

# Split – V, a new preparation tool

## Abstract:

The mechanical preparation of certain types of palaeontological material using ultrasonic tools, primarily used for industrial applications, has been commonplace for over 30 years and early developments produced favourable results.

The Split - V is a fine bladed ultrasonic tool, designed for removing excess solder from printed circuit boards, that can be used to remove rock and sediments in delicate preparation situations.

As against other tools currently available on the market, the Split - V transmits very low vibration, cuts quickly, is very accurate and has an interchangeable handpiece that can accept a variety of blades for different purposes.

## Introduction

Traditionally, much palaeontological preparation has been carried out using percussion instruments which consist of a handset that holds a tip which moves back and forth a particular distance (pitch) at a specific frequency. When correctly used, this 'micro-hammering' action breaks down the matrix surrounding a specimen. These fall into two main groups



### Pneumatic engravers (air scribes)

A number of models are available, ranging from large pitch, low frequency models to low pitch, high frequency models for the ultra-precise removal of hard matrix close to a specimen. All air scribes emit a flow of air from the tip, making them unsuitable for use on highly fragile or loosely consolidated specimens and matrix



### Electric engravers

These tools operate at a low frequency, and have a low, variable pitch, suitable for the ultra-precise removal of hard matrix close to a specimen. They also have the advantage of an assortment of different pointed tips.



A major problem with all percussion tools is that the movement of the tip transfers an unknown and relatively uncontrolled amount of vibration to the specimen. The amount of vibration transferred to the specimen reduces as a) the pitch is decreased and b) the frequency increases. These tools are unsuitable for soft and easily disaggregated matrices.



### Ultrasonic tools.

The ultrasonic descaler, as used in dental surgeries. Effective operation of this tool requires a spray of water to flow across a tip that is vibrating at an ultrasonic frequency.

The ultrasonic bath uses the same decavitation effect which utilises shock waves caused by the bursting of bubbles in the surrounding liquid



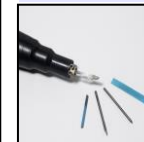
The presence of the water makes these tools inappropriate for specimens which may be soluble or damaged by water or those that have been previously consolidated with synthetic resins will react unfavourably with water as with animal based adhesives and fillers.



## Description

The Split-V unit comprises a power pack that provides 25KHz of vibration with a 20W maximum power output, a handpiece and several attachments. It is quite compact at 120x230x120 (mm) and weighing 2.0kg. It runs off a 100V AC, 50/60Hz power supply at 60W.

The accompanying handpiece (SP-9600) varies from 15 - 28 mm in diameter is 130mm long and weighs 130g. The headpiece comes with a gripping tip holder (HR-2120) that can be adjusted by allen key to accommodate the various tips that form the actively vibrating part of the tool. The unit uses an optimal power control system that automatically compensates when a load is put on the tip keeping the output level constant. This means that the tool can be used for long periods without heat build-up. There is a selection of tips available direct from the manufacturer. These consist mainly of tungsten carbide or a ceramic compound and come in a variety of differing shapes. The carbide tools include the "O-shape", which has a circular cross-section tip, and a range of "V-shape" tips with differing angles of nib (30°, 60° and 90°). The ceramic tools include the "Cylinder" and the "Flat" - a blade-like tool for scraping. Scalpel blades can also be used with the tool.



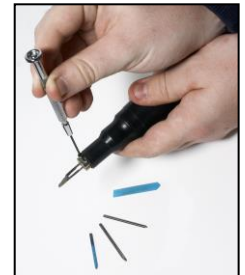
## Split v in use

The Split-V has been used for cleaning decay products from metals as well as preparation on stone and archaeological artefacts.

The Split-V is hand held like a pen at an angle of approximately 30 degrees to the surface of the object. The tip is then scraped lightly over the matrix to be removed allowing the ultrasonic vibration of the tip to disaggregate the matrix which can be brushed or blown away from the surface.

The Split v uses a different process of stress superposition to the decavitation effect caused by the other ultrasonic tools described

The amplitude of the ultrasonic vibrations is easily controlled via a rotary dial with an associated series on LED's showing the power applied to the handpiece. The amplitude assists in controlling the thickness of the layer of matrix that is disaggregated, allowing work to be carried out to an extremely high level of accuracy. It is vitally important not to place too much pressure on the tip as this will damage the specimen, or cause the tip to shatter.



## Health and safety implications

The use of gloves is recommended. Suitable ear defenders should be worn at all times and work should not be carried out too close to people who are not similarly equipped. Adequate extraction and eye protection should be worn at all times.

## Sandstone

The medium-fine grained sandstone was moderately hard, but poorly cemented. The *Edmontosaurus* material itself is well preserved and considerably harder than the surrounding sediment.

The ultrasonic vibrations from the Split-V quickly disaggregated thin layers of the sandstone. Using a scalpel blade as the tip, with relatively high amplitude provided an extremely fast way of cutting through large areas of bulk matrix. The "Flat" ceramic tip was used with lower amplitude to scrape matrix directly from the surface of the specimen. The lower setting caused no visible damage.

## Clay

This was harder and better cemented than the sandstone tested. The *Iguanodon* specimen itself is much harder than the surrounding matrix. The scalpel blade and moderately high amplitude allowed thin layers of the clay to be disaggregated with a high level of accuracy, although much slower than with the sandstone matrix. The "Flat" ceramic tip made slow progress through this matrix. Fortunately using the scalpel blade right up to the specimen itself made no visible damage.

## Dolomitised limestone

An extremely hard and well cemented matrix. In addition, The *Brachiosaurus* specimen itself is very fractured and fragile.

Using the Split-V on this matrix proved unsuccessful. Matrix does not disaggregate even at high amplitude and the scalpel blunts.

## Conservation with Split v

As part of the experimentation of the abilities of the Split v, an assessment of its use as a "conservation" tool was under taken in the Zoology dept. of the Natural History Museum. The removal of supporting and gap filling resins and glues from between bones, resulted in only minor visible surface scratching. The image shows a specimen of pigmy sperm whale caudal vertebrae before treatment. Whale bone is extremely porous and hence very easily damaged. This technique also allowed the vertebrae to remain attached to their articulated chevrons, outperforming most equivalent mechanical or chemical methods.



## Summary

The Split-V tool appears to be an extremely effective tool for the development of softer, less well cemented matrices – an area where traditional percussive tools are of little utility and as such is a welcome addition to the preparator's tool range. Additionally, it appears to be of most use on relatively soft, easily disaggregated matrices, making it the perfect partner to, rather than replacement for, more traditional percussive tools.

It can be used to an extremely high level of accuracy, as there is a much less percussive effect in close proximity to fragile specimens. However, it is of little or no use when applied to hard matrices such as dolomitised limestone, where the traditional tools provide the best option.