Engineered Cajun & Creole

First you make a roux. *Then you measure it.*

The trinity, the dark roux, cayenne laddered to a number, and the deep Creole savor — Louisiana's great pots designed on purpose, and every plate scored on the eight axes.

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Opening essay · The roux and the river

There is a sentence that opens half the cookbooks of Louisiana, and it is an instruction given like a prayer: *first you make a roux.* Flour and fat in a heavy pot, a wooden spoon, and the better part of an hour you are not allowed to leave — the color walking slowly from cream to peanut to penny to the deep red-brown of an old saddle, and the whole kitchen filling with a smell like toast and earth and something almost like coffee. We are a family of plant people who have stood over that pot in borrowed kitchens on both sides of the state, Cajun country and Creole city, and what we learned there is the thing this whole book was built to measure.



The hour before service, where every pot in this book begins — the question that became our kitchen was first asked at a table like this one.

Because the roux is not seasoning. It is savor, *made* — the Maillard reaction unspooling as the flour browns, hundreds of new molecules at once, and underneath them the quiet pull of glutamate finding mGluR1, the receptor that tells the body *here is nourishment, lean in.* For three hundred years a cook could chase that signal only by the color of the spoon and the ache in the arm. We can now grow it, read it, and place it exactly. The tomato that goes into a Creole sauce can be restored to **IFI-U 2,600**, roughly three times the free glutamate a century of shipping-first breeding left in the supermarket fruit. The cayenne can be laddered to a number instead of a wish. And the dark roux, which lives one careless minute from bitter, can be met with a garden tuned so that depth arrives without the scorch.

Everything in this book rests on the Iyengar Flavor Index — eight axes, one for each pathway through which a plant speaks to the body, each a single number built from one honest measurement. The measurement is EC_{50}: the concentration at which a stimulus drives its receptor to half of full response. A low EC_{50} means the receptor answers to very little; the compound is *loud.* Invert it against a fixed reference, scale by a thousand, and loudness becomes a score a cayenne, a tomato, and a cup of chicory coffee can all be read against on one page.

> $IFI(c) = 1{,}000 \cdot EC_{50}(\text{ref}) \,/\, EC_{50}(c)$

Heat through TRPV1, the savory floor through mGluR1, the sharp lift of mustard through TRPA1, the body you feel but cannot taste through the calcium-sensing receptor, the cool of mint through TRPM8, the tannin grip through the salivary proteins. Eight channels, eight numbers. We did not build the Index to replace the poetry of a Louisiana table — nothing replaces the hush when the gumbo is finally right. We built it because you cannot design what you cannot measure, and we had decided to design flavor on purpose. Every plate that follows carries its readout, so you can taste the intention and read it in the same breath.

Two cuisines share this book because they share a state and almost nothing else. *Cajun* is country cooking — the one-pot food of the Acadians, French Catholics driven out of Nova Scotia in 1755, who landed in the bayou prairies of south Louisiana and cooked what the land gave them: rice, the pig, the crawfish in the mud, a dark roux built from lard and whatever flour there was. *Creole* is city cooking — New Orleans itself, where French technique met Spanish, West African, Haitian, and Caribbean hands and pantries, and the tomato arrived through the port to stain the sauces red. Cajun runs brown and rural and built on the pot; Creole runs red and urban and built on the sauce. We write them side by side because the Index reads them both: the same eight axes, two different chords. Each axis is normalized to a scorecard maximum of 5,000, so a profile can be drawn as a radar and a cayenne, a tomato, and a cup of chicory can all be laid on one page without any of them running off the edge.

A word about who is at this table, because it runs under every recipe. We do not eat meat, and we never have. We came to Louisiana the way we come to every table we did not grow up at: with the garden in our hands and real reverence for what the people we love most put on their own plates. So the vegetarian dishes here are written from the inside, un-apologetic and whole — a *gumbo z'herbes* that was always its own tradition, long before anyone needed a reason to leave the meat out; red beans that need no hock to sing. And the crawfish, the shrimp, the andouille and the oyster are written with that same care, head-on, never as a thing to be sorry for and never as a thing imitated. This is a book about feeding a long table of very different people from one slow pot — the cousin chasing the top of the heat ladder, the child who wants none of it, the grandmother who wants depth without the burn. That is the oldest thing a family does. We only learned to do it on purpose, and to write down the numbers so you can do it too.

The chapters move the way a Louisiana meal is actually built: first the grammar of the pot — the trinity, the roux, the heat, and the molecular machine that lets us grow heat to a number — then the savory foundations that carry a vegetarian pot as far as any stock ever carried a meat one, then the great pot dishes, the Creole table, the sweet and bitter and botanical end of the night, and finally the whole thing laid out as data, so a formulator or a chef can cook any plate in this book twice and taste the same dish both times. Pour a cup of coffee. The roux takes forty-five minutes, and we are not allowed to leave it.



PART I OF VI

The Grammar of the Pot

the trinity · the dark roux · cayenne on TRPV1 · the molecular machine

Chapter 1 · The Holy Trinity — *onion, celery, bell pepper, and the pope.*

Before the roux is dark enough, you cut the trinity. Onion, celery, green bell pepper — the holy trinity of every Louisiana pot — and then, because the Creoles were Catholic and thorough, the garlic they call *the pope.* It is the aromatic foundation under gumbo, jambalaya, étouffée, sauce piquante, and red beans alike, and because it is almost entirely plants, it is the place in this cuisine where a plant family has the most to say. Every great Louisiana dish is, at bottom, an argument about what you do to these four vegetables before anything else goes in the pot.

The trinity is not one flavor. It is a small chord played across three receptors at once, and understanding which plant plays which note is the whole of why a good base tastes *complete* rather than merely oniony. Start with the alliums, because they do the heaviest and the least obvious work.

The kokumi floor — onion, garlic, and CaSR. Cut an onion and you release more than its sharpness. Alliums are storehouses of **γ-glutamyl peptides** — short chains like **γ-glutamyl-valyl-glycine** (γ-Glu-Val-Gly) and the glutathione tripeptide γ-Glu-Cys-Gly — and these are the agonists of **CaSR**, the calcium-sensing receptor on the tongue. CaSR does not report a taste you can name. It reports *kokumi*: mouthfulness, continuity, the sense that a flavor fills the whole mouth and stays there instead of landing on one spot and fading. A dish with good kokumi tastes rounder, longer, and more cared-for, and the person eating it usually cannot tell you why. On the Index this is **IFI-K**, and the onion we grow for the trinity is tuned toward it — an onion whose job is not to taste more like onion but to carry more body into whatever it starts.

The pungent lift — garlic, allicin, and TRPA1. Garlic plays a second note on a second channel. Intact garlic holds **alliin**, an odorless amino-acid derivative; crush the clove and the enzyme **alliinase** finds it and converts it, within seconds, to **allicin**, a reactive sulfur compound. Allicin is an *electrophile*, and it agonizes **TRPA1** — the sharp, bright pungency channel — not by sitting in a pocket the way capsaicin does, but by covalently modifying cysteine residues on the receptor's cytoplasmic side. That is why fresh garlic bites and aged garlic goes sweet: the bite *is* the allicin, and it is chemically fleeting. Our designed garlic reads on **IFI-K and IFI-P together** — the body and the bright edge on one bulb — which is exactly the double duty garlic does in a pot.

The green top notes — celery and bell pepper. Celery brings a cool, watery, slightly medicinal top note from **3-n-butylphthalide** and a whisper of bitterness from apigenin; it is the reason a trinity smells *fresh* and not just sweet. The green bell pepper brings the mild, grassy pyrazine note — **2-isobutyl-3-methoxypyrazine**, one of the

most potent aroma molecules known, detectable at parts per trillion — and a faint Capsicum sweetness with no heat at all, because the sweet pepper carries a recessive, non-functional copy of the very gene we will spend Chapter 4 rebuilding in its hot cousins. Celery is not among our engineered organisms and we do not pretend otherwise; it goes in as it grows, and it earns its place honestly.

Grown for depth, this four-plant foundation carries a body that older kitchens could reach only by cooking the base down for an hour or deglazing it with meat. That is the quiet trade this chapter makes: what used to require time or a bone, we grow into the plant.

A word on proportions, because the trinity is an argument as much as a mix. The classic ratio is two parts onion to one part each celery and bell pepper — onion-forward, because the onion carries the kokumi floor — though a Creole cook in the city often tips it further toward onion and a Cajun cook in crawfish country sometimes leans harder on the bell pepper. It is Louisiana's answer to the French *mirepoix* (onion, celery, carrot) and the Spanish *sofrito* (onion, pepper, garlic, tomato), and the swap of carrot for bell pepper is not trivial: it trades the carrot's sugar for the pepper's green pyrazine and faint Capsicum body, which is exactly why a Louisiana base smells grassier and less sweet than a French one. The garlic sits outside the count, added late, because its chemistry runs on a timer.

That timer is worth respecting, and it is the same timer in both alliums. In the intact clove or bulb, the flavor precursors and the enzymes that act on them are held in separate cellular compartments; the knife is what introduces them. In garlic, crushing lets **alliinase** convert **alliin** to **allicin** in seconds — the pungent peak — after which allicin decays steadily into milder diallyl sulfides, which is why garlic added early and cooked long goes sweet and round while garlic added late stays sharp. In onion, the same cut releases the **lachrymatory-factor synthase** that makes your eyes water and, more usefully for the pot, the **γ-glutamyl transpeptidase** route that assembles the kokumi peptides. Cut coarse and cooked slow, the alliums give body; cut fine and added late, they give lift. One plant, two dishes, decided by the knife and the clock.

PLANT	KEY COMPOUND(S)	RECEPTOR	WHAT IT GIVES THE POT
Onion	γ-glutamyl-valyl-glycine	CaSR	kokumi — the body
Garlic	allicin; γ-glutamyl peptides	TRPA1 + CaSR	the bright edge, and body
Celery	3-n-butylphthalide, apigenin	olfaction	the fresh green top note
Bell pepper	2-isobutyl-3-methoxypyrazine	olfaction	the grassy lift, a faint sweet



The cut face of a designed onion — the γ-glutamyl peptides that read as body, not sharpness, are concentrated in these rings.

The Trinity, Cut and Started

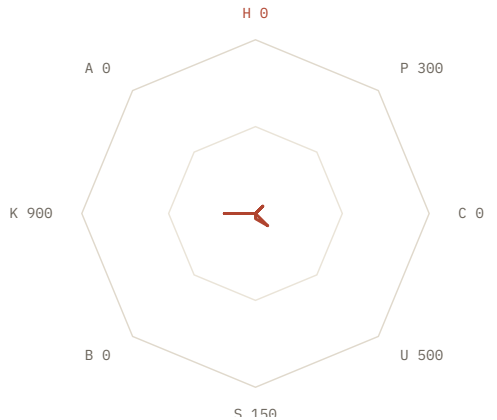
Makes the base for any pot in this book · 20 minutes · where everything begins

1	large	onion, from designed onion, diced
2	ribs	celery, diced small
1		green bell pepper, diced
4	cloves	garlic, from designed garlic, minced
2	tbsp	neutral oil or butter
		salt, a pinch

1. Warm the fat over medium. Add the onion, celery, and bell pepper together and let them *sweat,* not brown — fifteen minutes, stirring, until the onion turns glassy and the kitchen smells sweet and green. Browning here is a different dish; that belongs to the roux.
2. Add the garlic only in the last two minutes. It is the pungent top note and it scorches fastest; pushed too hard it turns acrid, the allicin cooking off before it can lift anything.
3. A pinch of salt draws the water out and concentrates the base. It is ready when it has gone soft and translucent and smells like the beginning of something that will take all afternoon.

Why it works — The onion and garlic flood the base with γ-glutamyl peptides, so the pot reads *round* long before any stock goes in; CaSR reports the body, not the flavor, which is why a good trinity tastes finished rather than merely oniony. Grown for that channel, the alliums need neither a long reduction nor a bone to carry it — the body is in the pot from the first minute.

IFI PROFILE



IFI-H	0
IFI-P	300
IFI-C	0
IFI-U	500
IFI-S	150
IFI-B	0
IFI-K	900
IFI-A	0

A nourishment note, quiet: the alliums that carry this base carry their own organosulfur compounds in with them — the flavor and the good of the plant grown on the same bulb, not traded one against the other.

Chapter 2 · The Roux — *the dark heart, measured.*

Now the roux itself, the thing the sentence promised. Equal weights of flour and fat, and then the long patience: a blond roux for a delicate étouffée, a peanut roux for a shrimp gumbo, and for a dark Cajun gumbo the deep chocolate-brown that takes forty-five minutes and all of your attention. A Louisiana cook learns the whole of it in the wrist — that the darker the roux goes, the more flavor and the *less* thickening power it carries, a trade you cannot cheat.

That trade has a mechanism, and it is worth knowing, because knowing it is how you stop being afraid of the pot. Flour is mostly starch — long chains of glucose packed in granules. When you heat those granules in fat, two things happen in sequence. Early, up to a pale blond, the starch gelatinizes and swells: this is where the thickening power lives. Push further and the heat begins to *dextrinize* and fracture those chains, breaking the long thickeners into short fragments. So a dark roux has fewer intact starch chains to set a gravy — hence a dark-roux gumbo is soupy and a blond-roux étouffée is lush. You are trading structure for flavor, one for one, as the color deepens.

And what is the flavor you are buying? It has a name on our Index, and it is not heat. It is **umami, and the body around it.** Browning flour is the **Maillard reaction** run slow: amino acids and reducing sugars collide into an Amadori rearrangement, then cascade into hundreds of new molecules — nutty **pyrazines** from Strecker degradation, roasty furans, and the dark **melanoidins** that give a roux its color. Under all of it, free glutamate is liberated and read on **mGluR1**, the savory floor. This is why a dark-roux gumbo tastes of long hours even early in the pot: the hours are in the browning, not only in the simmer.

It is worth naming the molecules, because they are the reason a roux smells like three things at once. The first move is the Maillard condensation of a reducing sugar with an amino group into an **Amadori** (or Heyns) rearrangement product; that unstable intermediate then fragments and recombines down dozens of branches. **Strecker degradation** of amino acids throws off aldehydes and the nutty, roasty **pyrazines** — 2-acetylpyrazine and 2-ethyl-3,5-dimethylpyrazine chief among them — that read as *toasted.* Caramelization of the flour's own sugars runs alongside, lending the sweet-bitter edge. And at the far end, past mahogany, the same chemistry that browned the flour begins to throw off free carbon and the bitter the receptor warns us of. The pleasure and the warning are the same reaction at two different minutes; the whole skill is knowing which minute you are in.

The fat matters too, and it is why a Cajun roux is built on oil or lard rather than butter. Butter's milk solids scorch around 150 °C, long before a dark roux is finished, while a neutral oil holds past 200 °C

without breaking. Butter makes a lovely blond roux for an étouffée and a terrible chocolate one. For the dark pots, use oil; save the butter for the pale work and the finish.

But the dark roux lives on a cliff edge, and the cliff is a receptor too. One minute too long and the flour scorches, carbon climbs into the mix, and the pleasure flips to the flat, scolding bitterness of **TAS2R38** — the receptor evolution built to warn us off burnt and spoiled things. There is no lushness past that edge, only char. The craft is to stop at mahogany, a shade before you think it is ready. The garden's job is to make that easier: an umami so grown-in, in the tomato and the alliums that follow, that you never have to push the roux to the edge to taste depth. You cook the roux for its color and its nutty top notes, and you let the plants carry the savory floor — so the one irreversible ingredient in Louisiana cooking is the one you are least likely to ruin.

ROUX STAGE	APPROX. TEMP	COLOR	THICKENING	CLASSIC USE
White	150–160 °C	pale cream	highest	béchamel, cream sauces
Blond	160–170 °C	straw	high	étouffée, light gravies
Peanut	170–180 °C	tan	medium	shrimp & okra gumbo
Brick	180–190 °C	red-brown	low	chicken & sausage gumbo
Chocolate	190–200 °C	dark mahogany	lowest	seafood & game gumbo

The Dark Roux

Makes about 1 cup · 45 minutes · do not leave the pot

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1  cup     all-purpose flour
1  cup     neutral oil
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1. Whisk the flour and oil smooth in a heavy, dry pot over medium-low. There is no shortcut and no walking away; the difference between a chocolate roux and a ruined one is sixty seconds of inattention.
2. Stir constantly — a figure-eight into the corners, where it catches first — as the color walks from cream to blond to peanut to penny. Breathe it; the smell tells you as much as the color. Nutty and toasty is the sound of Maillard; the first thread of acrid is the warning.
3. Pull it at the deep red-brown of an old penny, a shade before you think it is ready, because it keeps cooking off the heat. Drop the started trinity (Chapter 1) straight in to stop the color and perfume the base in one move.

Why it works — Maillard browning manufactures a savory that a thin stock cannot give — liberated glutamate and melanoidins reading deep on mGluR1 — which is why a dark-roux pot tastes of long hours while it is still young. We stop at mahogany because past it the flour's own char climbs onto TAS2R38 into bitterness; the restored tomato and alliums that follow carry enough grown-in umami that the roux never has to be risked for depth. Depth and the edge of ruin are the same minute; the garden buys you out of it.

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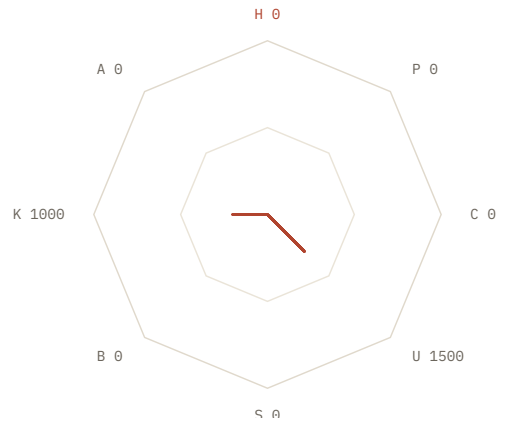


IFI-H		0
IFI-P		0
IFI-C		0
IFI-U		1,500
IFI-S		0
IFI-B		0
IFI-K		1,000
IFI-A		0



The color-reading craft of a Louisiana cook, in a cut pepper's deep interior — the roux is pulled by the same eye that reads a fruit this ripe.

The Oven Roux

Makes about 2 cups · 90 minutes, mostly unattended · the batch method

2	cups	all-purpose flour
2	cups	neutral oil

1. Whisk the flour and oil smooth in a heavy ovenproof pot and slide it, uncovered, into a 175 °C oven.
2. Stir every twenty minutes — the oven browns from all sides at once, evenly, with none of the scorch risk of the stovetop — until it reaches a deep mahogany, about ninety minutes.

3. Cool it and keep it refrigerated; a jar of dark roux is a week of gumbo waiting.

Why it works — The oven surrounds the roux with even radiant heat, so the Maillard runs uniformly instead of fastest at the pot's hot spots; there is no single scorching surface to tip onto TAS2R38. You trade the meditative stovetop ritual for reproducibility and a free arm — the same trade, in a kitchen, that the ≤7% batch CV is in a greenhouse.

Chapter 3 · Cayenne & the Louisiana Burn — *the heat axis, in full.*

Louisiana heat begins with cayenne and the pepper vinegar on every café table, and it runs as far up as you are brave enough to climb. "A little kick" is a wish; a number is an instruction — one that tastes the same in a Lafayette kitchen and a New Orleans one because it is anchored to the receptor and not to a memory. This chapter is where we earn the right to put a number on the burn, because to ladder heat honestly you have to know exactly what heat *is.*

The receptor. Capsaicin binds **TRPV1**, a non-selective cation channel standing as a tetramer in the membranes of the trigeminal nerve endings that line the mouth. The same channel is gated by temperatures above about 43 °C and by acid. Capsaicin's vanillyl head slides into a pocket between the S3 and S4 transmembrane helices and the lipid-facing fenestration; bound there, it *lowers the channel's thermal threshold.* The molecule does not warm the tissue by a single degree. It makes the nerve report a fire that is not there — calcium floods in, the signal runs to the brain, and the body answers to a burn that has harmed nothing. That is the honesty at the center of designing heat: it is a signal, exactly, and a signal can be tuned.

The pocket is specific enough to name. Capsaicin's vanillyl ring hydrogen-bonds to residues on the order of **Tyr511 and Ser512** at the lower end of the S3–S4 bundle, with **Thr550** and **Glu570** shaping the vanilloid site; mutate Tyr511 and the channel stops answering to capsaicin while it still answers to heat — the cleanest proof that the burn and the warmth enter by different doors into the same room. That separability is a gift to a designer: we can move the capsaicin signal without touching the channel's thermal job, and the body never loses its honest sense of real temperature.

The biosynthesis, end to end. Capsaicin is the condensation of two feedstocks the plant builds on separate assembly lines and joins at the last step.

- The **aromatic half** comes down the **phenylpropanoid branch** that runs in every vascular plant: phenylalanine → (PAL) → cinnamic acid → (C4H) → *p*-coumaric acid → (via C3H/4CL and the hydroxycinnamoyl transferase HCT) → caffeic acid → (COMT) → **ferulic acid** → vanillin → **vanillylamine**, the amine installed by the aminotransferase **pAMT**.
- The **aliphatic half** is a branched-chain fatty acid: the branched-chain aminotransferase **BCAT** feeds carbon from valine or leucine into a starter unit that the ketoacyl-ACP synthase **KAS** elongates into **8-methyl-6-nonenoyl-CoA**.
- The two halves are joined by **Pun1 / capsaicin synthase (CS)**, the AT3 acyltransferase, which condenses vanillylamine with the branched acyl-CoA into **capsaicin**. The length and saturation of

that acyl chain set the balance between capsaicin and dihydrocapsaicin — and with it the *shape* of the burn: where it lands, how fast it blooms, how cleanly it leaves.

In a typical fruit the capsaicinoid pool runs roughly **69% capsaicin, 22% dihydrocapsaicin,** and the rest nordihydrocapsaicin and minor relatives. The two majors feel different. Capsaicin blooms fast and high in the front of the mouth and then clears; dihydrocapsaicin arrives a beat later, sits lower and at the back of the throat, and lingers. Shift the ratio — by tuning the acyl-chain machinery upstream of Pun1 — and you shift the burn's architecture, not merely its height. A cayenne for a delicate étouffée wants a capsaicin-forward, clean-clearing profile; a chile for a long, dark gumbo can carry more dihydrocapsaicin, a heat that holds up under all that depth. This is why *how hot* is the shallow question and *what shape* is the real one.

There is also a mercy built into the receptor, called **desensitization.** Sustained capsaicin floods the nerve ending with calcium, which in turn quiets the channel, so a second bite reads milder than the first and a slow exposure across a meal is far kinder than a single spike. We design and we cook with that curve in mind — laddering heat so it builds and resolves rather than ambushes — which is part of what we mean when we say heat is a pleasure and not an assault.

Five of those enzymes (PAL, C4H, 4CL, HCT, COMT) belong to every plant with a sequenced genome. Only four are pepper-specific — pAMT, Pun1/CS, KAS, BCAT — which is the entire reason the method behind this book transfers to organisms that have never made a capsaicinoid in their evolutionary history. But in a cayenne, this whole machine already runs; our work is to make the terminal synthase run *more consistently and efficiently,* which is Chapter 4.

From concentration to loudness. The old measure of heat is the Scoville Heat Unit (SHU), a dilution assay: how many parts water to dilute an extract until a panel can no longer taste the burn. SHU tracks *concentration* of capsaicinoids. IFI-H tracks *loudness at the receptor.* They correlate, but IFI-H is the honest one for cooking, because it is anchored to TRPV1's half-activation and does not drift with extraction method or panel. The arithmetic is the same formula as every axis: a cayenne whose capsaicin half-activates TRPV1 at EC_{50} = 0.24 µM against a native reference at 1.0 µM reads **IFI-H = 1,000 × 1.0 / 0.24 ≈ 4,200** — it is 4.2 times louder than the reference, which is exactly the figure at the top of the ladder below. Here is the ladder we cook from, every rung a real cultivar with a real score.

CULTIVAR	SKU	SHU	IFI-H	AXES
Ember	SS-0087	866K	1,570	2/8
Cinder	SS-0088	1.05M	2,290	3/8
Kindle	SS-0089	1.25M	2,000	3/8
Flare	SS-0090	1.48M	—	4/8
Blaze	SS-0091	1.72M	2,630	4/8
Wildfire	SS-0092	1.96M	2,930	5/8
Scorch	SS-0093	2.21M	3,220	5/8
Firestorm	SS-0094	2.47M	3,490	6/8
Solara	SS-0095	2.72M	3,980	6/8
Phoenix	SS-0096	2.95M	4,200	8/8

For nearly all Louisiana cooking you live in the bottom third of that ladder and below it, down where a workhorse cayenne (*C. annuum*) sits around **IFI-H 400–900** — enough to warm a gumbo without closing a throat. The flagship superhots above are *C. chinense*, the habanero species, and they are here as the ceiling, not the everyday: the proof of how far the axis reaches, and the stock from which we meter a single bright drop into a boil or a vinegar when someone at the table wants the top of the mountain.

A note on how we hold it, because it is a value and not only a technique: heat, to us, is a pleasure and not an assault. Even at the summit we design for the *shape* of the burn — a heat you can taste *through,* that blooms and then clears — because a heat you can taste through is a heat that feeds you rather than one that only tests you.



Cayenne country at golden hour — the fruit the whole ladder is grown from.

Louisiana Pepper Vinegar

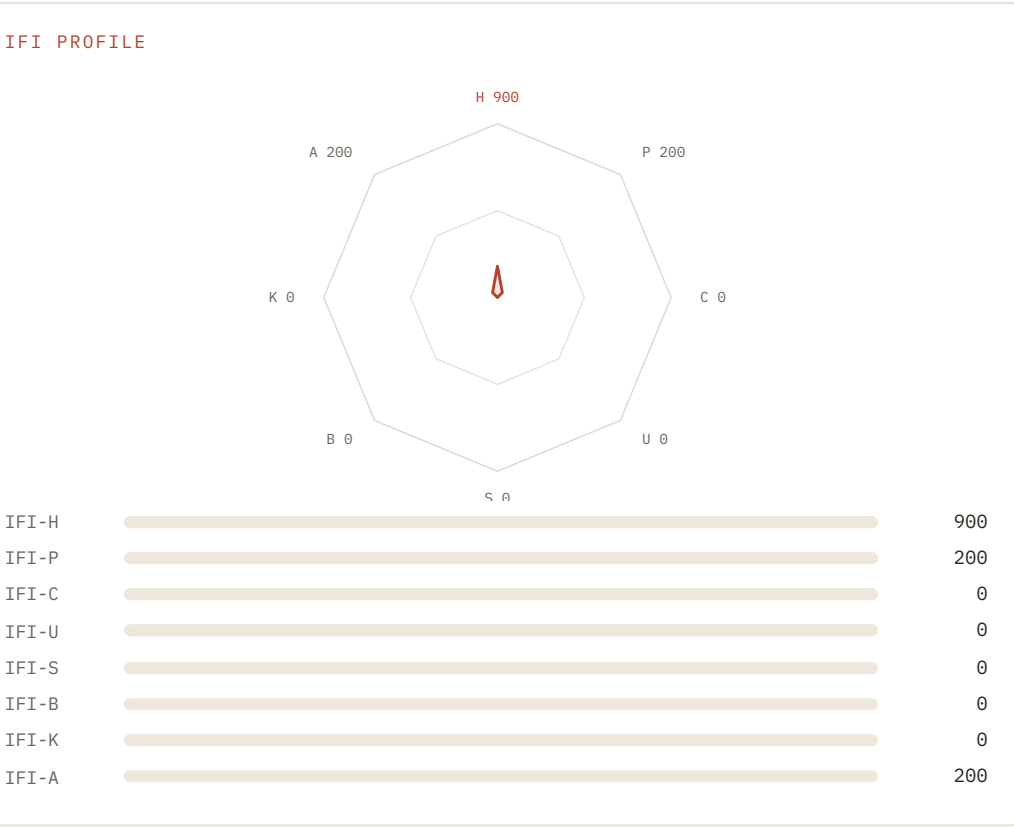
Makes 2 cups · the cruet for the whole table

```
1  cup     designed cayenne, chopped, to a measured IFI-H (below)
2  cups    white or cider vinegar, warmed
1  tsp     salt
2  cloves  garlic, lightly smashed
```

1. Pack the chopped cayenne and garlic into a clean bottle. For an everyday cruet, grow or choose the chile to **IFI-H 600**; for a serious one, **1,500**; for the rung that ends conversations, meter in a drop of **Blaze (IFI-H 2,630)** at a time.
2. Pour the warm, salted vinegar over to cover. Cap and let it sit a week in the dark; the acid draws the heat and the garlic out slowly, and the vinegar's own grip registers low on IFI-A.

3. Keep it on the table beside the gumbo. The pot comes seasoned to the mildest palate present; everyone else climbs from the cruet.

Why it works — Splitting the heat off into a table cruet is dignity made practical: nobody is dared and nobody is left out. Because the cayenne is grown to a measured IFI-H, the shake you add in February is the shake you remember from August — anchored to TRPV1, not to a guess. The vinegar's acetic acid also potentiates TRPV1 slightly, which is why a few drops read hotter than the raw chile suggests.



Chapter 4 · The Molecular Basis — *Pun1, the method, and two Pun1 substitutions the breeders never found.*

Everything in the last chapter assumed we could set a cayenne to a number and hold it there. This chapter is how. It is the most technical in the book, and it is the engine room of the whole company, so we will show the work.

Every prior breeding program chased heat the way a cook chases a roux's color — by watching the phenotype and hoping the genotype followed. Select the hottest fruit, save its seed, repeat for years, and accept that the next generation will scatter. That scatter is the enemy of a cuisine written in numbers: a wild-type hot-pepper line can vary **±42%** in capsaicinoid output batch to batch, which is the difference between a pleasant gumbo and a cruel one. We inverted the program. Instead of selecting outcomes, we designed the enzyme.

Step one — find where flux is controlled. A genome-scale **flux-balance analysis (FBA)** of the pepper's metabolism was run to find which reaction shapes capsaicin output. Carbon entering from phenylalanine partitions among many fates; our model predicts that flux control sits upstream in the phenylpropanoid pathway — at **4CL** and **HCT** — not at the terminal Pun1/CS step. Pun1 is the final capsaicin synthase; it labels the product, it does not govern the rate. The ESM2 work we describe below targeted Pun1 not to lift the heat ceiling but to improve the enzyme's catalytic efficiency and fold stability — trading the wild-type's ±42% output variation for the tight ≤7% consistency that makes a cayenne usable as an ingredient.

The flux model deserves a sentence of its own, because it is unglamorous and decisive. A genome-scale reconstruction writes every known reaction in the plant as a stoichiometric equation; a linear-programming solver then maximizes an objective — here, capsaicinoid flux — subject to mass balance and the uptake of carbon and nitrogen. Run that way, the model does not guess at a favorite gene; it returns a flux-control coefficient for every reaction, and control coefficients sum to one — a result you can act on. Our model predicted that the phenylpropanoid enzymes upstream hold most of the control; the terminal acyltransferase step is not the bottleneck. The ESM2 optimization still matters enormously: a more reliable, consistent Pun1 locks in whatever precursor flux the upstream pathway delivers, and ≤7% CV is the whole reason a cuisine can be written in numbers.

Step two — score every possible edit. We took the Pun1/AT3 sequence and used an **ESM2 650-million-parameter protein language model** to score every possible single-residue substitution — every position, every alternative amino acid — ranked by predicted effect on **catalytic efficiency × fold stability.** A language

model trained on the whole protein universe has, in effect, read how acyltransferases are *allowed* to be built; it can flag the substitutions that make a better, still-foldable enzyme and the ones that would collapse it.

Concretely, the model scores each variant by the change in its **log-likelihood** — how much more, or less, "protein-like" the edited sequence reads — a zero-shot estimate of effect that needs no training on this particular enzyme. We combined that signal with an explicit fold-stability term (the ΔΔG you will see in the table) and a catalytic-efficiency proxy drawn from the active-site geometry, then ranked. Of the roughly six thousand single substitutions possible across the protein, only a handful scored well on all three terms at once, and only three of those sat inside the catalytic domain where the flux model said an edit would actually pay. We cross-checked the top candidates against an AlphaFold model of the protein to confirm they sat where the chemistry happens.

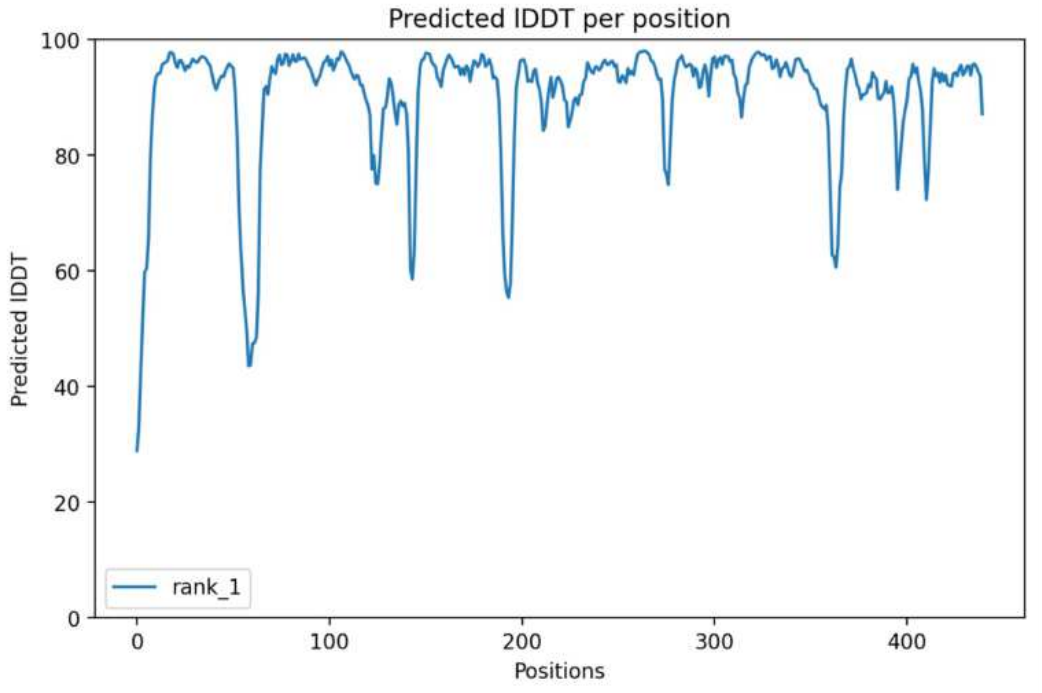


FIG. 4.1 — the Pun1/AT3 model colored by pLDDT confidence. The acyl-binding domain and the active-site cleft, where our two Pun1 substitutions land, are high-confidence (blue); the flexible termini are not, exactly as expected.

Step three — the two Pun1 substitutions. two Pun1 substitutions emerged that, as far as the sequence record shows, have never co-occurred in a natural pepper. Written in with CRISPR, they lift peak output and — just as important — collapse the batch-to-batch scatter.

EDIT	EFFECT	ΔΔG (KCAL/MOL)
S39L	binding-pocket affinity ↑ (N-terminal lobe)	−2.1
L345G	steric relief in the active-site cleft	−1.8
C175S	prevents a disulfide-misfold off-pathway	−0.9

A negative ΔΔG here means the edited protein folds *more* stably than wild-type; the two shipped substitutions (S39L · L345G) sum to a markedly more stable, more efficient enzyme. S39L tightens how the vanillylamine substrate is held; L345G opens the cleft just enough for the branched acyl chain to seat cleanly; C175S is a structural annotation from our modelling — a cysteine that occasionally locks the protein into a dead, misfolded form — identified during the design process and pulled from the final shipped construct; the double variant S39L+L345G is what goes into the plant.

Step four — the result. The edited line reaches a peak of **2,937,948 SHU** at a batch-to-batch coefficient of variation of **≤7%**, against the wild-type's 42%. That CV is the whole point. A chef can specify "IFI-H 900," and the cayenne delivers 900 in spring and 900 in August, which is the only way a cuisine can be written in numbers at all.

STAGE	TOOL	QUESTION IT ANSWERS
Bottleneck	genome-scale flux-balance analysis	`which reaction caps output?`
Variant scoring	ESM2 (650M parameters)	`which edits help and still fold?`
Structure check	AlphaFold model	`do the edits sit where chemistry happens?`
Installation	CRISPR, homology-directed repair	`write the two Pun1 substitutions in`
Validation	whole-genome sequencing + multi-harvest assay	`did it breed true at ≤7% CV?`

Two things make that promise real beyond the enzyme itself. The edits were installed by homology-directed repair against a designed template, then carried through enough generations to fix them homozygously and confirm they bred true, with whole-genome sequencing to check that nothing landed where it should not — an edited enzyme is an improvement only if it is also stable, clean, and heritable. And the coefficient of variation, that ≤7%, is a *population* statistic, not a single lucky plant: it is the spread measured across many plants and many harvests, which is the number a formulator actually needs, because a formulator buys a ton, not a fruit. The whole apparatus — the flux model, the language model, the CRISPR, the sequencing, the controlled growing — exists to turn a wish into a specification. We show the machine because a number you cannot trust is worse than no number at all.

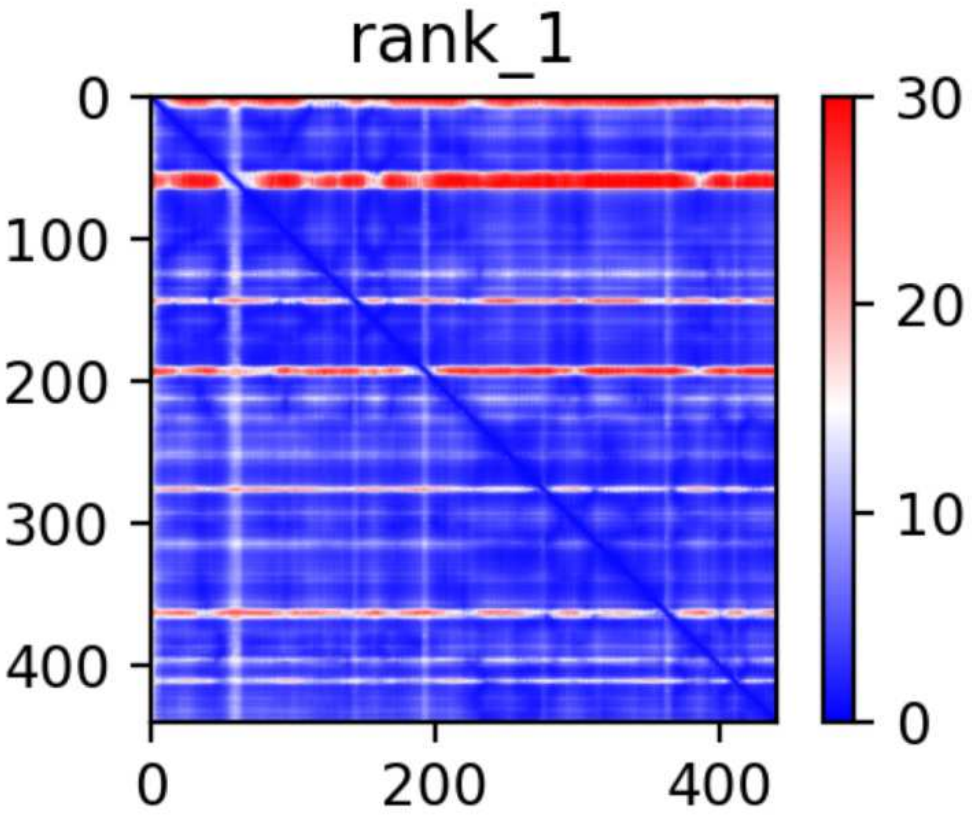


FIG. 4.2 — the predicted aligned error heatmap for the same model; the low-error block along the diagonal confirms the catalytic domain is modeled as a rigid, trustworthy unit, so the ΔΔG predictions for edits inside it can be believed.

The reason to spend four pages on an acyltransferase in a cookbook is this: the number under every recipe is only as honest as the plant behind it. A gumbo "seasoned to IFI-H 600" is a promise, and the ≤7% CV is how the promise is kept. The lushness of this cuisine — the depth, the slow pot, the long table — rides on a rigor you never taste directly. You only taste that the dish is the same dish you loved last time.



PART II OF VI

The Savory Foundations

umami · kokumi · pungency — how a vegetarian pot goes as deep as any stock

Chapter 5 · Deep Savor — *umami, and the tomato restored.*

A Louisiana pot is a savory pot. Gumbo, jambalaya, étouffée, red beans — the pleasure in every one of them is *depth,* the brothy, meaty, mouth-filling savor that makes a bowl feel like being fed. For most of history that depth came from long time, bones, or both. This chapter is how we grow it instead, and it is the hinge on which the vegetarian side of this book turns.

The receptor, and its trick. Savor is glutamate, and glutamate is read on **mGluR1** and on the heterodimer **TAS1R1·TAS1R3**, whose large clamshell extracellular domain — the "Venus flytrap" — closes around a glutamate molecule and signals. But the famous thing about umami is not the glutamate alone; it is the **synergy.** When a 5′-ribonucleotide — **IMP** (inosinate, from meat and fish) or **GMP** (guanylate, from mushrooms and aged ferments) — binds a second site on TAS1R1·TAS1R3, it acts as a *positive allosteric modulator:* it wedges the flytrap closed, so the glutamate already bound reads far louder. The effect is multiplicative, not additive. Glutamate and a ribonucleotide together can register an order of magnitude stronger than the sum of each alone. This single fact is why a dashi of kelp (glutamate) and bonito (IMP) is a revelation, and it is the lever a plant kitchen pulls hardest: stack a glutamate source and a GMP source and the pot roars.

The number on that synergy is worth carrying in your head: glutamate and a 5′-ribonucleotide together can read **up to roughly eight times** as loud as the glutamate alone — far past the sum of the two. In EC_{50} terms the ribonucleotide drops glutamate's half-activation concentration severalfold; the flytrap, wedged shut, answers to much less. It is also why "MSG" and "natural glutamate" are the same molecule doing the same thing: the tongue reads free glutamate whatever its origin, and the only honest questions are how much and against which partner. Our work does not shake glutamate from a jar; it grows it back into the fruit, where it travels with the rest of the tomato's chemistry instead of alone.

The tomato, and the ninety-three percent. The Creole half of Louisiana cooking is tomato cooking, and here a modern cook has been quietly robbed. A century of breeding for shipping, shelf life, and uniform redness pulled free glutamate *out* of the supermarket tomato — by our measure it carries roughly **7%** of the free glutamate of a vine-ripe heirloom; the other **93%** left on the truck. We grow it back. Routing carbon back through the native **GAD** (glutamate decarboxylase) and **GDH1** (glutamate dehydrogenase) steps that govern the fruit's glutamate pool, a designed tomato is restored from a limp **IFI-U ~300** to **IFI-U 2,600** — not a novelty, simply the tomato that tastes the way a tomato is supposed to.

The route is the fruit's own. Free glutamate in a ripening tomato is governed by the **GABA shunt** — glutamate is decarboxylated to GABA by **GAD** during early ripening, and then, as the fruit matures on the vine, the balance tips back and the glutamate pool climbs, with **GDH1** interconverting glutamate and α-ketoglutarate at the gate. Breeding for a firm, early-picked, long-shipping fruit locked that pool low, because a tomato pulled green for the truck never runs the late-ripening accumulation to completion. Restoring the native GAD/GDH1 balance simply lets the fruit finish the job it evolved to do. Nothing exotic is introduced; a suppressed endogenous process is allowed to run — which is precisely why we call it restoration and not fortification. In a Creole sauce this is the difference between a thin red gravy and one with a floor you could stand on. The designed tomato carries **2,040 constructs** behind it, the deepest-engineered organism in our garden after the peppers, precisely because so many people cook with it.



The restored tomato, cut — glutamate grown back into the fruit, not added at the stove.

Stacking the savory, in a pot. The practical craft of a deep vegetarian Louisiana dish is to stack glutamate and GMP sources so they multiply: the restored tomato (glutamate), dried mushrooms or a designed **shiitake/koji** note (GMP and glutamate), the Maillard roux (liberated glutamate), the alliums underneath. Where a cook once reached for the ham bone — a source of glutamate *and* IMP — we reach for the mushroom's GMP against the tomato's glutamate and arrive at the same multiplicative roar by a different, green door. The seafood pots do it too, honestly and without translation: shrimp and crawfish bring their own IMP, and against the tomato's glutamate the synergy is the whole reason a seafood gumbo tastes so profoundly of the sea.

A Deep Vegetable Stock

Makes about 3 quarts · 1 hour · the savory spine of a meatless pot

2		onions, from designed onion, halved, cut-side charred
1	head	garlic, from designed garlic, halved
4		ripe designed tomatoes, or a handful of sun-dried
2	oz	dried mushrooms — shiitake and porcini
2	sheets	kombu (kelp), for its glutamate
2		carrots · a bundle of celery tops and parsley stems
1	tbsp	designed yeast, nutritional, at the end

1. Char the onion cut-sides dry in a hot pan until black at the edge — a fast Maillard that seeds the stock with savor before any water goes in.
2. Add everything but the kombu and yeast, with cold water to cover generously; bring to a bare simmer and hold forty-five minutes. Slip the kombu in for the last ten only — boiled hard and long it turns slick and bitter.
3. Strain, then stir the designed yeast in off the heat. Taste: it should read brothy and round, never watery.

Why it works — Kombu brings glutamate, the mushrooms bring GMP, the charred onion brings Maillard savor and kokumi, and the designed tomato and yeast stack more of both. Four savory sources multiplying at TAS1R1·R3 and mGluR1 give a meatless stock a floor no amount of simmering plain vegetables could reach — the synergy, not the hours, is the depth.

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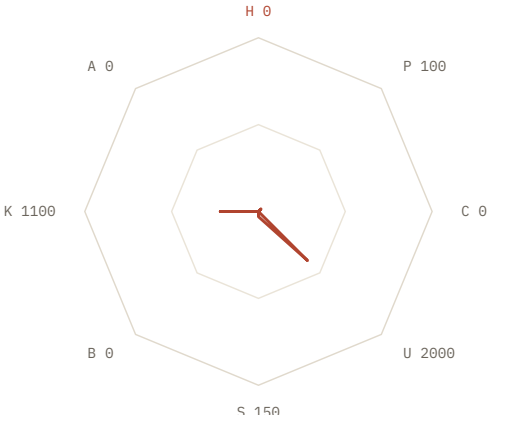

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IFI-P	100
IFI-C	0
IFI-U	2,000
IFI-S	150
IFI-B	0
IFI-K	1,100
IFI-A	0

Creole Sauce — the Mother Red

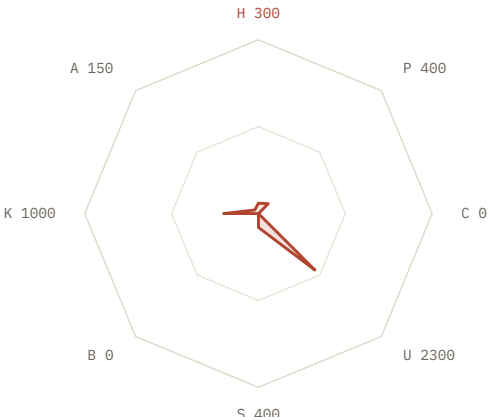
Makes about 4 cups · 45 minutes · the base under half the Creole table

1		Trinity, Cut and Started (Chapter 1)
6		ripe designed tomatoes, grated — or 2 cups best umami-restored, crushed
2	tbsp	tomato paste, from designed tomato
1	cup	vegetable stock
1	tbsp	House Creole Blend (Chapter 7)
2		bay leaves · a sprig of thyme
1	tsp	designed cane sugar, to round (Chapter 13)

1. Cook the grated tomato and the paste into the started trinity over medium until the raw edge cooks off and the color deepens to brick — eight to ten minutes. This browning is a small Maillard of its own; do not rush it.
2. Add the stock, the Creole Blend, and the herbs. Simmer, uncovered, thirty minutes, until it coats a spoon and tastes of long cooking.
3. Taste and settle it with the thread of cane sugar — not to sweeten, but to round the acid so the umami stands clear. Pull the bay. This is the sauce under shrimp Creole, sauce piquante, a weeknight red jambalaya, or eggs poached for a Creole brunch.

Why it works — The restored tomato brings the glutamate floor at **IFI-U 2,600**; the trinity and the touch of paste multiply it; the thread of cane sugar lowers the perception of acid so the savory is not masked. What reads as "cooked all day" is really three glutamate sources finding mGluR1 together — depth grown in, then concentrated, not boiled out of a bone.

IFI PROFILE



IFI-H	300
IFI-P	400
IFI-C	0
IFI-U	2,300
IFI-S	400
IFI-B	0
IFI-K	1,000
IFI-A	150

Chapter 6 · Kokumi & the Long Finish — *the body you feel but cannot taste.*

There is a quality in a great bowl of red beans, a long-simmered gumbo, a proper étouffée, that people reach for words and miss. *Rich,* they say, or *it has body,* or simply *it tastes like someone's grandmother made it.* They are all describing one thing, and it is not a flavor. It is **kokumi** — the richness, continuity, and mouth-filling fullness that a dish gains when it is *complete* — and it is read on **CaSR**, the calcium-sensing receptor, the same protein that monitors calcium in your blood, borrowed by the tongue to monitor a different kind of sufficiency in your food.

What kokumi actually does. CaSR responds to **γ-glutamyl peptides** — γ-Glu-Val-Gly, γ-Glu-Cys-Gly (glutathione), and their kin — which accumulate in aged, fermented, and long-cooked foods and in the alliums fresh. Activated, CaSR does not produce a taste of its own; it *modulates the others.*

CaSR is a **class C G-protein-coupled receptor** — the same architecture as the sweet and umami receptors, a large clamshell extracellular domain on a seven-helix stalk, working as a dimer — and in the body it is the sentinel that watches blood calcium in the parathyroid and the kidney. The tongue borrows it to watch a different kind of sufficiency. Kokumi was named only in recent decades, when researchers noticed that a tasteless fraction of garlic extract nonetheless made everything around it richer and longer, and traced the effect to **glutathione** (γ-Glu-Cys-Gly) and its γ-glutamyl relatives acting on CaSR. The word is Japanese — loosely, *rich taste* — and it finally labeled the thing every grandmother's pot had and no one could name. It makes sweet sweeter, salty saltier, umami rounder, and it stretches the whole sensation in time — the "long finish," the sense that the flavor arrives everywhere in the mouth and then stays. This is why a dish can be correctly seasoned and still taste thin, and why another with the identical salt and glutamate can taste like a blanket: the second one has kokumi and the first does not.

Where Louisiana finds it, and where we grow it. Traditional kitchens build kokumi with time and transformation: the long simmer that breaks proteins into peptides, the aged sausage, the Sunday bone carried into Monday's beans. Our garden carries several kokumi sources that need none of that waiting — **garlic** (IFI-K/P, 560 constructs) and **onion** (IFI-K, 40 constructs) fresh; a designed **yeast** (IFI-U/K, 240 constructs) that stands in for the depth of an aged ferment; **vanilla** (IFI-K, 40 constructs) for the sweet side of the table, where kokumi makes a custard taste like cream it does not contain. This is the quiet reason the dessert chapters lean on vanilla and a touch of designed yeast as much as on sugar: kokumi on the sweet side reads as *creaminess and length,* the sense that a praline or a

custard is richer and rounder than its fat can account for. A dessert with good kokumi needs less cream and less sugar to feel indulgent, because CaSR is stretching what is already there. Body is not a single ingredient you add; it is a channel you learn to feed. Grow the γ-glutamyl peptides into the plant and the body arrives in the first twenty minutes instead of the third hour — which is how a meatless Monday pot can taste as cared-for as the one built on a hock.

There is a second, slower source the long pot has always used without naming it: **proteolysis.** Hours of gentle heat break the proteins in beans, in a bone, in a stock, into free amino acids and short peptides — among them the very γ-glutamyl peptides CaSR answers to. That is the biochemistry hiding inside "it just needs to cook longer." What the garden offers is a shortcut that is not a cheat: start the pot already carrying the peptides the long cook would have made, and the three hours become a choice rather than a toll. You can still cook it long — some of us always will, because the pot minding itself is half the pleasure — but the depth no longer depends on the clock.



Designed garlic, cut — a fresh, measurable source of the γ-glutamyl peptides that read as body on CaSR.

Red Beans & Rice

Serves 6 · 2 hours (plus a soak) · the pot that minds itself

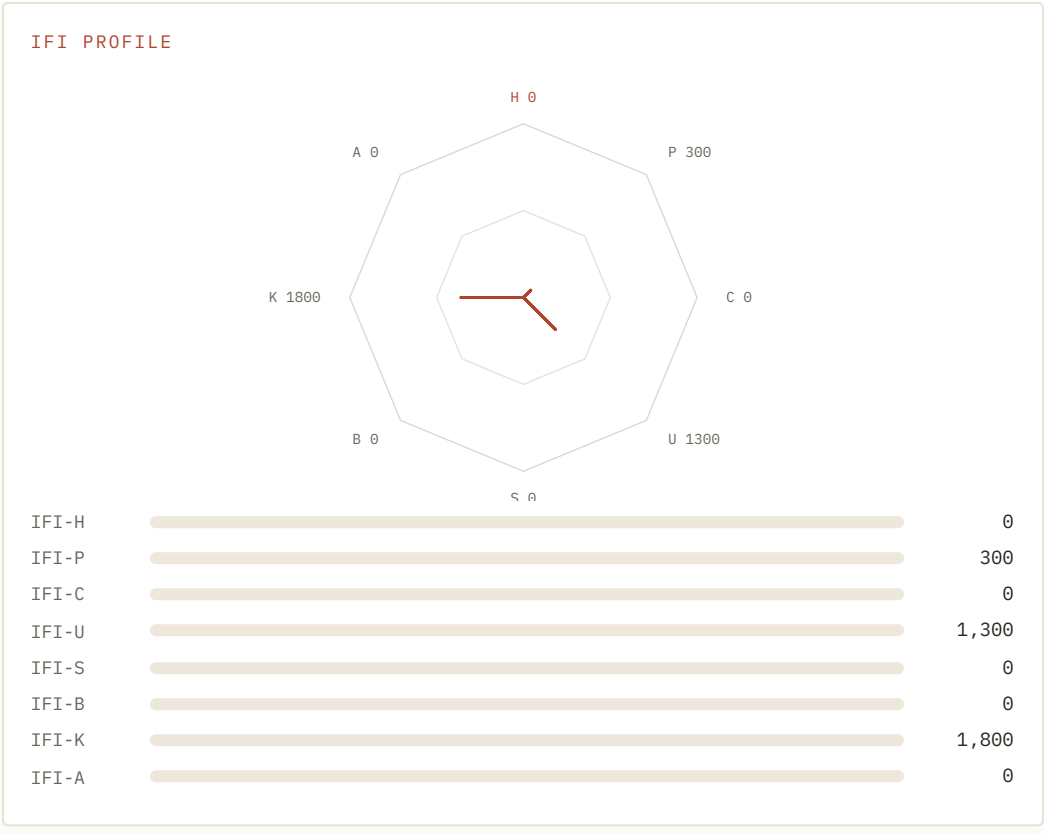
1	lb	dried red kidney beans, soaked overnight
1		Trinity, Cut and Started (Chapter 1)
6	cloves	designed garlic, extra, sliced
2	tbsp	nutritional yeast, from designed yeast
1	tbsp	House Creole Blend (Chapter 7)
2		bay leaves · a few sprigs fresh thyme
		salt · cooked white rice, to serve

1. Drain the soaked beans and add them to the started trinity with the extra garlic, bay, thyme, and water to cover by two inches.

2. Simmer low and slow — a lazy bubble, never a hard boil, which would split the skins before the insides give — for an hour and a half, stirring now and then, until the beans are fully tender and beginning to break.
3. Crush a cupful against the side of the pot and stir it back in; this is what turns the liquid creamy. Add the designed yeast and the Creole Blend, and cook twenty minutes more until the pot is thick and silky.
4. Season with salt at the very end — beans salted early stay stubborn. Serve over white rice, with pepper vinegar on the table.

For andouille: brown the slices first and build the pot on their rendered fat; it is a fine Monday either way, and the sausage is cooked in with the same care we give the beans.

Why it works — The alliums and the designed yeast flood the pot with γ-glutamyl peptides, so the liquid reads *rich* — CaSR reporting fullness — long before any bone could have given it. The crushed beans thicken their own gravy with gelatinized starch, and the grown-in kokumi fills the gaps, which is why the meatless pot tastes every bit as cared-for as the one with the hock. Kokumi is also why you salt less here than you expect: CaSR makes the salt already present read louder.



Nourishment note, quiet: a pot of red beans is a pot of plant protein and fiber that cost nothing in richness to get there — the body on the tongue and the sustenance in the bowl grown on the same vine.

Chapter 7 · The Sharp Edge — *pungency, mustard, and the aromatics.*

Depth alone goes flat. The reason a great gumbo does not cloy, the reason a rémoulade cuts through cold shrimp, the reason the blackening crust flashes bright before the heat arrives, is a second family of sensations entirely — **pungency,** read on **TRPA1,** the channel that answers to the sharp, the sinus-clearing, and the aromatic. Heat and pungency are constantly confused and are not the same thing, and holding them apart is half of seasoning a Louisiana pot correctly.

TRPA1 versus TRPV1 — two ways to feel a pepper. TRPV1 (heat) binds its agonist in a pocket, lock-and-key, and the sensation *lingers* — capsaicin's burn builds and dwells. TRPA1 (pungency) is agonized by **electrophiles** that *covalently modify* cysteine residues on the receptor's N-terminal ankyrin-repeat domain — a reactive handshake rather than a fitted key — and the sensation **flashes and clears.**

The chemistry is a Michael addition: the electrophile forms a covalent bond with specific cysteine thiols on TRPA1's cytoplasmic N-terminus — in the human receptor, cysteines around positions 621, 641, and 665 — a modification that opens the channel and then, as the adduct resolves and the small volatile molecule clears, lets it close. That covalent-but-reversible mechanism is the whole reason pungency is a *flash:* bright because the bond forms fast, brief because the agonists are small, volatile, and chemically fleeting. Capsaicin, by contrast, simply sits in its pocket until it slowly diffuses out. Two different physics, two different sensations, and one word — *spicy* — that English unhelpfully stretches across both. This is the entire difference between the slow dwell of cayenne and the bright, vanishing rush of mustard or horseradish that blows through the sinuses and is gone in seconds. One lingers; one resets. A cuisine needs both.

The TRPA1 pantry. Louisiana leans on a wide bench of pungent plants, and nearly all of them are ours:

- **Black mustard** (IFI-P/M, **2,790 constructs** — the second-deepest engineered organism in the garden): ground and wetted, its glucosinolates are cleaved by myrosinase into **allyl isothiocyanate**, the cold, clearing sting of Creole mustard and rémoulade. The glucosinolate–myrosinase system is a two-part charge the plant keeps disarmed until injury: intact, the seed holds the glucosinolate **sinigrin** and the enzyme **myrosinase** in separate compartments; grind and wet the seed and they meet, and myrosinase hydrolyzes sinigrin into the volatile that clears a sinus. Black mustard runs on sinigrin and allyl isothiocyanate (sharp, hot, fast); white mustard — also ours, at 200 constructs — runs on **sinalbin**, which yields a less volatile *p*-hydroxybenzyl isothiocyanate, milder and slower, more a tongue-heat than a nose-heat. Temperature is the dial: myrosinase works best cool,

and heat drives the volatile off, which is the whole reason a mustard bloomed cold bites and a mustard cooked into a sauce goes mellow. Horseradish and wasabi run the same chemistry on the same channel, which is why they stack so cleanly.

- **Garlic**, again: allicin on TRPA1 as well as γ-glutamyl peptides on CaSR — the plant that plays two channels.
- **Ginger** (IFI-P, 120 constructs): **gingerol** and, cooked, **zingerone**, a warmer pungency for the sweet end of the table.
- **Thyme** (IFI-P, 120 constructs) and **oregano** (IFI-P, 40 constructs): **thymol** and **carvacrol**, the aromatic terpene lift that defines the blackening crust and the herb note in a gumbo.
- **Cinnamon** (IFI-P, 40 constructs): **cinnamaldehyde,** a TRPA1 agonist that reads as warmth, for bread pudding and pain perdu.

Where heat is a dial you set once, pungency is a *lift* you layer — bright on top of depth, to keep the depth awake.



Designed thyme — thymol and carvacrol, the aromatic terpenes that lift a crust or a pot on TRPA1 and then clear.

The House Creole Blend

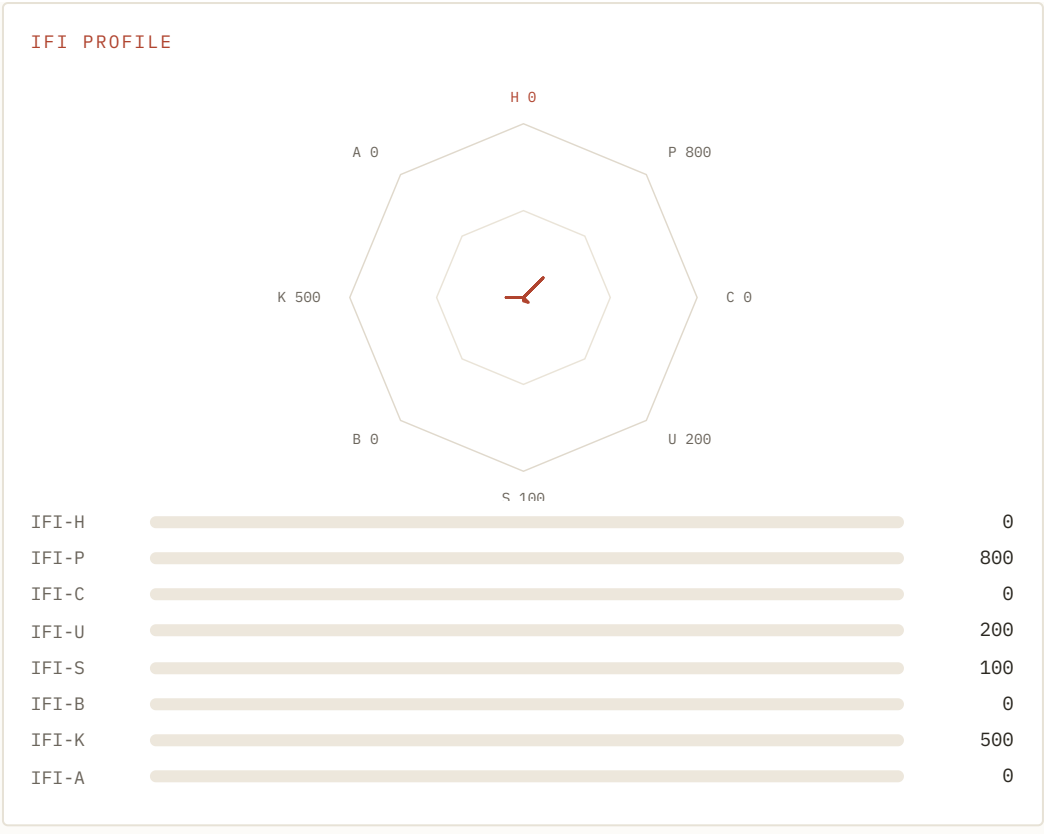
Makes about 1 cup · the jar by our stove

3	tbsp	smoked paprika
1	tbsp	kosher salt
1	tbsp	designed garlic, granulated
2	tsp	designed onion, granulated
2	tsp	ground thyme
2	tsp	ground oregano
1	tsp	white pepper
1	tsp	black pepper, coarse
		designed cayenne, to your rung on the ladder (Chapter 3)

1. Stir everything but the cayenne together until the color is an even rust and no salt sits in pockets.

2. Add the cayenne last and in stages, tasting the raw blend on a fingertip between additions, until the warmth lands where you want it. Everything above it is the frame; this is the one line you write yourself.
3. Keep it sealed, away from light. It is loudest in the first month, while the pungent aromatics still hold their volatile edge.

Why it works — Thyme and oregano stack thymol and carvacrol on TRPA1 for a lift that flashes and clears; garlic and onion lay kokumi underneath, the quiet body that makes a seasoning taste *finished* rather than merely hot. Keeping the cayenne separate and laddered means the frame tastes identical on a Tuesday and at a wedding — only the dial moves.



House Creole Mustard

Makes about 1½ cups · 10 minutes, plus a day to mellow · the coarse, stone-ground one

½	cup	designed black mustard seed (brown)
2	tbsp	designed white mustard seed (yellow)
½	cup	cider vinegar
¼	cup	cold water
1	tsp	salt · 1 tsp designed cane syrup

1. Soak both seeds in the vinegar and cold water overnight until swollen. The cold is deliberate; it preserves the myrosinase for the grind.
2. Pulse coarsely — Creole mustard is stone-ground and grainy, never smooth — adding the salt and the thread of cane syrup to round it.
3. Let it sit a day in the jar. Fresh, it is savage; after a day the harshest edge settles to a bright, deep sharpness. It keeps for weeks, mellowing slowly.

Why it works — Grinding cold maximizes the myrosinase that frees allyl isothiocyanate, so the mustard reads loud on TRPA1; the overnight soak and the day's rest let the volatiles equilibrate from *harsh* down to *sharp.* The touch of cane rounds the attack without dulling it — sweetness and pungency on two separate channels, balanced rather than blended.

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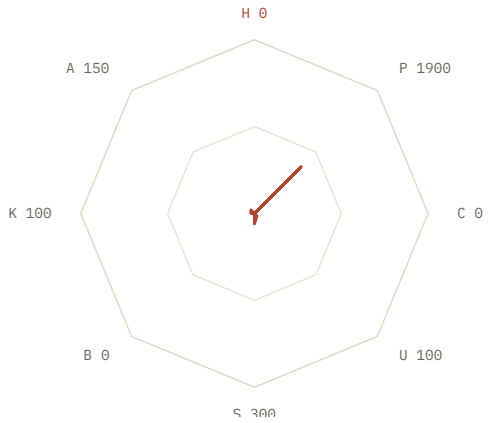

IFI-H	0
IFI-P	1,900
IFI-C	0
IFI-U	100
IFI-S	300
IFI-B	0
IFI-K	100
IFI-A	150

Creole Rémoulade

Makes 2 cups · the red-gold one · over cold shrimp or a fried green tomato

3	tbsp	designed black mustard seed, ground — or good Creole mustard
1	cup	mayonnaise (or a vegan aioli)
2	tbsp	tomato paste, from designed tomato, for the red
2		green onions, minced
2	tbsp	cider vinegar · 1 tbsp horseradish
1	tsp	House Creole Blend
		chilled boiled shrimp — or fried green tomatoes — to serve

1. Bloom the ground mustard in the vinegar with a splash of cold water for ten minutes. *Cold keeps the pungency sharp* — myrosinase works best cool, and heat would volatilize the allyl isothiocyanate away. You choose the intensity by temperature alone.
2. Fold the bloomed mustard into the mayonnaise with the paste, green onion, horseradish, and blend. It should be loud and a little fierce.
3. Chill an hour so it marries. Spoon generously over cold shrimp, or over fried green tomatoes for a meatless plate that gives up nothing.

Why it works — Bloomed cold, the mustard's allyl isothiocyanate hits TRPA1 at full volume and the horseradish stacks the same channel. Because pungency *flashes and clears,* a cold spoonful resets the palate against the richness of shrimp and mayonnaise instead of piling heat onto heat — it is the sauce as a bright cold knife.

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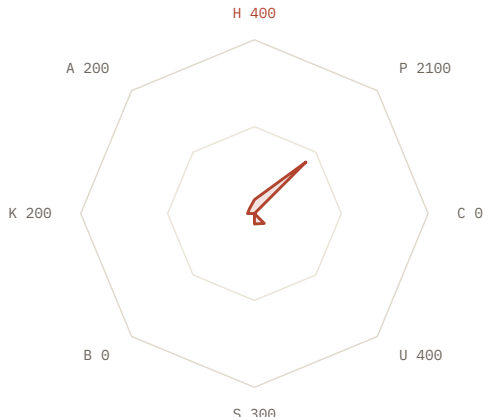

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PART III OF VI

The Pot Dishes

gumbo · jambalaya · étouffée — the great slow pots, composed and scored

Chapter 8 · Gumbo — *the long pot, read in full.*

If Louisiana has one dish, it is gumbo: the dark roux, the trinity, the slow savory liquid, and a thickener — okra in summer, filé at the finish, sometimes both. It is a composition, and composition is the thing the Index was built for. Everything we have laid down in the last seven chapters arrives in one pot here, so this chapter runs long on purpose. We start where the state's own Lenten tables start, with a **gumbo z'herbes** — a green gumbo of many leaves that was its own whole tradition on Holy Thursday long before anyone needed a reason to leave the meat out. Then, with respect and no translation, the seafood and the andouille.

Gumbo is the clearest edible record of who built Louisiana. The word itself is West African — *ki ngombo,* okra, carried across the Atlantic with the people enslaved to grow it, and okra is the summer thickener. The autumn thickener, **filé,** is Choctaw: ground, dried sassafras leaf, the gift of the people who were here first. The dark roux and the mother-sauce instinct are French; the tomato and the pepper came through a Spanish and Caribbean port; the rice underneath is the crop that shaped the whole lower Mississippi. No single culture invented gumbo. It is the pot where five of them had to sit down together, and it has simmered that argument into something like peace for three hundred years. We cook it as guests who were handed the recipe, and we try to be worthy of the handing.

The architecture of savor. A gumbo is a stack of glutamate and kokumi sources, each multiplying the ones beneath it. Read it as a circuit:

SOURCE	KEY COMPOUND	RECEPTOR	CONTRIBUTION
Dark roux	melanoidins, free glutamate	mGluR1	the Maillard floor
Restored tomato (Creole)	glutamate	mGluR1 / TAS1R1·R3	the savory body
Dried mushroom / shiitake	GMP (guanylate)	TAS1R1·R3 (allosteric)	the synergy multiplier
Shrimp, crab, crawfish (seafood)	IMP (inosinate)	TAS1R1·R3 (allosteric)	the oceanic synergy
Trinity + garlic + yeast	γ-glutamyl peptides	CaSR	the long finish, the body
Black mustard, filé	allyl compounds, aromatics	TRPA1	the bright lift that keeps it awake

Because glutamate and the ribonucleotides *multiply* at the receptor rather than add, a pot with three savory sources tastes far deeper than the sum of what went in. That is the whole secret of gumbo stated as biochemistry — and it is why a vegetarian pot built on roux + tomato + mushroom reaches the same depth the ham bone used to buy, by a green door.

The order you build in is not arbitrary; it is the sequence that lets each layer set before the next leans on it. Roux first, to its color, then the trinity dropped in to arrest it and release the alliums' kokumi. Then the tomato, cooked down until it loses its raw brightness and its glutamate concentrates. Then the liquid, slowly, so the roux emulsifies instead of seizing into lumps. Then the long gentle simmer, where proteolysis and reduction do the quiet multiplying. The thickener in its right place, and the bright lift — mustard, a last green, the pepper vinegar — at the very end, because pungency is volatile and would simmer away. Build it in that order and the pot sets like a well-made argument: each claim resting on the one before it.

The two thickeners. *Okra* thickens with mucilage — long-chain polysaccharides that give the summer gumbo its silk; it must cook long enough to lose its rawness. *Filé* — ground, dried sassafras leaf — thickens and perfumes with a woodsy, root-beer note, and it goes in **off the heat, at the finish, never at a boil,** or its polysaccharides rope into strings. Many Cajun cooks use one or the other; a few use both, in sequence. Either way the thickener is doing CaSR's work: giving the body something to feel.

The two thickeners work by different polysaccharides, and knowing which is which saves a pot. Okra's silk is **mucilage** — acidic pectic polysaccharides and protein that dissolve into long, water-holding chains as the pods cook; they thicken beautifully but they *rope* if the pot is rushed, which is why okra is cooked down first, dry or with a little acid, until the strings shorten and the raw edge goes. Filé's thickening is a gentler gum from the sassafras leaf, and it sets the instant it is warm — exactly why it goes in **off the heat, at the very end.** Boil filé and it clumps into ropes you cannot stir out; warm it softly into a finished pot and it thickens to an even body and perfumes the whole thing with a woodsy, root-beer note. The rule is simple and absolute: okra early, filé last, and never the two cooked hard together.



The long pot's ancestor in the greenhouse — the plants that carry a gumbo's depth, grown before they are cooked.

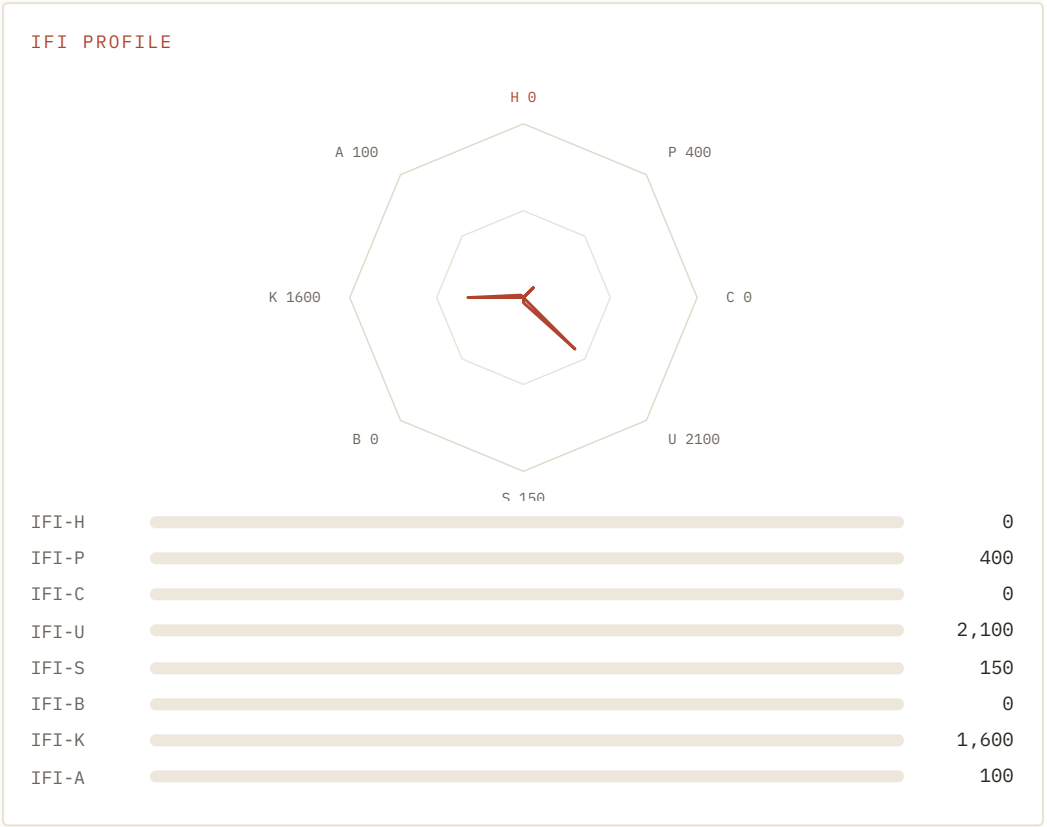
Gumbo z'Herbes

Serves 8 · 2 hours · the green pot, and the base for any gumbo you like

1	cup	Dark Roux (Chapter 2)
1		Trinity, Cut and Started (Chapter 1)
3	lbs	mixed greens — collard, mustard, turnip, spinach, parsley, carrot top
2		ripe designed tomatoes, grated (umami-restored)
1	cup	dried mushrooms, torn and soaked (reserve the liquor)
8	cups	vegetable stock
1	tbsp	House Creole Blend (Chapter 7)
2	tsp	designed black mustard seed, ground
2	tbsp	filé powder, at the finish
		cooked rice, to serve

1. Wash and roughly chop the greens — the more varieties the richer the pot; the old custom counts an **odd** number of greens for luck, and you make a wish for every one. Wilt them in batches in a dry pot, then lift out and chop fine, saving their dark liquor.
2. Build the gumbo on the Dark Roux: drop the started trinity in, then the grated tomato, and cook five minutes until it smells like a Creole sauce.
3. Add the greens and their liquor, the soaked mushrooms with their strained soaking liquid, the stock, the Creole Blend, and the ground mustard. Simmer gently, uncovered, forty-five minutes to an hour, until the pot turns silky and dark.
4. Off the heat, stir in the filé — never at a boil, or it ropes. Serve over rice, with pepper vinegar on the table.

Why it works — Three savory sources multiply at mGluR1: the Maillard roux, the restored tomato at **IFI-U 2,600**, and the mushroom's GMP wedging the glutamate louder. The slow allium-and-greens base lays kokumi under all of it, and the ground mustard throws a bright TRPA1 lift so the depth never goes flat. The filé gives the body something for CaSR to feel. No meat stock, and nothing missing.



Seafood Gumbo

the same pot, the Gulf folded in

Build the gumbo z'herbes base exactly as above, leaning on a peanut-to-brick roux rather than the darkest chocolate, and ease back on the mushrooms — the seafood brings its own synergy. In

the last ten minutes, fold in **1 lb shrimp, 1 lb lump crab, and a pint of shucked oysters with their liquor,** cooked only until just set. They are the point, not an afterthought; treat them gently and pull the pot the moment the shrimp curls. The oyster liquor is pure glutamate-and-IMP and belongs in the pot.

Why it works — The shellfish deliver **IMP** against the tomato's glutamate, and the allosteric synergy at TAS1R1·R3 is why a seafood gumbo tastes so overwhelmingly *of the sea* on a modest amount of actual seafood. The oceanic depth is the same multiplication the mushrooms did for the green pot, run through a different ribonucleotide.

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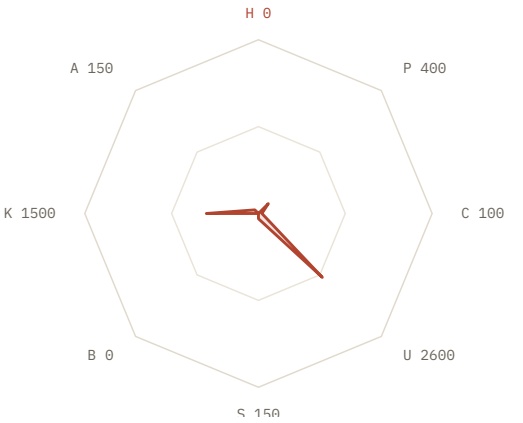

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IFI-K	1,500
IFI-A	150

Chicken & Andouille Gumbo

the Cajun pot, built on a dark roux

Brown chicken thighs and sliced andouille first, lift them out, and build the darkest **chocolate roux** in the rendered fat; the browned fond is a Maillard deposit that reads straight onto mGluR1. Return the meat with the stock and simmer until the chicken falls from the bone.

This is the smoky, mahogany Cajun gumbo, and it is cooked with the same attention we give the greens — fully, generously, without apology.

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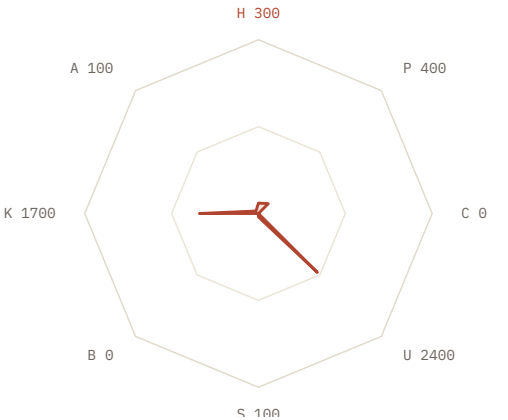

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IFI-A	100

Chapter 9 · Jambalaya & the Grain — *rice that holds the whole pot.*

Where gumbo is soup over rice, jambalaya is the rice cooked *in* the pot, swelling with everything around it — the Creole "red" version carrying tomato, the Cajun "brown" version going without. It is Louisiana's rice-and-everything dish, cousin to paella and jollof, and it stands or falls on one thing: the liquid the grains drink. Make that liquid savory enough and the rice itself becomes the flavor.

The physics of a separate grain. Rice is a balance of two starches — **amylose,** the straight-chain starch that keeps grains distinct, and **amylopectin,** the branched starch that makes them cling. Long-grain rice runs high in amylose, which is why a proper jambalaya is dry and separate and a risotto rice is creamy; the grain is the recipe. Toasting the rice in the base before the liquid goes in coats each grain in fat and gelatinizes the surface starch, setting a boundary so the grains cook *beside* one another rather than *into* one another. Then the lid goes on and does not come off: jambalaya is cooked by absorption, and every lift of the lid is steam and heat lost.

Two more physics decide a jambalaya. The first is **gelatinization:** starch granules absorb water and swell irreversibly above about 70 °C, which is the moment the grain turns from chalky to tender — too little liquid and the centers stay hard, too much and the surfaces dissolve into paste. The second is the thing Louisiana prizes, the **gratin** — the toasted crust a Spanish cook calls *soccarat* in a paella — where the bottom layer of rice caramelizes against the hot pot into a chewy, Maillard-deep floor. A Cajun cook fights for that crust; it is the reward, and the reason jambalaya is built in a heavy pot and not a rice cooker. (Retrogradation — the staling that firms cold rice as its amylose recrystallizes — is why day-old jambalaya fries up so cleanly: the grains have re-set and separate in the pan.)

Rice is also a frontier of its own in our roadmap — the **Dynasty** concept line, one of the long-horizon synthetic-pathway organisms, imagines a rice carrying savor and aroma in the grain itself. For now the rice goes in honest and unengineered, and the savor is grown into everything around it; the day the grain carries its own is on the map, not yet on the plate.

The two jambalayas split exactly where the two cuisines do. **Creole** (city) jambalaya is red — the tomato is in the pot, the dish built on the Creole-sauce lineage. **Cajun** (country) jambalaya is brown — no tomato, the color and depth coming entirely from a hard sear and a dark deglaze, which is why a Cajun jambalaya tastes smokier and more of the pot's own fond. Same name, same grain, two arguments about where savor comes from: the tomato, or the fire. We cook both, and the Index reads both — the red pot leaning on IFI-U from the fruit, the brown pot on IFI-U from the Maillard sear, arriving at the same floor by the city road and the country one.

The load-bearing tomato. Creole jambalaya is red because the tomato is *structural,* not a garnish — and a supermarket tomato, emptied of 93% of its peak umami, cannot carry a pot this size. Grown back to **IFI-U 2,600,** it saturates the stock the rice drinks, so every grain carries savor from the inside out. This is the clearest demonstration in the book of why restoring the tomato matters: in a sauce you can hide a weak tomato behind other things; in a jambalaya the rice *is* the tomato, concentrated, and there is nowhere to hide.



Long-grain rice, cut — high-amylose grains that cook separate and drink the savory they are cooked in.

Creole Jambalaya

Serves 6 · 1 hour · the red pot

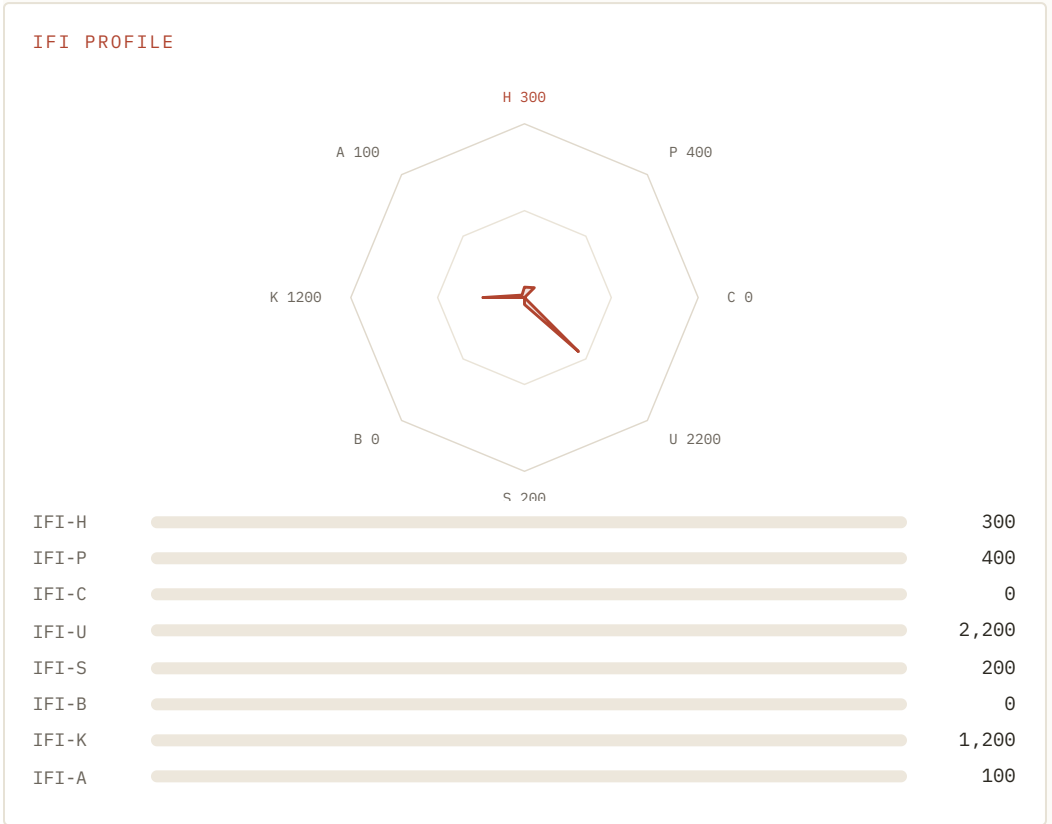
1		Trinity, Cut and Started (Chapter 1)
3		ripe designed tomatoes, chopped (umami-restored)
2	cups	long-grain rice
3½	cups	vegetable or shellfish stock
2	tbsp	House Creole Blend (Chapter 7)
1	cup	dried mushrooms, torn — or shrimp and andouille (below)
2		bay leaves · green onion and parsley, to finish

1. Cook the chopped tomato into the started trinity until it darkens and loses its raw edge — five to eight minutes. This is the flavor of the whole dish; do not rush it.
2. Stir in the rice and toast it a full minute, until each grain is coated and faintly translucent at the edge, so it will cook separate.
3. Add the stock, the Creole Blend, and the bay. For a vegetarian pot, fold in the torn mushrooms now for a smoky, meaty chew. Bring to a boil, then cover and drop to the barest simmer.
4. Cook 25 minutes without lifting the lid, then rest 10 off the heat — the rest is where the grains finish drinking. Fork through the green onion and parsley.

For shrimp and andouille: brown the sliced andouille first and build on its drippings; add the shrimp in the last five minutes so they stay tender. They are cooked with the same attention we give the mushrooms — fully, and without apology.

Why it works — The tomato is the structure, not the seasoning: at **IFI-U 2,600** its restored glutamate saturates the stock the rice absorbs, so every grain carries savor from within. The mushrooms

(GMP) or the shrimp (IMP) stack a second source that multiplies the first at TAS1R1·R3, which is why a meatless jambalaya still tastes as though it simmered with something rich.



For a Cajun brown jambalaya: leave the tomato out entirely. Sear sliced andouille and chicken — or, for a vegetarian pot, torn king oyster mushrooms and a handful of walnuts — hard in the pot until deeply browned and a dark fond coats the bottom; deglaze with a splash of stock, scraping it up, before the trinity goes in. The rice drinks that fond instead of the tomato, and the dish comes out mahogany, smoky, and drier — the country cousin of the red pot above, and no less complete.

Maque Choux

Serves 4 · 30 minutes · the summer corn, smothered sweet

6		ears corn, kernels cut, cobs scraped for their milk
1		Trinity, Cut and Started (Chapter 1), onion-heavy
2		ripe designed tomatoes, diced
2	tbsp	butter
1	tsp	House Creole Blend (Chapter 7)
		designed cane sugar, a pinch if the corn is not sweet enough

1. Cut the kernels and scrape the cobs hard for their starchy milk — that milk is the thickener and half the sweetness.
2. Smother the corn, its milk, and the tomato into the buttery trinity over medium, twenty minutes, until the corn is tender and the pot is creamy from its own starch.
3. Season with the blend; correct the sweetness only if needed. A pinch of sub-threshold cayenne widens the corn's sweetness without reading as heat (Chapter 13).

Why it works — Corn's own sweetness (IFI-S) rides on the trinity's kokumi and the tomato's umami, and the scraped cob-milk thickens the pot with gelatinized starch so it reads rich without cream. Corn is also a frontier line of ours — the **Storm** concept — but here it is summer corn, cooked the old way, measured the new way.

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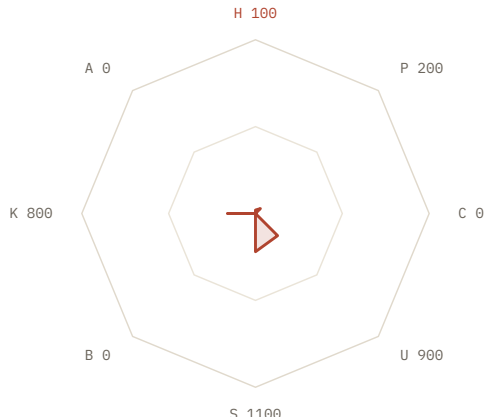

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IFI-K		800
IFI-A		0

Chapter 10 · Étouffée & the Smothered Dishes — *body without heaviness.*

Étouffée means smothered, and it names a whole technique as much as a dish: a short cook under a close watch, the lid doing half the work, the aromatics and a little liquid pulled into a glossy coating rather than a soup.

The word is the method: *étouffer,* to smother, to suffocate — to cook something close and covered in very little liquid so it braises in its own captured steam. It is the gentlest heat in the Louisiana repertoire, the opposite of the blackening skillet, and it rewards a light hand at every step. The roux stays blond because a dark roux would bully the delicate crawfish; the liquid stays short because a flood would make soup; the simmer stays a bare tremble because a hard bubble toughens shellfish in seconds. Everything about étouffée is restraint, which is why it is the dish that most exposes a weak base — there is nowhere to hide a thin trinity under a short, pale gravy. The body has to be *in the plant,* already there, or the dish reads watery. The crawfish étouffée is its most famous child — a blond or peanut roux, the trinity, a short savory gravy, and crawfish tails folded in at the very end and barely cooked, served in a ring of white rice. It is spring food, crawfish food, and it asks for restraint: too dark a roux, too hard a boil, and the delicacy is gone.

The problem étouffée solves. The whole dish turns on *body without heaviness.* The gravy must coat the back of a spoon and cling to the rice, yet stay silky and never gummy — rich, but not heavy. That is kokumi doing exactly what Chapter 6 described: richness you feel on CaSR rather than taste, continuity and mouthfulness without fat or long reduction. We grow it into the alliums so the smothering needs neither cream nor an hour to feel luxurious; the body is in the pot from the first minute, and the pale roux stays pale, which keeps the sweetness of the crawfish — or the sear of a mushroom — as the headline instead of the flour.

This is the cleanest demonstration in the book of kokumi earning its keep. A classic étouffée that lacks grown-in body gets rescued at the stove with butter and cream — fat standing in for the fullness the base could not supply. Grow the γ-glutamyl peptides into the alliums and the gravy reads luxurious on a single spoonful of butter and no cream at all, because CaSR is doing the work the fat used to fake. The luxury moves from the dairy into the plant, and the dish gets lighter without getting leaner-tasting. That is not a diet trick, and we would never sell it as one; it is simply where the richness honestly comes from once the base carries its own.

The smothered dishes extend the technique across the garden: smothered okra, smothered eggplant, smothered greens — vegetables cooked down under a lid with the trinity until they collapse into their own silk. These are not side dishes made important; they are the oldest everyday cooking of the region, and they are where a plant kitchen is most at home.



Designed eggplant, cut — the flesh that smothers down into silk, a kokumi carrier in its own right.

Crawfish Étouffée

Serves 4 · 40 minutes · the ring of rice

½	cup	blond roux (Chapter 2, pulled at peanut)
1		Trinity, Cut and Started (Chapter 1)
2	cups	shellfish or vegetable stock
1	lb	crawfish tails — or king oyster mushrooms, torn
1	tbsp	House Creole Blend (Chapter 7)
2	tbsp	butter · green onion · lemon, at the finish
		cooked white rice, to serve

1. Loosen the pale roux with warm stock a ladle at a time, whisking to a smooth, light gravy — no lumps, no skin.
2. Stir in the started trinity and the Creole Blend. Simmer fifteen minutes, gentle, until the gravy coats a spoon and tastes round.
3. Fold the crawfish tails in off the hard boil and cook just two or three minutes — only until set. For a vegetarian étouffée, sear torn king oyster mushrooms until golden and fold them in the same way; their chew stands in honestly for the tails.
4. Finish with the butter, green onion, and a squeeze of lemon to lift it. Spoon into a ring of rice.

Why it works — The grown-in kokumi of the alliums gives the gravy a CaSR-deep body, so it reads rich on a blond roux with no cream — the luxury is in the plant, not the fat. Pulling the roux early keeps the dish pale and delicate, so the sweetness of the crawfish (and its IMP, multiplying the alliums' glutamate) or the sear of the mushroom (GMP) stays the headline.

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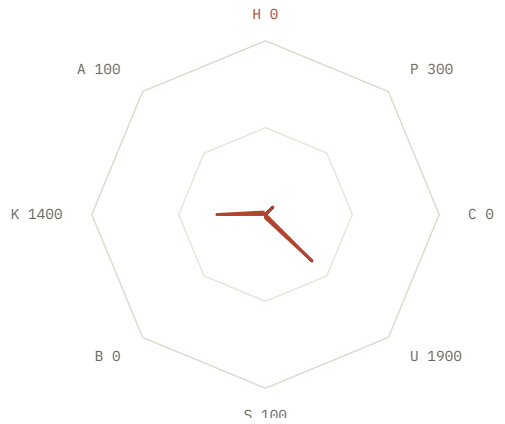

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IFI-K	1,400
IFI-A	100

Smothered Okra & Eggplant

Serves 4 · 45 minutes · the everyday pot

1	lb	okra, sliced — or more eggplant, if okra is out of season
1		eggplant, from designed eggplant, cubed
1		Trinity, Cut and Started (Chapter 1)
2		ripe designed tomatoes, chopped
1	tbsp	House Creole Blend (Chapter 7)
2	tbsp	neutral oil · a splash of cider vinegar

1. Smother the okra alone in the oil over medium-low first, fifteen minutes, stirring, until its mucilage stops roping and it turns toasty — this is the step impatience ruins.
2. Add the trinity, eggplant, and tomato; cover and smother thirty minutes more until everything collapses into a dark, silky tangle.
3. Brighten with a splash of vinegar and the blend. Serve over rice, or as the vegetable side to anything on this table.

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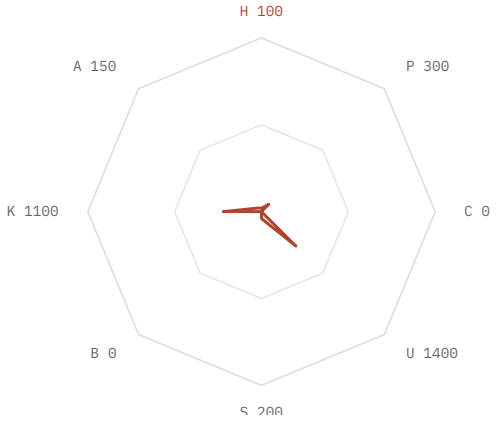

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IFI-K	1,100
IFI-A	150

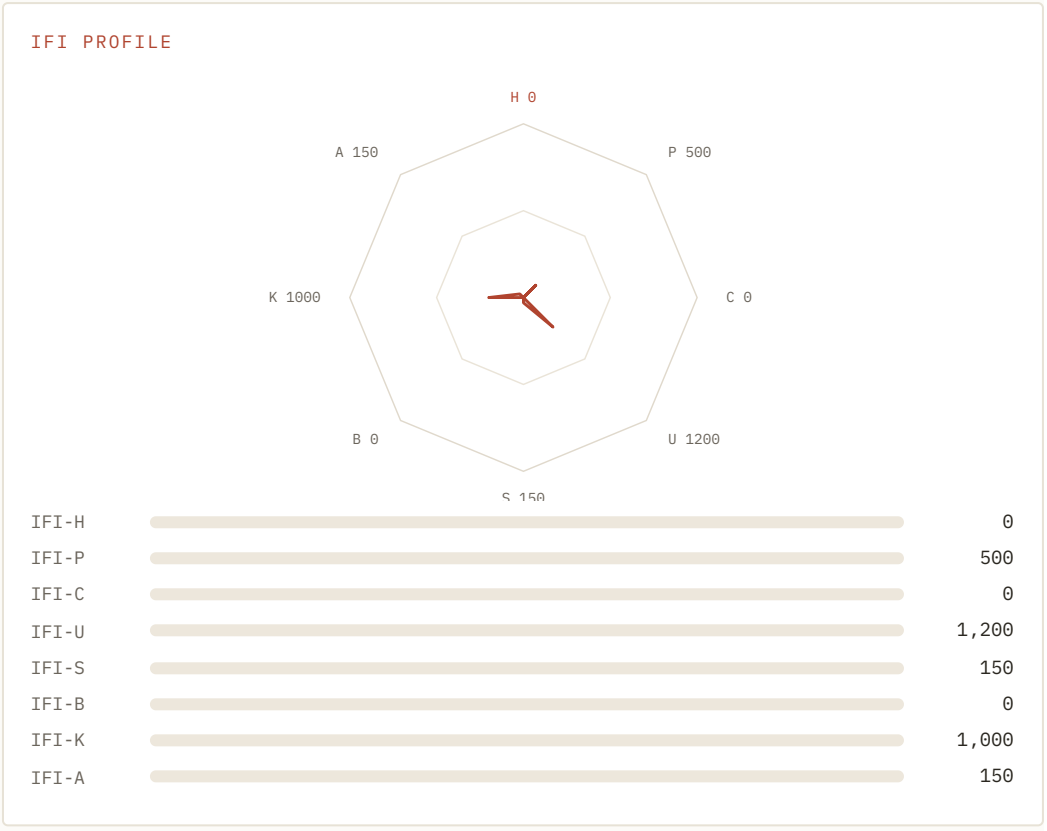
Smothered Greens with Pot Likker

Serves 6 · 1 hour · the everyday pot, and its best-kept liquid

3	lbs	mustard and collard greens, stems stripped, roughly chopped
1		Trinity, Cut and Started (Chapter 1)
6	cloves	designed garlic, sliced
1	tbsp	designed black mustard seed, cracked
1	tbsp	cider vinegar · a pinch of designed cane sugar
		salt · pepper vinegar, to serve

1. Wilt the greens into the started trinity with the garlic and cracked mustard seed, in batches, until they collapse.
2. Add a few inches of water, cover, and smother low forty-five minutes until the greens are silky and dark and the liquid has gone deep green-brown. That liquid is the *pot likker* — do not pour it off.
3. Sharpen with vinegar and a pinch of cane at the end; salt to taste. Serve the greens and their likker together, with cornbread to sop and pepper vinegar on the side.

Why it works — Long smothering breaks the greens down and builds kokumi by proteolysis while the trinity lays its own body underneath; the cracked mustard adds a bright TRPA1 lift so the pot never goes flat. The pot likker is where the water-soluble goodness of the greens ends up — the reason the old custom was always to drink it, and a nourishment note we make quietly and never as a claim.





PART IV OF VI

The Creole Table

the sauce system · the boil · the blackened crust · the city's cold sharp sauces

Chapter 11 · The Sauce System & the Boil — *the piquante, and the big pot.*

Creole cooking is sauce cooking — the city's French bones show in a family of mother sauces the way they do in Paris, but stained red with tomato and sharpened with cayenne. And Cajun cooking has its own grand communal dish, the boil, which is less a recipe than an afternoon. This chapter holds the two poles of the Creole table: the controlled, built sauce and the vast, improvised pot.

Sauce piquante — the red, sharp gravy. Built on the Creole Sauce of Chapter 5, a *sauce piquante* ("spicy sauce") is tomato savor met with cayenne heat and a vinegar lift — the gravy that smothers anything from eggplant to catfish to a Sunday's braise. It is the clearest everyday proof of composing across axes: the tomato on mGluR1, the cayenne on TRPV1, the vinegar and a little mustard on TRPA1, held in balance so none of them shouts.

Creole cooking inherited the French idea of a *mother sauce* — a base built once and sent in many directions — and bent it to the local pantry. The Mother Red of Chapter 5 is one; a **courtbouillon** (here a light, spiced tomato broth for poaching fish, not the French aromatic water) is another; a dark **sauce piquante** is a third. What makes them a family is a shared skeleton — trinity, tomato, stock, blend — and what makes them distinct is which axis is pushed forward: umami for a stew, pungency for a piquante, a bright acid lift for a courtbouillon. Learn the skeleton and you are not memorizing ten sauces; you are setting one set of dials ten ways. That is the whole economy of this book in a sentence. Where a cook once seasoned "to taste" and crossed their fingers, we set each axis to a number and the gravy tastes the same every time it is made.

The boil — seasoning from the outside in. A crawfish boil is a propane burner, a pot the size of a drum, newspaper on the table, and the long luxurious ritual of peeling and talking that lasts a whole afternoon — crawfish in spring, shrimp and crab in summer, and always the corn and potatoes that drink the spiced brine. The brine is where measuring matters most, because a boil seasons from the outside in and you cannot take it back. And the single most important lesson of the boil is counterintuitive: **the soak, not the boil, is where the flavor goes in.** Kill the heat the moment the shellfish are just done, and let everything *steep* — the proteins, cooling, draw the brine inward instead of toughening in it. Cook hard and long and you get rubber in bland water; cook short and soak and you get tender shellfish seasoned to the center.

The soak is osmotics, not magic. Crawfish and shrimp are muscle in a shell; in the brief hard boil the proteins set and contract, and if you keep boiling they keep contracting, squeezing water out and going rubbery. Kill the heat and the cooling flesh relaxes and, over ten quiet minutes, draws the seasoned liquid *inward* down the gradient

— salt, capsaicin, the mustard volatiles — so the seasoning reaches the center instead of staining only the shell. The potatoes and corn do the same thing more slowly, which is why they go in first and why they are, honestly, the best thing in the pot. (A note on the ritual: the crawfish are purged in clean water before they cook, and the pot is a social machine as much as a recipe — the long peeling *is* the point, and the seasoning is only what makes the peeling worth an afternoon.)



The brine's heat, grown to a number — a designed pepper hero for the pot that must taste the same every spring.

Sauce Piquante

Makes about 4 cups · 50 minutes · over eggplant steaks, catfish, or a braise

4	cups	Creole Sauce — the Mother Red (Chapter 5)
1	tbsp	designed black mustard seed, ground
1	tsp	designed cayenne, ground, to IFI-H 800
2	tbsp	cider vinegar
1		lemon, juiced · green onion, to finish

1. Bring the Creole Sauce to a low simmer and stir in the ground mustard and the cayenne metered to **IFI-H 800.**
2. Simmer fifteen minutes to marry, then sharpen with the vinegar and lemon at the end so the brightness survives.
3. Smother your eggplant steaks or fish in it and finish with green onion. Rice underneath, pepper vinegar alongside.

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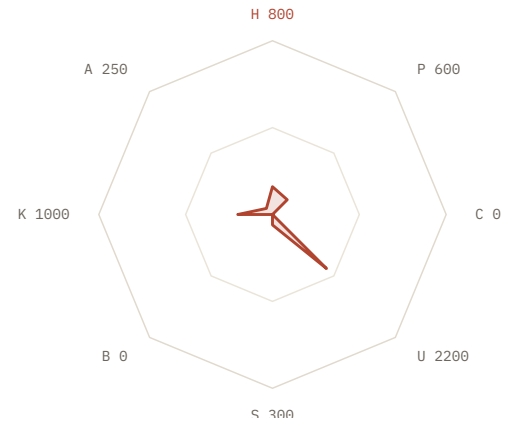

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IFI-C	0
IFI-U	2,200
IFI-S	300
IFI-B	0
IFI-K	1,000
IFI-A	250

The Seafood Boil, to a Number

Serves 8 · 1 hour · the afternoon-long table

5	lbs	crawfish — or shrimp and crab — purged and rinsed
2	lbs	small potatoes
4		ears corn, halved
2		onions, quartered · 1 head garlic, halved
½	cup	House Creole Blend (Chapter 7)
2	tbsp	designed black mustard seed
1	tsp	designed cayenne, ground, to IFI-H 900
		lemons, halved · salt

1. Bring a huge pot of water to a rolling boil with the Creole Blend, mustard seed, cayenne metered to **IFI-H 900,** the onions, garlic, lemons, and a generous hand of salt. Boil ten minutes so the brine is fully seasoned before anything goes in.
2. Add the potatoes; after ten minutes, the corn. These take the longest and they drink the spice, becoming half the reason to hold a boil at all.
3. Add the crawfish or shrimp and cook only until just done — three to five minutes — then **kill the heat and let everything soak** ten minutes more. The soak is the step that rewards patience and punishes a hard, long cook.
4. Pour it out over newspaper and eat with your hands, pepper vinegar and lemon within reach.

Why it works — Metering the cayenne to **IFI-H 900** sets the burn on TRPV1 to a precise, repeatable rung, while the black mustard adds a sinus-bright TRPA1 lift that cuts the richness of the shellfish. The potatoes and corn are sponges, pulling the spiced brine into their starch and sweetness so the whole pot reads seasoned, not just the shells.

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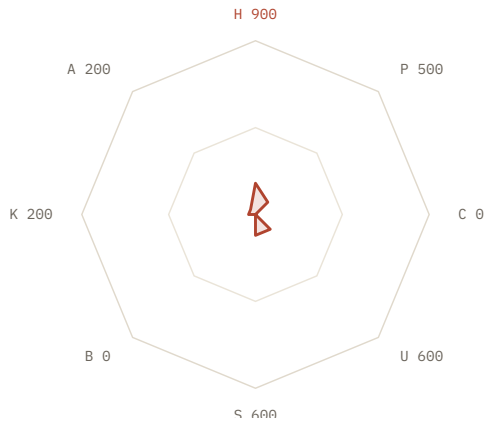

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IFI-U	600
IFI-S	600
IFI-B	0
IFI-K	200
IFI-A	200

Redfish Courtbouillon

Serves 6 · 45 minutes · fish poached in a spiced red broth (or eggplant, for a meatless pot)

4	cups	Creole Sauce — the Mother Red (Chapter 5), loosened with 2 cups stock
2	tbsp	House Creole Blend (Chapter 7)
1	tsp	designed cayenne, to IFI-H 600
2	lbs	redfish or drum fillets — or thick eggplant steaks
1		lemon, sliced · green onion, to finish

1. Loosen the Mother Red with stock into a brothy, spiced tomato poaching liquid; season with the blend and the cayenne metered to **IFI-H 600,** and simmer ten minutes to marry.
2. Slide the fish (or eggplant) in, barely cover, and poach at a bare tremble — never a boil — eight to ten minutes, until just set and flaking.
3. Lift gently onto rice, spoon the broth over, and finish with lemon and green onion.

Why it works — Poaching in the tomato broth seasons the fish from the outside in without the toughening of a hard cook; the restored tomato's umami penetrates the flesh while the gentle heat keeps it tender. That is the courtbouillon's whole logic: the sauce *is* the cooking medium, so savor and doneness happen in one step.

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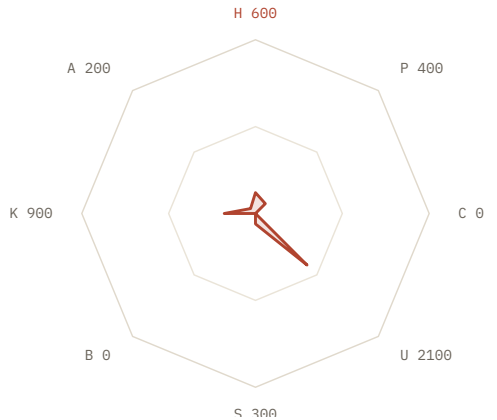

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IFI-C		0
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IFI-S		300
IFI-B		0
IFI-K		900
IFI-A		200

Chapter 12 · Blackened & Live-Fire — *the crust, at full volume.*

In the early eighties a Cajun chef pressed seasoned fish into a cast-iron skillet hot enough to fill the kitchen with smoke, and *blackened* became a word the whole country learned — often badly, which is why it is worth saying plainly what it is. Blackening is not burning. It is a deliberate char of spice and butter into a dark, aromatic crust, the fish or vegetable beneath kept just cooked through. Done right, the black is *flavor,* not ash, and the line between them is exactly the TAS2R38 cliff we met at the roux.

The technique is young — it belongs to Paul Prudhomme, the Cajun chef who in the early 1980s made blackened redfish so famous the fish was very nearly pulled out of the Gulf — but the physics are old. It depends entirely on the **thermal mass of cast iron.** A heavy iron skillet, preheated long and hard, holds enough stored heat that the cold, wet surface of the fish cannot cool it below the browning threshold; the crust forms in seconds while the interior barely has time to cook. A thin pan, or a cool one, dumps its heat the moment the fish lands, and you get grey, steamed fish with wet spice stuck to it. Preheat longer than feels reasonable — until the dry pan faintly smokes — and do not crowd it; crowding drops the temperature and steams the very crust you came for.

Why the crust tastes the way it does. The crust works almost entirely on the sharp channel. The thyme, oregano, paprika, and pepper of the blend hit the screaming cast iron and *bloom* — the aromatic terpenes (thymol, carvacrol) volatilize and throw onto **TRPA1** all at once, while the paprika's sugars and the butter's milk solids run a fast, hot **Maillard** into a savory, bitter-edged crust read on mGluR1. Underneath, the cayenne sits on TRPV1, laddered to taste. The whole art is to brown deeply without tipping into the burnt-carbon bitterness of TAS2R38 — the same edge as the roux, run in ninety seconds instead of forty-five minutes.

Use **clarified butter,** not whole, for the brushing. Whole butter's milk solids and water scorch and spit at blackening heat; clarified butter is nearly pure fat, with a smoke point high enough to carry the spice into the crust rather than burning on top of it. And read the smoke honestly: a thin bluish smoke off the spice and butter is Maillard, the crust forming; thick acrid grey smoke is the sugar and herbs past the cliff, into pyrolysis and the TAS2R38 bitterness. The difference is maybe twenty seconds and one notch of the burner — which is exactly why you blacken with the window open and your whole attention on the pan. It is the roux's cliff again, only run hot and fast. We grow the aromatics for exactly that front-of-mouth bloom, so the crust reads as perfume-and-spice rather than scorch, and the butter carries kokumi to round the whole thing.

Live fire extends the same chemistry outdoors: the grill's radiant heat and smoke run Maillard and a little pyrolysis across a surface while the interior stays tender — a rub built on our aromatics, heat

laddered by IFI-H, and the smoke read partly as pungency and partly as a savory, phenolic depth.



The dark, dramatic register of the blackened pan and the live fire — a designed cultivar in low light.

Blackened — Redfish or Cauliflower

Serves 4 · 20 minutes · open a window

4		redfish fillets — or 4 thick cauliflower steaks
3	tbsp	House Creole Blend (Chapter 7)
4	tbsp	butter, melted
1		lemon, to finish

1. Heat a dry cast-iron skillet until a drop of water skitters and vanishes — this takes longer than you think; a cool pan steams instead of blackens.
2. Brush the fish or cauliflower with melted butter and press the Creole Blend onto both faces in a thick, even coat.
3. Lay it in the dry pan and do not move it. Two to three minutes a side for fish, a little longer for cauliflower, until the crust is deep and set. The smoke is the method, not a mistake.
4. Squeeze lemon over at the table; the acid lifts the char and brightens the whole plate.

Why it works — Seared into a smoking pan, the blend's thyme and oregano throw their terpenes onto TRPA1 all at once — the bright, flashing lift that reads as *spice* rather than *burn* — while the paprika's sugars brown into a savory crust. The cauliflower's own char answers on mGluR1 the way the fish's glutamate does, which is why the vegetable version is a dish in its own right and not a substitution.

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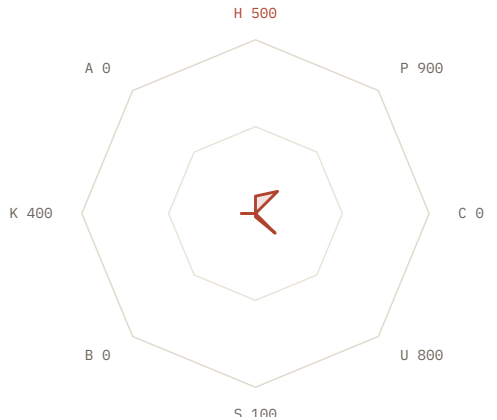

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IFI-U		800
IFI-S		100
IFI-B		0
IFI-K		400
IFI-A		0

Chile-Lemon Blackening Butter

Makes about ½ cup · 5 minutes · the finish that lifts the char

6	tbsp	butter, softened
1	tsp	House Creole Blend (Chapter 7)
		zest of 1 lemon · a little of its juice
		a pinch of designed cayenne, to taste
2	tbsp	minced green onion and parsley

1. Mash everything together and let it sit at room temperature an hour for the flavors to open.
2. Melt a spoonful over anything the moment it comes off the blackening pan or the grill; the cold acid and fresh herbs cut the char and wake the crust up.

Why it works — A blackened crust is deep and a little bitter by design; the lemon's acid and the herbs' fresh TRPA1 lift set against it are what turn *dark* into *bright-and-dark.* The butter carries kokumi to round the bite. It is the cold, fresh counterweight the hot crust needs — the plate's balance, spooned on at the very end.

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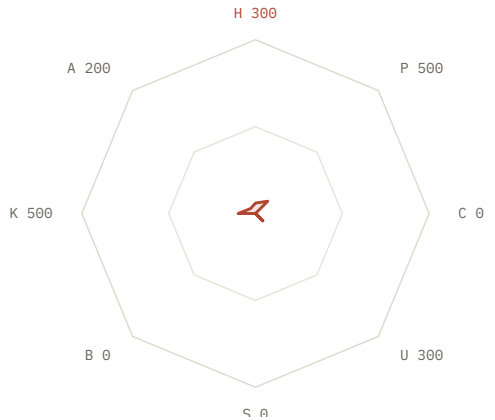

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IFI-C	0
IFI-U	300
IFI-S	0
IFI-B	0
IFI-K	500
IFI-A	200

Grilled Eggplant with a Cajun Rub

Serves 4 · 25 minutes · the live-fire plate

2		eggplant, from designed eggplant, in thick planks
2	tbsp	House Creole Blend (Chapter 7)
2	tsp	designed cane sugar (Chapter 13), for the crust
2	tbsp	neutral oil · a sprig of thyme

1. Salt the eggplant planks and let them weep twenty minutes; pat dry. Oil them and press on the blend cut with the cane sugar — the sugar is there to Maillard, not to sweeten.
2. Grill over a hot fire, turning once, until deeply marked and silky through. The sugar and the aromatics char into a crust the equal of any rub on meat.
3. Finish with thyme and a squeeze of lemon.

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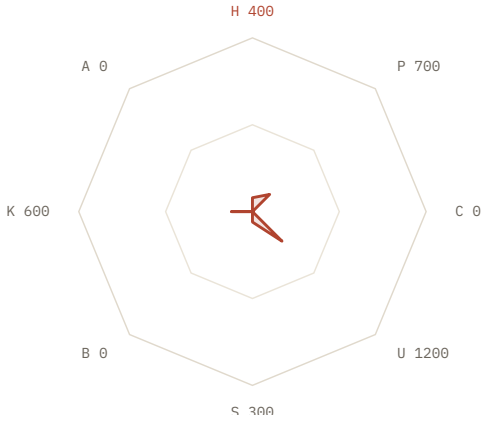

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IFI-U	1,200
IFI-S	300
IFI-B	0
IFI-K	600
IFI-A	0



PART V OF VI

Sweet, Sharp & Sustaining

cane and vanilla · the whisper of heat · chicory bitterness turned down · the botanical glass

Chapter 13 · The Sugarcane Country — *cane, vanilla, and a whisper of heat.*

Louisiana is sugar country — cane fields to the horizon, mills that scent whole parishes in the grinding season, and a cane syrup so dark and particular that pralines, bread pudding, and bananas Foster all taste faintly of the same land. That syrup is worth a word. Louisiana cane syrup is made by boiling pure cane juice in open kettles until it darkens and thickens — no sulfur, no refining, the whole juice reduced — so it keeps the minerals and the faint, almost smoky bitterness that cane loses on its way to white sugar. It is closer to a dark honey or a sorghum than to molasses, which is the by-product of making white sugar rather than the goal of anything. We grow the cane for that whole-juice character and amplify its sweetness at the plant, so a spoonful carries the dark cane soul at a lighter sugar load — the syrup doing on the sweet axis exactly what the restored tomato does on the savory one: the real thing, grown back to full. The desserts here lean sweet and warm and a little show-off, and they give a plant family two quiet pleasures: sweetness grown at the source so the actual sugar load stays gentle, and a whisper of heat that makes the sweet taste like more of itself.

Sweetness is a duet. The sweet receptor is the heterodimer **TAS1R2·TAS1R3,** and like its umami cousin it carries a "Venus flytrap" domain that must close for the brain to hear *sweet.* Crucially, sugars, the intense plant sweeteners, and the sweet proteins all bind at *different sites* on that dimer — sucrose in the flytrap cleft, **steviol glycosides** and **mogrosides** at other pockets, the sweet protein **brazzein** on the cysteine-rich domain. This is why we can lift perceived sweetness without lifting sugar: amplify the plant's own signal, or add an intense sweetener that moves the receptor hard at a vanishingly low dose, and the body reads *sweet* while the pancreas reads very little.

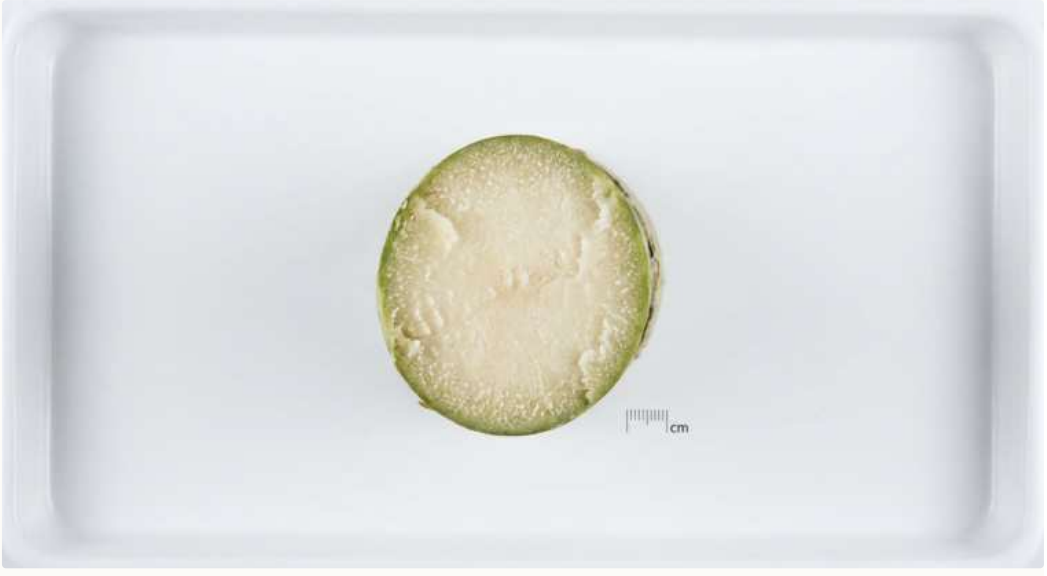
The bench is more varied than sugar's single note suggests. **Steviol glycosides** from stevia — rebaudioside A, and the cleaner-tasting rebaudioside M — run 200 to 300 times as sweet as sucrose and bind their own site on TAS1R2·R3; **mogrosides** from monk fruit, chiefly mogroside V, are sweeter still; and the **sweet proteins** — brazzein, thaumatin, monellin — are thousands of times as sweet by weight, latching onto the receptor's cysteine-rich domain in a way no small sugar can. Each has its own shape of sweetness and its own faint off-note, which is exactly why we blend them: a little steviol for lift, a little monk fruit for roundness, the plant's own restored cane sugar for body, so the sum reads like clean cane and not like any one sweetener announcing itself. The point is never to chase sweetness for its own sake; it is to let a Louisiana dessert keep its cane soul while carrying a gentler sugar load than it appears

to — an attribute, plainly stated, and never a health claim. Our garden carries that whole bench — **sugarcane** (IFI-S, 200 constructs) for the real cane note, **stevia** (IFI-S/F/M, 910 constructs) for steviol glycosides, **monk fruit** (IFI-S, 80 constructs) for mogrosides — so a Louisiana dessert can keep its cane soul and carry a lighter sugar load than it appears to.

The whisper of heat. There is an old cross-modal trick the region knows in its bones: a very small amount of cayenne in a sweet thing makes the sweetness *louder.* Held below the threshold where TRPV1 reports "hot," a trace of capsaicin still mildly sensitizes the trigeminal field and heightens attention, and the brain reads the sweetness arriving a beat behind as *more.* You never taste the heat as heat — only as more sweet, more dimension, a sauce that seems richer than its sugar.

This is a cross-modal effect, not a taste-mixing one: the trigeminal warmth and the gustatory sweetness are separate signals the brain integrates downstream, and a little arousal on the one sharpens attention to the other. It is the same reason a pinch of salt makes a caramel taste sweeter and a squeeze of lime makes it taste brighter — the senses are not sealed channels but a single verdict assembled from many. Louisiana has cooked by that truth forever, in the cayenne hidden in the chocolate and the black pepper on the strawberry; the Index only lets us set the heat precisely *below* the threshold where it would announce itself and become a different dish. It is the dessert expression of the same axis that runs the gumbo, dialed down to a secret.

Vanilla, the body of the sweet side. Vanilla (IFI-K, 40 constructs) is here for kokumi as much as for its aroma: it makes a custard taste of cream it may not fully contain, a continuity and richness read on CaSR. The world's most complex and most faked flavor earns its place on the sweet table by lending *body,* not only perfume.



Designed sugarcane, cut — the real cane note, grown so the sweetness can be amplified without piling on sugar.

Bananas Foster, a Whisper of Heat

Serves 4 · 15 minutes · the tableside show

4		ripe bananas, halved lengthwise
4	tbsp	butter
⅓	cup	cane syrup, from designed sugarcane
2	tbsp	designed-sweetener syrup (stevia or monk fruit)
1	tsp	designed cinnamon, ground
		a very small pinch of designed cayenne
¼	cup	dark rum · vanilla ice cream, to serve

1. Melt the butter with the cane syrup, designed sweetener, cinnamon, and the barest pinch of cayenne until it bubbles into a loose caramel.
2. Lay the bananas cut-side down and spoon the sauce over until they soften and glaze, two minutes.
3. Off the heat, add the rum and — carefully, at arm's length — flame it if you like the theatre; let it burn down to a glossy syrup.
4. Spoon over cold vanilla ice cream so hot and cold meet on the plate.

Why it works — The designed sweetener lifts IFI-S without the sugar load that would turn the sauce cloying — sweetness read on TAS1R2·R3 while the actual sugar stays modest. The cinnamon brings a warm TRPA1 lift, and the cayenne, held below *hot,* widens the sweetness from behind: you never taste the heat as heat, only as *more.*

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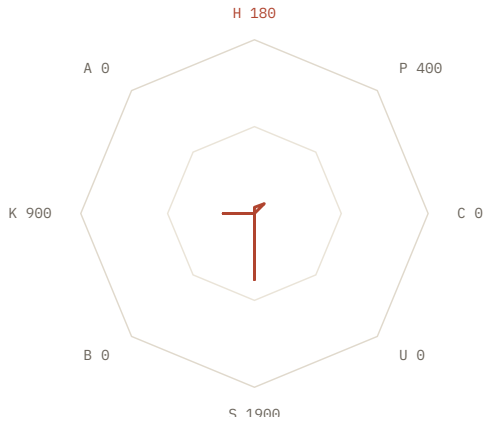

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IFI-C	0
IFI-U	0
IFI-S	1,900
IFI-B	0
IFI-K	900
IFI-A	0

Pecan Pralines

Makes about 20 · 30 minutes · the counter sweet

1	cup	cane syrup, from designed sugarcane
½	cup	designed-sweetener syrup, to keep the sugar gentle
2	tbsp	butter
1	tsp	vanilla, from designed vanilla
2	cups	toasted pecans
		a pinch of salt · the faintest cayenne

1. Cook the cane and sweetener syrups with the butter to the soft-ball stage, stirring, then beat off the heat until it turns opaque and begins to set.
2. Fold in the vanilla, pecans, salt, and a cayenne so faint it is a rumor. Spoon onto parchment and let set.

Why it works — Same principle as the bananas: the sweetness is grown and amplified rather than piled on, vanilla lends CaSR body so the praline tastes of cream, and the rumor of cayenne widens the whole thing. A gentler sugar, a fuller taste.

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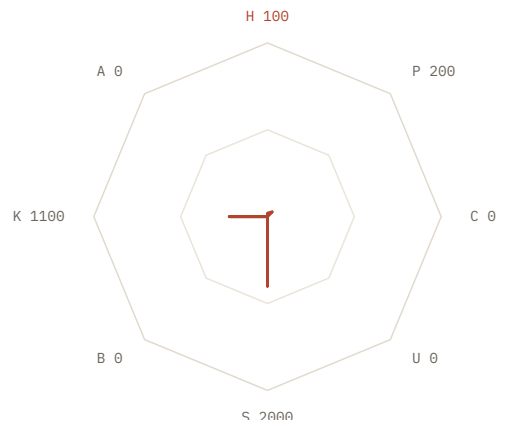

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IFI-P	200
IFI-C	0
IFI-U	0
IFI-S	2,000
IFI-B	0
IFI-K	1,100
IFI-A	0

Cane-Syrup Bread Pudding

Serves 8 · 1 hour · the Sunday pudding

1		stale loaf, torn — day-old bread, nothing wasted
3	cups	milk (or oat milk), scalded
⅓	cup	cane syrup, from designed sugarcane
3		eggs (or a flax-and-starch custard base)
1	tbsp	vanilla, from designed vanilla
2	tsp	designed cinnamon · a whisper of cayenne

1. Soak the torn bread in the custard of scalded milk, cane syrup, eggs, vanilla, cinnamon, and the faint cayenne until it drinks it all in.
2. Bake at 175 °C until set and burnished, about 45 minutes. Serve warm, with a cane-and-vanilla sauce spiked, just barely, with heat.

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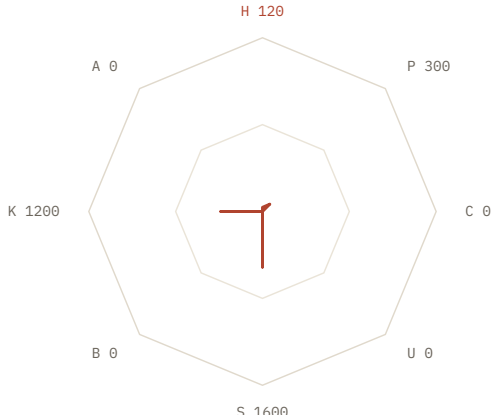

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IFI-U	0
IFI-S	1,600
IFI-B	0
IFI-K	1,200
IFI-A	0

Chapter 14 · Chicory, Coffee & the Bitter Turned Down.

The meal ends the way New Orleans ends every meal: café au lait, dark with roasted chicory, poured tall with scalded milk, a plate of beignets under a snowfall of sugar. Chicory came into the coffee in lean years — stretched the beans, the story goes — and stayed because the city loved it; it deepens the roast and lends a woody, almost caramel bitterness that is the taste of a morning on the river. The pleasure and the problem are the same quality: bitterness.

The receptor evolution gave us to say no. Bitterness is read by the **TAS2R** family — some two dozen receptors, broadly tuned, because the job they evolved for is to flag the enormous chemical variety of plant toxins. **TAS2R38** is the famous one, the receptor whose PAV/AVI haplotypes decide whether PROP and PTC taste bitter or like nothing, and it is a fair stand-in for the whole bitter channel.

But it is only one of about **twenty-five** human TAS2Rs, and that number is the whole architecture of bitterness. Sweet and umami each get essentially one receptor; bitter gets two dozen, because the job is not to identify a single molecule but to flag an open-ended universe of them — every alkaloid, glycoside, and defensive phenolic a plant might carry. Some TAS2Rs are narrowly tuned to a few compounds; others, like TAS2R14, are broadly promiscuous, catching dozens. This is why bitterness is the hardest axis to engineer and the one we work almost entirely by subtraction: you cannot sweeten a bitter compound away, because the receptors are watching for it specifically; you can only make less of it, or reroute it before the tongue ever meets it. Coffee lights up several TAS2Rs — via **chlorogenic-acid lactones** formed in roasting, caffeine itself, and the trigonelline-derived compounds of a dark roast; chicory adds its own **sesquiterpene lactones,** lactucin and intybin, the woody edge.

In a light roast most of coffee's bitterness comes from **chlorogenic acids;** roast darker and those break down into **chlorogenic-acid lactones** and then into **phenylindanes,** the harsh, lingering bitter of a very dark roast — the New Orleans roast, exactly. Caffeine contributes only a fraction of the total, perhaps a tenth; the roast chemistry is most of it. Our attenuation reroutes the precursors so fewer of those lactones and phenylindanes form, pulling the TAS2R signal down **20–65%** while the melanoidin color, the body, and the aroma — which come from other reactions entirely — survive untouched. And chicory brings something quietly good in with its bitterness: the root is rich in **inulin,** a prebiotic fiber, which we mention once and never dress up as a claim. The cup stays as dark and serious as the city likes; it only stops scolding. Bitterness is the one axis we work almost entirely by *subtraction.*

Darkness without the scold. Rerouting the bitter precursors at the source lets us pull the TAS2R signal down **20–65%** without touching the roast color, the body, or the chicory's own depth. The cup stays as black and serious as the city likes it and lands softer on the

tongue — the roast's melanoidins and the chicory's caramel woodiness come through while the harsh edge stays low. Our designed **coffee** (IFI-B, 40 constructs) is a small library by our standards, because the lever is subtle and the target is precise: take away the scold, keep the soul. The same attenuation serves a dark chocolate, a hoppy glaze, a bitter green — anywhere the depth and the harshness are the same molecule and you want to keep one and lose the other.



Designed coffee, cut — bitterness rerouted at the source so the roast's depth survives and the scold does not.

Chicory Café au Lait

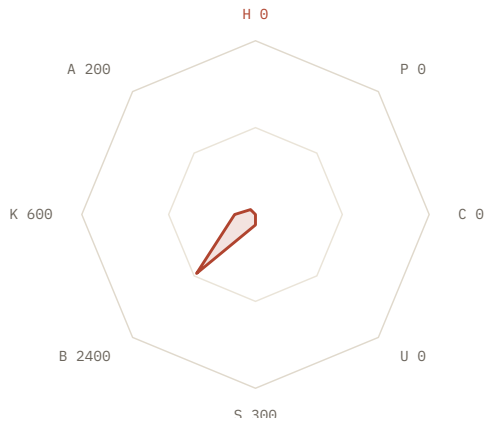
Serves 2 · 10 minutes · the last cup

4	tbsp	designed coffee, dark roast, with chicory
2	cups	whole milk (or oat milk)
		cane syrup, from designed sugarcane, to taste

1. Brew the coffee and chicory strong — darker and heavier than an ordinary pot; this cup is meant to be bold.
2. Scald the milk until it just steams and froths at the edge, never to a boil.
3. Pour coffee and hot milk together in equal measure, from a height, so it foams. Sweeten with a thread of cane syrup if you like.

Why it works — The coffee is grown with its bitterness attenuated, so the chicory's woody depth and the roast's darkness come through while the harsh TAS2R38 signal stays low — the cup reads deep and round rather than sharp. The scalded milk adds a little kokumi on CaSR, which is why café au lait tastes softer and fuller than the same coffee taken black.

IFI PROFILE



IFI-H	0
IFI-P	0
IFI-C	0
IFI-U	0
IFI-S	300
IFI-B	2,400
IFI-K	600
IFI-A	200

For a hot night, pour the same coffee over ice with a few bruised mint leaves: a designed mint carries cooling high on IFI-C, a TRPM8 rush of cool-without-cold to finish the meal from the other direction.

Café Brûlot

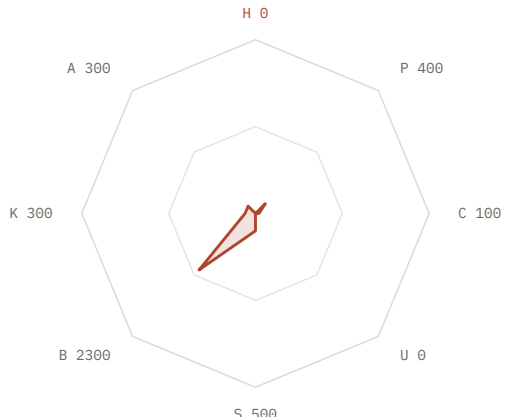
Serves 6 · 15 minutes · the flamed coffee, an old Creole theatre

3	cups	designed coffee, dark roast with chicory, hot and strong
		peel of 1 designed orange and 1 lemon, in strips
4		whole cloves · 1 stick designed cinnamon
2	tbsp	designed cane syrup
¼	cup	brandy and a little orange liqueur

1. Warm the brandy, liqueur, cane syrup, citrus peels, cloves, and cinnamon in a wide pan until the spices perfume it.
2. At the table, if you like the drama, touch a flame to the warmed spirit and let it burn low — then pour the hot coffee in to put the fire out and marry everything.
3. Ladle into small cups through the peels. It is after-dinner coffee as a performance, and the attenuated roast keeps it deep without turning harsh under all that citrus and spice.

Why it works — The dark coffee carries depth with its bitterness pulled low on TAS2R, so the orange's own gentle bitterness and the clove-and-cinnamon TRPA1 warmth sit *beside* it rather than piling onto a harsh base. Flaming the spirit is caramelization in a pan — theatre that is also flavor.

IFI PROFILE



IFI-H	0
IFI-P	400
IFI-C	100
IFI-U	0
IFI-S	500
IFI-B	2,300
IFI-K	300
IFI-A	300

Chapter 15 · Cocktails & Botanicals — *the Sazerac as a composition.*

New Orleans is a drinking city with its own canon — the Sazerac born on Royal Street, the Ramos gin fizz shaken until the bartender's arm gives out, the bittered and the anised and the long cold. Read as flavor engineering, a classic New Orleans cocktail is a tightly balanced composition across the same eight axes as the food, only poured — bitterness held in tension with sweetness, a pungent-aromatic lift, sometimes a cooling finish, the astringent grip of a good bitters. This is the glass version of everything the book has argued: the axes compose, and the composition is the recipe.

The cool channel, named at last. The one receptor we have not yet met carries the finish of a mint drink: **TRPM8,** the cold-and-menthol channel, the mirror of TRPV1. Where capsaicin makes the body report heat that is not there, **menthol** makes it report cold that is not there — it binds TRPM8 and lowers the channel's thermal threshold, so a cool drink reads *colder,* a mint leaf reads arctic.

TRPM8 is the exact mirror of the heat channel. Where capsaicin lowers TRPV1's threshold so warmth reads as fire, menthol lowers TRPM8's threshold so coolness reads as cold; both channels are, at bottom, thermometers a molecule has lied to. The synthetic super-cooling agent icilin drives the same receptor far harder than menthol, which is how we know it is the channel and not the mint doing the feeling. And like heat, cool can be desensitized and laddered — a drink can open with a bright menthol snap and settle into a gentle coolness, or hold one long even chill, depending on how the TRPM8 signal is dosed. On the Index this is **IFI-C,** and it is the one axis in this book that finishes a dish by making it feel *colder than the ice* — which on a Louisiana August night is close to mercy. On the Index this is **IFI-C,** and a designed mint carries it high; a bruised leaf or a drop of designed-mint tincture is how a hot-night drink finishes clean. Against the warmth of rye or the sweetness of a syrup, that false cold is a whole dimension.

Bitters and anise. A dash of aromatic bitters is a concentrated hit of the TAS2R channel and a little astringency; absinthe and Herbsaint carry **anethole,** the anise molecule, which reads partly as sweet and partly as a cool, licorice lift. The craft of a bittered cocktail is the craft of a roux in miniature — walking bitterness right up to the pleasurable edge and no further — and the same attenuation that tames a coffee can soften a house bitters so it lifts without scolding.

The astringency in a good bitters is its own axis, read not on a taste receptor at all but on the **salivary proteins:** tannins and related polyphenols bind and precipitate the proline-rich proteins that keep saliva slippery, and the mouth reads the loss of lubrication as *grip* and *dryness* — the pucker of an over-steeped tea or a young red wine. In a cocktail that grip is structure; it gives a sweet, spirituous drink a dry edge to pull against, the way the tannin in wine frames the fruit. Gentian, the classic bittering root, carries both the TAS2R

bitterness and a little of that astringent grip, which is why a dash of bitters does more than taste bitter — it tightens the whole glass. On the Index this is **IFI-A,** the eighth axis, and the Sazerac leans on it quietly.



Designed ginger — gingerol's warm pungency, for the bittered and the bright glass alike.

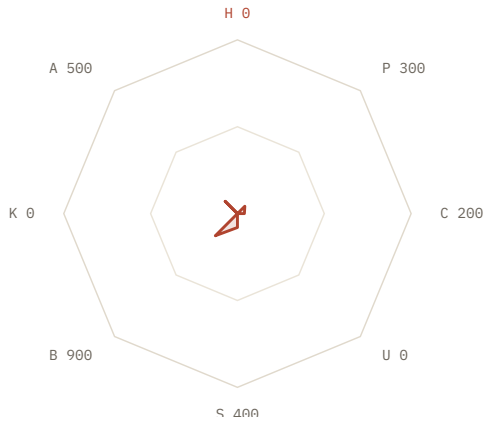
A Sazerac, Composed

Serves 1 · the Royal Street classic, read on the axes

2	oz	rye whiskey
1		sugar cube, or a bar-spoon designed cane syrup
3	dashes	Peychaud's-style bitters
		absinthe or Herbsaint, to rinse the glass
		lemon peel, expressed and discarded

1. Rinse a chilled rocks glass with a few drops of absinthe; discard the excess. The anethole coats the glass as aroma, not volume.
2. Stir the rye, cane syrup, and bitters with ice until very cold, then strain into the anise-rinsed glass — no ice in the finished drink.
3. Express the lemon peel over the top for its oils and discard it. The drink is a tension: bitters and anise lifting over a whisper of cane, the rye's warmth underneath.

IFI PROFILE



IFI-H	0
IFI-P	300
IFI-C	200
IFI-U	0
IFI-S	400
IFI-B	900
IFI-K	0
IFI-A	500

The Cool South — a Mint & Cane Cooler

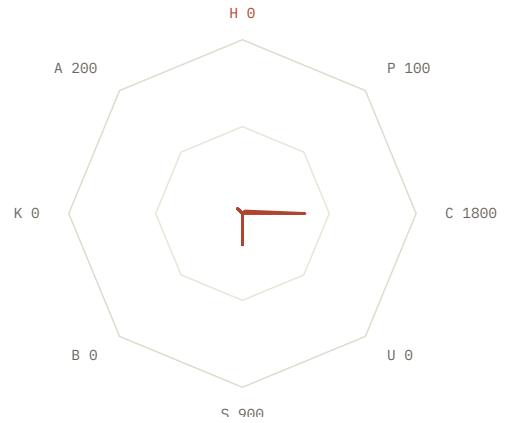
Serves 1 · the hot-night mocktail (or with white rum)

8		mint leaves, from designed mint, bruised
¾	oz	cane syrup, from designed sugarcane
1	oz	lime juice
		soda water · a drop of designed-mint tincture
		white rum, optional

1. Gently bruise the mint with the cane syrup — bruise, do not shred, so you release the menthol without the bitter chlorophyll.
2. Add lime and ice (and rum, if you like), top with soda, and finish with a single drop of mint tincture for a cooling lift that lasts the whole glass.

Why it works — The menthol drives TRPM8 so the cold reads colder than the ice can account for — cool-without-cold, high on IFI-C — while the cane syrup lifts sweetness on TAS1R2·R3 at a gentle sugar load and the lime's acid keeps it bright. A summer drink engineered to feel like shade.

IFI PROFILE



IFI-H	0
IFI-P	100
IFI-C	1,800
IFI-U	0
IFI-S	900
IFI-B	0
IFI-K	0
IFI-A	200

Pomegranate Shrub, Bittered

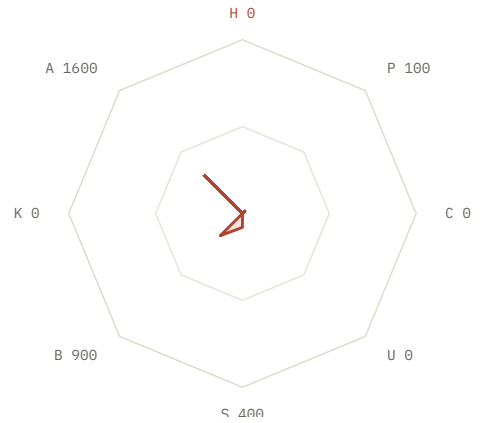
Serves 1 · the astringent, non-alcoholic glass (or with gin)

1	oz	pomegranate shrub (designed-pomegranate juice + cider vinegar + cane, aged a week)
2	dashes	attenuated aromatic bitters
		soda water
		a strip of designed-orange peel
		gin, optional

1. Build the shrub, bitters, and ice in a tall glass (add gin if you like) and top with soda.
2. Express the orange peel over the top. The drink is dry, tart, and faintly bitter — a grown-up cooler that leaves the mouth clean rather than coated.

Why it works — Pomegranate's tannins grip the salivary proteins for a real astringent spine (IFI-A), the shrub's vinegar keeps it bright, and the attenuated bitters add TAS2R depth without harshness. Sweetness is kept low on purpose; this is the glass for the end of a rich meal, when the palate wants a dry, clearing finish rather than another sweet one.

IFI PROFILE



IFI-H	0
IFI-P	100
IFI-C	0
IFI-U	0
IFI-S	400
IFI-B	900
IFI-K	0
IFI-A	1,600



PART VI OF VI

The System

the whole cuisine scored · the garden behind it · grown right, held to a number, served to a long table

Chapter 16 · The Cajun & Creole IFI Ladder — *the whole cuisine, scored.*

Here is the book as data — the part a chef pins by the stove and a formulator reads twice. Everything in the preceding chapters resolves into three tables: the garden behind the cuisine, the heat ladder you cook from, and the composed dishes scored side by side. Read together, they are the argument of the whole volume: that a cuisine written in numbers is not colder than one written in wishes — it is simply one you can hand to someone else and trust them to cook.

Before the tables, a word on how to *read* a profile, because the numbers are only useful if they mean something in the mouth. Read a scorecard as a shape, not a sum. The tall single spike — rémoulade's pungency at 2,100, café au lait's bitterness at 2,400 — is a dish that does one thing with conviction; it belongs *against* something, a counterweight, not alone. The broad, even profile — gumbo's umami-and-kokumi plateau, Phoenix's eight-way reach — is a dish that feels *complete,* that fills the mouth from several directions at once and reads as "depth" precisely because no single axis is shouting. A good Louisiana meal is a sequence of shapes: a spiky bright thing (the cold rémoulade, the mustard) to wake the palate, a broad deep thing (the gumbo, the beans) to satisfy it, a tall sweet thing (the praline) to close it. You are not cooking numbers; you are composing a progression of shapes across an evening, and the numbers are only how you make the same progression happen twice.

The Louisiana garden — the plants behind the pots. Every designed organism this book leans on, what it carries, and the job it does.

PLANT	CONSTRUCTS	PRIMARY AXES	ROLE IN THE POT
Pepper (cayenne lineage)	1,060	all	the heat, laddered
Tomato	2,040	S / U / F / M	the Creole savory floor
Black Mustard	2,790	P / M	the bright, clearing lift
Garlic	560	K / P	body and edge, *the pope*
Yeast	240	U / K	depth without a ferment's wait
Sugarcane	200	S	the cane soul of the sweet end
Ginger	120	P	warm pungency for dessert
Thyme	120	P	the aromatic terpene lift
Shiitake / Mushroom	80 / 40	U	the GMP synergy multiplier
Onion	40	K	the kokumi floor
Oregano	40	P	the herb crust
Coffee	40	B	chicory's depth, the scold removed
Cinnamon	40	P	warmth on TRPA1
Vanilla	40	K	the body of the sweet side

The heat ladder, for the table. The full flagship ladder from Chapter 3, with the everyday Louisiana working range marked. You live near the bottom and below; the summit is the proof and the cruet's secret.

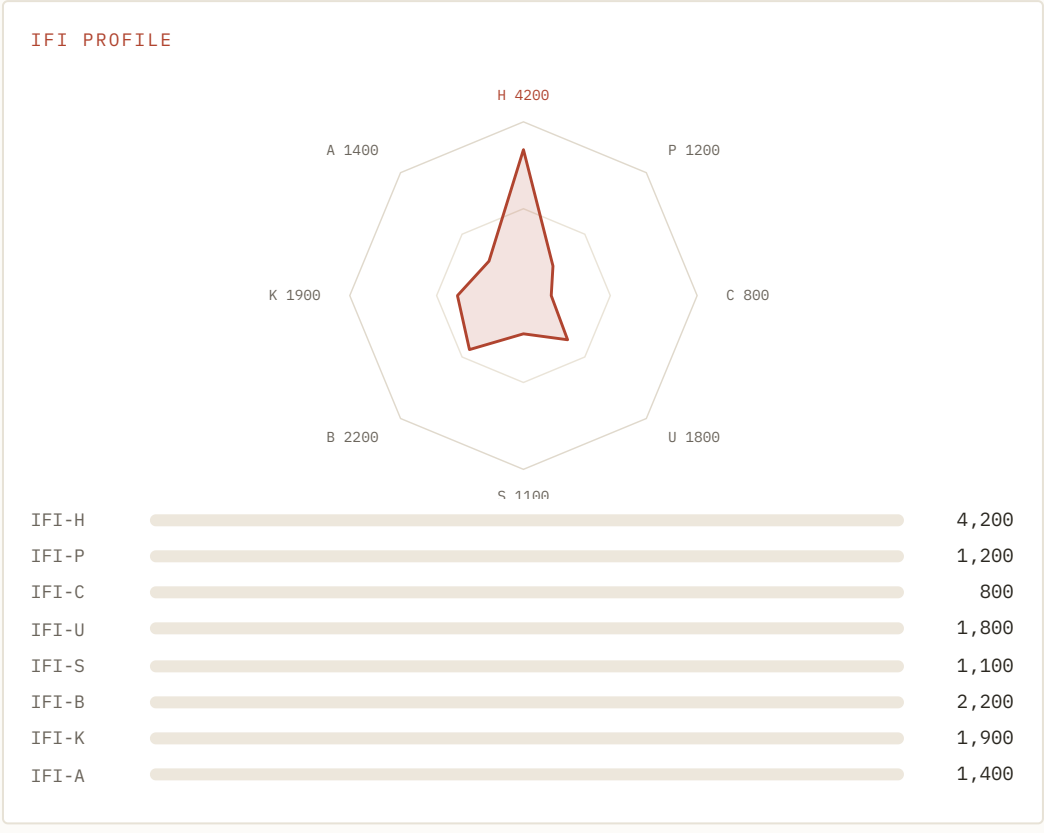
CULTIVAR	SKU	SHU	IFI-H
everyday cayenne	—	30–120K	400–900
Ember	SS-0087	866K	1,570
Cinder	SS-0088	1.05M	2,290
Blaze	SS-0091	1.72M	2,630
Wildfire	SS-0092	1.96M	2,930
Firestorm	SS-0094	2.47M	3,490
Solara	SS-0095	2.72M	3,980
Phoenix	SS-0096	2.95M	4,200

The composed table. Every major dish in the book, read across its loudest axes, so you can see the cuisine's shape at a glance — the savory-heavy pots, the bright sharp sauces, the gentle-sugar sweets.

DISH	H	P	U	S	K	B	C	A
Gumbo z'herbes	0	400	2100	150	1600	0	0	100
Seafood gumbo	0	400	2600	150	1500	0	100	150
Creole jambalaya	300	400	2200	200	1200	0	0	100
Crawfish étouffée	0	300	1900	100	1400	0	0	100
Red beans & rice	0	300	1300	0	1800	0	0	0
Sauce piquante	800	600	2200	300	1000	0	0	250
The boil	900	500	600	600	200	0	0	200
Blackened	500	900	800	100	400	0	0	0
Rémoulade	400	2100	400	300	200	0	0	200
Bananas Foster	180	400	0	1900	900	0	0	0
Café au lait	0	0	0	300	600	2400	0	200
Mint cooler	0	100	0	900	0	0	1800	200

A pattern jumps out of that table once you look for it: the pots live in the **U–K quadrant** (savory and body), the sauces and the boil push **P and H** (pungency and heat), and only the sweets and the last cup carry **S, B, C, and A** in any force. That is Louisiana's flavor fingerprint, drawn in data — a savory-forward cuisine with sharp bright accents and a sweet, bitter, cooling coda. Hand this table to someone who has never tasted gumbo and they could not cook it, but they could tell you, correctly, what kind of place invented it: somewhere hot, with a long growing season, a working port, and a deep need to make a little protein and a lot of rice taste like plenty.

And the ceiling — the one fruit that holds all eight. When you want to show a table what *every axis at once* can look like, grown into a single pepper, there is one cultivar that holds it. The only one we have ever designed to register on all eight axes — the first in history to do so, and the top of the ladder besides.



Phoenix · SS-0096 · 2.95M SHU · the full-spectrum flagship. Three AI-designed Pun1 mutations — S39L · L345G — found with a protein language model, ranked by predicted efficacy × stability, confirmed

against a flux-balance model, and written in with CRISPR. The highest heat ever specified in a commercial construct, and the first to carry company on every other axis.



Phoenix in the controlled chamber — the first cultivar engineered to register on all eight axes at once, and the argument of a Louisiana table grown into one fruit.

Read that profile and you can read a Louisiana table itself: heat towers, but it never stands alone — savory under it, body around it, bitterness held low, a bright sharp lift and a cool note set against the fire. The roux, the trinity, the cayenne, the cane, and the chicory, grown into one pepper. That is not where you cook from every day. It is the proof that the eight axes are one instrument, and that a cuisine is a chord.

Chapter 17 · Grown Right for the Pot — *nourishment, consistency, and the long table.*

We came to Louisiana as plant people, with the garden in our hands, and we never pretended otherwise. This last chapter is where the quiet things under the whole book come up for air: why we grow the way we grow, how we hold a number steady across a season, and the one rule of hosting that every recipe here was secretly built to serve.

Grown to hold the most it can. Under every recipe in this book runs an intention we rarely name on the page because it is not a claim and must never be sold as one: that food should be grown to carry the most nourishment it can, and that the body should be able to draw the most from it. The restored tomato is the clearest case — in growing its glutamate back toward **IFI-U 2,600,** we were restoring the whole ripe fruit a shipping-first century had thinned, and what came back with the flavor was the fruit's own fuller chemistry. A pot of greens for a gumbo z'herbes is a pot of iron and folate as much as a pot of savor; red beans are protein and fiber that cost nothing in richness to get there. We do not design nutrition into a dish to make a health claim — there are none in this book, and there will be none. We design flavor and nourishment as **the same act,** because to us they always were, and we let that be an intention you can feel rather than a promise we make.

Held to a number. A cuisine written in numbers is only as honest as its reproducibility, which is why the dullest figure in the book is the one we are proudest of: a batch-to-batch coefficient of variation of **≤7%,** against the 42% of wild-type lines. That is what turns "season to IFI-H 600" from a poem into an instruction. It is bought with the whole machine of Chapter 4 — the flux model that found the bottleneck, the language model that scored the edits, the CRISPR that wrote three of them in, the controlled-environment growing that holds the conditions steady — and it is spent, invisibly, every time a dish you cooked in August tastes the same in February. Consistency is not the opposite of soul. It is how you give the same soul to someone far away and trust it to arrive.

The controlled environment is part of how that soul travels. A plant grown in a tuned, monitored room — light spectrum, temperature, nutrient, water all held steady — does not swing with the weather the way a field crop does, and it is that steadiness, as much as the genetics, that holds the ≤7% line. It also lets us grow close to where the food is eaten, on a schedule rather than a season, which is its own quiet kind of nourishment: a tomato in February that actually tastes ripe, because it was allowed to finish on the vine a week away instead of gassed green on a truck. None of this is a claim about

health. It is a claim about *honesty* — that the fruit on the plate is as whole as the fruit we measured — and honesty is the only thing a cuisine written in numbers is really selling.

The whole garden, the whole library. The plants in this book are a small corner of a larger work: **42 host organisms** under cultivation, **8 sensory axes,** and on the order of **19,000 engineered constructs,** of which about **1,000** are live and purchasable today, drawn from a catalog of some **78,800** SKUs. The method behind them is public where it should be — **3 patents filed, 21 peer-reviewed papers** posted openly under CC BY 4.0 — because a thing that asks a table to trust it should show its work. The cayenne on your stove is the visible tip of that; the ladder, the restored tomato, the attenuated coffee, the sweet proteins, and the one eight-axis pepper are all the same library, read through the lens of one cuisine.

We are careful, deliberately and always, about the line between an attribute and a claim. We will tell you that a dish carries less sugar at the same sweetness, or more of a leaf's own iron because the leaf was grown whole and cooked in its own likker, or that a tomato was restored to the glutamate it would have held on the vine — these are measurable facts about the food. We will never tell you a dish *cures, detoxes, heals,* or *prevents* anything, because that is not a thing food does and not a thing we would sell. Nourishment, to us, is an intention you can feel and a fact you can measure, held strictly apart from medicine. That discipline is not a legal nicety; it is the same rigor that makes us show the ΔΔG and the CV. A number you can trust and a claim you cannot are opposites, and we would far rather be the first than the second.



The family's hour in the greenhouse — the work and the table belong together; the computing was one pair of hands, the rest is everyone's.

The one rule of hosting. Everything in this book was built to pass a single test — not whether it can thrill one palate, but whether one pot can feed a whole long table of them: the cousin chasing the top of the ladder, the child who wants no heat at all, the grandmother who wants depth without burn, all fed from the same roux and none of them an afterthought. The rule we cook by, learned at every table we have ever cooked for, is this: **season to the floor, ladder from the table.** Cook the pot to the mildest palate present — pull it to *depth and savor,* not to heat. Then set the dials within everyone's reach: the pepper vinegar, the Creole blend, the cold sharp rémoulade, the

cane-sweet finish. Each person climbs to their own rung. Nobody is dared, and nobody is left out. That is hospitality rendered as engineering, and it is the reason the eight axes are worth measuring at all.

So: make the roux, and do not leave the pot. Cut the trinity, and let the garden carry the body a bone used to carry. Season to the floor, ladder from the table, and let the slow pot do the ancient part — flavor grown toward its fullest and nourishment grown in on the same vine. Cook these for the people at your table, the ones who eat crawfish and the ones who don't, side by side, the way they have always sat at ours. First you make a roux. Then you measure it. That was always the whole point of measuring anything.

These are computational designs; Scoville Splice's cultivars and constructs have not been experimentally validated in a laboratory.