

THE ORIGINAL PAPER-MAKERS.

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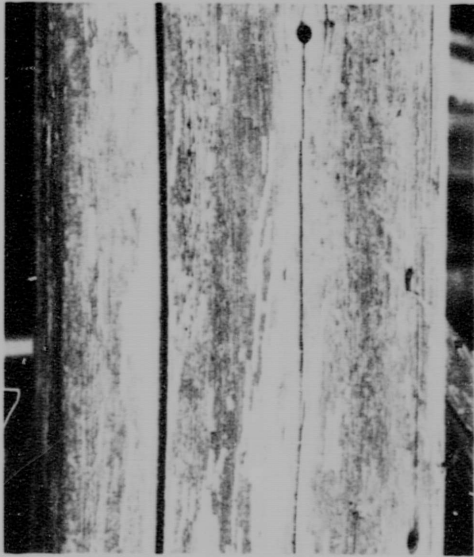
It has often been pointed out that the most indispensable substance in the world for mankind is the green coloring matter of plants known as chlorophyll, for it alone can transform the innutritious solids of the earth and gases of the air into food for us and for the animals we prey upon. But immediately after the food-producing chlorophyll must be ranked as next in importance another vegetable product, cellulose. This material forms the greater part of the rigid skeleton of trees that we call wood, and is the principal constituent of all vegetable fibres, such as cotton, linen and hemp. The timber with which we build and furnish our houses is mostly cellulose, and all our textile fabrics

apprehended. Paper is the guardian of all the records of mankind. We are the heirs of all the ages, because paper has preserved our heritage for us. It is the chief agent in the diffusion of knowledge, without which progress is impossible, and in a thousand unconsidered ways it is woven into the complex of modern culture. And yet, essential as it is to man, it was not he who originally invented it.

Apparently manufactured by the Chinese before the Christian era, paper was not known in the Western World until introduced by the Arabs in the 8th or 9th centuries A.D., when it soon spread over Europe. For hundreds of years it was made principally from linen rags, but with the enormous growth of newspapers in the 19th century this source became inadequate, and about fifty years ago, paper began to be made direct from the cellulose of wood. Now vast forests are felled annually to provide us with our daily portion of more or less reliable news.

But long before the Arabs or the Chinese, countless ages even before our paleolithic grandfather chipped his first stone axe, wasps were making paper from the cellulose fibres of wood by practically the same method as that followed in the latest improved mill of to-day. The whole process of paper manufacture from wood virtually consists in separating the flexible cellulose fibres from the softer parts, dissolving out the gums and oils, eliminating the coloring matter, and lastly, with the addition of size to give the material substance, felting the fibres into sheets. The human manufacturer attains these ends by means of massive machinery and corrosive chemicals. The wasp leaves it to the slow inevitable chemistry of the sun and rain to free the wood of gums and oils, her salivary glands provide the necessary size, and she uses her powerful jaws to loosen and manipulate the fibres.

As is generally known, wasps belong to the Hymenoptera, that large and dominant order that includes, besides our old friends the bees and ants, a large number of more uncommon insects, such as saw-flies, ichneumons, gall-flies, horn-tails and chalcids. The best paper-makers among the wasps are found in the genus *Vespa* which comprises some forty species distributed the world over, and all social in their habits. Their colonies are composed of queens, males and workers, similar to the communities of their close relations, the social bees and the ants. Some *Vespa*s construct their nests in hollow logs or holes in the ground, and as Nature never wastes any time in works of supererogation,



The light streaks show where *V. maculata* has been gathering wood fibre.

of vegetable origin are practically pure cellulose. And besides providing mankind with such primitive necessities as shelter and clothing, of the countless commodities demanded by modern society, it supplies a large number, ranging from high explosives to artificial silk. But of all these more sophisticated products of cellulose, the most vital to the civilization of to-day is undoubtedly paper.

The supreme importance of paper in the modern world is not always realized. True, the rulers of Germany know now that even a scrap of it may be of the gravest import; but that the whole fabric of civilization is bound together by paper is seldom