

Molecular Gastronomy

Molecular Gastronomy – Study-Based Notes

1. Definition & Scope

Aspect	Description
What it is	The scientific investigation of the physical and chemical transformations that occur during cooking.
Goal	To understand why ingredients behave the way they do, and to use that knowledge to create new textures, flavors, and dining experiences.
Key Disciplines	Food chemistry, physics, microbiology, sensory science, and culinary arts.

2. Historical Milestones

Year	Event	Significance
1960s-70s	Early work by Harold McGee (e.g., <i>On Food and Cooking</i>)	Laid the foundation of food science for chefs.
1988	Publication of “ Molecular Gastronomy ” by Hernán Gómez (Spanish)	Coined the term.
1992	Heston Blumenthal opens The Fat Duck (UK)	First restaurant to systematically apply scientific techniques.
1997	Ferran Adrià launches El Bulli (Spain)	Popularized avant-garde techniques (espuma, spherification).
2000s	Spread to mainstream (e.g., Molecular Cuisine books, TV shows)	Techniques become accessible to home cooks.

3. Core Scientific Concepts

Concept	Principle	Culinary Application
Emulsification	Mixing immiscible liquids (oil & water) using surfactants.	Mayonnaise, vinaigrettes, foams.

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Gelation	Formation of a 3D network that traps water.	Agar?agar gels, gelatin desserts, pectin jams.
Gelatinisation	Swelling of starch granules in hot water.	Thickened sauces, custards.
Denaturation & Coagulation	Protein unfolding and re?binding due to heat, acid, or enzymes.	Egg?based foams, sous?vide meats.
Caramelisation & Maillard Reaction	Non?enzymatic browning that creates flavor compounds.	Crust formation, roasted coffee.
Phase Transition Control	Manipulating solid?liquid?gas equilibria (e.g., freezing point depression).	Liquid nitrogen flash?freezing, flash?gelatin.
Spherification	Calcium?induced gel membrane around a liquid core.	Caviar?like pearls, “caviar” of fruit juices.
Foam & Espuma	Stabilizing air bubbles with surfactants (lecithin, gelatin).	Air?infused soups, flavored foams.
Sous?vide	Precise low?temperature water bath (typically 55?85?°C).	Uniform doneness, texture retention.
Flash Freezing	Rapid cooling (liquid N?, CO?) to form micro?crystals.	Sorbets with smooth mouthfeel, “ice?cream” powders.

4. Frequently Used Ingredients & Tools

Ingredient	Function	Typical Dosage (per 100?ml)
Agar?agar	Strong gel, high melting point	0.5–2?g
Xanthan gum	Viscosity enhancer, stabilizer	0.1–0.5?g
Sodium alginate	Forms gel in calcium	