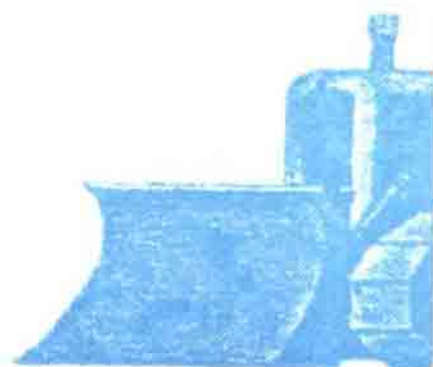


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This special edition is for readers for whom English is a second language. It can be read by anyone who has learned 2,000 words of English.



Tools: **SHAPERS** **OF HUMAN** **PROGRESS**

ORIGINAL TITLE: Tools: Shapers of Civilization

Arnulf K. Esterer



TOOLS

Shapers of Human Progress



The Ladder Series books are specially prepared editions of well-known American books. They have been made easier to read for the enjoyment of readers for whom English is a second language.

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TOOLS

Shapers of Human Progress

by ARNULF K. ESTERER

Original Title: *Tools: Shapers of Civilization*

A Ladder Edition at the 2,000-word Level

Adapted by Arnulf K. Esterer

Fawcett

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INTRODUCTION

From Stone Tools to Outer Space

This book is about tools, and it will help us to have a fairly clear idea of what the word means today. Because the word "tools" is used so freely to indicate so many different articles, we must develop some guides for our own use.

A tool, as people once understood the word, was an **implement** which the worker used in direct relationship with the material to be processed. We might say that the earliest tools were a means of extending a human being's own bodily powers. A knife gave him cutting powers which fingernails and teeth lacked; fingers and fingernails needed help from a **shovel** to dig the soil for plowing and planting. A sharp **flint** fixed to the end of a stick could bring down a wild animal for food, with power bare hands did not have, and at a speed which a man's feet could not match. A knife could

cut the beast's flesh and bones for food and prepare the animal skin for clothing and shelter.

These were tools—implements handled directly by the worker upon his materials. We have tools today which are simply further developments of these ancient devices.

Man, with tools in his hands and his work growing along with the richness of his imagination, now began to need another kind of implement. He needed something to guide him in handling tools more **efficiently**. So he made a number of different indicators for necessary information: indicators of length, of **pressure**, and a number of other qualities. This class of implement, the indicators or instruments, became the tools of medicine, engineering, and the other sciences, wherever exact measurement is necessary.

Another class of implement is the compound tool. Compound means that it consists of two or more connected parts. Together these parts perform work. The **lever**, for example, is a compound tool. Such a compound tool is called a machine. But in actual use we usually reserve this term for more **complex** compound tools, such as the sewing machine. Very simple ones are usually not spoken of as machines but are known by their own names.

When one of these machines is used to produce power, as in the automobile engine, we speak of it as a **prime mover**. Prime movers are used to move other machines. Such tools are not simple extensions of the human hand or foot; their strength and power are much greater.

The "tool" idea has grown into our language. It

can be found everywhere. Anything which can be used to accomplish a purpose is known as a tool. Education is spoken of as a tool to gain employment. Similarly, a newspaper can be a tool, and an idea can also be a tool.

All this is a long way from the ancient flint. What is marvelous is the fact that human beings have done it themselves. From the first flint and stone tools to the spaceship of the present, man has been the inventor, always trying to improve whatever could be improved, making something more from something less, adding to man's education, skill, and comfort.

The history of toolmaking is indeed the story of civilization itself. Let us take a searching look at these tools with which man has built civilization. Let us watch him cleverly solve everyday problems, find the money to produce what he has designed, meet with lucky accidents, and make them, too, yield benefits. This is the exciting, almost unbelievable story of man at work.

With His Bare Hands

In 1838 a French government worker, Monsieur Boucher de Perthes, excitedly reported that he had discovered some flints in the Somme River near Abbeville in the north of France. He was sure that human beings had shaped them into tools.

Scientists of that time were excited by this report for a different reason, however. It was not possible, they cried! Man, earth's most glorious creature, would not perform such childish tasks as making tools from flints.

A group of English scientists went to Abbeville. On May 26, 1859, they reported that the flints really were tools made by early man.

Excitement spread. Scientists looked around more knowingly. They found similar tools in many places.

THE FIRST TOOL MAKERS

How old were these tools? Modern methods of dating show them to be about 400,000 years old. They were made from flint by hitting it until a point or cutting edge was formed.

Until quite recently we could not find out the age of such very ancient tools. We could simply guess their age from the layers of earth in which the stone tools were found or by "styles" in their manufacture. Then a new method was developed which could be used with all materials containing the chemical element carbon. All living plants and animals contain a form of carbon called carbon-14 which is constantly being renewed by radiation. After death, the amount of carbon-14 slowly becomes less. Its rate of lessening follows a natural law: the older the piece of bone or wood, the less carbon-14 will be present. Naturally, after hundreds of thousands of years have passed, the radio-carbon test does not give very exact information. Stone implements found with very old human bones could therefore not be exactly dated either.

A method of dating rocks which contain small amounts of a heavy metal element named "uranium" has more recently been developed. It works in this way. As time passes, the uranium atoms break apart. This is called "fissioning." As the atoms fission, they make tracks in the rock. The more tracks, the greater the age. "Fission-tracks" can be observed and counted with the aid of powerful instruments. The age of the rock can then be established with considerable certainty. For very

ancient times, the fission-track method produces more exact results than the radiocarbon method.

Not too long ago, Dr. L. S. B. Leakey found human bones and stone tools in Tanganyika in Africa. Fission-track dating of the stone tools indicated that the bones and tools he had found were two million years old! It is interesting that we need man's newest tools to determine the age of his oldest ones. And it is strange, too, to realize that the more we seek to learn how long man has been on earth, the farther back in time we find we are going.

We now believe that man used even simpler forms of tools in a much earlier period, perhaps before the first ice age, in what is called the **Pliocene Age**. These simple, earliest tools differ very little from pieces of rock found accidentally in nature.

Among the various flint implements, which scientists believe were man's earliest tools in the Old Stone Age, or Paleolithic Age, the first important tool seems to have been the hand ax. This was a large, heavy, flat piece of flint with a sharp edge. It was held in the hand and had no handle. It was a combination tool, with the weight and force of an ax and the sharp edge of a knife.

In the New Stone Age, or Neolithic Age, man began to grow crops. In that age, we find him using axes with handles and other tools to clear the forests and prepare the soil.

Not all of man's early tools were stone, of course. He learned to use bones of big animals for saws, wood for hunting bows, thin bits of bones

for needles, and even the red and yellow chemical produced by iron for cave paintings. But because stone tools were more lasting, they have been found in greatest numbers.

As the stone ages passed and man found copper, his tool-making became more advanced. Metal as a tool material was greatly superior to stone. He made tools from copper, then from bronze, and later from iron. The Iron Age was practically yesterday—it began probably in 1500 B.C., in Asia Minor.

For most of his time on earth, man the tool-maker had a difficult life. His tools were simple and rough; improvements were made slowly. He knew only the past and the present, but he could see that he was steadily improving. What would he have thought if he had been able to see into the future—our present day!

ELASTICITY

Human beings made very early use of the quality of elasticity. Perhaps man first noticed elasticity in his own body, when he jumped or threw a stick. He soon began to bend wood into a curve, tie the ends together with some material like animal skin, and use it for powerful rock-throwing or stick-throwing.

In Roman times engineers perfected throwing-machines for war. Josephus, a historian in the time of the ancient Romans, reported the power of such machines in his story of the battle of Jerusalem. Speaking of the heavy stones which

these machines threw long distances, he said that they could knock down anyone who stood in their path. Today we use the same principle of elasticity, but instead of rocks, airplanes are shot into the air from the decks of airplane-carriers.

We now have great numbers of elastic materials. Furniture, clothing, machinery—all are improved by the use of springs or springy materials. For example, automobiles everywhere have rubber tires and steel springs.

And today, as at the beginning, human beings use their own "spring"—the muscles of their bodies.

CUTTING THROUGH HISTORY

"Human progress has gone step by step with the discovery of better materials of which to make cutting tools," says Kenneth P. Oakley in his book *Man the Tool-maker*.

The knife surely seems to be the most important tool man has ever made for himself. He has needed it to get and prepare his food, to help him make his clothing and shelter, to make beautiful objects of wood and other materials, to remove diseased parts of the human body and to defend himself.

Stone Age man had great success in producing sharp edges on flints, ~~but, cutting tools were~~ greatly improved with the discovery of metal. ~~How man discovered metal is a story that is lost~~ to us in the distant past, but it was very likely an

accident. Perhaps he happened to use some green or black rocks among the stones with which he set up a sort of fireplace for a hot wood fire. After the wood had burned and the ashes cooled, he may have discovered the copper which had melted out of the rocks. The early toolmakers used combinations of copper and tin to make bronze cutting tools. Axheads of this metal were used in ancient Crete, Greece, and Rome, and are used sometimes today.

Perhaps it was an accident also which led man to discover how to treat iron to change it into steel. He may have heated an iron axhead in a fire, and then accidentally dropped it into some cold water. When he then attempted to sharpen his axhead, he discovered that it was surprisingly hard. The iron had become what we now call steel. The edge of the steel ax could be made much sharper than the edge of an iron ax.

Because of these qualities, steel became the preferred metal for cutting tools and swords. Some of history's most famous swords were made in Damascus, in what is now Syria. The story is told of one swordmaker of Damascus who made a blade sharp enough to cut a ball of wool thrown into the air.

Not as marvelous, perhaps, but necessary for man's existence, have been the knives used in food preparation, ~~in the production of clothing, and in the building of shelter.~~ It would be difficult to ~~imagine, for example, what the fanciest modern kitchen would be like if there were no knives in it.~~