Molecular and Physical Gastronomy
30 June 2021

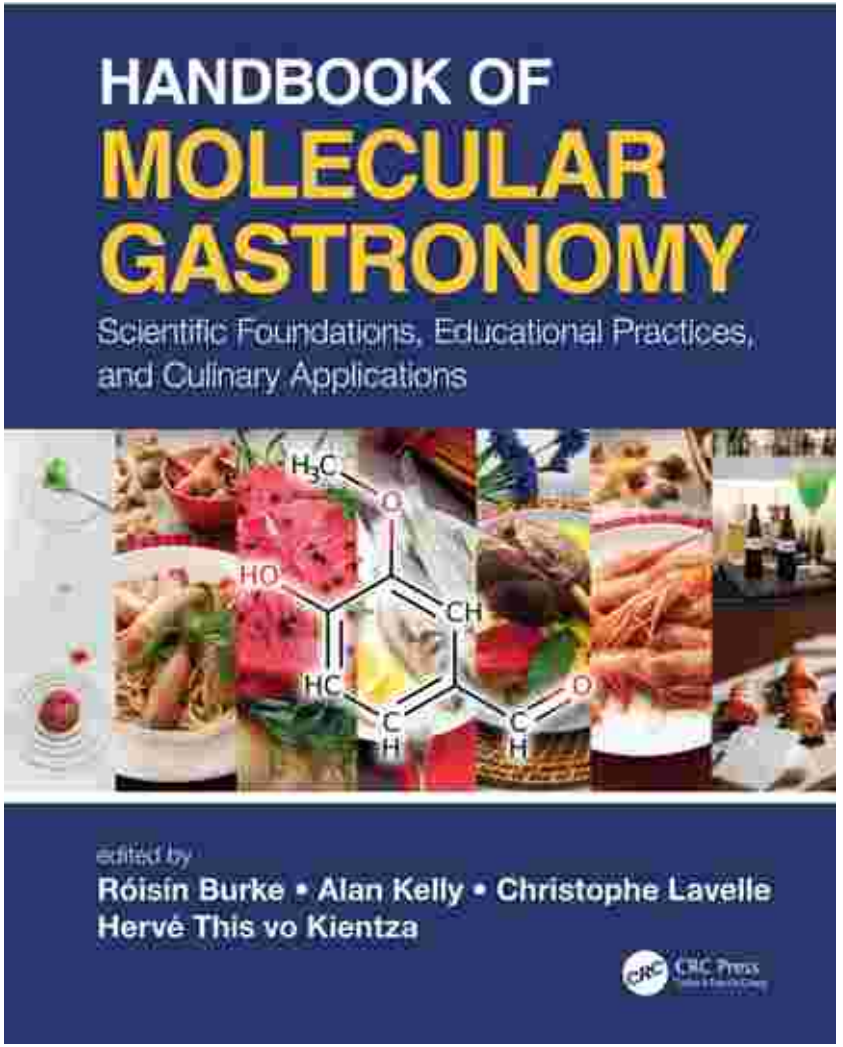
Science, Educational practices and Culinary Art

AgroParisTech

INRAE
science for people, life & earth

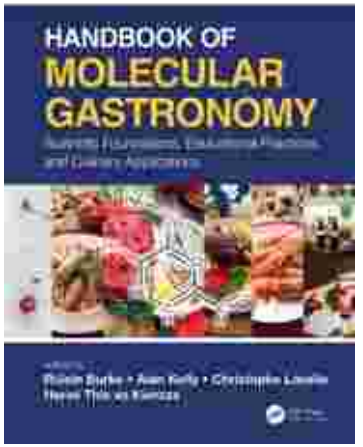
An adress by Her Excellency the Ambassador of Ireland in France

Here is a new link between us



HTvK

Three parts



1. Scientific research (molecular and physical gastronomy)

2. Educational practices

3. Applications to culinary art (« edible ideas »)

What is molecular and physical gastronomy ?

A good example

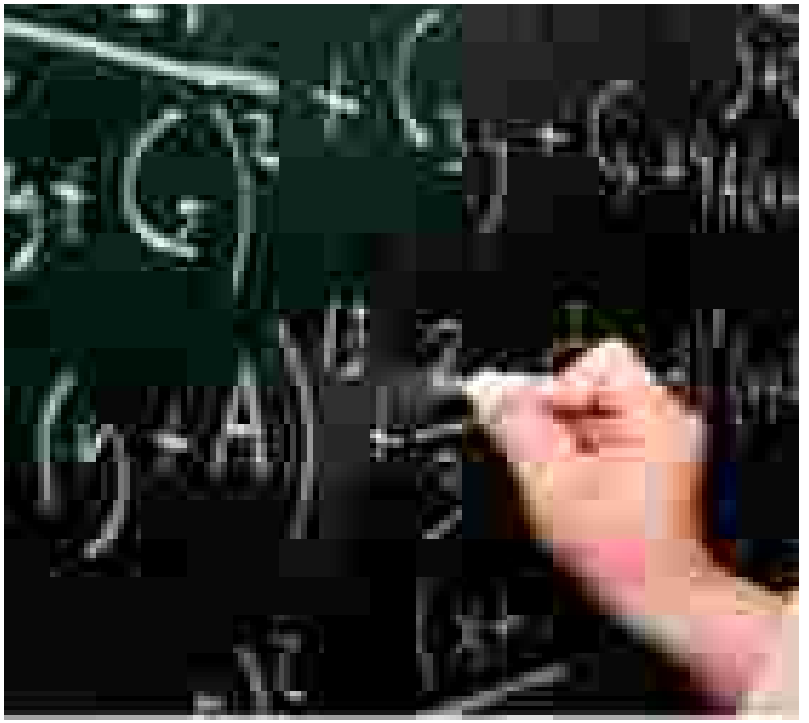
Sciences of nature: looking for the mechanisms of phenomena

A first pillar: experiment !

- "A good way to reach the truth is to **prefer experiment to any reasoning**, because we are sure that, when a reasoning disagrees with experiment, it contains an error, at least hidden. Indeed it is not possible that a sensible experiment can be opposed to the truth. And this is a principle that Aristotels was praising, and whose strength and value are much over those that are based on the authority of any man in the world''
- Galilée (1564-1642)

A second pillar: calculation

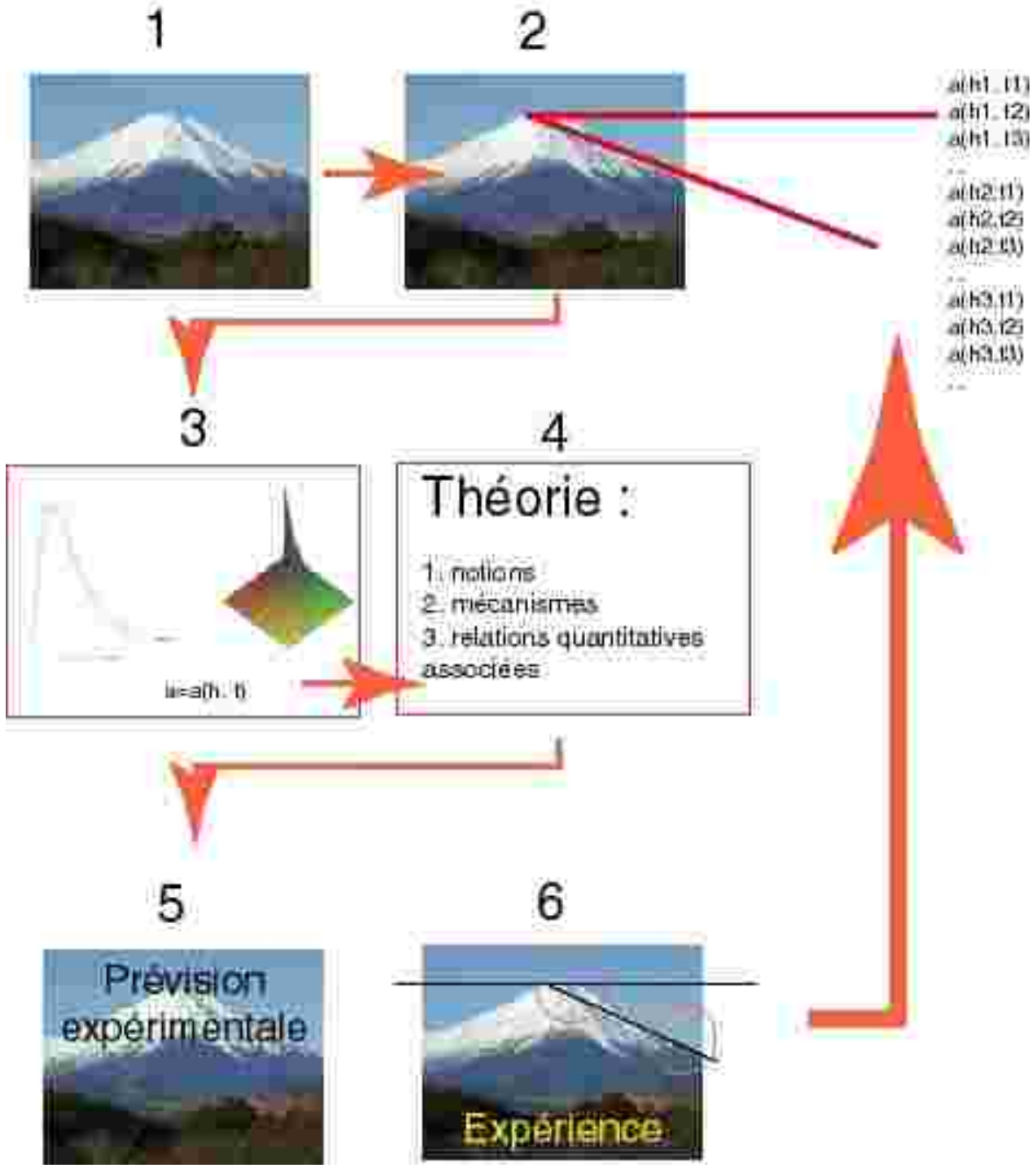
"Philosophy [nature] is written in that great book which ever is before our eyes -- I mean the universe -- but we cannot understand it if we do not first learn the language and grasp the symbols in which it is written. **The book is written in mathematical language,** and the symbols are triangles, circles and other geometrical figures, without whose help it is impossible to comprehend a single word of it; without which one wanders in vain through a dark labyrinth."



Francis Bacon (1561-1626)

‘’every thing to do with natural phenomena, be they bodies or virtues, should (as far as possible) **be set down, counted, weighed, measured and defined**. For we are after works not speculations, and, indeed, a good marriage of Physics and Mathematics begets Practice’’

A view of the method of sciences of nature.



Remember our goal!

There are too many interesting questions !
Which one should we choose ?

-Photosynthetic pigments as being transformed during the thermal treatment of plant tissues

- Release of proteins during animal tissue thermal heating in aqueous solutions
- Green chemistry : thermal treatment at 100°C in aqueous solution of organic compounds from « food »
- Modification of the color of saffron processed in aqueous solution, with or without light
- Distribution of estragole in the various compartments (water, oil, gas, animal tissues) during a culinary recipe
- Extraction nutriments from plant tissues
- Is the coffee beverage from the inside of seeds different from the internal part ?
- Why apricots appear sourer after thermal treatment (31P NMR spectroscopy) ?
- Differences between wines thermally processed at low or high heating power
- « Freshness » of yogurts : an influence of the microstructure ?
- Exchange between plant tissue and aqueous solution during thermal treatment

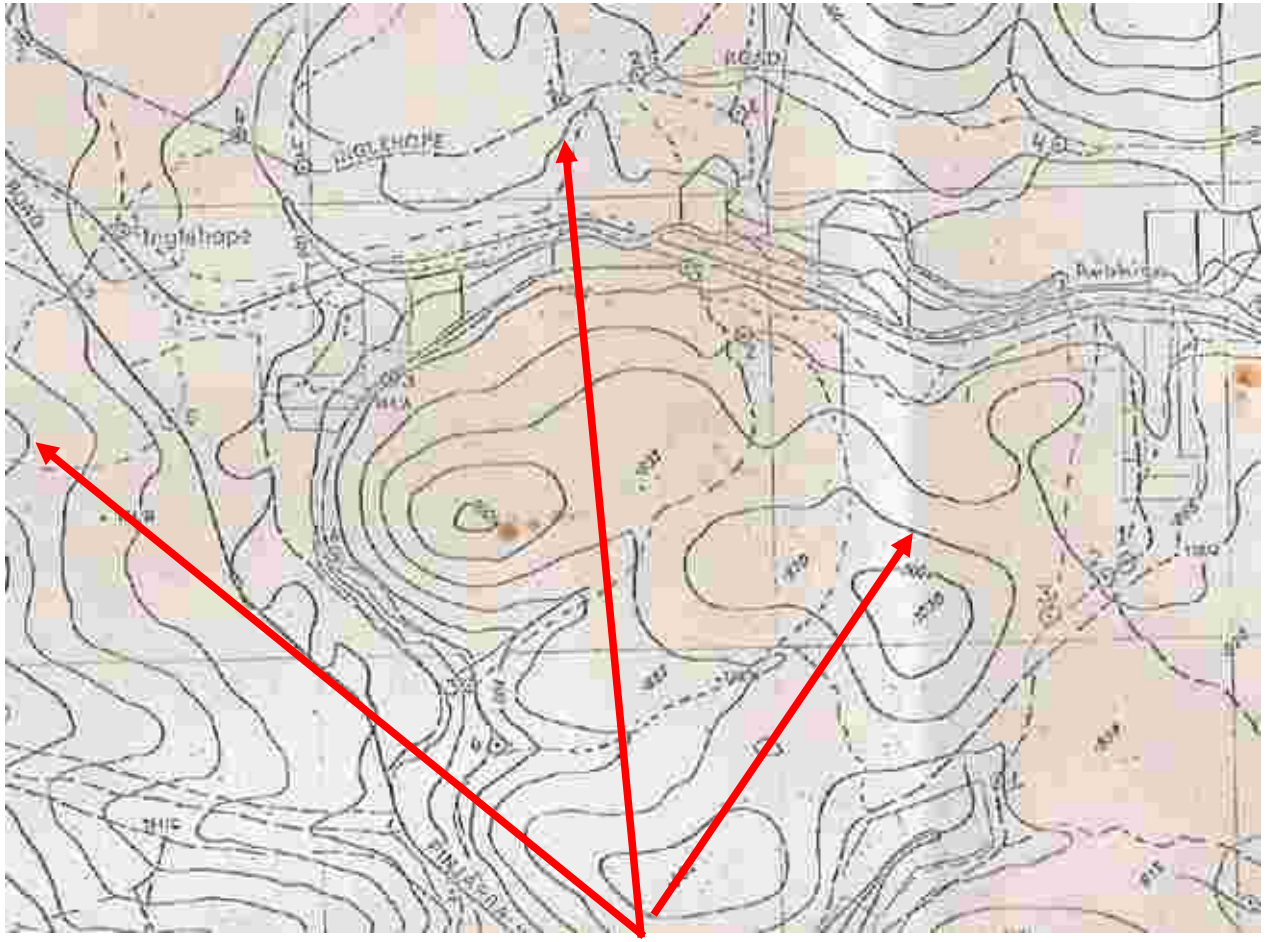
...

The issue of scientific strategy (Where is there a montain?)

Behind us

In front of us

Which direction should we use ?



Methods, instead of directions ?

A list (to be augmented, please)

(1) Transforming adjectives and adverbs into quantitative parameters (introduction of new concepts);

(2) Looking for the mechanisms of phenomena;

(3) Focusing on oddities, contradictions, discrepancies and "symptoms";

(4) Designing "microscopes";

(5) Making science from a technical question;

(6) Refuting a theory;

(7) Solving a problem;

(8) Assuming that any fact, result, observation, phenomenon should be considered as a particular example of general categories that we have to invent;

(9) Looking behind the "ordinary": this means not accepting what was accepted;

(10) Making the contrary of what was always proposed;

(11) Looking deeply enough to what an experiment can reveal, and work deep enough to see the impact.

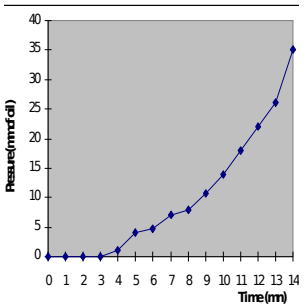
(12) It is good to see the tree but one should also see the forest

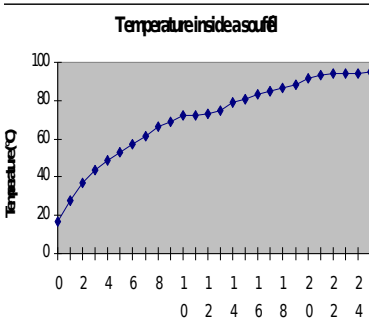
Which ones are missing ?

So that :

Les bulles d'air se dilatent

P V = n R T





L'eau s'évapore

Etc.
Ad infinitum

1988 : creation of Molecular and Physical Gastronomy

« Molecular and Physical Gastronomy is the scientific exploration (looking for the mechanisms) of phenomena that occur during culinary processes (« cooking »). »

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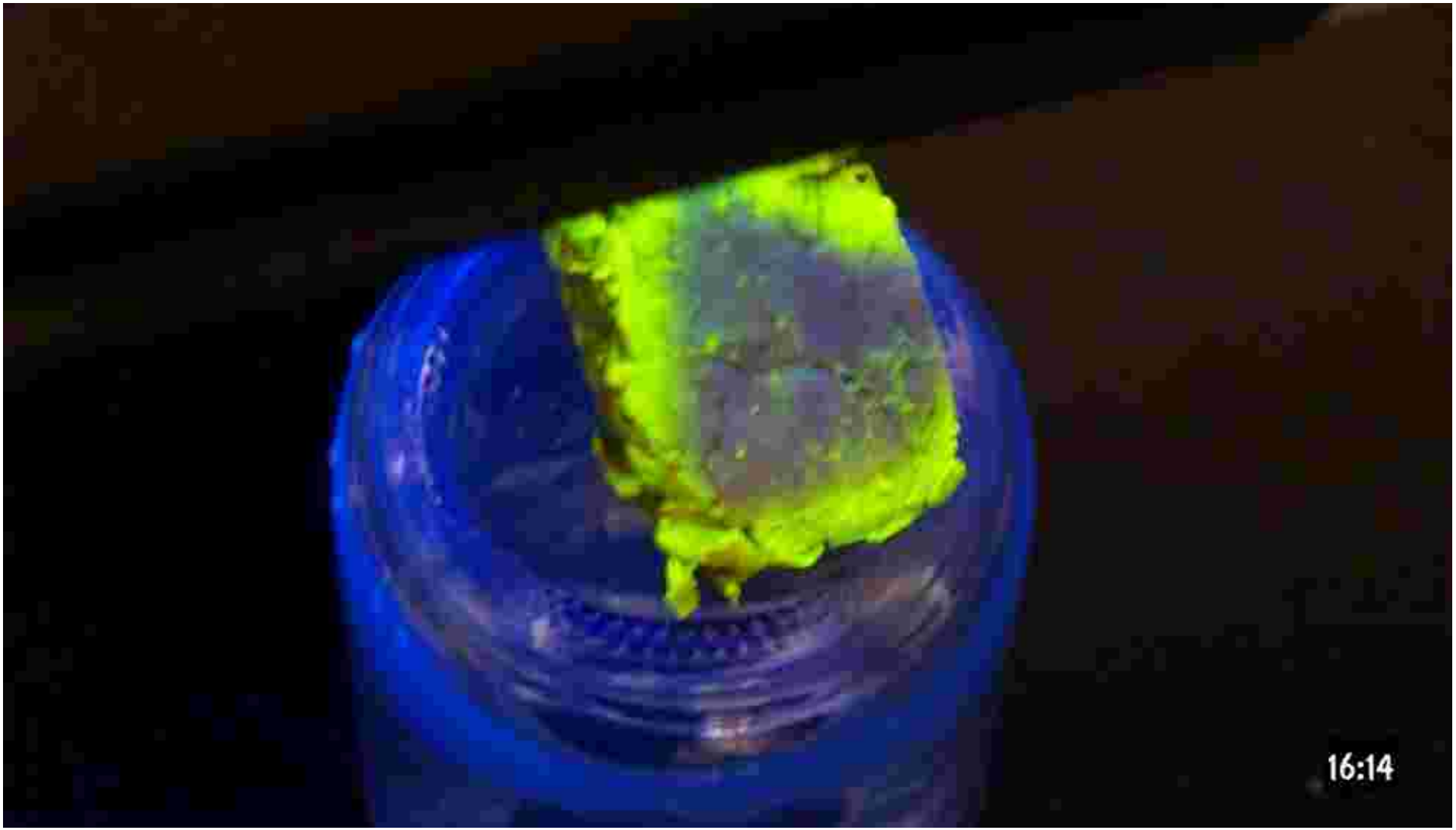
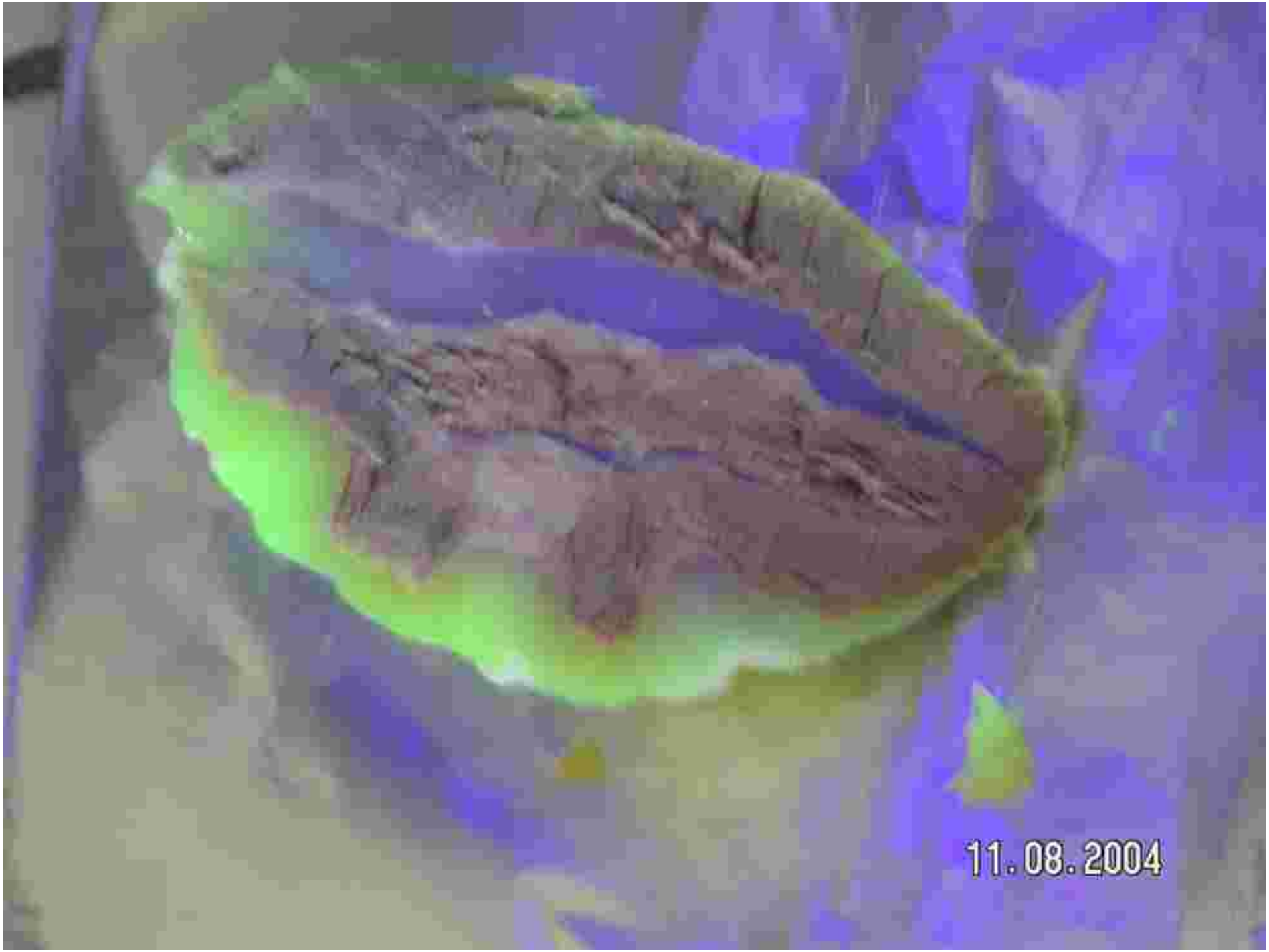
Only one example marinades



The question is « How ? »



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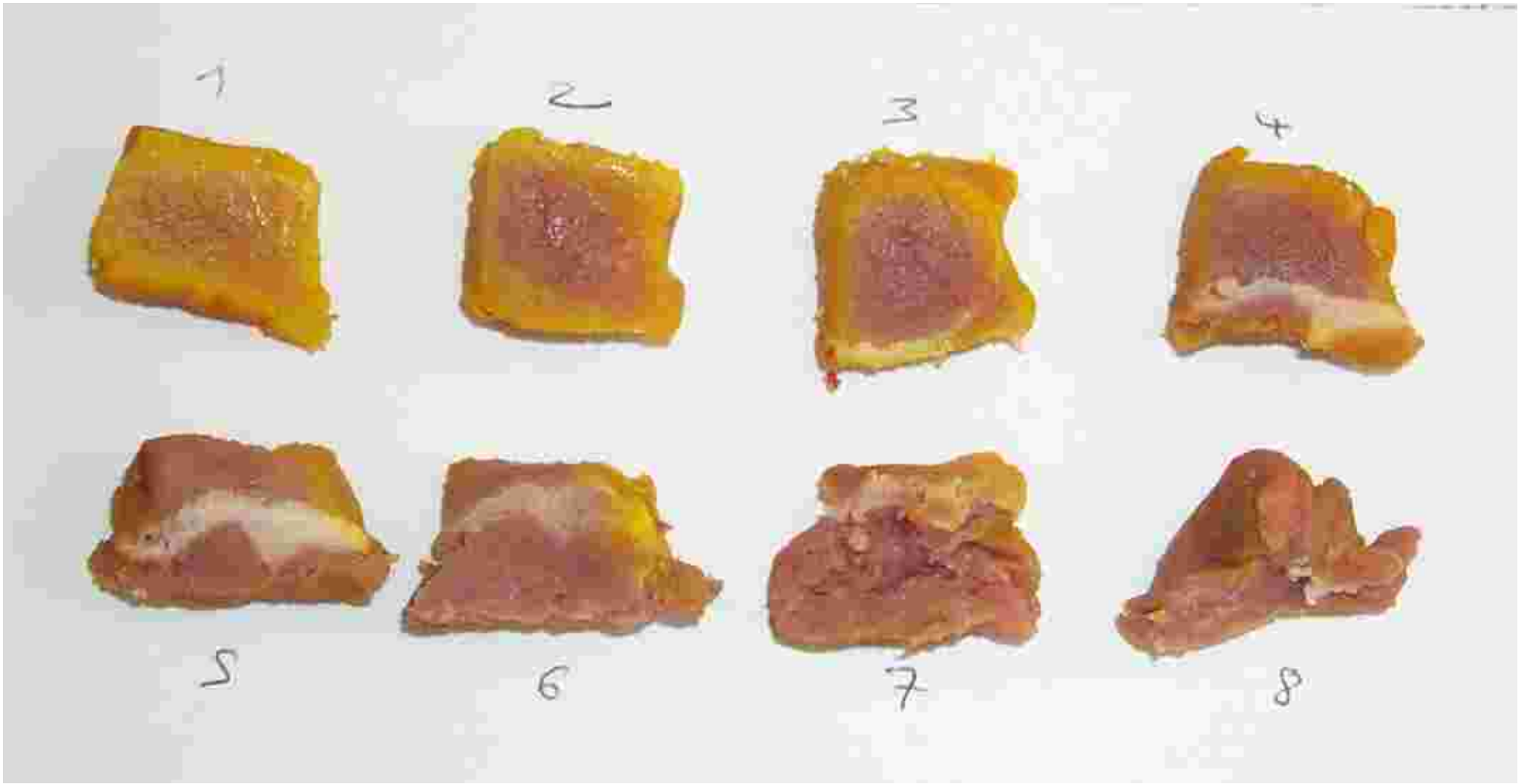
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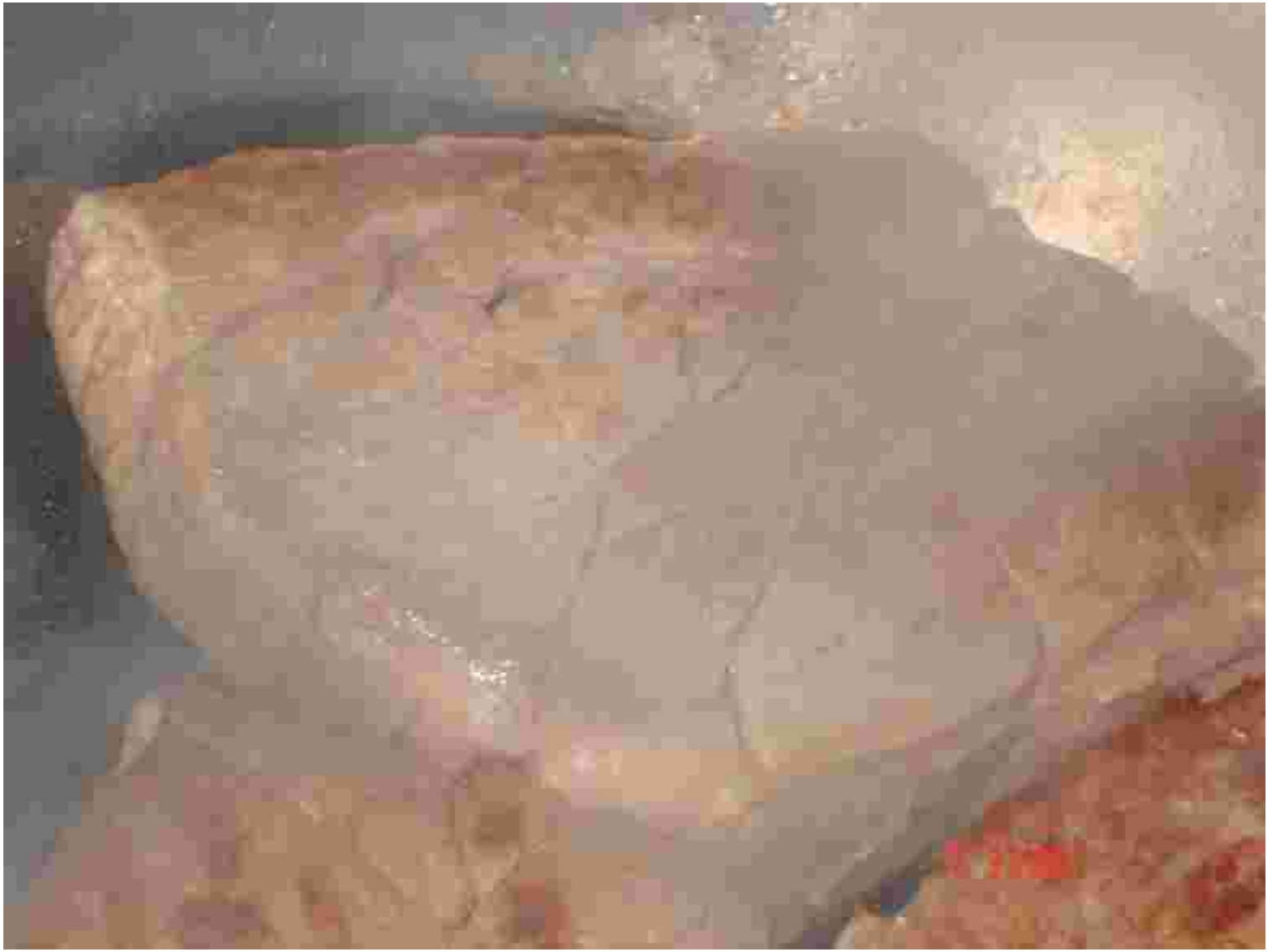
The question is « How ? »

Gallus gallus, 30 min, 100 °C, $CuSO_4$

The question is « How ? »

Bos taurus, 300 °C, 7 min

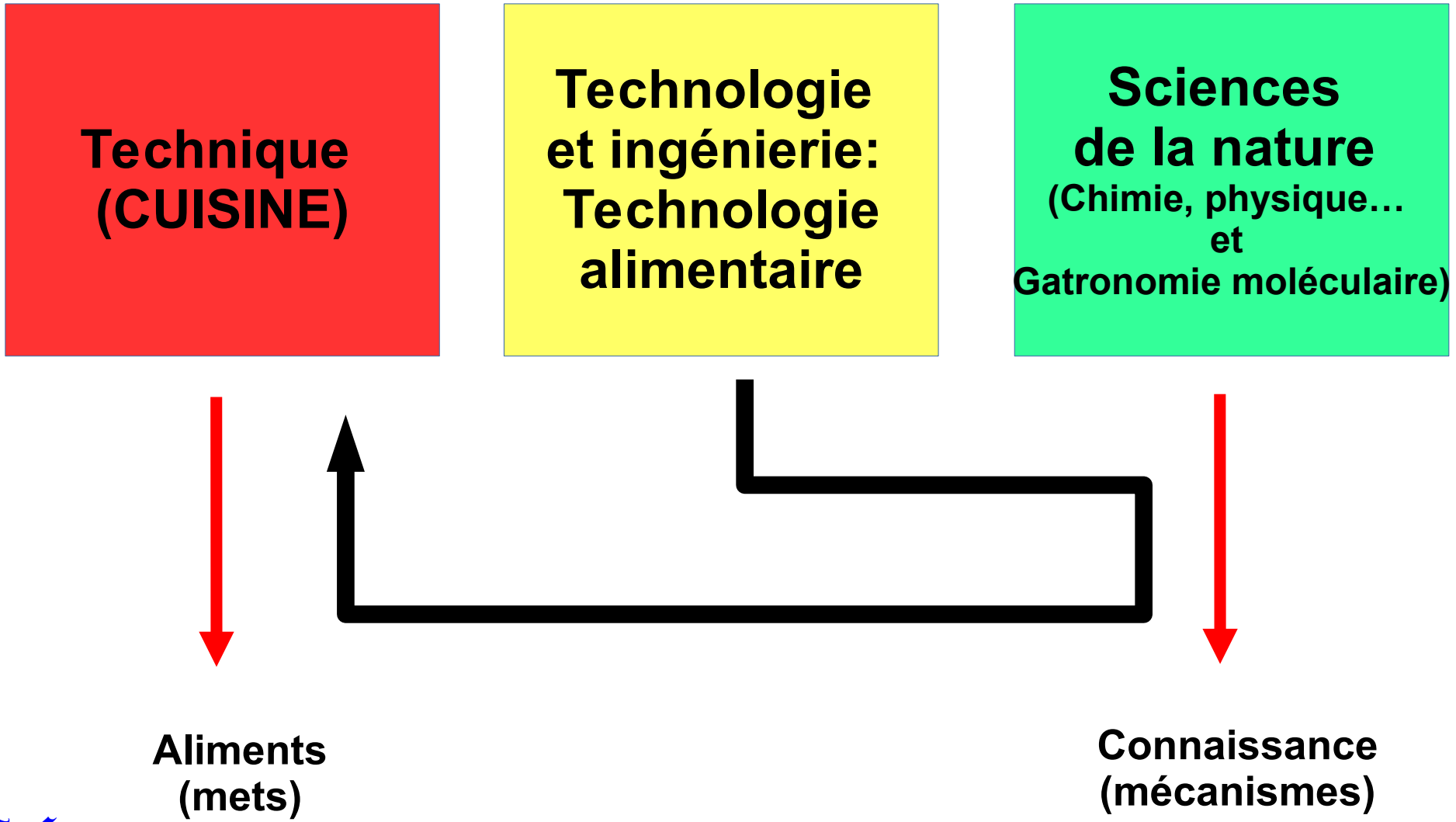


The question is « How ? »

Retraction of pate a foncer

Retraction of puff pastry

Technique, technology, science



The fruit is not the tree

Funny to see how much techology there is, and how few science !

Bioactive compounds of beetroot and utilization in food processing industry: A critical review

Exploring the impacts of postharvest processing on the aroma formation of coffee beans – A review

Phenolic compounds and antioxidant activities of tea-type infusions processed from sea buckthorn (Hippophaë rhamnoides) leaves

Chloroplast-rich material from the physical fractionation of pea vine (Pisum sativum) postharvest field residue (Haulm)

Characteristics of flavonol glycosides in bean (Phaseolus vulgaris L.) seed coats

Wine production using free and immobilized kefir culture on natural supports

Variations in chlorophyll and carotenoid contents and expression of genes involved in pigment metabolism response to oleocellosis in citrus fruits

Use of a smartphone for visual detection of melamine in milk based on Au@Carbon quantum dots nanocomposites

Physicochemical properties and phenolic content of honey from different floral origins and from rural versus urban landscapes

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Our program today

Session 1, chairperson Alan Kelly

14.15-14.35 : Sugars: Soft Caramel and Sucre à la Crème – an Undergraduate Experiment about Sugar Crystallization, by Irem Altan, Patrick Charbonneau, Justine de Valicourt

14.35-14.55 : Dehydration in the kitchen, by José Miguel Aguilera

Session 2, chairperson Roisin Burke

14.55-15.15 : Meat tenderness and its evolution during cooking, by Jean-François Hocquette and Alain Kondjoyan

15.15-15.35 : Sourdough, by Mark Traynor and Imran Ahmad

Tea Break (or coffee, or rather Cremant from Alsace)

Session 3, chairperson Christophe Lavelle

15.45-16.05 :Food Innovation from traditionsA satellite educative trip from Paris-Beirut-Doha to Montpellier, by Reine Barbar

16.05-16.25 : Note by Note Cooking, by Dao Nguyen and Pasquale Altomonte

16.25-16.45 : Questions, Comments, Discussion, Follow up with the third event (September 8th).

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Education

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For example, in primary schools

2001

2021

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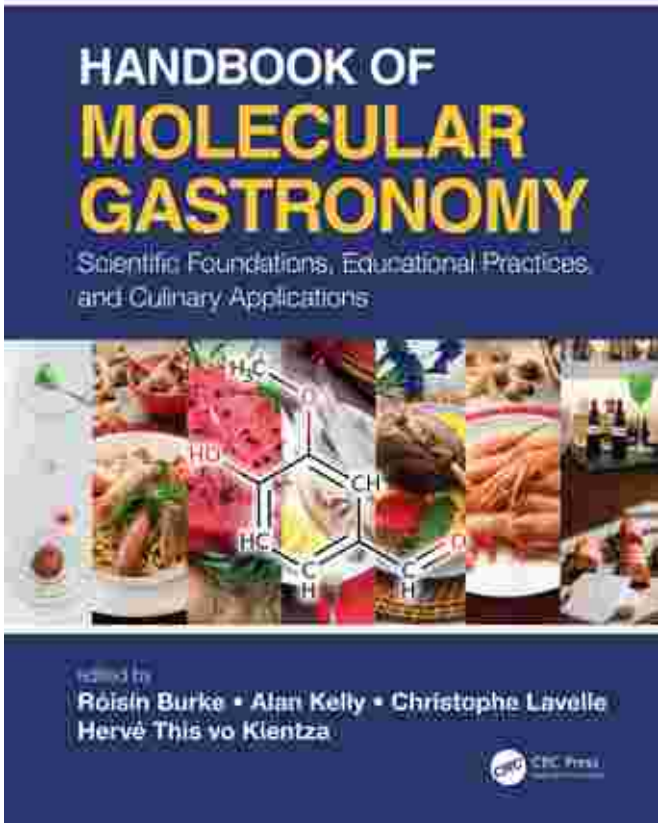
For cooking

Priestley

2021 :
a friendly community



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2021 : and the number of groups of research is growing

Now, every year : the International Workshops on Molecular and Physical Gastronomy

10 th
International Workshop
on Molecular and Physical Gastronomy
(IWMPG 10)

1-3 June 2021

For connection:
https://eu.bbcollab.com/guest/

Suspensions
(liquid suspensions, solid suspension
complex suspensions)

INRAE ICMPG

A tool for the activities of our community
(don’t be shy, send manuscripts)

In the Int J Mol Phys Gast

The content of this Journal

1. Editorials : http://www.agroparistech.fr/-1-Editorials-.html

2. Science Section : http://www.agroparistech.fr/The-Scientific-Section.html

3. Letters to the Editors : http://www.agroparistech.fr/Letters-to-the-Editors.html

4. Publications by University students :

5. Educational Applications of Molecular Gastronomy :
http://www.agroparistech.fr/Educational-Applications,2207.html

6. Technological Applications of Molecular Gastronomy :
http://www.agroparistech.fr/Technological-Applications,2211.html

7. Comments : http://www.agroparistech.fr/Comments,2213.html

8. News :http://www.agroparistech.fr/In-Brief,2209.html

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Celebrate knowledge and gourmandise!

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