

LMC, EPFL, August 20th 2018

Brief Look back into the History of LMC

Prof. Dr. Dr. h.c. Folker H. Wittmann

EPFL, ETHZ, Tongji, and QUT

Founding of the first Laboratory

1918



Dr. Henri Demierre

Electro-chemiste and
Secretary of the Engineering School



Prof. Marius Lacombe

Mathematics and Geometry,
Director of the Engineering School

View of the First Laboratory 1918



Professor Jean Bolomey

1927-1949



He graduated at the Engineering Institute Lausanne (EIL) in 1904 and worked first in leading positions on different construction sites such as Rickentunnel and power stations such as Barberine and Vernayaz.

In 1927 he was nominated Professor for Railway Constructions and Building Materials.

He became famous in concrete technology after having established a relationship between water to cement ratio and strength of concrete

$$R_c = K \left(\frac{C}{E} - 0.5 \right)$$

Professor Jean-Pierre Daxelhofer

1949-1972



Daxelhofer created the “Laboratoire des Matériaux pierreux”.

During this period many large dams and wide span bridges for the highway system were built. His main task was to support construction industry by consulting and by materials testing.

Just one example: concrete of a large highway bridge did not harden. He solved the problem.

The laboratory served mainly as standard testing laboratory.

Prof. Jean-Pierre Delisle

1974-1978



He first worked for three years in the laboratory under Jean-Pierre Daxelhofer, followed by a period of stays in England, Germany and France.

He played an important role during the formation of the Materials science department at EPFL.

He was an excellent teacher and his lecture notes were used by several colleagues for a long time.

He died too early.

Folker H. Wittmann

1980-1989

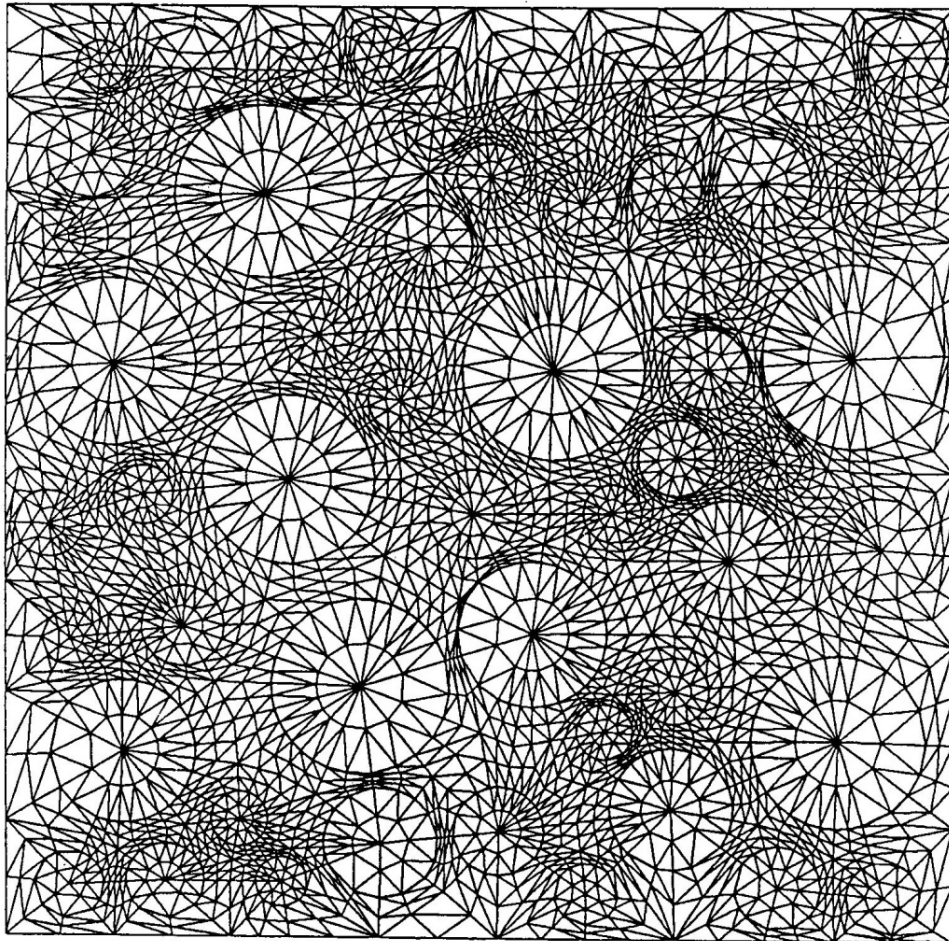


I was Assistant Professor at Munich University and Full Professor at Delft University, The Netherlands, before coming to Lausanne.

When I arrived at LMC in Lausanne there existed two groups:
One was concentrating on materials testing with **Fermin Alou** as leader.
The second was working on conservation of stones (conservation de la pierre) with **Vinicio Furlan** as leader.

The Third Group

My task was to set up and further develop a third group of young scientists, all active in materials science and research:



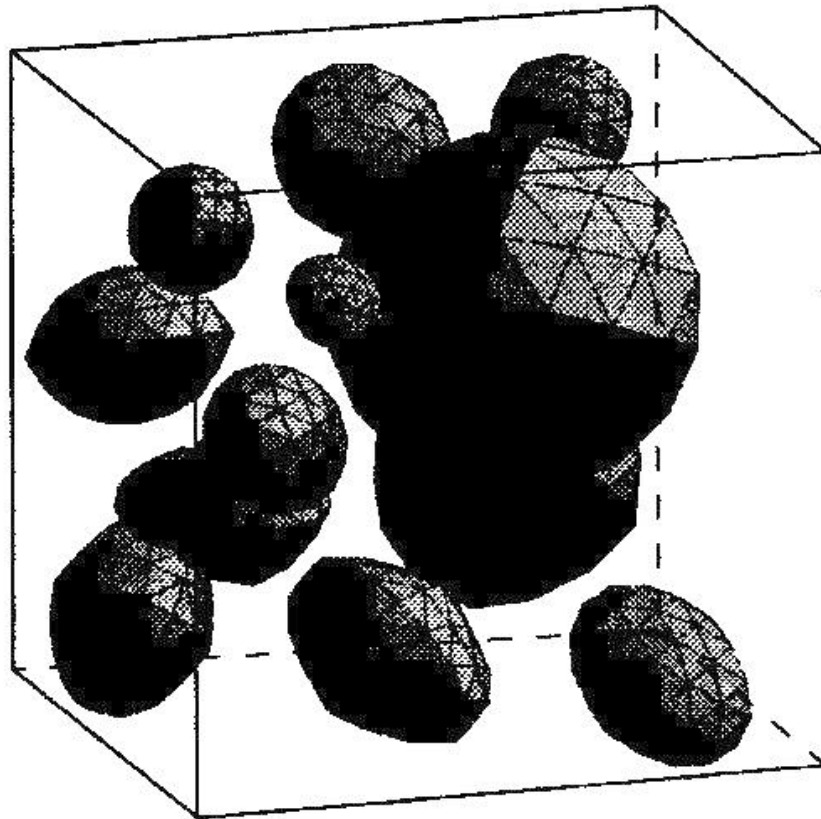
First Example:

Numerical Concrete, le béton numérique

- P. E. Roelfstra
- H. Sadouki

Moisture movement, shrinkage, thermal stress and crack formation could be studied in detail for the first time with this model.

The Third Group



The 2D numerical concrete has later been extended to 3D numerical concrete

- T. Hörsch

This allowed us to take the composite structure of concrete into consideration under load, during drying and under thermal gradients.

The Third Group

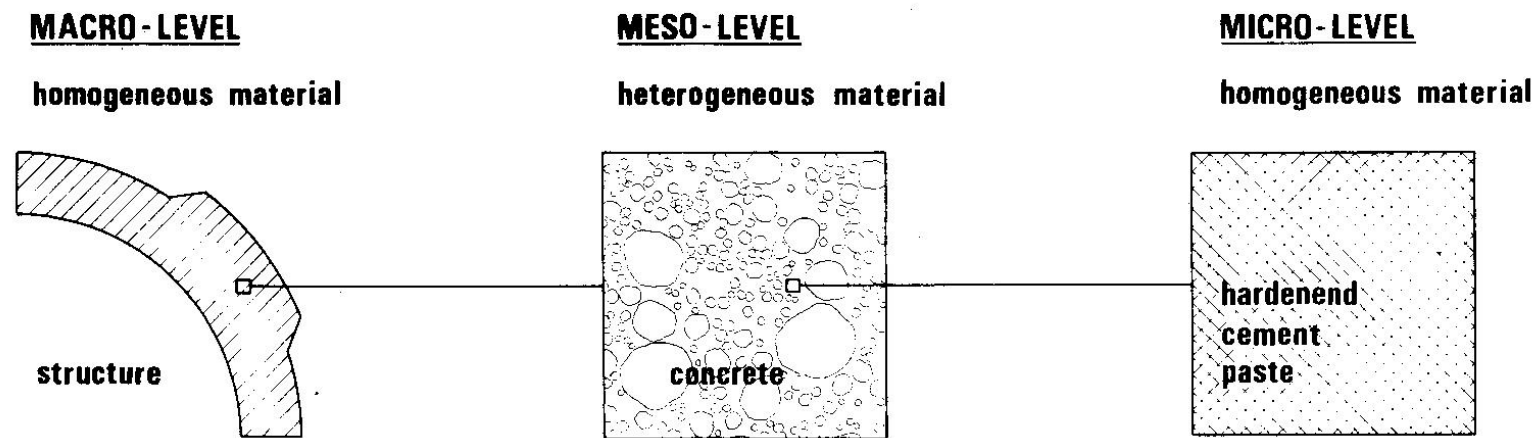
Second Example:

3L-Approach (P.E. Roelfstra and C.L. Kamp)

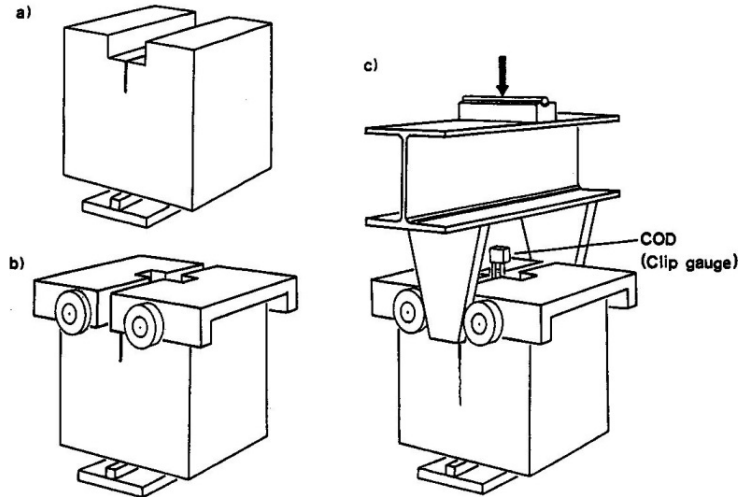
Properties of hardened cement paste are described on the micro-level.

Resulting properties are introduced into the numerical concrete, meso-level.

Material laws are obtained on the macro-level.



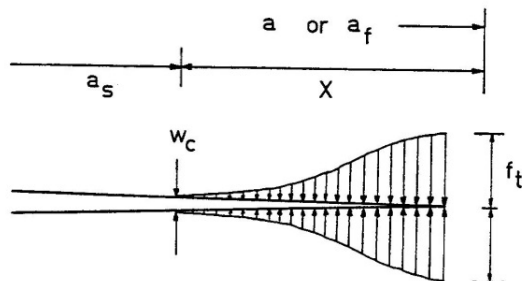
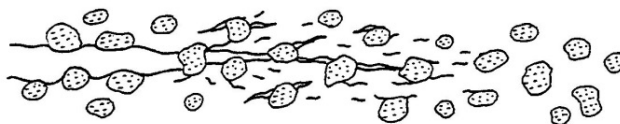
The Third Group



Third Example: Fracture Mechanics A.) Wedge Splitting Test

- *Eugen Brühwiler*

This method has been cited hundreds of times by now and it is still widely applied.

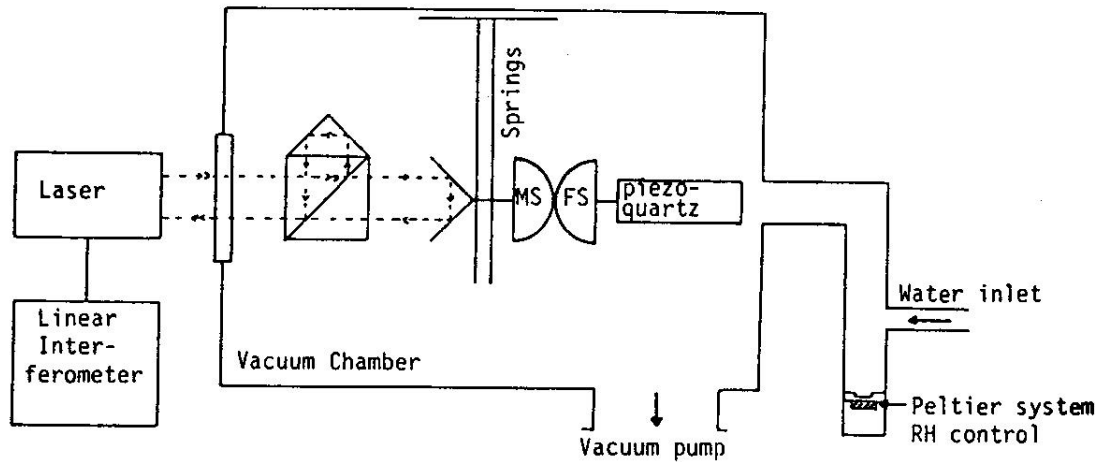


B.) Fracture Energy and Fracture Process Zone

- *Xiaozhi Hu*

The fracture process zone was studied numerically in detail; size effect.

The Third Group



Fourth Example:

Disjoining Pressure and van der Waals force

- C. F. Ferraris

Influence of adsorbed water films on shrinkage and creep and also on strength of hardened cement paste and concrete could be explained and quantified.

Third Group

Close international cooperation was set up with outstanding American colleagues such as Zdenek Bažant and Paulo Monteiro with Japanese colleagues such as H. Mihashi, K. Rokugo, and K. Iriya with Chinese colleagues such as X. Z. Hu and K. Duan

Third Group

- In 1985 I was invited to present a condensed course for four weeks on “Building Materials Science” at Tongji University, Shanghai.
- One year later I was nominated Professor of Tongji University.
- Close contacts still exist.

Third Group

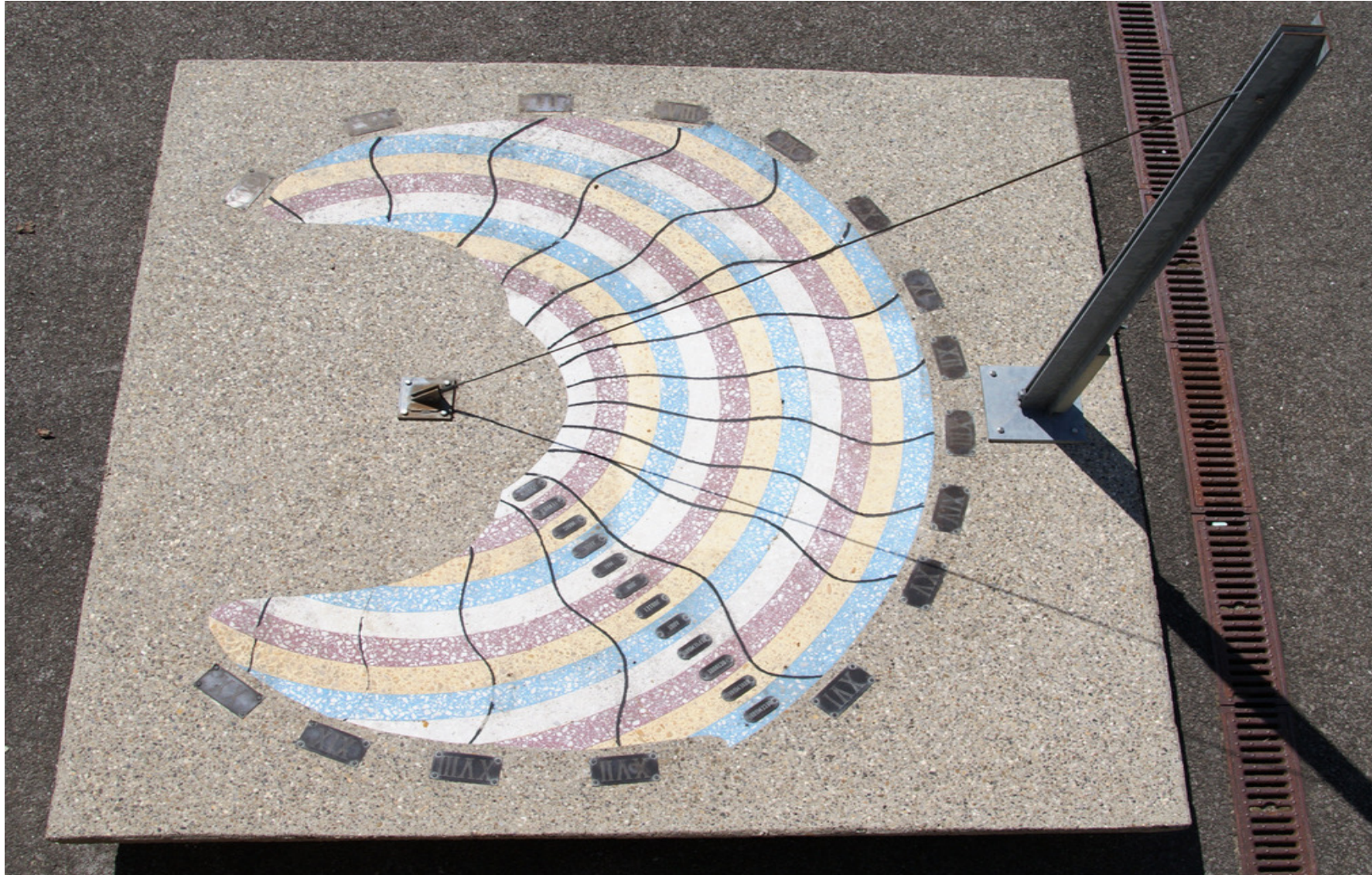


1. Example: La voute fameuse

But, we have not only worked on sophisticated fundamental research!

Une construction en argile, pour étudier la résistance et la vie de service dans le climat suisse.

Third Group



2. Example: le cadran solaire sophistiqué, made of colored concrete

Third Group

We organized numerous workshops, seminars, and international conferences, once with more than 1000 participants, as for instance:

- Fracture Mechanics of Concrete
- Creep and Shrinkage of Concrete Structures
- Structural Mechanics in Reactor Technology (SMiRT-9)

By the way, all meetings were opened with a concert, presented by members of LMC. Mr. Prim par example.



Final Remarks

- It was a great pleasure for me to work with highly motivated persons at LMC of EPFL.
- Many of the PhD students and of the guest researchers found later attractive positions in other universities or research institutes.
- Final Question: Was it wise to leave this position so early?