by Nik Tarasov

Four years ago, work began on the development of a new instrument that will be different from the outset and that offers great flexibility to its future user. ***Nik Tarasov*** *takes a look behind the scenes and reports from first hand experience on the long path from idea to production line.*

The story of Elody

The story of the development of a new recorder

The idea

One day in 2009 I received a phone call from Karl Danner, owner of Music House Danner in Linz: 'Nik, I have something for you. Come along when you get time – you will be amazed ...' With so much secrecy involved I became really curious, even more so as I did not remember having ordered anything from them. When at last I made it to the shop he took me into their studio technology department. Everything had been prepared: a head-high unit of loudspeakers wired to a mixing desk; a member of staff was holding an inconspicuous looking recorder in his hand that was wired up to the mixing desk. With a short 'try this' they handed me the recorder. Carefully I played a phrase – from the box came a strong signal: clear, very loud recorder sound without any distortion or feedback (and this despite the fact that I stood right in front of the loudspeaker). Puzzled, my eyes looked into two grinning faces – and then I understood: Danner had been in the audience a few years previously when, in a programme including pop music, the recorder was not, as so often in this context, at the periphery but at the centre of the performance, and it was supposed to be the leading voice. This meant that it should be clearly audible – in theory more than in practice, above the noise of the thundering guitars, basses, drumkit and all the other modern instruments. In order to

Nik Tarasov, playing a modern harmonic alto recorder in a pop concert in 2006, using a standing microphone.

achieve this I had sometimes used free-standing microphones, sometimes a head set, or a small microphone fixed to the instrument – electrically amplified and with a slight echo effect. Disadvantages were inherent to each one of these amplification methods and could not be ignored: on the one hand I had to be very careful not to catch any whistling feedback whenever the general volume increased. On the other hand all this equipment can be very awkward to cope with: a standing microphone renders you immobile on stage; the mountings of small microphones can move slightly during playing or moving and as a result no longer function properly ...

While all this was going through my head, Danner explained how the new method worked: the general principle was to insert a recording membrane into the inside of the instrument. In this way the sound of the recorder can be more easily isolated from nearby surrounding noises: it will not amplify the music from the other musicians as well, or at least not to the same extent. In order to record only the tone inside the recorder, a small hole has to be drilled into the wall of the instrument – as the Danners found out, the optimum place is the top of the head joint, very close to the underside of the labium. A microphone capsule with a tiny membrane is inserted that precisely seals off the inner bore; on the outside is a socket where a cable can be inserted that sends the signal to an amplifier.

The Vision

At this moment I had a vision. It occurred to me that if something can be this reliable in operation it may be possible to combine several effects. This is something that had never quite worked reliably in practice from an acoustic point of view – I was thinking along the lines of an electric guitar.

The Danners were happy to find several effects units which I put to the test by selecting strong distortion, and then turning the level up to get the most extreme and crass sound effects possible. What I heard was one of those happy moments, that one never forgets.

Danner handed me the new microphone unit and I left the shop immensely grateful to the specialist music dealer who looks after his customers in an exemplary and creative way. Lost in thought I walked through Linz. The idea was taking hold that my devotion to the recorder may gain new perspectives. Besides all well-known and less well known aspects of this historically versatile instrument another imposing option appeared on the horizon – yes, even of certain liberation from its current image. Might it be possible in the not too distant future to turn the volume of a newly designed recorder up to the same level as that of other instruments? With a new powerful and colourful tone in variations ranging up to aggressively distorted sounds that can hold their ground in any loud environment, i.e. in the context of bands ... ▶

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A sack full of things to do

For all the euphoria, and aware that developments are very rarely really novel – they merely resurface and evolve in different shapes, I undertook some research to find out who may previously have had similar ideas.

Earlier developments and patents

In the records of applications for patents I found several similar ideas, some of which had been accepted, others rejected. To mention just a few: as early as 1958 the inventor George Barron applied for a patent for a device to amplify woodwind instruments with low sound pressure. This was in the shape of a pickup that was fixed to the inside of an instrument, close to the mouthpiece. The American patent for this system was registered in 1961. In 1969, Daniel J. Tomcik designed the piezo-electric pickup system as part of a more complex invention that also interacted with the air column inside a wind instrument. In 1986 a group of inventors from Hamamatsu in Japan applied for a patent for a variety of sound changers for a recorder that were placed very close to the labium, or even cleverly fitted inside the block and were to reproduce all tones in an optimal way; this was approved in 1988. Finally, the recorder maker Philippe Bolton registered a patent for a very similar system in France in 1995, and I remembered having tried his system many years ago. In hindsight I was surprised that this did not set me off thinking at the time.

Apart from Bolton's development, all the other ideas were already history. Not something that would really encourage anyone to look into this topic yet again ... However, I was under the spell of what I had experienced and my musical expectations in this context were becoming too strong to stop now.

Choice of instrument

All previous experiments were aimed at electrifying a traditionally made recorder. As success with this had been somewhat limited the task was to find other approaches. Having played in a band I realised that the treble recorder would be the right sized instrument for this plan: the sound of lower instruments in particular gets lost too easily when everyone else plays, even in solo passages, due to the lower sound pressure in the recorder – the descant on the other hand can be rather too penetrating when played for too long and, because of its high register, is not suitable for every musical situation. So it was not surprising that the obvious choice fell on a member of the most recent generation of recorders: the Harmonic Modern Alto with keys for F sharp, F and E, previously developed by me. Its lowest tone, E, happens to correspond to the lowest and highest strings of the guitar that makes them perfect musical partners. It is true that

An Elody Space viewed from the side. The instrument lies flat on any surface without any danger of it rolling away due to its shape.

The cable connected to the pickup turns the Elody into an electro acoustic instrument.

E and A major are not the recorder's favourite keys but as the blues' modes miss out the classic leading note and prefer the minor third, the guitar's favourite keys lie well under the fingers on this recorder. Furthermore, a harmonic modern instrument has a full and stable sound even at the bottom register and maintains a flexible tone up to three octaves – without any awkward covering of the sound hole as seen on most traditional recorders. In all respects the perfect instrument for further development ...

Technical considerations

Looking at the package of the microphone system Danner had sourced, I noticed that this type of microphone had successfully been used with other wind instruments (clarinets, saxophones) to amplify their natural sound level for live gigs, and indeed was originally developed for this. So I went along to the maker and described my idea – he did not send me away.

First the system had to be optimised for the recorder. As our instrument works with a considerably lower sound level and also produces different frequency ranges in comparison to reed instruments, some physical-mechanical adjustments became necessary. A further hurdle proved to be that the usual phantom-powered microphone systems (i.e. condenser microphones requiring an external power connection) are unsuitable for direct coupling into a chain of effects units. Furthermore, cables with standardised plug and socket connections (so-called XLR-plugs) may be suitable for connection to a mixing desk but not to the socket of common sound effects units. After several stages of development we finally decided to drop the idea of aiming for a microphone based solution but instead developed a special sort of pickup system for the recorder. During the developer's trial to reliably pick up sounds from various different wind instruments, the idea arose of making use of a piezo-electric membrane that has been used to pick up vibrations from the body of an acoustic instrument in a completely novel way. Normally these pickups are used to amplify the body vibrations of acoustic string instruments. A special new development has now made it possible to use the advantages of the piezo-electric technique to directly access the sound transmitted in the air column inside the recorder. The air waves inside the recorder set a very thin metallic piezo-membrane into vibration and this produces a corresponding signal strength in the piezo. The new pickup does not require a power source but should always be connected to a device with high-impedance input. Attaching this system to the inner bore of a recorder confirmed the advantages mentioned above: On the one hand it guarantees a direct, dry sound irrespective of the surrounding conditions (similar to the conditions in a recording studio) which in turn provides an ideal star- ▶

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Limitless sound possibilities: apart from the natural tone production the Elody can be played using band equipment: illustrated is a loudspeaker box with 12" speaker and microphone as well as a classic tube amp and preamp effects pedals.

ting point in all performing venues – a prerequisite for adding effects units and their reliable settings. On the other hand positioning the pickup close to the labium requires a comparatively stable signal to be picked up regardless of weaker or stronger registers.

Thirdly, a special relationship between the sound pressure inside a Modern Alto and the adjustment of the pickup contributes to a certain calm in the system: used inside a recorder it is not subject to feedback or interference from outside.

In order to protect the membrane from the moisture inside the bore of a recorder (condensation from playing), it has been coated with a protective varnish.

A specially developed passive cable can now be connected to the outside socket of the pickup (the system does not require external power). The plug at the other end of the cable is a standard mono mini-jack that, for practical reasons – as we will see, is identical to a standard guitar jack.

And more equipment ...

Fitted with this device the recorder was ready to be tested, and connected to a choice of effects units. Most of them have been developed for use with electric guitars. It cannot be wrong to take advantage of experience gained in this field and advance along similar lines, especially as by doing so the recorder player, who usually does not have much experience in these matters, will be able to call on a band's guitarist for help and guidance. Trial and error is usually the best way to find out and better than just a theoretical approach. A lot of what works for the guitar in this respect will also work for the recorder if the controls are suitably adjusted. As our cable is very similar to the cable for the guitar – as previously mentioned – it is easy to try and test the entire range of guitar equipment.

Let us look at a typical set up for stage and studio, simplified and briefly: generally every component has its own characteristic sound – so the choice of equipment will be determined by personal taste and the quality of sound required; therefore listen carefully and only choose what you like.

Everything starts with an amplifier. It magnifies an incoming signal not only in power but will also add a particular sound quality. There are several types of amplifiers: some are transistor-based and therefore really high fidelity amplifiers, or modelling amps with digital processors. Expensive analogue amplifiers are based on electronic tubes that will add a full warm sound to the signal and add the characteristic distortion typical of rock and pop music by deliberate overmodulation of the signal (achieved by turning the drive and gain control).

A multi effects processor contains a multitude of digitally simulated effects units in one, and can be linked in any order. In addition to the different settings that can be adjusted by various controllers and switches, a foot controler like the one shown, can also be controlled by way of a foot switch or pedal while playing the Elody.

From the amplifier the signal is carried to a suitable loudspeaker that produces the sound and adds its own characteristic qualities. Some devices combine amplifier and loudspeaker in one unit. With the addition of one or two condenser microphones set up in the immediate vicinity, this sound can be used for recording or for input into a mixing table for a larger stage loudspeaker system.

Effects

The classic method of amplification will be considerably exhanced by use of various effects units connected in combination. The least obvious but, for use with a recorder, still very effective way, is a simple foot pedal that can be used, for example, to control the volume. More popular are so-called stompboxes (small units which contain a special effect to be switched on and off by foot): there are **equalizers** – devices for the filtration of sound that can pick out certain frequencies of a tone and change these as desired. The naturally dry recorder sound can be enriched by adding an artificial concert **hall** effect and will be enriched in this way. A **delay** unit will add various kinds of echo as required. Further modulators are the sound widening **chorus**, the **flanger** or the **phaser** (whereby one of a double tracked signal is delayed by a small and gradually changing period leading to the characteristic wafting sounds). Further vibrations will be achieved with **tremolo**, **vibrato** and **Leslie** effects. The frequency spectrum of a tone can be filtered and modulated with a **wahwah** pedal similar to a dynamically controlled damper, as the name implies. The **compressor** ensures a certain sound pressure by evening out extremes in volume. Additional devices may be an **exciter** (for psycho-acoustic additional effects) or a **harmonizer** (adding harmonies to a single melody line – in real time). **Distorters**, probably the most popular effects units, are standard equipment in the pop culture. Through overmodulation they ensure a dirty sound, the width and breadth of this is never-ending, ranging from the so-called crunch to the rumbling overdrives and distortions of rock music, and to the often simulated sawing screaming of metal.

Those who feel overwhelmed by the technology and do not want to lose their perspective or use up their budget straight away might decide to go for a multi effect processor that digitally simulates all the above mentioned elements (apart from the actual amp output and loudspeakers). Multi-effect processors are either built into a floor board (a box that lies on the floor and is operated by foot), or they can be downloaded to a computer (in which case an interface is required – a small, usually USB-powered box for the connections). The smallest and cheapest component at present is an application for mobile phones that can also be connected to the instrument via a min interface and fits into a trouser pocket. ▶

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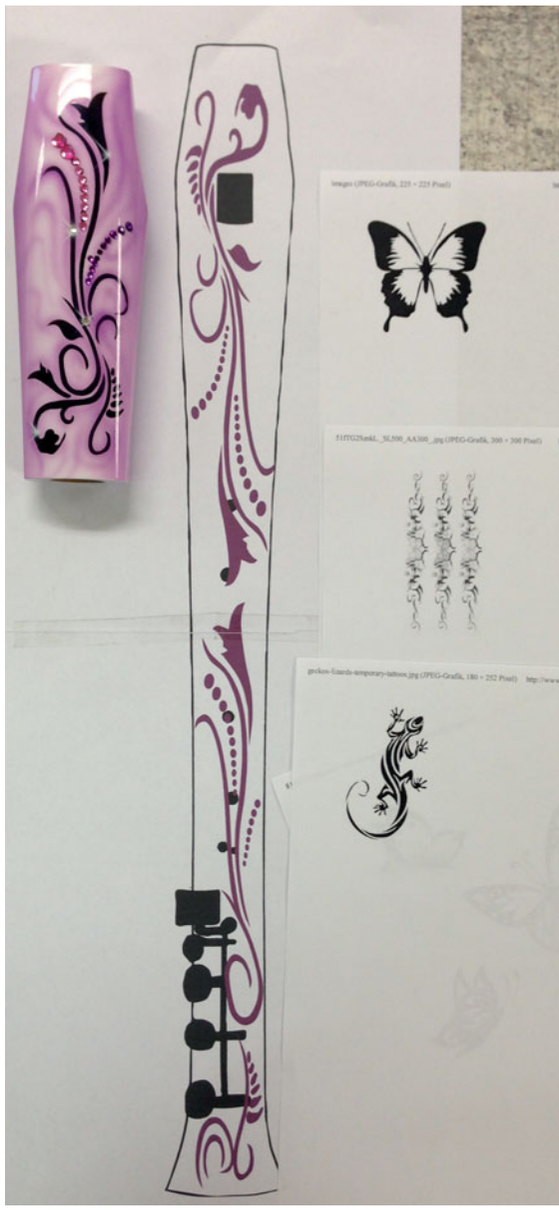
Different shapes of Elody prototypes in their crude stage – stained in trial colours.



Design sketches for the Elody Lovely

Perhaps now one can begin to imagine the wealth of opportunities opening up with this new recorder. It will no longer be necessary to rely on the rather sterile sounding so-called wind controlllers, the purely electric wind instruments that send artificial MIDI-signals to a synthesizer or sound module. Instead, one plays the instrument normally, using learnt techniques in all their detail. But now the tone can also be managed and altered electro-acoustically in many ways by deliberate choice: ranging from adding just a slight new sound to a complete distortion of the original sound.

Design

Recent discoveries show that we are at a turning point – similar to guitarists around ninety years ago: classical guitars, as quiet instruments, only became fully suitable for an ensemble and could carry a melody line due to the introduction of electrical amplification. Linking instrument and amplifier as a unit – the resulting opportunities made the electro-acoustic guitar. It did not only change the original sound of the acoustic instrument – it also drastically changed the external appearance of the instrument: no electric guitar would want to resemble a disguised acoustic guitar. And yet, both are mainly produced from wood.

I therefore decided not to alter the inner values of my new instrument – that is the bore and characteristic wood sound. But the external appearance would have to be distinct. I realised that for this purpose I would have to get away from the traditional circular profile and fancied a new, aesthetically pleasing, comfortable to touch exterior shape. Realising that solid wooden recorders are round because they are turned on a lathe (either by hand or automatically), it follows that the way the instrument is made

Artistic preparation for the various designs of Elody in the Airbrush Studio.

The so-called 0-series of Elody in their different finishes: the externally finished instruments require the mounting of the key mechanism as well as the drilling of finger-holes and cutting of windway and labium.

will have to be altered if one wants to achieve a completely new shape – the result should be ergonomically as good as its predecessor, or even better.

Looking at hand and finger position I decided that the new recorder should have the same curve as the fingers in a relaxed playing position. Relaxed fingers should come to rest completely or lie on the instrument whenever they are not lifted to open a finger hole. In order to achieve such a natural broad curve on the upper side of the instrument, a computer controlled wood shaper realised an almond-shaped cross-section in the workshops of Mollenhauer Recorders. The lower side of the almond-shaped body was given a mirror-image hyperbolic countershape so that four edges are formed that are not noticeable to the touch but stabilise the instrument as it lies in the hand. At the same time this shape ensures an even weight and will prevent unwanted motion – it cannot roll away in the way a round recorder does. This property greatly benefitted the design of the key mechanism: set within the overall shape of the instrument there is no danger that it comes into contact with any surfaces, so there is no danger that it will be deformed. The length of the recorder was also designed with a slight concave curve that is typical for any type of recorder: a wide head joint, narrow fingering section and a funnel-shape foot joint. The time-tested round inner bore perfectly fits into this newly designed shape.

Surface

Analogous to the advances in electric guitars, I wanted to get away from any traditionally designed recorder exterior. One way or another colours should be brought in but not just as a simple coat of paint. ▶

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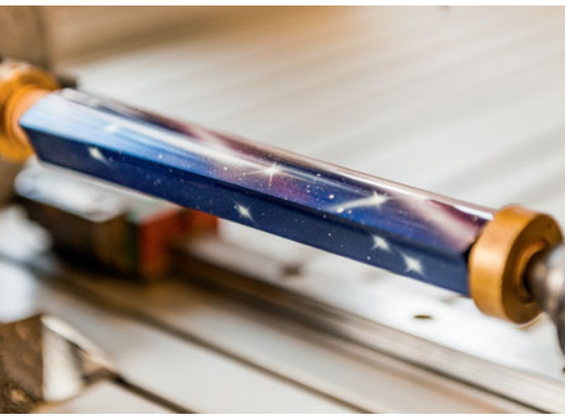

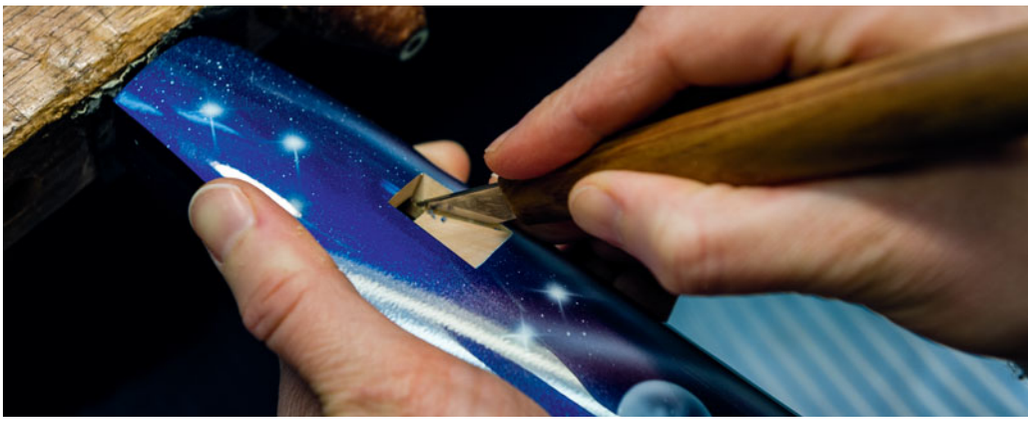

Various stages of the production of the Elody at Mollenhauer: fixed in a vice for the drilling of the middle part, the mounting of the keys and the re-cutting of the labium.

I was thinking more in terms of a design in an unusual colour scheme – particularly for our instrument. Also, I wanted the surface to be as hard, protective and sturdy as possible, that is, completely sealed, but delightful to touch with attractive sparkling looks. Only the airbrush technique combines all these ... Carried out by an artist, the new instrument was given an elegant multi-layered high-quality coating that I had not seen in this context: a range of motives and decor suitable for any emotional expectation.

From prototype to production line

How can I describe my feelings when I finally held the first complete instrument in my hand and played on it? The reactions of a selected number of people who saw the new instrument was also interesting to watch. I was amazed that just the response to the exterior shape and the natural acoustic sound of the new instrument resulted in amusement. Without any warning or further comment I played this recorder in two concerts of baroque music – the largely positive emotional comments from the audience amazed even me. I was so surprised that I began to realise that there are two sides to this new concept: On the one hand there was an interesting new recorder that looked extremely cool and exciting and would certainly cause a stir; and yet, it can be played in a traditional way and is even suitable for standard repertoire – due to the pickup being completely and unobtrusively hidden in the body of the instrument so as not to disturb anybody. Those who would like to do so can use the cable included in the package and with just one click attach the instrument to suitable equipment and travel into the world of endless electronically influenced sounds – and conquer a range of additional musical styles. This instrumental combi package, difficult to describe in just a few words, somehow required a catching name. My brother Aleks had the idea: Elody.

While Mollenhauer in Fulda has begun manufacturing a first series of Elody, and designing marketing strategies, I will be standing in a studio recording its debut CD. From 10th April 2013 Elody will be shown in public at the Frankfurt Musikmesse:
I wonder what the response will be ...

I would like to thank all who have helped and contributed to the production of Elody, even if not mentioned by name.

Info:
www.mollenhauer.com
www.elody-flute.com
www.vintgar-music.com

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A French version of this article is also available on www.elody-flute.com.