Dripping

By Andreas Bick

A Sound Composition for the WDR Studio Akustische Kunst
Awarded the Prix Ars Acustica 2000
Editing: Klaus Schöning
First broadcast: 18th November 2000
Length: 29 min.

"Drip drop, drip drap drep drop. So it goes on, this water melody for ever without an end. Inconclusive, inconsequent, formless, it is always on the point of deviating into sense and form. Every now and again you will hear a complete phrase of rounded melody. And then – drip drop, di-drep, di-drap – the old inconsequence sets in once more. But suppose there were some significance to it! It is that which troubles my drowsy mind as I listen at night. Perhaps for those who have ears to hear, this endless dribbling is as pregnant with thought and emotion, as significant as a piece of Bach. Drip-Drop, di-drap, di-drep. So little would suffice to turn the incoherence into meaning. The music of the drops is a symbol and type for the whole universe; it is for ever, as it were, asymptotic to sense, infinitely close to significance but never touching it. Never, unless the human mind comes and pulls it forcibly over the dividing space."

"Water Music" (1920) – Aldous Huxley

dripping introduces the listener to imaginary rooms, whose physical structures are made tangible by the composition of droplets generating sound. The droplets can be thought of as being the echoes of a location system, which gives the listener access to a whole microcosm of almost unperceivable sounds from the perspective of an insect. The initially irregular dripping sounds describe a path through a "virtual" soundscape of various different material consistencies. They then begin adopting rhythmic patterns that create a hypnotic atmosphere as a result of their combined repetition and nuanced fluctuation. The spectrum of dripping patterns ranges from the zero value (according to information theory) of a steadily dripping water tap to the broadband noise produced by rain, though the emphasis lies in experiencing dynamic dripping systems whose information content is described approximately by the middle of these two poles (1/f-noise).

The melodic and rhythmic structures were created using dripping devices that were specially constructed for *dripping*. The equipment comprised several burette-like droppers that were connected to a water supply by symmetrically arranged hoses. The dripping behaviour of each of the outlets influenced one another because the hoses were all interconnected. Changes to the water pressure and flow velocity generated self-organising processes leading to complex rhythmical patterns. The arrangement of resonating bodies with different pitch characteristics beneath the droplet outlets led to the formation of melodic structures – a free-running system of self-generating musical patterns was the result. The dripping exhibited a rhythmical subtlety organised around a clearly discernible pulse and demonstrated considerable musical complexity. In order to analyze these complex structures, a looping technique was used which "drifted" through the material, moving through it in tiny steps. This permitted a flowing shift to take place in the rhythmic interpretation each time the loop was run. By using this montage technique, several dripping patterns could be interwoven into dense structures that developed out of the above-mentioned tangible rooms and "virtual" soundscapes.

dripping is divided into five sections based on the principle of the Chinese theory of Wu Xing, or five phases. These five transformation states are generated by one another in an endless cycle. Their characteristics can be attributed to the elements of wood, fire, earth,

metal and water. The resonating bodies that are used in each section correspond with these elements and describe an imaginary room that is initially "scanned" using sparse and isolated droplets. Over time, rhythmic references begin taking shape between the individual droplet pulses, and complex structures start forming – a constant alternation between contraction and relaxation and between ordered and disordered states underlays the whole composition.

- **The sound of a droplet**

Droplets do not produce a sound on their own nor do they have their own characteristic sound (despite the fact that they have a tendency to oscillate in zero gravity). Only when they strike an object, i.e. a resonating body, do they generate a sonic event. This percussive event is isolated and amplified so that listeners can immerse themselves in the sound and experience it at an as yet unfamiliar proximity. The listener begins to notice that although the drops produce a superficially uniform sound, each impact does in fact generate a different reverberation in the resonating body, the overtones ring out slightly differently and the drops splash and scatter into thousands of tiny droplets that can be heard as a light drizzling sound. This seems paradoxical: no droplet is the same as the next despite the fact we tend to accept the notion that they exhibit some kind of universal and recurring self-similarity, whose shape any freefalling liquid takes on. In this perfect embryonic state, liquid molecules attempt to reveal as little of their surface area to their surroundings as possible. *To see the world in a grain of sand* – to recognise the cosmos in a droplet of water if we look, or in our case listen, closely enough.
Another dimension was added to this basic phenomenon in the form of a varied assortment of resonating bodies – the instrumentation. The resonating bodies are associated with the above-mentioned five elements and only idiophonic objects were chosen which resonate naturally after the impact of a droplet. Some resonating bodies were available in various pitches and were used to create melodic structures. Instruments made from metal, wood, glass and clay were used, such as flower pots, agate disks, wooden boards, cognac glasses, singing bowls and gongs, but also materials like sand, gravel, stone, plants, leaves, foliage, metal sheets, etc. played a role. Other unusual sonic events were also incorporated, such as the vaporisation of water droplets on hot coals, the dancing of a droplet on a stove hotplate and the impact of a hot droplet on ice. Some recordings of droplets falling into vessels of water were carried out using an underwater microphone. Various instruments and pentatonic pitches were combined to produce a harmonic structure that was subject to constant change due to the overlaying of individual resonances (implied harmonies).

- **Creation of droplet patterns**

The droplet patterns were created using a dripping device based on the research equipment used by experimental physicists investigating dripping water taps. Research showed that if water droplets, initially of the same size, were produced at the same regular intervals, and the flow velocity within the water tap was then increased, a phenomenon known as period bifurcation would occur causing pairs of droplets of varying size to be produced per unit of time. Further increase in the flow velocity caused additional period bifurcation, which produced an irregular series of droplets just before the formation of a constant stream of water. The behaviour of the system described irregular curves on a graph, which are called chaotic or strange attractors, and point to deterministic concepts for the random behaviour.

If several droplet outlets are combined, however, a global coupling starts taking effect that leads to a synchronisation of the individual drop sequences and to 2, 3, 4...n-cyclical period bifurcation. Furthermore, after a new droplet separates, the visible trembling of the remaining droplet suspended from the outlet seems to influence the behaviour of the dripping system. It seems that the high frequency oscillations involved in this trembling constantly excite themselves and lead to a subtle variation in the point in time at which a droplet separates.
The dripping device was constructed as follows: a water bucket was suspended from the ceiling. The bottom of the bucket was fitted with a hose and the flow of water through it could be controlled precisely using two taps. This hose was connected to the actual dripping device, which had to be mounted at a height of at least 1.50 to 2 m above the ground. To ensure a constant flow rate, the water container must have a surface area of at least 1 square metre and the droplet outlets should be positioned 1 m below the water surface. Various dripping devices were used – generally hoses arranged in a circle with equally spaced droplet outlets. Various resonating bodies could be placed on the ground and recorded using separate microphones. The water drained away into a children's paddling pool and the resonating bodies' immediate surroundings were dampened with soft material to prevent splashes and drained water from spreading.
The following parameters can be used to influence the drop pattern: the density of droplets and therefore the dripping speed can be changed by adjusting the water flow. The use of various types of outlets leads to a range of different droplet sizes and other rhythmic structures. By using more viscous liquids such as oil or glycerine, more sluggish, slower rhythms could be created without the universal mechanisms of droplet formation being altered.

- **Rhythmic pattern and ambiguity of the material**

The rhythmic patterns generated by the above dripping device have certain qualities:

- The listener perceives a clear rhythmical underlying beat that is paraphrased n-cyclically by the dripping or, expressed musically, paraphrased in quarter, eighth and sixteenth notes and in triplets. However, the listener does not perceive any rhythmical emphasis, the "one" becomes blurred and can conceivably occur on any beat. This ambiguity of the rhythmical material means it can be interpreted musically in various ways.
- The ostinato rhythms appear to be repetitive only superficially – the rhythmical subtlety is actually subject to constant change, each passage is different from the next. This is where a fundamental principle of nature can be experienced: on the macro-level, cyclical processes and pattern-forming processes take place conforming to simple uniform natural laws. However, on the micro-level, every single unit proves to be totally unique.
- The finest rhythmical quantization of a series of droplets is around 20 pulses per second, i.e. near the frequency at which the human brain is no longer able to discern them. This is an important basis for the application of the above-mentioned looping technique.

This montage technique involves works with the axis of the pulse running through the polyphonic dripping pattern. This pulse is used to split the audio material into time windows that drift through the rhythmical material. After every repetition, however, the window jumps by one unit (for example 1/32 of a beat) in the direction of the time axis and causes a drift. Because of this, a rhythmic cycle occurs in 32 different versions

before a repetition takes place. Our hearing, however, is too slow to discern this minimal offset. What we hear is much more a flowing, shifting rhythm moving around a constant centre, which, in the case of a 4/4 rhythm, corresponds with the 2nd and 4th beat. Furthermore, we hear 33 instead of the expected 32 loops, which means we perceive the pattern at a slightly higher speed. This new tempo can be calculated according to the following formula:

New tempo = original tempo + (original tempo / (unit / loop length)),

whereby "Unit" represents the number of offset steps per beat and "Loop length" stands for the length of the loop in quarter notes (i.e. 2 in the case of a 1/2 beat, 4 in the case of a 1/4 beat, etc.).

This montage technique can be used for all rhythmic recordings but it has the most pleasing effect if the value for the offset steps is at least around 20 pulses per second, i.e. around the frequency at which the human brain can just about discern separate pulses.