

Ga

Elements 31

gallium

Oscar van Dillen

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Elements 31: Ga

Elements 31: Gallium is the sixteenth album in a 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 inverted single line pencil drawings made by the composer.

The work on this album was created, composed, recorded, and produced February-March 2023. All works, cover art and booklet of this album were created by Oscar van Dillen.

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 with*.

In our times we need new and innovative operas and symphonies, whether electronically or no; let these forget the simpler stories of our past and use these new narrative sources of our present and future for reference and inspiration."

--Oscar van Dillen

* 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:

- Elements 1: Hydrogen Deuterium Tritium H D T
- Elements 118: Oganesson Og
- Elements 6: Carbon C
- Elements 8: Oxygen – Ozone O
- Elements 14: Silicon Si
- Elements 7: Azote N
- Elements 2: Helium He
- Elements 15: Phosphorus P
- Elements 20: Calcium Ca
- Elements 12: Magnesium Mg
- Elements 38: Strontium Sr
- Elements 4: Beryllium Be
- Elements 56: Barium Ba
- Elements 88: Radium Ra
- Elements 49: Indium In
- Elements 31: Gallium Ga

Tracks

1. Gallium – section 1	03:45
2. Gallium – section 2	03:20
3. Gallium – section 3	01:32
4. Gallium – section 4	01:48
5. Gallium – section 5	02:08
6. Gallium – section 6	03:52
7. Gallium – section 7	01:51
8. Gallium – section 8	01:42
9. Gallium – section 9	02:00
10. Gallium – section 10	02:54
11. Gallium – section 11	02:39
12. Gallium – section 12	01:59
13. Gallium – section 13	02:00
14. Gallium – section 14	01:44
15. Gallium (complete)	33:21

Total duration: 1:06:42

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 in a free way, and go through the steps of open perception and appreciation individually, without recipe, without a priori dos 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 – can you perceive every form distinctly enough, some things may be harder to hear, or are 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 created by the music in you personally.

Ways of Listening to the Elements

The series *Elements* by Oscar van Dillen consists of medium to long duration digitally created electronic compositions which have a more static, installation-like character, exploring the borderlands between musical and spatial composition, linking up music and architecture, both arts concerning Space. It is a remarkable feature of human anatomy that the ear is the organ that perceives sound as well as space, by hearing and orientation. Inside in the *cochlea* (inner ear) resonating longitudinal crystals distinguish the frequencies within sound.

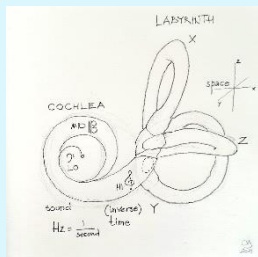
Outside on top of the same organ there are the three half-circles of the *Labyrinth*, perceiving spatial movement along an XYZ axis system. The direct perception of 4-dimensional space-time itself can be seen in this essential part of our anatomy: one organ handling perceptual elements of both space 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.

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 set to play on repeat.

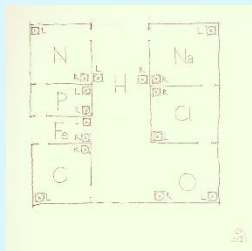
For installation playback of the series Elements, van Dillen proposes this option of creating simultaneously playing (looping) versions of various Elements widely spaced apart over a large space or several neighbouring spaces.



Listeners could actively move around through the music or choose to linger or sit in certain spots for some time.

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 everything in between.

If such architectural installations are placed in a museum, they will allow for 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.

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*.

In his youth, Van Dillen spend quite a lot of (sometimes dangerous) time in his own small chemical laboratory, being patiently and lovingly inspired, coached, and

sometimes warned, by his uncle the professional chemist Hugo Wertheim.

This series Elements is an elaboration of this lifelong love for the basic building blocks of matter as it formed in the millions upon millions 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 completed element compositions in gray

Gallium

Gallium (Ga) is 31st element and the 4th period element in group 13, known as the *Boron group* and because of their +3 value named *triels*. This is a group in some ways more closely related to group 2, the *alkaline earth metals*, than the periodic table diagram visually suggests. Similar to the elements of the Lanthanoids and Actinoids, groups 3-12 are inserted into a larger structure. Considered in this way, Gallium is a (not too remote) neighbor of Calcium. The whole group further consists of Boron, Aluminum, Indium, Thallium and the synthetic and very radioactive Nihonium.

Gallium is one of the elements named after a country as it was named after his native France (*Gallia* in Latin), by its discoverer, Paul-Émile Lecoq de Boisbaudran in 1875.



light spectral lines of the element gallium

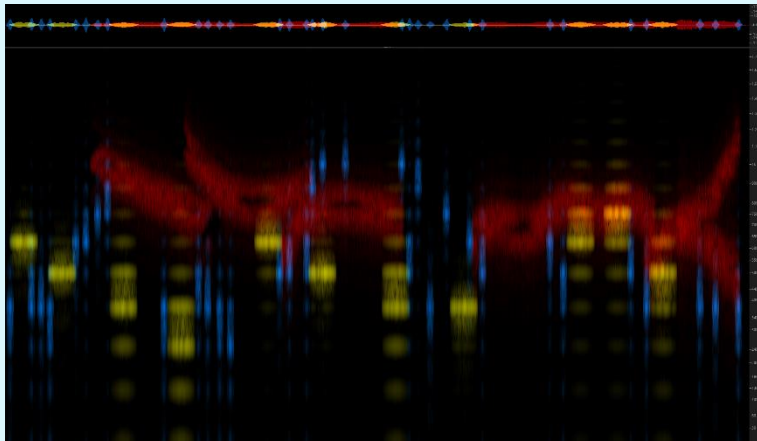
Some conjectured he may have named it after himself rather, as there is also the Latin word *Gallus* for cockerel. Mendeleev himself also claimed its discovery because he had predicted it and its properties before. It had to be similar to element 13 Aluminium, and indeed Gallium is found in small amounts in its ores. Gallium is however also resembling Zinc (element 30, its left neighbor) in important ways, and so did escape prediction as well as fulfill it.

Gallium has of all elements the largest fluidity range of temperatures with a melting point of 30°C and a boiling point of no less than 2229°C , which makes it very suited for use in thermometers as a nontoxic liquid metal.

Most of all though, Gallium is used in telecommunication chips, solar cells and in LEDs, and is a vital component of the basics of semiconductor technology today. As one of the rare metals, it is also politically and economically fought over, and especially its polluting ways of extraction for use in green energy sources such as solar cells raise questions about the sustainability of our current methods.

Music of Gallium

The composition process of Gallium started with a spectral germ cell composed of three layers, here and in the score identified as red, yellow and blue. Each layer is a spectral melody that stands in counterpoint to the other layers. But the cells also stand in counterpoint to other renderings of itself, in different durations and pitch.



gallium sound spectral germ cell with frequencies and mixed volumes

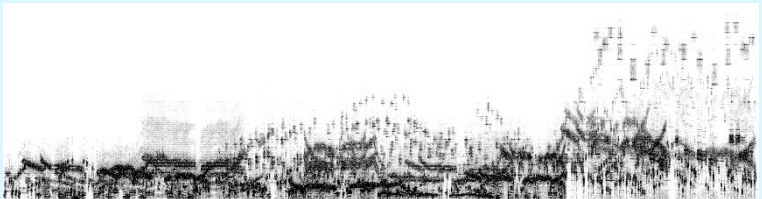
The process of electronic composition can be so complex that often notes and partial scores or particellas while working can be needed to keep a full overview of the work in progress, to retain the full freedom to compose and change. For this purpose van Dillen developed his graphical scores using a *Stravigor*, made in Barcelona.

A particella like this could also be used as an intermediary step to create a faithful instrumental and acoustic version of the same work, a precise *instrumentation* of what was originally a purely contemporary electronic work. It of course contains selected information only.

The image displays three pages of handwritten musical notation for a piece titled "CALLIDA". The notation is graphical, using horizontal lines and various symbols to represent musical elements. The first page is titled "FULL CELLS - CHANNEL STRIPPED" and includes a circled "1" and a circled "10". The second page is titled "CELL LAYER 1 (RED) + SAT" and includes a circled "10" and a circled "10". The third page is titled "CELL LAYER 2 (YELLOW) + SAT" and includes a circled "10" and a circled "10". The notation consists of multiple staves with horizontal lines, some labeled with "SAT" and "CELL". The bottom of the page includes the text "TEMPO 50 up accelerando" and "75 up ritardando". The signature "VAN DILLEN" and the date "MAY 2022" are visible in the bottom right corner.

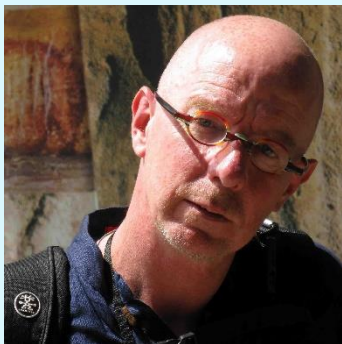
Much more than with instrumental composition, the process of electronic composition is often (though not always) directly in sound, just as a sculptor and painter work: not by making graphs and plans like architects do, but directly working in the matter itself. The electronic work in progress is continually heard and evaluated, then developed and changed, and heard again, re-evaluated, et cetera. During instrumental composition the real sound is always *imagined* on the basis of perhaps tones played on the piano, which may also limit the imagination to merely the well-known frequencies and pitch classes. While composing complex works containing polyrhythmic or microtonal passages van Dillen advises to always sing ("electronic solfege" would embody "singing" what you create and creating what you sing):

"if you want it you should write it, but you have no real license to write it as long as you cannot sing it, so learn to sing what you want to write before you write it, certainly before you print it".



Oscar van Dillen

Oscar Ignatius Joannes van Dillen ('s-Hertogenbosch 1958), is composer and performer of music, professor of music at Codarts University for the Arts in Rotterdam, as well as visual artist. A polyglot and an erudite world citizen, he is also one of the pioneers from the early years of Wikipedia, having been founding president of Wikimedia Nederland and serving as a trustee of the Wikimedia Foundation. Van Dillen has studied a wide variety of musical traditions with many renowned teachers. His music education having started at the age of 7, performing both classical and rock music in his youth, van Dillen first studied North-Indian classical music (sitar, tabla, vocal) with Jamaluddin Bhartiya at the Tritantri School in Amsterdam and bansuri with Gurbachan Singh Sachdev at the Bansuri School of Music in Berkeley, California. Next, he studied classical and jazz flute at the Sweelinck Conservatory in Amsterdam. He took composition lessons from Misha Mengelberg. As a flutist, he was taught by Lens Derogée and Dieks Visser, and followed masterclasses from Pierre-Yves Artaud, Geoffrey Gilbert and Barthold Kuijken.



After his following postgraduate studies of medieval and Renaissance music with Paul Van Nevel in Leuven (Belgium), he studied classical and contemporary composition with, among others, Dick Raaymakers, Diderik Wagenaar and Gilius van Bergeijk at the Koninklijk Conservatory in The Hague, with Klaas de Vries, Peter-Jan Wagemans and René Uijlenhoet at the Rotterdam Conservatory and with Manfred Trojahn at the Robert Schumann College in Düsseldorf, where he also received lessons in conducting from Lutz Herbig. As a composer he furthermore followed masterclasses from, among others, Isang Yun, George Crumb, Jan van Vlijmen, Marek Stachowski, Zbigniew Bojarski and Gerard Brophy.

A founding member of the Rotterdam School of composers and the author of its manifesto, he currently works as professor of music at the Codarts University of the Arts Rotterdam since 1997, teaching composition and arranging, improvisation, world music composition, music history and music theory in the Jazz-, the Pop-, the World music, the Classical music, and the Music Education Academies of Codarts.

Oscar van Dillen is the inventor of *original world music composition*, combining strictly composed- with improvised classical and folk traditions, and their techniques and mentalities for creating music: a new and contemporary form of art music.

Van Dillen is a member of Nieuw Geneco and the Dutch-Flemish Society for Music Theory. As of 2020 his scores are published by Donemus, of which he is a board member from 2022.

Next to his fulltime work as composer, musician and pedagogue, van Dillen is also a visual artist. As composer, he has been a regular member of various juries, among which the composition prize juries, in the Val Tidone Festival Competitions, since 2013.

Oscar van Dillen's personal website: www.oscarvandillen.com

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music is sound and silence



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