



At

Elements 85

astatine

Oscar van Dillen

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Elements 85: At

Elements 85: Astatine is the thirtieth album in the series of music on the Elements, a very large work in progress consisting of electronically/digitally created architectural music compositions by Oscar van Dillen.

The cover art in the Elements series consists of color inverted pencil drawings made by the composer.

A word of warning: after careful listening, the world around you may not sound the same any longer.

The work on this album was conceived of, composed, created, recorded, post-produced and mastered April – May 2024.

All works, cover art and booklet of this album were created by Oscar van Dillen, additional images from Wikimedia Commons.

On scientific content as artistic inspiration

"The new BIG STORIES are all told by science, their scope is vast, and their telling has only begun relatively recently. We are daily getting updates on answers to all the ancient basic questions of life that inspired human art, cultures, and religions for millennia, and we are getting *verifiable* answers this time. Most important is perhaps that we are also facing completely new questions.

It is high time the old myths and beliefs are abandoned and replaced by contemporary, that is to say: *scientific* sources of information, imagination, and inspiration. The vast field of modern science is far more complex, has a verifiable and direct relation to reality, and it offers a far greater abundance of possible stories and references for artists in all disciplines than any older belief or myth system, however poetic, could ever come up with¹.

In our times we need new and innovative music in all genres, whether electronically or no; let these leave behind the stories of our alleged past and use such new narrative sources as our present times offer for reference and inspiration."

--Oscar van Dillen

¹ as was superbly demonstrated by writers such as Stanislaw Lem (The Cyberiad), Primo Levi (The Periodic Table), and Italo Calvino (The Complete Cosmicomics).

All albums in the Elements series so far, in order of release:

| | | | |
|--------|---------------|----------------------------|-------|
| i. | Elements 1: | Hydrogen Deuterium Tritium | H D T |
| ii. | Elements 118: | Oganesson | Og |
| iii. | Elements 6: | Carbon | C |
| iv. | Elements 8: | Oxygen – Ozone | O |
| v. | Elements 14: | Silicon | Si |
| vi. | Elements 7: | Azote | N |
| vii. | Elements 2: | Helium | He |
| viii. | Elements 15: | Phosphorus | P |
| ix. | Elements 20: | Calcium | Ca |
| x. | Elements 12: | Magnesium | Mg |
| xi. | Elements 38: | Strontium | Sr |
| xii. | Elements 4: | Beryllium | Be |
| xiii. | Elements 56: | Barium | Ba |
| xiv. | Elements 88: | Radium | Ra |
| xv. | Elements 49: | Indium | In |
| xvi. | Elements 31: | Gallium | Ga |
| xvii. | Elements 13: | Aluminium | Al |
| xviii. | Elements 5: | Boron | B |
| xix. | Elements 81: | Thallium | Tl |
| xx. | Elements 3: | Lithium | Li |
| xxi. | Elements 11: | Natrium | Na |
| xxii. | Elements 19: | Kalium | K |

- xxiii. Elements 37: Rubidium Rb
 xxiv. Elements 55: Caesium Cs
 xxv. Elements 87: Francium Fr
 xxvi. Elements 9: Fluorine F
 xxvii. Elements 17: Chlorine Cl
 xxviii. Elements 35: Bromine Br
 xxix. Elements 53: Iodine I
 xxx. Elements 85: Astatine At

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---------|---|-----|-----|-----|-----|-----|---------|-----|-----|-----|---------|---------|-----|---------|---------|---------|---------|
| 1 | [Image] | | | | | | | | | | | | [Image] | | [Image] | | | |
| 2 | [Image] | | | | | | | | | | | | [Image] | | [Image] | [Image] | | |
| 3 | [Image] | | | | | | | | | | | | [Image] | | [Image] | [Image] | | |
| 4 | [Image] | | 21 | 22 | 23 | 24 | 25 | [Image] | 27 | 28 | 29 | 30 | [Image] | 32 | 33 | 34 | [Image] | [Image] |
| 5 | [Image] | | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | [Image] | 50 | 51 | 52 | [Image] | [Image] |
| 6 | [Image] | | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | [Image] | 82 | 83 | 84 | [Image] | [Image] | [Image] |
| 7 | [Image] | | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | [Image] | 114 | 115 | 116 | 117 | [Image] | [Image] |
| | | | Rf | Db | Sg | Bh | Hs | Mt | Ds | Rg | Cn | Nh | Fl | Mc | Lv | Ts | [Image] | |
| | | | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | |
| | | | La | Ce | Pr | Nd | Pm | Sm | Eu | Gd | Tb | Dy | Ho | Er | Tm | Yb | Lu | |
| | | | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | |
| | | | Ac | Th | Pa | U | Np | Pu | Am | Cm | Bk | Cf | Es | Fm | Md | No | Lr | |

Tracks

| | |
|---------------------------|---------|
| 1. Astatine – section 1 | 7:23 |
| 2. Astatine – section 2 | 7:43 |
| 3. Astatine – section 3 | 6:24 |
| 4. Astatine – section 4 | 3:43 |
| 5. Astatine – section 5 | 7:17 |
| 6. Astatine – section 6 | 7:46 |
| 7. Astatine – section 7 | 6:09 |
| 8. Astatine – section 8 | 6:33 |
| 9. Astatine – section 9 | 7:17 |
| 10. Astatine – section 10 | 6:19 |
| 11. Astatine – section 11 | 6:59 |
| 12. Astatine – complete | 1:13:33 |

Total duration:

2:27:06

Architectural approach

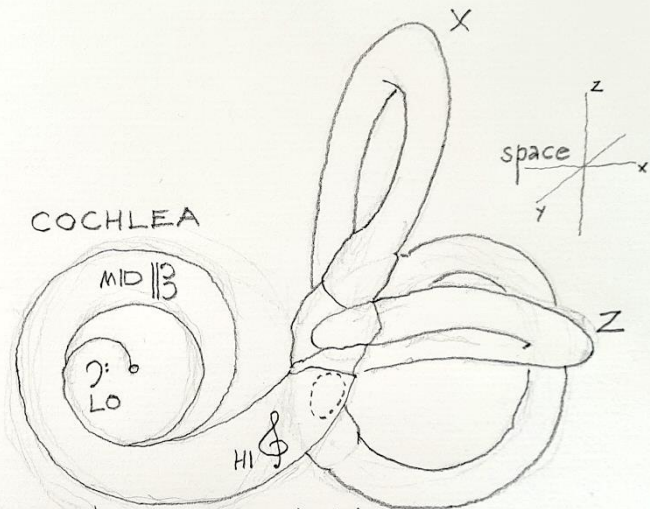
The series *Elements* are digital compositions which have a more static, installation-like character, crossing the border between musical and spatial composition, linking up music and architecture, both arts concerning Space.

It is a remarkable feature of human anatomy that the inner ear is the organ that perceives sound as well as space. Inside in the *cochlea* resonating crystals distinguish the frequencies within sound. Outside on top of the same organ there are the three half-circles of the *Labyrinth*, perceiving spatial movement along an XYZ axis system.

The direct perception of 4-dimensional space-time itself can be seen in this essential part of our anatomy: one organ handling perceptual elements of both space and time in unison.

Space, in the perception of XYZ orientation on the inside of the *Labyrinth*: spatial movement and balance. Time, or rather the inverse of time in Hz and frequency cycles/s in the perception of pitch on the inside the *Cochlea*.

LABYRINTH



COCHLEA

MID || B

HI
LO

HI

sound

(inverse) Y
time

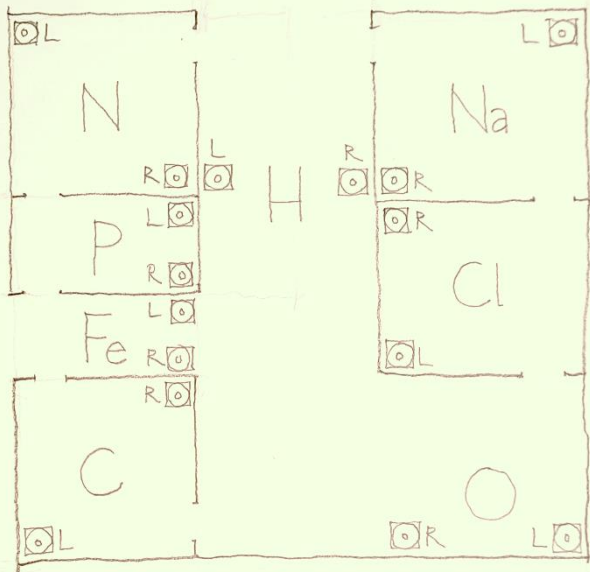
$$\text{Hz} = \frac{1}{\text{second}}$$

CS
2021

Van Dillen's compositions in the series Elements can be listened to in several ways. Traditionally these are: privately over loudspeakers or headphones, or in a concert situation, that somewhat awkward setting where a group of interested people are sitting immobile and listening to what comes out precorded out of a professional loudspeaker system, with no apparent performers in sight.

Each of the Elements is created to be able to stand on its own, as a deeply composed and serious work of art, to be enjoyed on its own. Yet the Elements series as a whole has also been conceived to work and sound together as a larger ensemble: a potential meta-symphony of works, to be exhibited and enjoyed in an architectural sound installation of a variety of Elements.

For installation playback of the series Elements, van Dillen proposes this option of creating simultaneously playing (looping) versions of various Elements widely spaced apart over a large space or several neighboring spaces. Listeners could actively move around through the music and choose to linger or sit in certain spots for some time.



gy
2021

Also at home, a smaller version of an installation can be realized by playing several (looping) compositions in adjacent rooms, so they somewhat overlap and audibly interact. The only thing needed is one playback device per home installation element.

It is the composer's wish that he himself as well as others will be able to create an ever-evolving range of different choreographies for various architectural installation performances of these works in the future, of diverse sizes and durations, ranging from the very intimate to the truly monumental and in everything between.

If such architectural installations would be placed in a museum, they would allow interaction with visual arts as well, but they could also be put in very dark settings.

Meanwhile at home, the listeners are challenged to DIY DJ and mix two or more of these compositions and turn one's home into a personal theatre or museum.

A degree of inclusion of the listener into the process of creation can thus be achieved.

Creative vs recreative music, art vs entertainment

All of us are being conditioned not to use our senses to the full, neglecting and discarding much of the information they provide us with, sometimes we are even told, asked, or taught, not to trust our very own perception. Our sight, touch, taste, smell, and especially hearing can however perform much better than they are challenged to do in common situations in the modern world, flooded as it is by media that tend to replace the experience of the world. The works of van Dillen present a challenge to the willing listeners who want to discover what their hearing can do, and to develop their capacities for hearing, waking up from the boring drones of mass-produced mainstream commercial auditory merchandise.

“Music”, often reduced to a mere inciter of emotions, can recapture its delicate and deep thoughts. The music of van Dillen embarks on a perceptual journey, searching for the primal musical power, away from today’s formalized recombined standard forms, techniques, and sounds. This music acquires its possible meanings and stories, pictorial associations and emotions, on its own artistic terms.

Ways of hearing

Just like in other arts and sciences, the history of music gradually develops from the prehistory of music, bit by bit findings and remainders from long ago start appearing in the archaeological record. Painting left its oldest recognizable works to us, in caves. These are found all over the world, from Africa, Australia, Indonesia, and Europe. In Spain, the currently oldest found cave paintings were found, dating back to more than 64,000 years. To compare, the age of the Neolithic archaeological site Göbekli Tepe with its wonderful architecture and sculpture is estimated to be between 10,000 and 11,500 years, meaning the oldest paintings preserved are at least over 6 times older. At this age, the humans having made them are still classified as Neanderthal, which most people do not realize is partly us too, as many humans today share vestiges of Neanderthal genes, or similar genes in Asia. A persistent solipsistic attitude of looking at these our common ancestors tends to hold on to the belief that “we” came to Europe only later, but this narrow view of

what is “us” is gradually shifting in paleoanthropology². The descent of humans is now found to be a complex web of interconnections, reconnecting and interbreeding, not a simple tree with branches splitting off, its structure is much more alike to a mycelium or rhizome. Music is lucky to have in its archaeological record a flute of close to the same age as the paintings in the Maltravieso cave: the Divje Babe flute, preserved because it was made of a cave bear femur, not wood nor bamboo, and this flute happens to have a pentatonic scale built into it. So music history started with a Neanderthal flute and a scale, at around 55,000 years ago, but of course no composition survived.

Still older than these is the Bruniquel cave, where the other humans the Neanderthals built with broken stalagmites 176,000 years ago.



² See the excellent book *Close Encounters with Humankind* by Sang-Hee Lee and Shin-Young Yoon, 2015/2018

We take for granted that music makes use of tones, pitches, scales and harmonies, forgetting that these are special cases of sounds as heard and recognized by our ears. Yet music has always consisted of much more than these specific sounds such as tones, but since these are mostly not represented in contemporary notation, they seem to be irrelevant and are forgotten, even not heard. The 21st century is flooded with “music”, some of it made by artists who cannot read notation or cannot even sing in tune, some of these world famous and immensely rich. We cannot even think of starting to understand the origins and true nature of music if all we are aware of is this mix of worldwide broadcast and sold popular or commercial music in other genres in general. If such a daily listening experience, marketed to us by many contemporary media, characterizes, delineates, defines, and sets the boundaries of what we consider to be “music” is used as reference, then auditive exploration of new music is made very hard indeed. Great innovators are often largely misunderstood and undervalued, even by their peers. More time and more music are needed, and open ears.

In the various surviving living traditions of world music, memories and vestiges of prehistoric music can sometimes still be found, *along with the various disciplines of listening these require*. The secret of their appreciation lies in the willingness to commit the necessary effort to learn to understand such different languages of music, it cannot be expected that every music is always immediately a language which explains itself while listening to it. Like with learning a spoken language, learning to understand other musical languages takes time and effort. Once one has developed a basic understanding, learning will proceed by repeated and discovering listening. Mere hearing, as people are supposed to do with mass marketed "music" will not suffice, just as one cannot absorb knowledge by sleeping with a book under one's pillow. Along with the development of understanding new musical languages, listening itself is being schooled and trained in the process, and *the world around you may not sound the same any longer*, as van Dillen warns above. While becoming more precisely aware of sound, the perceived world becomes more real perhaps, or larger, surprising, more meaningful.

On listening to electronic music today

The meaning of the term *electronic music* has changed dramatically since modern composers started to work with electronic equipment in radio studios after the second world war. In the 50's and 60's of the 20th century it meant mostly avant-garde esthetics by an elite group of mostly male composers making the headlines for this at the time niche medium. Today the term changed meaning but at the same time its history is in the process of being rewritten as more and more female composers are being credited for having played a defining role in the development of the medium. In 2021 the acclaimed documentary film called *Sisters with Transistors* was released, it demonstrated this process for a larger than specialist audience. One can also conclude that on the whole and over time the term *electronic music* defines a *medium* rather than a *style*.

Compositional ideologies played a major role in the times of avant-garde aesthetics, and they still do for many contemporary composers today. In more popular genres this aesthetics has been transformed to a more practical

approach to the instruments actually used, with more musicianship involved in the creation of works, and less cold quasi scientific laboratory-like calculations to justify the results (a major consequence and certainly a hobby of the avant-garde ideologues). Today the first thing a young listener will think of when expecting to hear *electronic music* will be known as EDM, or Electronic Dance Music. Music to party, to dance, to have fun. A starker contrast to the early composed electronic music, say to the times of a Stockhausen and his Etudes I and II and Kontakte can hardly be imagined. Meanwhile the innovative pioneering work of Eliane Radigue was almost completely ignored. What the early electronic composers shared was a very elaborate working process: to create a single minute of music took days/weeks to produce. With the rapid and drastic advances of technology in our times with regards to sound generation and recording this changed completely. What used to take a large studio with very expensive hardware to produce can today be done on a good laptop with professional software, much of it affordable or even free and open source.

When listening to electronic music, one misses the musical instruments such as strings and winds, yet on careful listening there may be sounds referring to these, but more flexible and moving in sound than the physical instrument could ever practically realize. Moreover, with electronic music one misses a musician for every single sound, there may be just one person performing on a laptop, or just a recording, and one stares at loudspeakers (never stare at loudspeakers btw, rather try to locate the sounds instead, as they are not in the speaker but resonating in the room). Most electronic music is however still made by humans and by composers' choices, the path from human action and sound creation is just somewhat different than playing an instrument, a mouse or a button or a wheel is moved, a bit more technically indirect perhaps, but at the same time producing an audible sound not significantly less instantaneous than playing a live piano would. Moving the mouse, the wheel or the button are of course less visible on stage than a performance on a piano or wind instrument, where an informed viewer can read the keys.

The truly informed listeners to electronic music will be able to recognize historical instruments when used, such as the ARP 2500 or 2600, or the Buchla 200, or the Moog Modular, in case these are used. Each of these iconic and historical instruments can be found again today, mostly in the form of software versions, but now and then in hardware form, all newly made, sometimes with new, sometimes even with “vintage” components. Most modern synthesizer clones reliably reproduce the iconic sound and usage, and sound but slightly different. Hearing the differences between old hardware and modern hard- or software can be similarly a specialist skill as in being able to hear the differences between a Steinway, a Bösendorfer, a Yamaha, a Fazioli, or a Schimmel grand piano – *on a recording*. Not obvious, not obvious at all, as music is about music first of all and not about musical instruments at all. Still, diehard electronic composers may swear by certain hardware: Moog, Buchla or ARP synths. Likewise acoustic instrumentalists swear by instrument brands and types, Muramatsu or Haynes flutes, Selmer vs Yanagisawa saxophones, Stradivari vs Guarneri or Amati violins, etc.

Specific instruments matter more to performers and should not be made into criteria for listeners. Nevertheless, being able to hear *types of instruments* is just as important in acoustic as in electronic music. Can one recognize the sound of a clarinet and distinguish it from the oboe, from the soprano saxophone, or the flute? Can one pick up the melody of the bassoon, the French horn, the trombone? Similarly with electronic music: can one hear the wave form types, the sine, the modulated sine, the square and mixed triangle waves in slightly detuned unisons, the types of noise, white, pink, brown? Can one hear certain brands of hardware being used, type of filters or a ring modulator, or the synthesizer itself in case of an iconic known sound?

Most difficult of all: can one hear how a music was made, composed, and produced? Most important of all: can one actually enjoy this music, both with and without all this knowledge and ability to recognize specifics?

And lastly: can we actually let go of the illusion of being in control of that *pet* we call our *mind* and let the music and musical perception simply take over and surprise us?

The challenge with innovative contemporary music made for listening per se such as this album, lies in a challenge to connect freely, and personally go through the 4 steps of open perception and appreciation, without a priori do's and don'ts, without expectations but with memories, with a sense of exploration as in starting a new novel or unknown movie without spoilers:

1. **Observe** – *hear everything, don't be distracted, be aware of what happens in the various registers of time, tone, timbre, space, and volume (the range of each is much larger than with instrumental music): try to imprint what you hear into memory, ask yourself what is it objectively that I heard?*
2. **Evaluate** – *question your perception, can you hear the form distinctly enough, some elements may be harder to hear, are there some sounds that affect you emotionally or even physically: observe and evaluate the effect of it.*
3. **Interpret** – *observe your mind creating associations of its own: they are yours and not in the music itself, yet are valid responses created by the music in you personally.*
4. **Appreciate** – *open your ears and mind and forget the impoverished listening experience of mainstream music.*

Elements of both Music and Chemistry

The Elements referred to in the title are obviously the chemical elements: the very first of the periodic table of which is Hydrogen with its remarkable isotopes Deuterium and Tritium, the only isotopes with their own chemical abbreviation. Less obvious from the titles is the use of Elements of Music, as described in his original approach to composing: his *method* (not a system) of *prepositional analysis*, developed from 1998-2011 by van Dillen.

Prepositional analysis is a new approach to the creation and analysis of music, not restricted to any style or vocabulary, but based on how humans hear music and perceive its elements Sound and Silence in interaction. Sound manifests itself in spectrum, time, and space, and from this observation 5 categories are derived, which sum up to 6 with silence included. These both include and transcend Stockhausen's 5 dimensions of sound (pitch, duration, volume, timbre, and place). Based on the interactions a set of 22 prepositional analytical concepts is postulated, for use in creative composition or analysis.

These elements of music have in fact been used for a longer time and some if not all of them can be found in music history. In the work on this album, they are used to create new music inspired by the chemical elements. The chemical elements, being such basic building blocks of matter, represent the basis for every existence, and for life. By means of Mendeleev's system for natural matter, and thus for material nature, van Dillen ventured to compose his meta-symphony *Elements*.

This series *Elements* is an elaboration of a lifelong love for the basic building blocks of matter as it formed during the billions of years following the Big Bang.

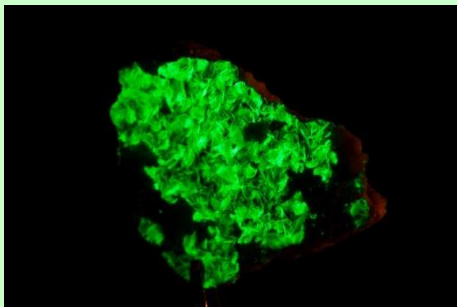
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 1 | 1 H | | | | | | | | | | | | | | | | | 2 He |
| 2 | 3 Li | 4 Be | | | | | | | | | | | 5 B | 6 C | 7 N | 8 O | 9 F | 10 Ne |
| 3 | 11 Na | 12 Mg | | | | | | | | | | | 13 Al | 14 Si | 15 P | 16 S | 17 Cl | 18 Ar |
| 4 | 19 K | 20 Ca | 21 Sc | 22 Ti | 23 V | 24 Cr | 25 Mn | 26 Fe | 27 Co | 28 Ni | 29 Cu | 30 Zn | 31 Ga | 32 Ge | 33 As | 34 Se | 35 Br | 36 Kr |
| 5 | 37 Rb | 38 Sr | 39 Y | 40 Zr | 41 Nb | 42 Mo | 43 Tc | 44 Ru | 45 Rh | 46 Pd | 47 Ag | 48 Cd | 49 In | 50 Sn | 51 Sb | 52 Te | 53 I | 54 Xe |
| 6 | 55 Cs | 56 Ba | | 72 Hf | 73 Ta | 74 W | 75 Re | 76 Os | 77 Ir | 78 Pt | 79 Au | 80 Hg | 81 Tl | 82 Pb | 83 Bi | 84 Po | 85 At | 86 Rn |
| 7 | 87 Fr | 88 Ra | | 104 Rf | 105 Db | 106 Sg | 107 Bh | 108 Hs | 109 Mt | 110 Ds | 111 Rg | 112 Cn | 113 Nh | 114 Fl | 115 Mc | 116 Lv | 117 Ts | 118 Og |
| | | | | 57 La | 58 Ce | 59 Pr | 60 Nd | 61 Pm | 62 Sm | 63 Eu | 64 Gd | 65 Tb | 66 Dy | 67 Ho | 68 Er | 69 Tm | 70 Yb | 71 Lu |
| | | | | 89 Ac | 90 Th | 91 Pa | 92 U | 93 Np | 94 Pu | 95 Am | 96 Cm | 97 Bk | 98 Cf | 99 Es | 100 Fm | 101 Md | 102 No | 103 Lr |

periodic table with currently published element compositions in gray

Astatine

Astatine is counted among the Halogens because of its structure and hence place in the Periodic Table. It is however a very unstable element, as its half-life is only 8.3 hours. Despite its instability, it is a naturally occurring element, and an estimated 100 grams is thought to exist on the entire planet earth at any given time, but as each of these atoms is short living, the atoms of the 100 grams will be distributed widely. Astatine comes from the natural radioactive decay of the elements Uranium and Thorium, which each are more abundant than Astatine.

Similar to Technetium, which is not naturally occurring, but has a similar half-life, Astatine is currently being studied for treatment of cancer as well.



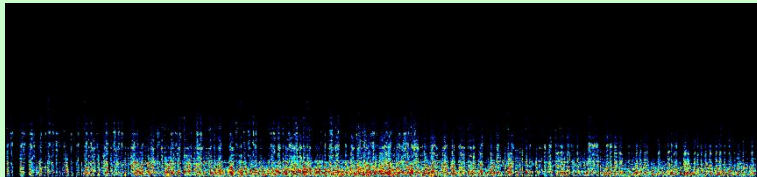
Music of Astatine

The music series of the Halogens uses mosaic as a formal principle, reflecting the halogens chemically combining and forming both salts and organic molecules.



complex original sound generator for astatine in bitwig 5.2 beta 1 grid

In the case of Astatine, a constantly moving sound, based on complex frequency modulation was composed first.

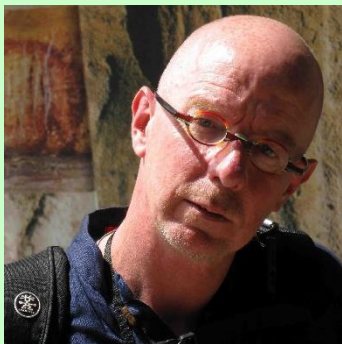


spectral graph of the music of astatine

A stack of long samples, varying between 5 and 40 minutes, was created, modulating the generative basic sound further in different ways. Resonances were added, and at this point the middle frequency register was subdued to leave space for the later to be added low piano tones' natural long sustains and harmonics. Multi layered bandpass filters with envelope-reactive pitch shifts were used to create a novel *frequency expansion* (mostly loudness compression and expansion are used, but this technique was especially designed for use here). Finally, the new compressor+ in Bitwig 5.2 beta 1 served to glue the layers together in various ways. During the mixing process in Reaper 7.15, 6 longer samples were gated with a reactively dual-filtered gate (HP and LP envelope-reactive), while the opening of the finely tuned gate triggered midi, set to the low tones A0, Bb0, B0 and their perfect fifths E1, F1, and F#1. Thus the 6 piano tones, each belonging to a sound layer, were rhythmically glued to the envelopes of electronic sounds. Thus deliberate and precise composing and generative techniques, as well as electronic and acoustic sampling, were combined.

Oscar van Dillen

Oscar Ignatius Joannes van Dillen ('s-Hertogenbosch 1958), flutist, composer, and visual artist. A generalist rather than a specialist, next to his music studies in Indian classical music, Jazz, European medieval and renaissance music, and contemporary composition and music theory, he also studied architecture and mathematics.



He was a founding member of the Rotterdam School of Composers, having written its manifesto in 1997. His works span a wide variety of styles and genres, encompassing full score compositions for classical musicians ranging from solo pieces to full orchestras, style-specific scores for ensembles of jazz and world music musicians, as well as electronic works, and electro-acoustic compositions. In a more advisory role, he has been and is part of cultural advisory boards and competition juries, as well as on the board of Donemus, and on the board of Wikimedia International, having founded the Wikimedia organizations in the Netherlands as chairman.

He teaches composition, improvisation, music theory, and music history at Codarts University of the Arts Rotterdam.

Oscar van Dillen's personal website can be found at

www.oscarvandillen.com

OIJRECORDS can be found at

www.oij-records.com

Donemus and Donemus Records can be found at

www.donemus.nl

OIJ RECORDS

music is sound and silence



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