preen their feathers? Why?
5. How are the coverings of water fowl especially adapted to their mode of life?
6. Study the arrangement of the feathers on a bird; a pigeon or

sparrow may be readily obtained for the purpose. Are the feathers distributed evenly over the body?

7. Is there any obvious advantage in the manner in which the feathers are distributed?

8. Mention the uses you can see for feathers?

9. What animal can you name that is covered with fur? Name one covered with hair? What difference is there between fur and hair? Examine a dog and a cat.

10. Can you suggest any reason why one animal is provided with fur and another with hair?

11. Which is the better protection against injury? Which is the warmer covering?

12. Where are fur-bearing animals found? Where are those with a hairy covering found? Compare wool with both hair and fur?

13. Read something of the history and habits of the fur and wool bearing animals.

14. Study the scales of a fish and snake; what is their chief use in each case?

15. Do the coverings of fishes and snakes change in any way with the seasons?

16. If possible, secure a snake skin that has been shed and examine it closely; how does the snake get out of it? Are the scales shed?

17. Is the right side out? Note the transparent covering that was over the eye.

18. How does the covering of the turtle differ from that of both the snake and the fish?

19. Do insects have skins? How does the outside of an insect's body differ from most other animals studied?

20. What peculiarity in the covering of a crawfish? What is its most important use?

21. Can you see how it is possible for the animals which have such hard coverings to grow?

22. How do the different modes of life of the various animals observed correspond to their coverings?

III. THE SKIN OF THE HUMAN BODY.

1. Compare the skin on the back of the hand with that on the palm in color, thickness, sensitiveness and markings.

2. Why is the greater thickness on the palm?

3. On what other parts of the body is the skin similar to this? Why?

4. What is the effect of manual labor on the skin in the palm?

5. Is there any difference in the causes which operate on the palm and on the sole of the foot?

6. What causes the creases in the palm?

7. Note the short hairs covering the back of the hand; examine with small magnifying glass. At the root of each hair is a small oil gland which pours out upon the surface a minute quantity of oil. Notice the softness and flexibility of the skin.

8. When is it that the skin on the hands becomes harsh and chapped?

9. How is oil affected by cold weather? How must it affect the flow from the glands in the hands?

10. How do the hands feel after having had them in soap-suds? What must be the effect of the soap on the oil?

11. Why should the skin be wiped dry after washing?

12. What is the best way to prevent the hands from becoming chapped?

13. What would you suggest as the natural remedy?

The outer layer of the skin which sometimes may be rubbed up as white scales, and which forms the clear skin in a blister, is the cuticle or scarf skin. As it dies and is worn off it is replaced by the true skin underneath. When dry, it cracks and exposes the sensitive layer lying under it.

A small cake of pure mutton tallow rubbed over the hands at night is a simple and effective remedy. It should not be smeared on in great quantity. Nature never oils the skin in that way, and we should imitate her in this respect.

14. What is perspiration? Is it pure water?

15. What causes tend to increase perspiration? To diminish it?

16. Passing outward through the skin and opening at its surface, are very many minute tubes that convey the perspiration from the sweat glands; these are situated in the deeper layers of the skin. The openings of these glands may be seen through a magnifying glass in rows in the palm.

The sweat glands in health are continually throwing off from the body waste matters which are carried to them by the blood.

17. How must the heat of the body be affected by the evaporation of perspiration from its surface?

18. Do you become warmer or cooler when you perspire freely? Since the skin thus assists in maintaining a proper heat in the body, it is a *heat regulator*.

19. Rub a little oil briskly on the hand; what becomes of it? Has it evaporated?

20. Why is it that liniments may be applied to the skin for ailments that lie deeper, as in case of a sprain? The skin is an organ of *absorption*.

21. On what part of the body is the skin most useful in giving us the sense of touch?

22. The sensitiveness of the skin in different parts may be tested by using a pair of dividers with sharp points thus: close the eyes and allow some one to touch the skin in various places, now with the single point then with the double point. Find when you can distinctly distinguish the two points when they are closest together.

23. Try in this way the palm, back of hand, cheek, tongue, lips, back of neck, arm, ear, etc.

24. How many important uses have we found for the skin?

25. Examine one of the finger nails. Note the opaque area near the base called the lunula, and also how the skin is attached around the inner end.

26. Does the skin grow fast to the edge of the nail?

27. Why does the skin sometimes break and peel backward from the base of the nail?

28. To prevent this, loosen the skin by running around the edge the dull point of a knife:

29. In what way are the nails most useful? What happens if they are allowed to grow too long? If trimmed too closely? How does the care of the nail affect the shape of the finger-tips?

30. How does biting the finger nails spoil them?

31. Why is a knife better than scissors for trimming them? The nail is made of thin layers, and scissors, especially dull ones, tend to separate them.

32. Of what use to us is the hair on the head?

33. Can you give a good reason for brushing and combing it?

34. Note the white powdery flakes that may be sometimes brushed from the head. Where do they come from?

35. Compare these with the cuticle which may be rubbed from the back of the hand.