



The Wersi Sound Factory Master Classes

Master Class 5 : June 2013 : The Envelope Tab

The next tab section of Sound Factory after Filter-Map is the Envelope, so that is the subject of this Master Class which is divided into two sections. In the first section we consider the essential characteristics of Envelopes and relate these to the controls found within Sound Factory. In the second section, Ian Terry provides a useful analogy to Envelopes by using the Expression Pedal and also offers some experiments to help understand the parameter values on the Envelope tab of Sound Factory, and Jeff Ormerod provides a few examples of how an existing sound might be usefully changed by using the Envelope controls. Audio demonstrations of those edited Envelope sounds are available to listen to by downloading them from the Sound Factory Master Classes panel on the Sound Factory page of the WersiClub International website.

Here is a screenshot of the Envelope tab.

The Envelope screen

The Sample whose Envelope parameter values are displayed in the boxes under the graph is highlighted in orange

We shall look at each of these parameter values in association with the graph

We shall look at these parameters separately

What is an Envelope?

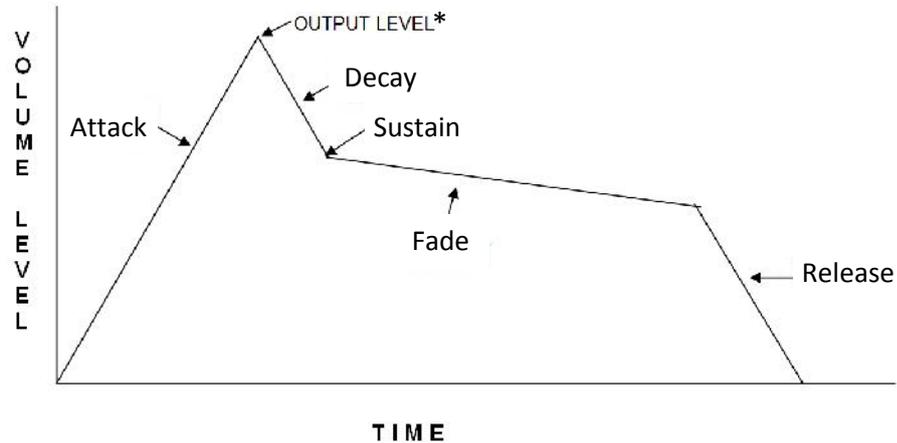
We could well start with the question: what exactly is an Envelope?

The screen above shows a graph. This graph has a shape to show its various parts but, in fact, the shape will change as the values in the boxes below the graph are changed. You won't see the change in the graph shape on the screen, however, because that graph displays just a static picture. In this Master Class we shall be showing you some changed graphs to represent different values for those parameters.

The shape of the graph is the Envelope of the sound, in this case of the volume or loudness of the sound, as a key is pressed on the keyboard (and after the key is released). Envelopes can represent other ways in which the sound may change, for example, brightness. Let's inspect the graph a little more closely as it's obviously the key to all of this.

The Envelope graph explained

*Output Level is not one of the ADSR Envelope parameters



Various labels have been added to the graph and the axes. Let's look at the axes first. If you remember graphs from school Maths, the vertical axis is the 'y' axis and is labelled here as Volume Level while the horizontal axis is the 'x' axis, labelled here as Time. Neither axis has been calibrated with values and we shall not need to do that at all. This is because we shall be using the graph just to gain a 'picture' of the overall shape of Envelopes and shall not be doing any calculations or measurements. All that will be done for you behind the scenes, in the way the graph is produced for this Master Class.

Let's look now at the labelled lines and points, working from left to right. If the label refers to a point, then that is a 'constant' value, in this case a straightforward Volume Level value. If the label refers to a line, that is a 'time' or 'rate' value, ie the amount of change of the Volume Level with time. The angle of the slope, for rate values, indicates the speed of the rate of change: a steep slope represents a fast rate of change while a shallow slope represents a more gradual rate of change.

The Envelope uses three separate 'time' values (Attack, Delay and Release) and a 'constant' value (Sustain) to create a shape which can be user defined and this Envelope graph is generally referred to as an ADSR Envelope. In addition there is a fourth 'time' value, Fade, which means the whole envelope could be called an ADSFR Envelope.

Attack

1. Attack. This represents the way a played note starts sounding. To begin with there is silence. Then the string or column of air begins to vibrate ending with a sound whose loudness is represented by the next label; Output Level. The value of Attack is given by the first box under the graph on the screen: Attack ms. You will see therefore that it represents a time value (ms = milliseconds, or thousandths of a second). A value of zero means the attack phase in the sound takes zero time. Now that is obviously impossible. Any string or column of air has a mass and will take a finite amount of time to achieve maximum vibration. An Attack value of zero therefore means the smallest amount of time physically possible. It can be assumed to be instant.

In Sound Factory we can insert an actual time value for the Attack phase, and this can range from 0 ms to 32 seconds. By comparison, the Sound Controls section of the instrument allows the user to specify only a numerical value with a range between 0 and 127. In either case, specifying larger values for the Attack phase will only be appropriate for use in very slow pieces of music where the notes are well-sustained.

Output Level

2. *Output Level. This value is not included among the parameter boxes below the graph on the screen. It is actually represented, for the individual Sample Layers, by the Volume value under Sample. It can therefore be assumed to have a value between - dB (silence) and +12dB (maximum volume). Its actual value does not matter for drawing the Envelope. In the Selector Panel the volume level of each Selector is represented by a series of values between 0 (silence) and 127 (maximum volume).

Decay

3. Decay. This represents a rate of change in volume level immediately after the Output Level has been achieved. A value of zero means the Decay returns from maximum to the current Sustain Level value instantaneously. A value above zero gives the duration in milliseconds (or seconds) during which the sound is decaying below that Output Level to the current Sustain Level.

Sustain

4. Sustain. You will see that this is expressed as a percentage, that is a percentage of the Output Level value. It is therefore the volume which the sound will achieve at the end of the Decay phase. The Decay time states how long the sound will take to achieve this Sustain Level.

Fade

5. Fade. This is another rate value yet expressed as a percentage. If that value is negative it represents the time taken for the sound to fall to a zero volume value immediately after the Decay phase. A positive value represents the time taken for the sound to rise back to its Output Level value immediately after the Decay phase. The full event in either case will occur only if the note is held for long enough. If the key is released before the full Fade has been achieved, the Release value then occurs.

Release

6. Release. This represents the time taken for the sound to decay to zero level after the key is released. It therefore provides a form of reverberation, but only if there is still a sound to be heard at the start of the Release phase, obviously.

All these parameters in Sound Factory appear to be linear, except Fade which appears to be exponential. For drawing the graphs Fade has been taken as linear.

It should be obvious that some of these parameters interact with each other. For example, if the Sustain value is 100%, changes to the Decay value have no effect. Be careful, though, because to test that out you need to ensure that the Fade value is zero, otherwise what you hear can be a bit confusing. A Fade value above zero will cause the sound to start decaying as soon as the Output Level is reached, so long as Decay is zero. You can delay the start of that Fade by increasing the value of Decay, but the 'shelf' effect of the Sustain phase is lost.

Ian has provided a very illuminating analogy by which to understand what the parts of the Envelope do, using the expression pedal on the organ. Here is that explanation.

First turn down your master volume control to less than half otherwise it can get very loud if you leave it in a high position. Next, select an Organ sound, eg Organ Drawbars 1, which is a drawbar-based sound so there will be a need to have a couple of footage drawbars, under the ToneWheel Upper Manual label to the right of the display screen, selected to hear anything. Load this into Selector 1. In Selectors > Advanced, turn off the Dynamics switch for this layer. Pull the Upper 1 volume drawbar out to its maximum position. If you just test the keyboard, there should only be the Organ sound; nothing else is activated on this manual. When you test this you might hear the Reverb adding some ambience to the sound. We need to temporarily disable this effect for these experiments. If you have the OX7 software installed, in your main display panel select, from the possible page options along the top row, Mixer. This takes us into a sub-page with six different faders/volume controls. If you touch the word Edit directly underneath the word Organ, we are taken deeper into a dedicated menu system for the organ sounds. In the list on the right hand side (under the words Advanced Organ Inputs, touch the box labelled Drawbars. Another sub-page appears. On this page, touch the button next to Aux so it reads Off instead of On. This will disable the reverb send from the OX7 unit to its dedicated effects unit. Stay on that OX7 screen during the following three Stages.

If you don't have OX7 installed on your system, you can turn the two Reverb sends to zero by going into Selectors, and locating the send amounts which are found in the Upp1 column of control values, labelled Reverb and Reverb 2.

Now we can use the Expression Pedal to emulate the parameters of the Envelope.

Stage 1 - Attack

First pull your Expression Pedal back to zero volume (you should not hear anything from the Upper Manual if played). Then play either a note or chord of your choice and hold it. You should still hear nothing until you start to move the Expression Pedal.

Attack

Ian's Expression Pedal analogy for understanding Envelopes

Once you have started the note(s), move the Expression Pedal from zero to maximum over a period of time, keeping the change constant/linear with your foot. When you get to maximum volume/value with the Pedal let go of the notes. Do this again only this time either take a longer or short period of time to complete the value change from zero to maximum. Try this a few times with differing speeds of Expression Pedal action.

In each case, what you are hearing is, in a sense, a crescendo - a value of zero increasing to its maximum over a period of time. The period of time was your choice, and it is this value which is changed when you alter the values in the parameter box for the Attack in Sound Factory. A large value will give a slow(er) Attack, smaller values will give a quick(er) Attack. Because this is electronic, we are able to supply values that can change much more quickly than we can control with our Expression Pedal, or supply values which seem to take a very long time to change. All will change at a constant rate with much more control than a foot on an Expression Pedal can produce. It is only the time it takes to get from zero to maximum that can be changed, and it is this parameter that Attack in an Envelope refers to.

Decay

Stage 2 - Decay

This is the reverse of the Attack phase. It goes from the maximum to the value set by the Sustain parameter. Sustain is a constant value (a percentage of the Output Level set by the Volume dB value under the Sample tab) and not a time-based value. If Sustain is set to zero, it will create a 'decrescendo'. If Sustain has a value set at maximum (100%), we will not be able to hear the effect of the Decay phase working. If Sustain has any other value, eg 70%, the Decay value will cause the sound level to change from the Output Level to the current Sustain value (eg 70% of the Output Level) during the time specified in the Decay value box.

The other thing is that the Decay will always follow the Attack phase providing the key is being held down continuously. The Decay phase will wait until the Attack phase has reached the Output Level before the Decay will commence, taking the period of time displayed in its value box for going from maximum volume (the Output Level) to the constant value specified by the Sustain value. The shorter the period of time specified for the same Sustain value to be reached, the faster will be the rate of volume change, and vice versa. Decay is therefore inextricably linked with Sustain in terms of what is heard.

Once again we can mimic this behaviour using the Expression pedal. This time, make sure your pedal is at maximum before you start, then play your note or chord, start to move your pedal again at a constant/linear rate to zero. Like before, it is the rate of change that we are able to control with our foot and therefore it will be the rate of change that the parameter value called Decay will be altering in SF.

At this point, just by using the first two stages we can create some useful shapes for controlling sounds. For example, you could have a slow fade in and a slow fade out, or by making the Attack a small value (fast Attack) and the Decay a larger value (slow Decay) create a percussive type of Envelope. We can also create unusual sounding Envelopes which have no acoustic equivalent by setting a slow Attack (large value) and a short Decay (small value) (Contracussion).

Sustain

Stage 3 - Sustain

This phase is straight forward really; it does not change its value over time but it remains at a constant value all the time a key is held down. We can, however, set the volume level that the Sustain will have after the first two phases (Attack and Decay) have completed their individual time durations.

Try combining the action of increasing and then decreasing your Expression Pedal but, instead of going to zero at the end each time, try to finish with some sound still present coming from your speakers. Depending on the position of your pedal, the volume coming from your speakers will be affected accordingly. The same behaviour will happen in Sound Factory using the Sustain parameter value. You can set where the sound will come to rest. It can be loud or very quiet, depending on your settings.

Release**Stage 4 - Release**

So far everything has happened with a note being held down (known as a key-down trigger or gate). The Release phase is different from the others as it requires a key-up (or off) trigger/gate to become activated. This is why it is called Release - you need to let go of (release) the key(s) to activate it. This of course can happen at any time you wish. You can be playing some long notes and the ADSR will be set to allow the Attack, Decay and Sustain stages to all be heard. However, by playing shorter notes we can skip over some or all of those stages and go straight to the Release value. Release is a bit like the Decay in that it will drop to zero over a period of time, but it can do this from any phase point and with any value of that point the ADS is supplying when the key is released. Once again, it is the time it takes to drop from the current value to zero that we are able to control in Sound Factory.

To demonstrate this, on your OX7 screen switch the Aux send back on and exit back to the main control screen. You haven't changed anything permanently, so when asked if you wish to save the setting, select No. Once there, select Strings1 Soft * (090-000-006) for Selector 1 (or exit Selectors and then select that Strings1 Soft sound, if you don't have the OX7 software). In either case, set Reverb and Reverb 2 values to zero under the Selectors tab.

We can hear the Release working with this Strings sound example, (Strings1 Soft *). Play and hold a note or chord as before, as soon as you release the keys you are playing, the ADS Envelope will flip into its R (Release) mode and change the current volume level to zero over the time specified by the Release value. We can hear the sound reducing in volume over that period of time. If we change the Release value in the envelope we can either extend or reduce the amount of time taken to return to zero after the key(s) have been released.

Fade

Extensions of functionality in Envelopes.

Wersi (in OAS) has modified the standard paradigm of an Envelope by adding the function Fade in-between Sustain and Release, as well as providing the ability to modulate directly from/by Velocity without needing to use the Matrix (using the Velocity to table on the Envelope tab screen).

Fade will work only when the Sustain phase has become active and only if Fade has a value other than 0 (zero). Its values can be either positive or negative. Because of this ability, and because it is linked to the Sustain parameter value, it is important to understand which way a Fade will appear to work with some settings and not others: time to use Sound Factory to help understand this parameter.

Change the current sound selection in Selector 1 to Pan Pipe 1 * (090-000-019), in Selectors switch on Dynamic for Selector 1 and then proceed into Sound Factory/Expert Edit.

Change the following values on the relevant tab screens.

1. Sample Tab

Sample Edit	
Wave Start	From 3% to 50%
Velocity	From -7% to 0%

2. Filter Map

Filter	
Velocity	From +66% to 0%

3. Envelope

Velocity to:	
Attack	From +17% to 0%
Volume	From +58% to 0%

In addition, on the LFO/Matrix tab disable all settings by turning all Destinations to Off.

With these edits put in, the instrument sound will now ignore any Velocity information sent from the keyboard to the tone generator for this layer.

**Experiments
to carry out
on the
Envelope
parameter
values**

The first thing to do is to confirm our earlier experiments with the Expression Pedal, so set each of your five Envelope values (Attack, Decay, Sustain, Fade, Release) to zero. When you play the keyboard all you should hear is a faint clicking sound (this sounds a bit like the key click from earlier electronic organ days). This is the sound of an Expression Pedal being opened and closed at a rate much faster than humanly possible, without our touching the pedal itself.

Let's just check our first investigations with the parameter Attack. Increase the Attack parameter value from 0 ms (milliseconds) to a larger time value, say 490 ms (just under half a second). Play the keyboard, and as we found out by using the Expression Pedal (no need to touch that pedal now so set it so you can hear the effect easily; the instrument does the rest for us now), we get a crescendo - a value of zero increasing to its maximum output during a period of 490 ms. Increase this value further to 5.00 s (five seconds now). The same thing happens, we still get a crescendo, but it now takes five seconds to complete the value increase from zero to maximum output (Output Level). Put in a much larger value (21.09 s for example), and this will now be the total time it takes the Attack parameter to go from zero to maximum output (quite a long time).

You may have noticed that once the Attack phase is complete there is a 'plop' at the end. This is owing to the fact that once the Attack has finished its phase the Decay then takes over. The Decay here is set to a very small value, 0 ms (zero), and so closes the sound down virtually instantaneously. We can correct that in the next test.

Just as we have confirmed the Attack parameter behaviour, we will now look and listen to the Decay and its influence on a sound.

Continuing to use the 'Pan Pipe' sound, return the Attack ms value to 0 ms (zero), then move over to the Decay and supply it with some values. Small values turn this into a very percussive sound: 32 ms for example reminds me of the tune 'Popcorn' by 'Hot Butter'. Larger values will give us the sort of percussive envelopes that we are used to hearing from acoustic percussion instruments.

As before, we can combine these two parameters (Attack and Decay) to create simple custom Envelope shapes. We can fade in and out with control over how long each phase/stage takes. Set Attack and Decay to 518 ms and we have created a crescendo/decrescendo. If you set the Attack to a larger value than the Decay you will get something similar to Contracussion that used to be available on the analogue Wersi organs. Also notice that when Decay has a reasonable value assigned into it (40 ms or larger), it is able to remove the 'plop' after the Attack has completed its phase.

Now if you play the sound with its current settings:

A = 518 ms; D = 40 ms; S = 0%; F = 0%; R = 0 ms,

you can occasionally notice that, on the release of the keys, the 'plop' has somehow returned. Don't panic as this is not the Decay malfunctioning but the fact that the Release phase has now taken over. Basically you have let go of the keys being played before the Attack/Decay phases have been able to complete their individual phase cycles. Release is set to 0 ms at the moment and will therefore create the 'plop' just as the Decay did earlier. Change the Release value to 40 ms and the 'plop' will disappear just as it did when using the same or larger Decay values.

Whilst we are here on the Release parameter, try even larger values and the notes will take longer to fade away after the key(s) have been released. Remember, you are in control of when this (Release parameter) will take over just by releasing the key(s) when you decide it is time to do so.

Using this additional Fade parameter opens up some unusual kinds of behaviour. Still using the same Pan Pipe sound, try the following settings:

A = 518 ms; D = 40 ms; S = 0%; F = 0%; R = 706 ms.

You'll notice you hear a soft Attack followed by a quick Decay phase but only if you hold the note(s) down. If you release the notes before either the Attack or Decay phases are complete the Release will take over and reduce the sound to zero over the time specified by the Release value. So playing long(ish) note values produces no Release phase (because the Attack and Decay phases both get to complete their phase cycles, and with Sustain set to zero the volume of sound has already become silent so there is nothing to return to zero once the Release phase is activated). Play shortish notes and the Release phase will take over from whatever phase is currently active when you release the key(s) and return the signal output to zero during the time specified in the Release value.

Let's now give the Sustain a value greater than zero to work with; S = 50%, for example. Now, with this value input as well, we can play and hold the key(s) indefinitely and they will continue to sound accordingly (this is assuming that the sample selected to play is one which is 'looped', and not a 'single-shot' like the 'Drum' and 'Percussion' samples available in Sound Factory). Holding the key(s) will cause all of the sections using key-down triggers (ADS) to work through their individual cycles/phases, one after the other as you can hear. When you eventually let the notes go, the Release will reduce the current Sustain value to zero in the time amount specified in its value box.

At this point it's a good idea to engage the Fade parameter to hear it working as well. First of all, remember that this parameter is 'bi-polar' in its function. That means it can use values that are positive or negative in its value field. Let's give it a value of -25%. Play and hold a/some key(s) and you will find the Fade function is now working. Instead of the Sustain remaining constant until you let go of the key(s), the sound now starts to drop in volume but only after the Sustain phase has started and not before. If you heard it dropping before the Sustain value was reached, that would be the Decay taking the sound to the current Sustain value). Sustain was set to 50% and is now working its way towards zero volume at a percentage rate specified in the Fade value box (-25% in this example). (This Fade value would be better expressed as a bi-polar time value in 'ms' like the others which are 'time-based'. In some senses it is a bit like the 'Breakpoint' envelope shapes that have appeared on Korg and Yamaha instruments). We can use larger or smaller negative numbers and each will change the time it takes to return the Sustain value to zero. Larger Fade numbers produce a quicker response, whereas smaller numbers require a longer time to hear their effect.

If you put a value of -100% into Fade, for example, it would at first appear that the Decay and Sustain phases are ignored or overshoot. This isn't the case, and here's the proof. Put the following values into the Envelope and play:

A = 40 ms; D = 1000 ms; S = 50%; F = -100%; R = 706 ms.

Playing notes with this setting produces a sound with a quick build (A = 40 ms) to its maximum volume. It then starts to reduce its volume to 50% (S = 50%) over a one second (1000 ms) period (D = 1000ms), and then when it reaches its Sustain value of 50% of the Output Level the Fade is activated and reduces the Sustain value to zero almost instantly (F = -100%). If you let go of your keys(s) at any time during this Envelope, the Release phase immediately becomes active and takes over from the current in the Envelope.

Positive values work in the same way only this time, instead of working towards a final volume level of zero, they are all working back towards the maximum output (Output Level). Using the above values change only the Fade to +10% and play/hold a key. This time the volume will start to increase in output once the Sustain value is reached, from 50% to 100% at the rate of the Fade value.

If you now change the Sustain value to 0% the sound will (if you hold the key(s) long enough) work through its Attack and Decay phases which appear to increase the volume from zero to maximum and then decrease the volume from maximum to zero, and then the Fade will take over after the Sustain value and increase the volume from zero to maximum again.

This allows other variations to be programmed into the Envelope for further fine-tuning. The Fade isn't linear like all the other 'time-based' phases. I tend to use the Fade instead of the Decay when creating percussive Envelopes because it sounds more musical to my ear than a linear decay producing the same effect: or I use a combination of Decay and Fade for my Synth Bases.

Let take a quick look at when Fade does not appear to work. Put these values into the ADSFR:

A = 40 ms; D = 1000 ms; S = 100%; F = +50%; R = 706 ms

and then try playing some keys. Now because the Sustain value is at maximum already, the Fade (+50%) cannot increase the volume any further. Fade can function only if the Sustain value supports a change of volume in the direction that the Fade value is set to. So in order to have a positive Fade function, the Sustain must have a value smaller than the possible maximum (100%). This allows for the change to take place. Set Sustain to 20% and the Fade value of +50% will increase the volume.

The same thing happens if we give Fade a negative number. It must be supported by Sustain having a number greater than the possible minimum (zero). If Fade is -50% and Sustain is zero, there is no room for any adjustment and Fade will not be able to function. Change Fade to +50% and the volume level will rise from zero to maximum, or leave Fade at -50% and set Sustain to 20% and the volume level will fall from 20% to zero.

Let's now deal with the two direct modulation choices, both of which are modulated by Velocity.

Velocity to Attack

Most acoustic instruments have some control over the time it takes to build the sound from nothing to something. In other words they can shape their individual volume/harmonic envelope. For example, take a Violin. In general the player will use a bow to excite the strings of the instrument to produce a sound. The bowing, as it's called, can be slow, fast or anything in-between. The speed and strength of the bowing affects the response time of the sound from the instrument, thus changing the sound's character. The player can also use his/her finger(s) to strum or pluck (pizzicato) the strings. Once again, this changes how the instrument behaves.

With Sound Factory and using Velocity to Attack (the first value box in the Velocity to table), we can change the value the Attack parameter is set to according to how fast we hit the key(s). Remember that Attack determines how much time it takes to change the volume of the sound from zero to maximum. We can set a Velocity to Attack value to modify our Attack parameter value by either adding to or subtracting from its value according to our speed of hitting the key(s). Because that Velocity can vary a great deal, we can use this to modify the Attack time a great deal as well. This gives us a lot of player control over any instrument available in Sound Factory. We can have slow strings when we play a soft Velocity and quicker strings when we play with a harder Velocity.

Load Pan Pipe 1 * (090-000-019) into Upp 1 again, make sure Dynamic is on, and then go into Sound Factory/Expert Edit.

Select the Filter-Map screen.

In the Filter table, change Velocity from +66% to 0% (zero). This disables the Dynamic from affecting the harmonic response of this sound.

Select the Envelope screen.

The
'Velocity to'
function

Velocity to
Attack

Select Layer 1 and adjust the parameters to the following values:

A = 490 ms, D = 160 ms, S = 48%, F = 0% and R = 48 ms.

Also set the Velocity to table values to:

Attack = +100%.

Volume = 0%.

Velocity is now controlling/modulating the Attack parameter value. If you play gently you will get a slow Attack on the front of the Pan Pipe. If you play harder, the sound will become more responsive to your playing giving us greater control/expression.

Change Velocity to Attack from +100% to a value of -100% and try again. This time the response works in reverse: playing softly produces a quick Attack time while playing with more velocity will increase the Attack time to give the instrument a slow Attack response.

All Brass, Woodwind & String instruments benefit from having some amount of Velocity to Attack value adjustment to their Envelopes. This gives us much more control to musically phase like the real equivalents are able to. This also allows us all to tailor the instrument's sounds to our individual specific requirements.

Velocity to Volume

Velocity to Volume is how much Velocity information will be passed on to modulate the Volume of this layer, (each layer in Sound Factory can be set to a different value if required). Once again you can give this value a negative number; then it works in reverse. This is another way of creating a 'Velocity Cross Fade' between two or more layers in a sound.

So that covers all the basics of ADSR Envelopes, or in our case ADSFR Envelopes.

Final notes. Basically, Envelopes create shapes. Those shapes are active when we are holding a key, for example. They are able to create movement within a sound that is user defined.

All of this refers only to the Amp envelope, and by default it controls the volume of its own layer. Things do get complicated once the Matrix becomes involved because it has the ability to not only send this Envelope to other sections of our choice, but it can also invert the entire shape and apply a selection of modifications to the values being sent!

Another important point is that contained within the Matrix options there are other envelopes of differing types (functions) available for use. These can also be sent to any of the available destinations, inverted, combined and modified as well, and all at the same time!

This opens up some possibilities which will be part of our future exploration of the Matrix tab starting with the next Master Class.

What is the point of all this? Well, as Ian has explained above, it allows the player to set an automatic change in the volume of a note during its playing, something which players of string and wind instruments are able to do while playing, as well as allowing the keyboard/organ player to adjust that change by the way the keys are being played. A further effect can be achieved on the keyboard by the use of After Touch, but we shall need to wait until we start looking at the Matrix tab before we can change how Wersi has set up After Touch on existing sounds.

An example of an Envelope drawn from the Envelope values of a Wersi sound

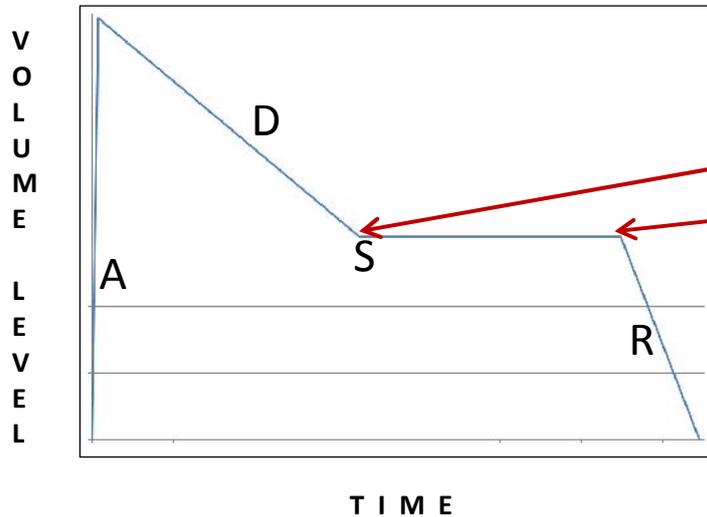
Here is an example of the actual Envelope values for the Pan Pipe 1 sound. The values given in Sound Factory are:

Attack : 4 ms
Decay : 160 ms
Sustain : 48%
Fade : 0%
Release : 48 ms

The Output Level is taken as its maximum.

Here is the graph resulting from those values:

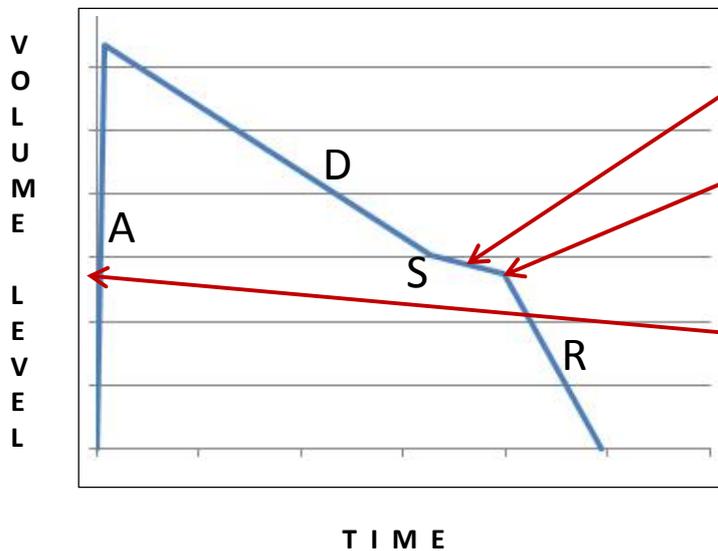
An arbitrary value for how long a key is held down is also needed in order to complete the drawing of these graphs in this Master Class



Because Fade is 0% the volume level at the end of Decay stays at the Sustain level until the key is released. That length of time is dependent upon the playing and is not integral to the Envelope. An arbitrary time for holding the key is therefore assumed here in order to produce the graph.

If we change this set of values and make Fade -35% then the graph changes to the following shape:

How the Envelope graph changes if one of the values (Fade) is changed



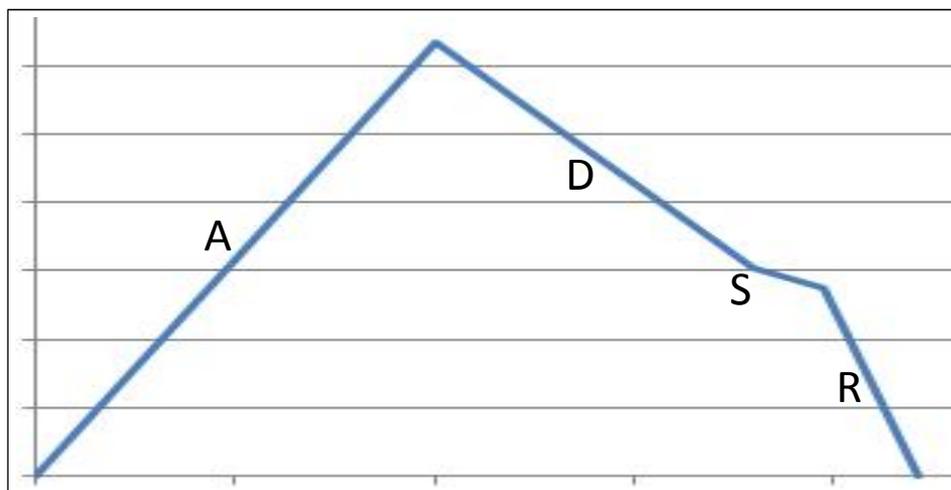
The slope here is determined by the Fade value

Again, because the time of releasing the key is part of the playing and not part of the Envelope values, an arbitrary point for that has to be assumed in drawing this graph and therefore the volume level reached by the sound at that time is also arbitrary.

The graph still provides an approximate shape to the designated Envelope.

One final change for now to this Envelope would be to decrease the Attack, ie make it last longer. Here's the Envelope resulting from giving Attack a value of 200 ms.

Decreasing the Attack (ie increasing its value)



Because the Attack phase now lasts longer, the note takes longer to reach the Output Level. All other values remain the same and I have purposely stretched this particular graph to show that. It is the overall shape of an individual Envelope which is important to be able to interpret for Sound Factory, not make measurement comparisons between them.

I hope the graphical expression of the values is now understandable and does not require any further annotation of the graphs.

Jeff's Examples

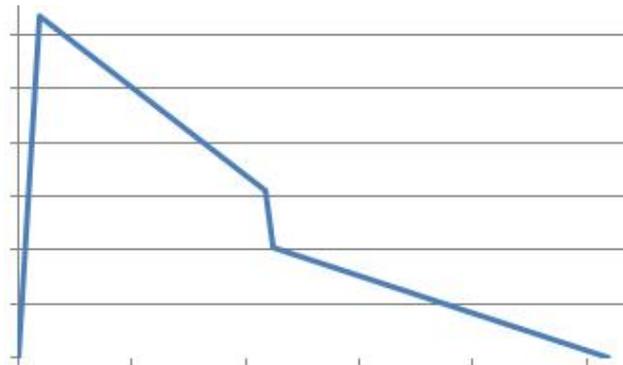
Jeff has provided three examples of new sounds that can be created from existing sounds using the Envelope controls. In the first example we modify the Attack Rate, in the second the Release Rate and in the third the Fade Level.

Example 1: Modifying the Attack Rate

For the first example we use the Musicbox * sound. Increasing the Attack Rate by a small amount will tame the rather pronounced click present at the beginning of the sound and make it more pleasing to the ear. Increasing the Attack Rate still further together with a reduction in the Velocity Volume level produces a much softer build up that gives the sound an ethereal quality ideally suited to the playing of spooky types of music. Here's how to do it.

- 1) Load the Musicbox * sound (090-000-111) into the Sound Factory. You will see that the sound comprises two samples, the Musicbox sample and the factory default sample UserSF-Sine. Select the Musicbox sample.
- 2) Select the Envelope Tab page and in the Attack ms box change the value to 90ms. This will remove most of the initial attack from the sound. In the Velocity to section set the Volume to -50%. This will soften the build up of the sound.
- 3) The UserSF-Sine sample also contributes an attack component to the sound and as such requires a corresponding adjustment to its attack rate. Unfortunately it's a characteristic of the Sound Factory that these factory default samples can neither be deleted nor edited, so it will be necessary to perform this adjustment on the overall sound. Select the initial Sound Controls Page and in the Attack box change the value to 25%.

Musicbox Envelope



There is an audio download of this sound featuring "Hedwig's Theme" from the film "Harry Potter and the Philosopher's Stone" on the Sound Factory page of the WersiClub International website. For those not familiar with Harry Potter, Hedwig is Harry's Owl !

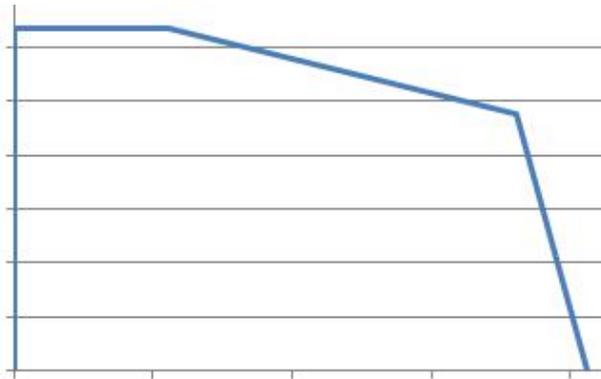
Example 2: Modifying the Release Rate

For the second example we use the Flugel Klassik * piano sound. All the piano sounds are sampled with short release times so that they can be used in conjunction with the manual sustain functions assignable to a swell pedal footswitch or a footswitch piston if you have these fitted. As an alternative to this we can build in a sustain component to the sound using the Release Rate parameter. Here's how to do it.

- 1) Load the Flugel Klassik * sound (093-000-089) into the Sound Factory. You will see that there are five samples in this sound. The top two samples Grand Piano R and Grand Piano L provide the right and left stereo components for the lower and middle octaves of the keyboard whilst the bottom two samples Grand Piano R and Grand Piano L provide the same for the higher octaves of the keyboard. The Grand Piano Impulse sample adds in the sound of the hammer. Select the top Grand Piano R sample.
- 2) Select the Envelope Tab page and in the Release ms box change the value to 5 s. This will set a sustain time that decays over a period of 5 seconds.

- 3) Change the Release ms value for all the other Grand Piano R & L samples to 5 s.

Piano Envelope



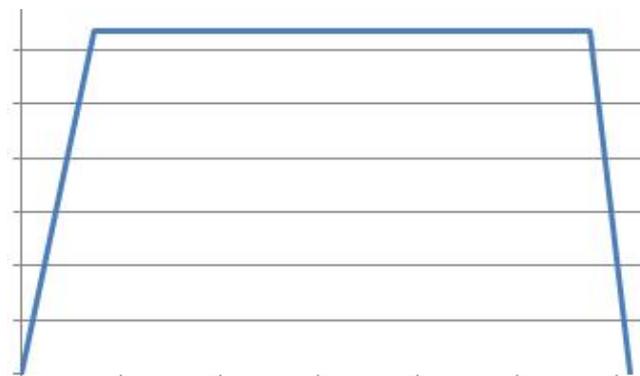
There is an audio download of this sound featuring the theme from the film 'Exodus' on the Sound Factory page of the WersiClub International website.

Example 3: Modifying the Fade Value

The final example is a development of an original idea suggested by Colin for the final chord of Richard Strauss's "Also Sprach Zarathustra". In it we use the Fade parameter in conjunction with the Sample Delay parameter to fade out one sound and fade in another. The sound to be faded in can either be created as a separate Sound Factory sound or added into an existing sound. In this example we will modify an existing sound. If there are other sounds selected on the other layers of the Total Preset these will need to be faded out as well. Here's how to do it.

- 1) Load the sound chosen to contain the additional sound to be faded in into the Sound Factory and ensure that the Sample Tab page is selected. We will add a pipe organ sample to the bottom of its samples list. The easiest way to do this is first to select the option Free to Clipboard then select the bottom sample in the list and then select the option Paste Behind. A new sample will now appear at the bottom of the list with the name Empty Sample. We now need to change this sample to that of the pipe organ using the two drop down lists Sample Bank and Samples. Select Organs from the Sample Bank list and Digital Church organ from the Samples list. The sound of this sample will now change to that selected but its name will remain the same until the sound is stored.
- 2) Now we need to apply a delay to this sample so that it will begin sounding some time after the chord is struck. Locate the Sample Delay section on the Sample Tab page and set the Mode value to Time and the Delay ms value to 3.71 s.
- 3) Next we need to adjust the envelope parameters for this sample so that when it begins sounding it will do so with the gradual build up that provides the fade in function. We can also take this opportunity to extend the release rate to give the effect of the organ sounding in a large auditorium. Select the Envelope Tab page and set the envelope parameters to the following values, Attack 1.47s, Decay 0ms, Sustain 100%, Fade 0%, Release 810ms.
- 4) For each of the other samples in the samples list (excluding any special effects samples) we will need to adjust the Fade parameter. Select the first sample to be adjusted and in the Fade box change the value to -16 %. This will gradually fade out the sound to 16% of its sustain value.
- 5) Change the Fade value of all the other samples in the samples list to -16 %.
- 6) If there are other sounds used on other layers in the Total Preset repeat this fade operation for each of these and save as new Sound Factory sounds.

Organ Envelope



There is an audio download of this sound featuring the final few bars of "Also Sprach Zarathustra" on the Sound Factory page of the WersiClub International website. A separate Total Preset containing all the modified sounds is used for the final chord. You will be able to hear the orchestral sounds fading out and the pipe organ fading in.

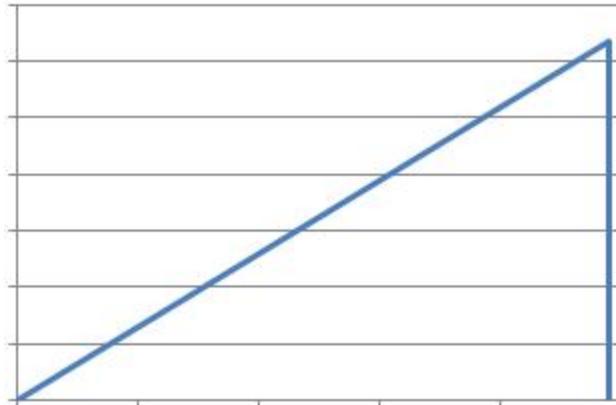
Ian's Example

Contracussion (from Ian)

This effect, originally available only on the EF1 board of the Helios/Galaxis series, was then dropped when the EF2 board came along and hasn't been seen since. However, Sound Factory is able to mimic the behaviour of the 'contracussion' switch by adjusting the 'shape/times' of the envelope generator for any sound.

It's a simple fix. On the Envelope page, turn the Attack time up to 500ms (half a second) for example, set the Decay time to zero. Set Sustain to zero. Play a note or a chord, hold it, and the sound will fade-in after your key-down and, depending on how long the Attack time is set, reach its peak and then vanish.

Contracussion Envelope



We have now come to the end of what may be called the introductory sections of Sound Factory. We do have to look at the global settings under the General tab, but that will come much later. In general, you will find you can leave that page as it is for all experimentation at present. Our next step is the big one. We shall be diving into the Matrix which is where all the magic of Sound Editing really comes into its own. We guarantee you will be somewhat astounded with the extent to which you can edit sounds in the Matrix.

Ian Terry
Jeff Ormerod
Colin Moore

June 2013