Carl-Johan Rosén

At the Catastrophy-Point

The analytical observer's notes on Complementary Cubes

olllllll

Stockholm, April 2016

Dear Mr Manfred Mohr

For two years I've been working my way towards the code of one of your early programs: the one that produced the short animated film Complementary Cubes in 1974. It has been quite a long journey, and one which took some unexpected turns. I now find myself at a point from which I can venture no further without contacting you for some advice.

Complementary Cubes presented itself to me as I was looking for a piece of visual material, generated from code, which I could use as a starting point for an artistic and sort of media-archeological exploration. I wanted to seek the Fortran code you wrote in 1974, to establish a new type of connection between surface and code. In this process, I have also encountered the digital video object, which by default breaks all symmetries of the cube and enables a new kind of aesthetics of video materiality.

As I started to collect my thoughts and materials, to formulate my questions to you, it became evident that I both needed and wanted to share the process which your film has led me through, in much greater detail than I initially thought. Therefore — and I hope you will enjoy it — this letter have taken on the extended form of a book.

Sincerely
Carl-Johan Rosén

Fictional video space and virtual video object space

Speculations

Product and program

Encountering the cubes

Over the past five years, my artistic practice has been focused on one general question: what is it like to experience the world as a digital process? In the spring of 2013 I published a book called I speak myself into an object. I wrote a computer program, a software, which, when run, assembles its own code into a book. Through that book I wished to explore how code printed on paper would force me to read the code differently, compared to reading it on the computer screen. And if this other reading mode would open up the programming language as a tool to communicate with a digital process in a new way.

In 2014 I was searching for some kind of digital material, like a video, which I could use as a starting point for further studies of programming languages as a communicative bridge to digital processes. I wanted the material to be the product of a computer program, and I wanted to disassemble the material in order to identify the code from which it had been generated. As it happened, I went to the release of your book Artificiata II here in Stockholm, and at that event I encountered your work for the first time. One of the works shown at the release was Complementary Cubes, and it struck me like a flash of light: that video was the material I was looking for. I learned that the video was available online, and I immediately downloaded and secured a copy with which I could begin my work.

There were two criteria in my choice of material. First, the material needed to be the product of a software written specifically to produce it. In other words, the visual surface needed to be based in programming

Complementary Cubes, 1973-1974, was programmed in FORTRAN IV and run on a CDC 6400 computer.

A DATAGRAPHIX 4460 microfilm camera rendered the data into a 16mm film.

This footage was originally written for the 16mm film "Cubic Limit" but was not used in the film. It shows all the combinations of 2 rotating cubes one with "n" edges and the other with "12 minus n" edges.

This copy is a digitization of the original 16mm film.

Manfred Mohr

First published:
Cubic Limit, Galerie Weiller, Paris, 5/29 - 6/28 1975

language. Secondly, the visual material needed to be of non-complex and non-random composition for my experiment to be possible. Complementary Cubes seemed to meet both of these criteria. The first one without a doubt, since the introductory panel of the video referred to its creation process in terms of writing in the programming language Fortran IV. I considered the second criteria fulfilled too, as I was able, just by looking at the video a few times, to roughly formulate an algorithm which would produce a sequence of images similar to Complementary Cubes. I was not entirely sure that Complementary Cubes was non-random though, but the cubes kept rotating and the lines kept shifting at a steady pace, which I considered promising indications.

At the beginning of this process I knew only of Complementary Cubes and of a few other works which were shown at the release, and I knew only of them what I saw and what I was told on that evening. I decided to keep my ignorance intact for the time being, as I feared that knowledge about how you and others had commented on these and later works would possibly lead me astray on my expedition to find the code. As I write this, however, I've studied the other works from the Cubic Limit series, and read what statements, interviews and essays I've been able to find, where your work on the three-dimensional cube is discussed.

The video material

The material that I have been able to access is a 640 by 480 pixels digital video which I downloaded from Youtube.[1] According to the website the video was uploaded on March 15, 2013, by the user "Manfred Mohr." An introductory information panel has been prepended to the digitized film. It states that Complementary Cubes was created during 1973-1974 using a computer and a microfilm camera to render images to 16mm film, and that this copy is a digitization of the original 16mm film. It also states that the programming language Fortran IV was used to write the code for the program. The video is 5 minutes and 39 seconds long, including the panels at the beginning (20 seconds) and at the end (6 seconds).

The video shows two white, outlined, incomplete cubes rotating side by side in a black void. Twelve lines are needed to construct a complete cube, and the cubes of the video are incomplete since they are always composed by less than twelve lines. At the start of the video the left cube is almost complete (eleven lines are drawn), while the right cube is hardly recognizable (one line is drawn). Over time the number of lines drawn in either cube shift periodically, so that halfway through the video eleven lines of the right cube are drawn, while only one of the left cube. The title of the video and the introductory panel lead me to conclude that a line that is drawn in the left cube is not drawn in the right, and vice versa. The panel states

> *[The video] shows all the combinations of 2 rotating cubes one with "n" edges and the other with "12 minus n" edges.*[2]

Halfway through the video, after all but one line have moved to the cube at the right side of the video, all lines disappear. After an intermission of about a second, the lines appear again, now with all but one line drawn in the left cube. After this the shifts continue, and again the line density of the right cube increases slowly. I've found a text on your website, which is similar to the text on the information panel, but where you've also written that "[The video] shows 2 sequences of all the combinations of 2 rotating cubes."[3] Even though you don't explicitly state that the video is a repetition of two identical sequences, there seems to be some sort of repetition involved.

Cubes out of context

The cubes rotate in a void, and I've been conducting much of my analysis with little or no knowledge of the context in which the material was created. I didn't know how important the cube have been throughout your whole career, and I still don't know very much about the cube in general art history. But I didn't enter into this investigation with the cube as the focus of my interest. I was interested in the code behind the surface phenomena, and the code of your film was what I was initially drawn to. After the greater part of my analysis was complete, or at least after the point when I felt that I knew in which direction my analysis was going, I dared look into the writings on your work.

From different texts, exhibition catalogs and anthologies I learned that you've left both the film medium and the three-dimensional cube behind, and moved on to multi-dimensional cubes represented in non-

time-based media. Complementary Cubes appear to be a sort of parenthesis, or a failed experiment even, during the Cubic Limit work phase. On your very generous website, you have a section called "Experimenting with computer films" where you explain that you were invited to use a (in the early 1970s) brand new computer to experiment in making animations.

> *I gladly accepted and during the next 4 years I made several short computer films. It was a very painful experience since the process was very slow and the turnover dragged out over many months.*[4]

And in the exhibition catalog for the Cubic Limit exhibition, you compared film to print.

> *My experiments indicated an enormous discrepancy in the perception of sequences of different rotated incomplete cubes drawn on paper and the same sequences shown in an animated film.*[5]

The latter quote is not explicitly critical about film as a medium for your investigations, but taking into account that you didn't work with moving images for about two decades after Complementary Cubes, I can only assume that the painful experience of making film was not outweighed by the results.

Furthermore, you wrote that Complementary Cubes "was originally written for the film Cubic Limit but was not used in the film."[6] Even though you did include film in the Cubic Limit exhibition, the particular sequence I've been studying was evaluated, found wanting and excluded from the exhibition.

Putting these pieces of information together I can

only conclude that Complementary Cubes is a work you did not consider very interesting, and it was created in a medium which you neither saw fit for further exploration of the cube, nor did enjoy working with. Exactly this work is what I wish to discuss with you.

In the essay "Manfred Mohr's abstract aesthetic" Marion Keiner states that symmetry, for you, is a synonym for immobility, stability and death. And that the three-dimensional cube, which is explored in Complementary Cubes and the Cubic Limit series, could not lead to anything new, but only to an evolutionary standstill.[7] In Cubic Limit II you began to break symmetry by dividing the cube, and in all of your works since you seem to have been avoiding the easily recognizable three-dimensional cube, and been working only with cubes in four dimensions or more.

To realize this after having spent quite some time with Complementary Cubes, I feel a little awkward contacting you regarding this particular work. I can only hope that you'll bear with me as I dive deeper into the medium, its temporary aspects, and how these affect the three-dimensional cubes. But I think you'll be pleased to hear that the method by which I have processed the material actually breaks symmetry, and reveal new perspectives from which the cube can be observed.

From product to program

The concepts of code and surface are often linked by a linear and unidirectional narrative. According to this narrative a code is compiled to a program, which gives rise to a process, which generate a visual surface.

This isn't a false description of a relationship between code and surface, but it is a description which makes the code an inaccessible and mysterious object from the perspective of the observer of the visual product. My intention with this project is to establish another link between code and surface, using the surface as my starting point. If it is possible to establish a reverse connection between surface and code, such a connection could be a beginning of further explorations of how code can be described and discussed.

(I consider a running software an actor in society. I sometimes call this type of actor a digital being or a digital actor, but mostly I refer to it as a digital process. Digital processes seem to have an increasingly large impact on how society is formed. Together with humans, animals and other actors they co-determine what humans can say, create and become. Therefore, I believe it is necessary to explore the possibilities of human language to describe these digital processes as well as the programming languages that humans use to write code to conjure these processes.)

During the past few years, I have come to realize but have still not been able to properly articulate, that it's often the process, the procedure, the algorithm, or even the program, rather than the product, that compel me to work. There is a kind of aesthetic of the process which I'm not able to fully bring to the surface and make visible. From statements that both you and others have made about your art, I get the impression that you are aware of this procedural or algorithmic

aesthetics too. Marion Keiner writes, "Mohr leaves it to the observer, however, to decide whether he wants to follow up the story of how these compositions originated."[8] The observer is certainly not forced down this line of thoughts, but you seem to want to leave traces for the observer to find, and to seek the path (back) to an algorithm. I think there are more reasons for my choice of Complementary Cubes as my working material than I initially thought. I must unknowingly have seen some traces of the story of Complementary Cubes' origin, which lead me to seek the program behind this product.

At the catastrophy-point

In an artist statement of the exhibition catalog of Cubic Limit I, you wonder

> *whether an exact definition can be found showing the rotational position and the minimum number of lines required to maintain the three-dimensional illusion of an incomplete cube. Can we designate at what point there is a visual collapse into two dimensions?*[9]

The question is left unanswered, but the parenthesized sentence that follows, gives this point a name.

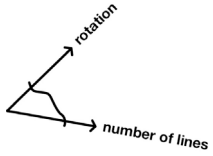
> *(This collapse, if it is definable, could be called after the 'Théorie des Catastrophes' by the french mathematician René Thom, a catastrophy-point).*[10]

The limit of the cube—the point beyond which an observer can no longer recognize the cube—is sometimes passed in Cubic Limit as well as in Complementary Cubes. Beyond this point, the product of the program (like a print or a film frame) does no longer reveal enough

traces to let the observer find a path back to the original cube. Not simply to a cube, as would be appropriate if I was speaking of a symbol (or an "être-graphique") which may or may not be linked to the idea of a cube, but precisely back to the original cube because it's the algorithmic representation of the cube I'm referring to. Regardless of the visual product and its level of incompleteness, the program which produced the visual output held the complete and original cube at the moment of production. Regardless of how many of the cube's lines were drawn (even none), the program which performed the drawing represented the complete cube, and the time-less algorithmic concept which the program implemented still represents the complete cube. Wouldn't it, therefore, be possible to identify a point, analogous to the catastrophy-point, beyond which the observer would no longer be able to trace the preceding program/algorithm? These two points do not necessarily exist within the same dimensionality. The geometric catastrophe might precede the algorithmic catastrophe in some cases, and succeed it in others. Some symbols might "maintain the three-dimensional illusion of an incomplete cube,"[11] but not the possibility of reconnecting with the algorithm, and vice versa. This line of reasoning can be extended by asking: can a product of a program, in general, be thought of as an incomplete representation of the program? If the answer is yes, and an observer was presented with an increasing amount of products of the same program, the integral representation of the program would be decreasingly incomplete. This is what you've done in Cubic Limit and in Complementary Cubes. You've pro-

vided the observer with a large amount of products of the same program. Most prints depict large amounts of cubes, and the film is a sequence of frames representing a cube. And as I learned late in this analytical process, some (maybe all) individual works in Cubic Limit are products of the same algorithm. Given only one symbol or drawing, an observer would be able to extract no or any algorithmic description. But given a sequence, the scope of possibilities is drastically narrowed, and the illusion of an incomplete algorithm is maintained.

You write about the catastrophy-point in singular form, but you mention two points implicitly. "[T]he rotational position and the minimum number of lines"[12] seem to constitute two different trajectories along which we would find two different points of collapse. In combination, these two, non-parallel trajectories define a two-dimensional space in which the point of collapse could be identified as a curve rather than a point. A range of catastrophy-points separate a field of combinations of rotations and number of lines that uphold the illusion, from a field of combinations representing a collapse. If a third parameter would be added, such as color, the fields would become volumes in a three-dimensional space. Even though it would make sense to talk about multiple catastrophy-points, or even a catastrophy-curve and a catastrophy-surface, I will continue to refer to a singular catastrophy-point. Probably due to the same rhetorical reasons you did.



The algorithmic catastrophy-point, which I proposed above, can also be marked in the two-dimensional space of rotation versus number of lines. The collapse

of the illusion of the cube and the collapse of the illusion of the algorithm are not necessarily the same, and therefore these two parameters must be considered non-aligned in the two-dimensional space. The two catastrophy-points (curves) can be of different shapes and position. They might overlap at some places, and they might define a field between them. Could it be that one collapse affect the other, so that the illusion of the algorithm collapses because the illusion of the cube collapses? Or could it be the other way around, that the algorithm is visible only when the cube has collapsed? For example: using a certain number of lines, the illusion of the cube is maintained. At a certain, lesser number of lines (catastrophy-point one) the illusion of the cube collapses. Instead, the illusion of the algorithm might be perceived, until a certain, even lesser number of lines are used (catastrophy-point two) and that illusion collapses as well. I can't say that I've perceived this step-wise collapse with the change of the number of lines, but it seems meaningful to present this type of play of illusions, in which a collapse of one illusion (of the cube) lead to the rise of another (of the algorithm). In such a model, a collapse does not denote a disintegration into nothing, but a transformation into something else, and two (or several) catastrophy-points might be the same point seen in different perspectives. In such an aesthetic of the collapse, I can speak of a collapse into code, where a symbol or a surface collapses to reveal an algorithm or a code. That's the catastrophy-point I'm searching for.

Notes

1. Complementary Cubes on YouTube: https://www.youtube.com/watch?v=LaukRoa4--8 Another copy is available on Vimeo: https://vimeo.com/65093060
2. Introductory panel of Complementary Cubes.
3. Mohr in “Experimenting with computer films.”
4. Ibid.
5. Mohr in Cubic Limit.
6. Mohr in “Experimenting with computer films.” My underlining.
7. Keiner in “Manfred Mohr’s abstract aesthetic.”
8. Ibid. My underlining.
9. Mohr in Cubic Limit.
10. Ibid. René Thom have also inspired the writers of the Oulipo in their discussions of the ‘clinamen’.
11. Ibid.
12. Ibid.
13. Mohr in “Experimenting with computer films.”
14. Mohr in Cubic Limit.
15. Image on page 98 of Der Algorithmus des Manfred Mohr.
16. Silveira in “Exercícios morfológicos a partir da obra Cubic Limit (1973-1975) de Manfred Mohr.”
17. Mohr in Cubic Limit.
18. The images on the pages 147 to 155 are created by David Karlsson at Interspectral.
19. The order of the corner graphs correspond to my initial, false ordering of the cube edge lines. But since these graphs don’t serve to confirm the combinatorics already extracted by other means, I’ve left the order this way.
20. Mohr in “Cubic Limit I - 1973-1975 and parts of Cubic Limit II - 1976-1977. The 12 edges of the Cube are used as an Alphabet.“

21. Images of the respective works are available at http://www.emohr.com/mohr_cube1_161.html and http://www.emohr.com/mohr_cube1_154c.html I wrote this section before I found the printed copy of P-154-C in Der Algorithmus des Manfred Mohr. I must have failed to recognize the importance of the image because the numbers below the randomly rotated cubes are unreadable, and because it was actually P-154-B that caught my attention. P-154-B contain cubes with all sides drawn, while P-154-C is closer to the catastrophy-point (by being both rotated and containing incomplete cubes) and thus harder to extract the information I needed from.
22. Mohr in Cubic Limit.
23. Mohr in Dimensions.
24. I've explained this in the introductory chapter.
25. Mohr in Cubic Limit.
26. Mohr in Drawings Dessins Zeichnungen Dibujos.
27. Mohr in Cubic Limit.
28. I will have to return to this topic at another time. In short, it's an effect of positioning the cut-plane of the video object space non-orthogonally to all of the dimensional axes, and interpolating the pixels using a non-smoothing method like nearest neighbor.
29. Conversation with Barbara Nierhoff in Manfred Mohr - broken symmetry.

Sources

Herzogenrath, Wulf (Ed.) **Manfred Mohr - broken symmetry**, 2007. Kunsthalle Bremen, Bremen.

Keiner, Marion. "Manfred Mohr's abstract aesthetic" In **Manfred Mohr**, 1994. Waser Verlag, Zürich. Digital copy available at http://www.emohr.com/ww2.html

Mohr, Manfred. **Drawings Dessins Zeichnungen Dibujos**, 1974. Galerie Pierre Weiller, Paris. Statement availbale as a digital copy at http://www.emohr.com/ww2.html

Mohr, Manfred. **Cubic Limit**, 1975. Galerie Pierre Weiller, Paris. Statement available as a digital copy at http://www.emohr.com/ww2.html

Mohr, Manfred. **Dimensions**, 1979. Galerie D+C Mueller-Roth, Stuttgart. Statement available as a digital copy at http://www.emohr.com/ww2.html

Mohr, Manfred. **Divisibility**, 1981. Galerie Gilles Gheerbrant, Montréal.

Mohr, Manfred. **Divisibility II**, 1985. Galerie Teufel, Köln.

Mohr, Manfred. **Divisibility III**, 1986. Galerie D+C Mueller-Roth, Stuttgart.

Mohr, Manfred. **Laserglyphs**, 1992. Viviane Ehrli Galerie, Zürich.

Mohr, Manfred. ”Experimenting with computer films” on http://www.emohr.com/collab-exp/col_mohr-film.html Last accessed on March 9, 2016.

Mohr, Manfred. “Cubic Limit I - 1973-1975 and parts of Cubic Limit II - 1976-1977. The 12 edges of the Cube are used as an Alphabet.“ on http://www.emohr.com/two_1972.html Last accessed on March 9, 2016.

Rider, Alistair. “Scripted Variations” In **Manfred Mohr, One and Zero**, 2012. Carrol/Fletcher Gallery, London.

Rosen, Margit (Ed.) **Der Algorithmus des Manfred Mohr**, 2014. ZKM, Zentrum für Kunst und Medientechnologie, Karlsruhe.

Silveira, Rodrigo. “Exercícios morfológicos a partir da obra Cubic Limit (1973-1975) de Manfred Mohr” Supposedly published at “9° Congresso Brasileiro de Pesquisa e Desenvolvimento em Design” in 2010. Downloaded from http://blogs.anhembi.br/congressodesign/anais/artigos/69860.pdf in February 2016.