The beginnings of CMM

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1963-1967 : Before CMM

It is difficult to understand the way CMM has evolved into the institution it is today, if we do not look back a few years before its creation.

At BRGM (Geological Survey) Georges Matheron was an engineer at the French Geological Survey, in Paris, and he was establishing a new theory for ore bodies estimation, called geostatistics. In 1963 I started my PhD thesis under his direction, while working at Iron and Steel Institute, near Metz. A thesis which started by mining estimations and finished by the birth of mathematical morphology. I was Matheron's cadet for 10 years, meeting quite often at Nancy where I was his teaching assistant for courses on probability. But some times I would go to Paris to meet with him. When one would enter his office, one could see very big room, with a small wooden table at the center, which engulfed in a huge cloud of smoke coming from a pipe, and in the middle of the cloud, Matheron.

At the Geological Survey, the relations between Matheron and his director were far from the amicable. Each one thought of the other an arrogant idiot. This resulted in moments of tension, the most memorable being the thesis defense of Matheron in 1965. The room had just filled up when the director made his entry, and sat at the first row so as to be visible to everyone, especially to Matheron. Once the defense had started he slept ostensibly, with his head over his crossed arms placed on the table, not to be woken until the very end when the president of the jury had asked the traditional question : *Does any person who has a PhD want to ask a question?* He then put up his hand and addressed Matheron :

Director : *You see Matheron, mining engineers barely understand single integrals, and your variances here, with their double integrals...*

Matheron : *As it has been said, sir, in geostatistics the symbol* $\iint$ *is not for a double integral but a sixtuple...*

At Ecole des Mines Matheron was not slowed down by the Geological survey. In the fall of 1963 he mutated to Ecole des Mines de Paris, and began teaching probability. Ecole des Mines had planned, for the mid-future, to create a series of research departments, pompously called centres of research. For this purpose, geostatistics, and later mathematical morphology, turned out to be new thematics to develop as soon as funds and premises would be available.

For funding, School of Mines used to bet on the concept of oriented research, i.e. possibly theoretical, but with actual industrial outputs. Practically, it was meant that School of Mines was funding at most half of the budget, plus the premises.

But where to find the premises? In 1965, President de Gaulle had obliged the Parisian Grandes Ecoles to establish their research activities outside Paris, so as to be able to expand. At the same time, the same de Gaulle had also booted NATO outside France, which lead to the departure of the American air-force from Fontainebleau. This freed up a lot of barracks.

The director of School of Mines therefore contacted the Mayor of Fontainebleau to get access to these buildings. But the Mayor had something better for him. The city had just constructed a new secondary school, and had the older one available to be occupied. Situated right in the center of the city, and composed of three noble mansions, it was incomparably more attractive than modular barracks of the US army, dating from the fifties. School of Mines rented it by a lease of one franc for 99 years.

1968 : Settling in

Pavilion Maintenon In January 68, when Matheron and I visited the Fontainebleau site, the school's delegate showed us the plan of occupation of the various buildings. The director had already decided the allocations, and mathematical morphology had received two rooms. Matheron then asked the delegate, pointing towards a non allocated building :

Matheron : *And that, who is that for ?*

Delegate : *This pavilion has not be allocated yet and furthermore it has to be renovated.*

Matheron : *This shall be the Centre of Mathematical Morphology !*

And so it was done. We inherited this way the farm house of Madame de Maintenon, the future wife of Louis the fourteen. It had been renovated by rich owners in XVIII and XIX centuries, who had added a brick aisle which doubled the size of the buiding and completed it with three large lounges. Finally, the mansion of Madame

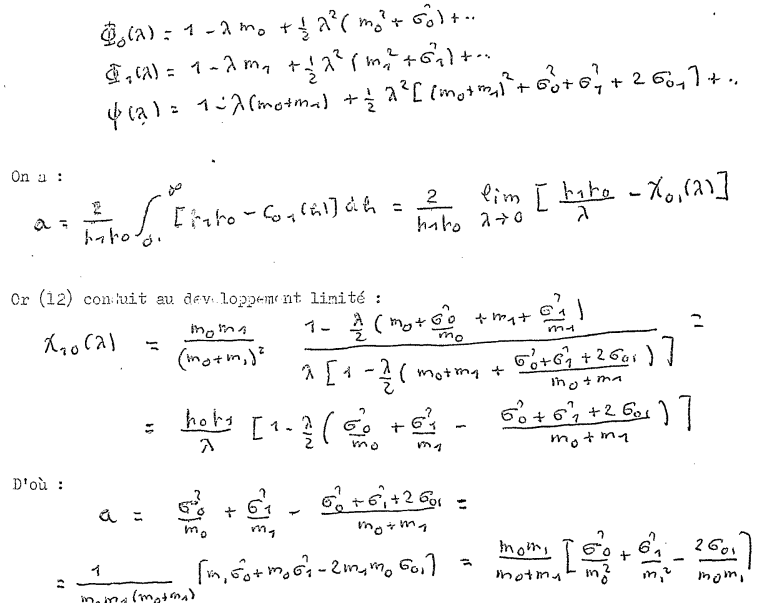
de Maintenon became in 1924 part of Fontainebleau high school, and more precisely, the girls dormitory.

Pavilion Maintenon. One sees the XIX aisle only, the Maintenon part is hidden by the trees.

Just after having inherited the building, we went and had a look at our new acquisition. The magnificent walls of the main lounge had been covered by terrible calicos representing mythological scenes with little shepherds, but the two other lounges were intact. Their mirrors and their superb penellings, which are still in place, had preserved the walls from any artistic aggression.

At the second floor, about twenty bidets, washbasins and toilet pans, more or less chipped, were aligned in the current lab of electronics. In the oldest part of the house, the ceiling of the second floor was in danger of falling down, and the access to the upper rooms was forbidden. And so on ...

First summer school Anyway in April 68 we entered the Pavilion as it was, and we began to prepare a summer school of mathematical morphology for next September. It was planned for lasting two weeks, and with two options of geostatistics and mathematical morphology, which is obviously too much. Matheron himself typed the course on stochastic processes, full of hand written formulae and alterations. The document had the old fashioned charm and the ease in reading of a middle age papyrus. Four new Phd students were supposed to help us, though they were mainly trying to learn.



Specimen of Matheron lecture notes for the first summer school.

In the cafeteria we were served at the place, on tables covered by tablecloths. After the lunch one could practice volley ball, or pétanque. All that with music playing in the background, because one of the pavilions, normally a part of the campus, was still an annex of the conservatory, for classical dance. Nothing was visible, but we could hear Chopin valses interpreted as military marches, with a big bang on the floor each three bars.

Between May and September 1968, CMM multiplied by four its size, from 2 to 8 people.

1969 : Starting time

The activity actually started in 1969, with the first budget, with the first research contracts, the first papers, and the official inauguration. In 69, the staff grew from 8 to 17 people. Each PhD student took part in the management, for buying the furniture, for discussing with the painters, etc. One secretary liberated Matheron of the tedious task of the type, which multiplied his production by three. And what a production! For the only year 1969, there are 136 pages of external reports, 155 pages of new courses and 562 pages of internal research notes. Some of them, such as Universal kriging, or Ambarzoumian processes, have the size and the quality of a thesis in mathematics.

Break after the lunch: Matheron (behind a small cloud of Shipper), I stand on his left.

Texture analyser The first texture analyser had been constructed, and patented, at Iron and Steel Institute in 1964 during my PhD thesis. In 66, I prepared a second patent (about openings) for occupying myself during my milirary service. Meantime, Matheron and I attempted to market the device by proposing a license to two French industrialists, Thomson and Nachet. Without any success. But two years later a door opened, a door that we could not expect.

This occurred in 1969. We needed a microscope for the new prototype of texture analyser that Klein was building. I ordered it at Leitz-France, and clarified some peculiar demands. My interlocutor pumped me for information for one hour, and concluded by the sentence: *Could you come with me to Wetzlar*[1] *before the end of the week?*

The travel to Wetzlar, initially planed for one day, lasted two days. Three people multiplied the questions, about 2-D opening in particular. When I told them - in my own English- that image analysis begins by transforming the initial image into another, a certain number of times, and ends only by measurements, they started to strongly speak in German amongst each other. I was completely out of the discussion, but finally they came back to English and asked me to stay one day more for repeating my comments. The second day afternoon, they proposed to buy a license.

Coming back to CMM, I announced the good news to Matheron. The second patent was ready, and we had to determine *who* should register it. We then discovered that

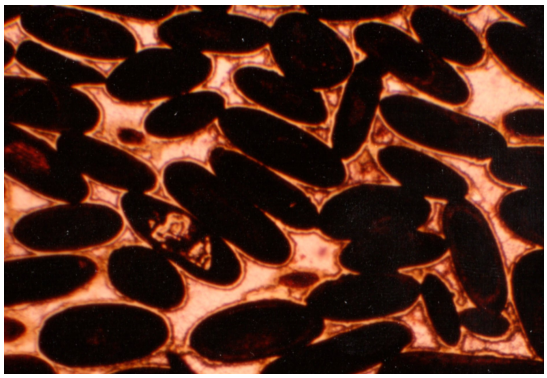
[1]Leitz parent company, in Germany.

- neither the Director of CMM,
- nor the Director of School of Mines,
- nor the Director of Mines department, at the Ministry of Industry,
- nor the Minister of industry,
- nor the Minister of budget,

were authorized person to register the patent. Fortunately, this was entering the prerogatives of the Minister of Finance, so that for any question, we just had to follow the hierarchical way, i.e. the whole series of the above steps.

Finally, the patent was registered by ARMINES the non profit organization in charge of the contracts at School of Mines. It was the only tractable solution, though ARMINES was completely external to the affair. During ten years, Leitz succeeded in marketing the system, and greatly contributed to the diffusion of mathematical morphology in metallography, biology, and medicine (pathological anatomy, cytology)

Inauguration The inauguration of Fontainebleau campus occurred in 1969 and was a great moment. The prototype of texture analyzer was just finished, and our bosses presented it as the tangible, indubitable, proof that woolly-minded research could lead on perfectly concrete outputs, which, moreover appealed to the German industry.



Thin section of iron ore used for the inauguration

Klein, Gauthier, and I were waiting near the prototype. A thin section of iron ore was placed under the microscope, and visible on a TV monitor. The device, a massive metallic cube with a keyboard, was equipped with thirty counters, each of them having six red diodes. After some time, we heard the confused noise of a torrent of mud coming from far away, and the flow entered. In less than one minute, forty persons invaded the lab like a viscous fluid, whose maximal viscosity turned around the Minister of Industry.

My comments : *On the TV monitor, we can see oolithes of iron ore. They are surrounded by a crown of chlorite. The thicker it is, the poorer the ore. And today, for the first time, on can quantitatively estimate the thckness of the crown. As you will see now.*

At that very moment, a ministerial attaché put his foot on the cord of the device, and all the vibrating red diodes suddenly became black. I did not notice anything, but Gauthier rapidly re-plugged in the analyzer.

The thirty counters became red again and displayed thirty series of six zeros, immediately replaced by thirty random numbers, sent by Klein from the keyboard. Meanwhile, I was explaining the hole effect on cross-covariances, to conclude:

My comments : *It thus suffices to compute the difference between the counter of the maximum and its neighbors for getting the result, here it is between counters seven and eight, as you can see.*

A long silence followed, broken by the Minister, who set the question

Minister : *In which units are these measurements expressed?*

My answer : *in ten power minus six, sir.*

The Minister seemed to appreciate, turned on his heel, and went away, followed by the flow.

The adventure of CMM had begun ...