

Stone Age Tools in a Modern Society

The development of modern technology has greatly improved tools for medical use, particularly materials that are used in surgical applications

For example, the addition of certain materials to common metals can alter the properties of steel (so properties can be strictly controlled)

Examples of metal additives to steel include the following:

Carbon: for hardness (e.g. used in cutting tools)

Aluminum: for smooth surfaces and high tensile strength

Chromium: for hardness, strength, elasticity, and corrosion resistance

Nickel: for high tensile strength and hardness

Nickel-chromium: for high tensile strength, corrosion resistance, and abrasion/corrosion resistance

Still...there are some geological materials that have proven extremely useful in their natural state:

Examples:

Chert (chemical sedimentary rock made of microcrystalline quartz)

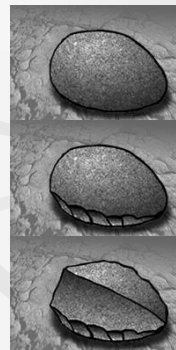
Quartzite (metamorphosed quartz sandstone)

Obsidian (volcanic glass)

All are made of silica (in pure form, lacking mineral cleavage) and have a conchoidal fracture. Broken surfaces are extremely sharp !

All three were used widely by humans for the manufacture of hunting and cutting tools .

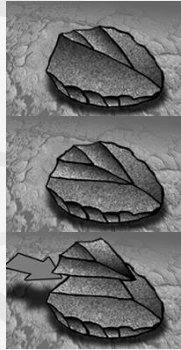
How a Neanderthal made a stone tool



A suitable stone was chosen

The "core" was shaped by removing flakes around the edges

Flakes were removed from the centre towards the edge



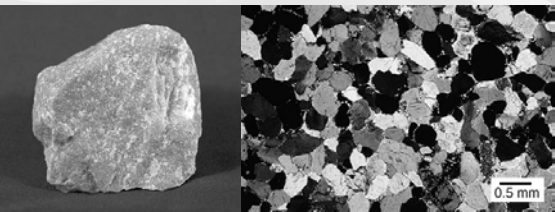
flaking continued...

...until the surface has been shaped and prepared to the desired dimensions

A striking platform was prepared at one end. The platform was then struck and the last flake was removed to a predetermined shape with sharp edges all around.

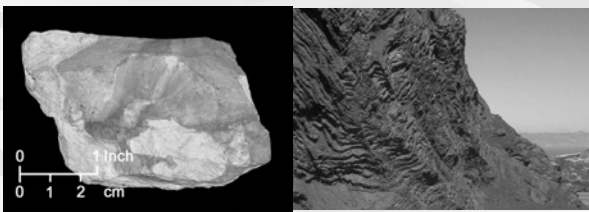
Limitations of Materials Used in Tool-Making

Quartzite is suitable for coarse cutting, but shaping is limited by breakage along relict grain boundaries (although fused, grain boundaries inherited from original sedimentary rock may remain).



Limitations of Materials Used in Tool-Making

Chert, being a chemical sedimentary rock resulting from precipitation of silica from seawater, can be shaped more precisely than quartzite, but some crystallinity is present at a microscopic level.



Obsidian: The Ultimate Natural Cutting Material

Obsidian is natural volcanic glass produced by rapid quenching of magma. The magma has been cooled so rapidly that no crystals have developed.

As a consequence, obsidian can be flaked to produce a cutting edge at the molecular level.

The edge of an obsidian tool can be up to 100 times as sharp as a scalpel made of surgical steel.

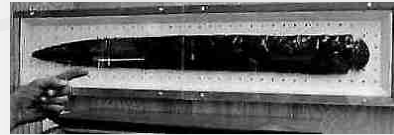
The downside, is that a fine obsidian blade must be handled delicately (easily broken).

Obsidian



Use of Obsidian (Aztecs in Central America, pre 16th century)

Prehistoric arrowheads, knives and spear points in many parts of the world, including Mexico and Central America, were made of obsidian flaked into very sharp cutting tools. Spanish conquistadors learned that a single blow from a good Aztec obsidian-edged sword could behead a horse !



Ancient Surgical Use of Obsidian

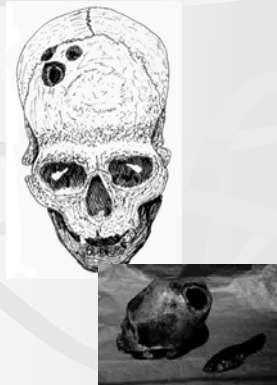
An interesting aspect of the ancient (pre- 16th century) Inca culture in Peru is the widespread "trepanning of skulls".

Reason for practice unknown, but may have been to enhance the healing of damaged areas of the skull (injuries from battle).

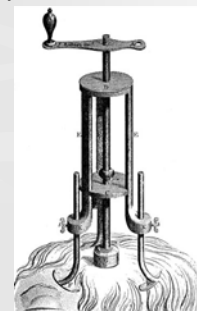
The operation was presumably carried out under anesthetic, probably using coca or alcohol. With an obsidian scalpel, the scalp and muscles were cut away, baring the bone of the skull.

After this, the surgeon may have dealt with the affected area by marking it out with a series of small drill-holes made by an obsidian needle, cleaning and polishing the bone, cutting through the perimeter of drill-holes, substituting the removed bone with a gold plate, closing the wound and applying bandages (made of Llama wool).

Incan trepanation



Do-it-yourself trepanation
(19th century illustration)
-yikes !



In the modern day, many people fashion stone implements in the same way as did Stone Age peoples.

They call themselves flint knappers because, in Europe, flint is the most commonly knapped material. But, in fact, any cryptocrystalline (crystalline on microscopic level) rock is suitable.

Of the three types of blades, obsidian blades are sharpest, while those made of chert and flint are more durable.

Contemporary flint knappers take their work very seriously. Some of their work will be used in experimental archaeology.

Knapping: A Lost Art ?

An expert knapper can recognize whether a prehistoric implement was begun by one knapper and finished by another or how to tell the work of a left-handed toolmaker from that of a right-handed toolmaker.

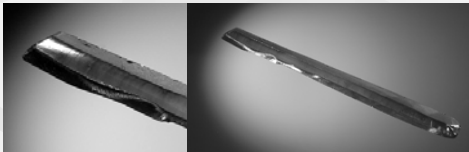
A few knappers, can even recognize the work of knappers from the same family; the craftsmanship of a father may be clearly apparent in the work of his sons.



Modern Use of Obsidian Blades

Modern use of obsidian tools for surgery was introduced indirectly by Donald Crabtree, an anthropologist who studied prehistoric lithics in France.

Crabtree is credited with instilling in the nineteen sixties an awareness of how much more can be learned by actually replicating stone artifacts than by merely studying them.



The Legacy of Crabtree

When Crabtree himself had to have part of a lung removed, he introduced his surgeon to the knapper Flenniken.

Following the surgeon's specifications, Dr. Jeffrey Flenniken (Washington State University) knapped a set of obsidian blades.

The incision they made, Crabtree later insisted, healed quickly and cleanly--and to prove it, he would lift his shirt to show that the scar on his chest was barely visible.

The Legacy of Crabtree

Since the successful Crabtree operation, Flenniken has knapped hundreds of blades for surgical use.

A colleague needing open-heart surgery decided to demonstrate the superiority of obsidian blades.

Asked his surgeon to make half the incision with an ordinary scalpel and half with an obsidian blade knapped by Flenniken.

Not only did that part of the incision made with the obsidian blade heal more quickly, but while the scalpel left a prominent visible scar, the obsidian blade left only a faint pink line.

Surgical Uses of Obsidian Scalpels



Used in minor operations (e.g. sensitive eye operations) and major operations (e.g. open heart surgery)

Operations are being done employing obsidian scalpels.

Outcut lasers and remain sharp, unlike a steel blade...

An obsidian scalpel reduces or almost eliminates scarring, speeds healing and causes less tissue damage.

Additional Advantages

If used correctly, will not dull (unlike steel blades)

Also, relatively inexpensive (apart from knapper's fees)

Leaves no trace metals behind (trace metal residues can sometimes be a problem in patients with sensitivities to some trace metals)



Modern obsidian hunting knife

Other thoughts

An interesting note: many aboriginal people have abandoned steel blades for spears and skinning implements in favour of traditional obsidian tools, which are sharper and longer-lasting !

So stone tools can be superior to modern tools !

Also remember that various geological materials find their way into pharmaceuticals as active ingredients, binders, and fillers.

So we are not actually too far removed from our ancient ancestors !

