

THE SCOVILLE SPLICE LIBRARY · VOLUME XXXIX

Game Day

Snacks, dips, wings, sauce. *Heat you can host.*

The party book — every shareable thing we carry to the loudest table of the year, each dish laddered by heat and read on all eight axes, so one spread can feed a whole room at the exact warmth each guest came for.

SCOVILLE SPLICE · GROWN BY OUR FAMILY. ENGINEERED FROM SCRATCH.

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Opening essay · The loudest table

There is one afternoon a year when food stops being the background and becomes the event. The television is loud, the room is louder, and nobody is sitting down. People stand in a loose orbit around a counter, talking with their hands full, and the whole social physics of the day resolves to a single question asked a hundred times without words: *is it safe to reach for that bowl?* Not safe in the clinical sense. Safe in the way a crowd negotiates heat — the quiet arithmetic every guest runs before the first chip goes in, the glance at whoever took the plunge ahead of them, the small private relief or the small public theater that follows.

We have cooked for that room our whole lives. Long before any of us could read a chromatogram, we were reading faces around a platter of wings, learning that a party is not one palate but forty, spread across a range so wide that the same bowl is a dare to one guest and a disappointment to the next. The old solution was to make two versions and hope. The better solution — the one this book is built on — is to understand heat well enough to *place* it, rung by rung, so a single spread can carry a child's plate and a chilihead's plate at the same table without either one lying about what it is.



The greenhouse walk at dawn — where the family began asking how to put a number on a thing we had only ever tasted.

Here is the thing we love about game-day food, and the reason we gave it a whole volume: it is the most honest cooking there is. Nobody plates a nacho to be photographed from above with tweezers. A dip succeeds or fails in the hand, in the second bite, in whether the bowl is scraped. It is generous by design — built to be shared, built to disappear. And because it lives at the extremes of flavor — the molten, the fermented, the burnt, the fiery — it is the clearest possible stage for what our family actually does, which is to take the compounds that drive taste and tune how *loudly* they speak.

That word, loudly, is the whole science in one breath. When you feel heat, capsaicin is not warming your tongue; it is binding **TRPV1**, an ion channel on the trigeminal nerve that normally opens for temperatures above 43 °C and for acid. The molecule lowers the

channel's threshold, so your body reports a fire that is not there. How much fire depends on the concentration at which that channel reaches half of its full response — its **EC₅₀**. Invert that number against a fixed reference, scale it by a thousand, and the fire becomes a score you can write on a card next to a recipe:

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IFI(c) = 1000 · EC₅₀(ref) / EC₅₀(c)
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We call it the Iyengar Flavor Index, and across this book you will see it on every dish, eight axes at a time: Heat, Pungency, Cool-Burn, Umami, Sweetness, Zero-Bitter, Kokumi, Astringency. It is not a gimmick and it is not a nutrition label. It is the number that lets a host do something hosts have never been able to do — promise a guest exactly how hot the bowl is, and keep the promise, because the cultivar that seasons it was grown to a batch-to-batch consistency of seven percent or better, where the field crop it replaced drifts by forty.



PART I OF VI

The Heat You Can Host

TRPV1 · the EC_{50} ladder · wings · the sauce engine

Chapter 1 · The crowd curve — *one bowl, every tolerance.*

Start with the problem no recipe has ever solved, because it is not a recipe problem. Put forty people in a room and ask each of them to rate the same jalapeño, and you will not get one answer with a little noise around it. You will get a curve — a wide, lopsided distribution that runs from the guest who finds a raw jalapeño painful to the one who eats it like a grape and reaches for the serrano. That spread is not opinion. It is biology, and most of it is written in a single receptor.

Capsaicin, the compound that makes a chili hot, binds **TRPV1** — the transient receptor potential vanilloid 1 channel, a non-selective cation channel studded along the free nerve endings of the trigeminal system in the mouth. TRPV1 is a heat-and-danger sensor first and a taste receptor never; it has no business in flavor at all, which is exactly why chili heat feels like an event rather than a taste. When capsaicin wedges into the channel's vanilloid pocket, it shifts the voltage-and-temperature threshold downward by tens of degrees. A mouth at 37 °C suddenly reports itself as burning. Calcium floods in, the nerve fires, the body answers with sweat, salivation, a quickened pulse, and the endorphin wash that is the entire reason anyone does this to themselves on purpose.



A superhot in cross-section — the pale placental tissue, not the walls or the seeds, is where capsaicin is made and stored.

The spread across your guests comes from how many TRPV1 channels each of them carries, how those channels are sensitized or desensitized by a lifetime of eating, and how the rest of the nervous system scales the alarm. A regular chili eater has genuinely fewer available channels at the surface — repeated exposure drives TRPV1 into a calcium-dependent desensitization, the receptor's own volume knob turning itself down. This is not metaphor. It is why tolerance is real and why the friend who "can't taste anything below a habanero" is telling the truth. The crowd curve is a receptor-density curve.

Scoville, and why we stopped trusting it alone

The number everyone knows is the Scoville Heat Unit, and it deserves respect as the first serious attempt to measure a sensation. Wilbur Scoville's 1912 method diluted a pepper extract in sugar water until a panel of tasters could no longer detect heat; the dilution factor was the SHU. It was a receptor assay run on human beings before anyone knew the receptor existed. Its weakness is that it measured *people* — panels drift, palates fatigue, and the error bars are enormous.

Today we quantify capsaicinoids directly by high-performance liquid chromatography, measuring capsaicin and dihydrocapsaicin in parts per million and converting: roughly **16 SHU per ppm** of total capsaicinoids. Pure capsaicin lands near 16,000,000 SHU. That gives a hard, reproducible number for *how much* heat compound a pepper holds. What it still does not give you is how *loud* that compound is at the receptor — and those are different questions. Two capsaicinoids at the same ppm do not activate TRPV1 equally, because the length and saturation of their acyl tail changes how well they seat in the pocket. Capsaicin and dihydrocapsaicin differ only by one double bond in that tail, and they burn with different *shapes*: capsaicin flares bright and fades; dihydrocapsaicin is slower, deeper, and sits at the back of the throat. The IFI-H axis is anchored to the EC_{50} precisely so it captures loudness, not just mass.

The ladder

Here is the structure that governs this entire book. We do not think in "mild, medium, hot." We think in rungs, each tied to a receptor-level band and to the everyday peppers and the engineered cultivars that live there.

RUNG	NAME	EVERYDAY PEPPER	SHU BAND	OUR TIER	IFI-H
0	Aromatic	ginger, black pepper, paprika	0 (non-capsaicin)	aromatics	0–60
1	Sunlit	shishito, poblano	100–1,500	table	40–150
2	Social	jalapeño, Fresno	2,500–8,000	table	200–450
3	Honest	serrano, cayenne	10,000–50,000	table	500–900
4	Committed	habanero, Scotch bonnet	100,000–350,000	Habanero line	1,000–1,500
5	The Challenge	the flagships	866,000–2,950,000	SS-0087 → SS-0096	1,570–4,200

Most game-day food lives on Rungs 1 through 3. That is not a compromise; it is where shareability lives. A bowl set at the Social rung is a bowl the whole curve can reach — the heat-shy guest with a little bravery, the median palate with pleasure, the committed eater who will reach for the hot-sauce bottle on the side and build their own rung up. The art of hosting is not maxing the heat. It is placing the base at a rung the room can share and then offering ladders *up* — a bottle, a spoon of chili crisp, a bowl of sliced raw Fresnos — so every guest climbs to their own number.

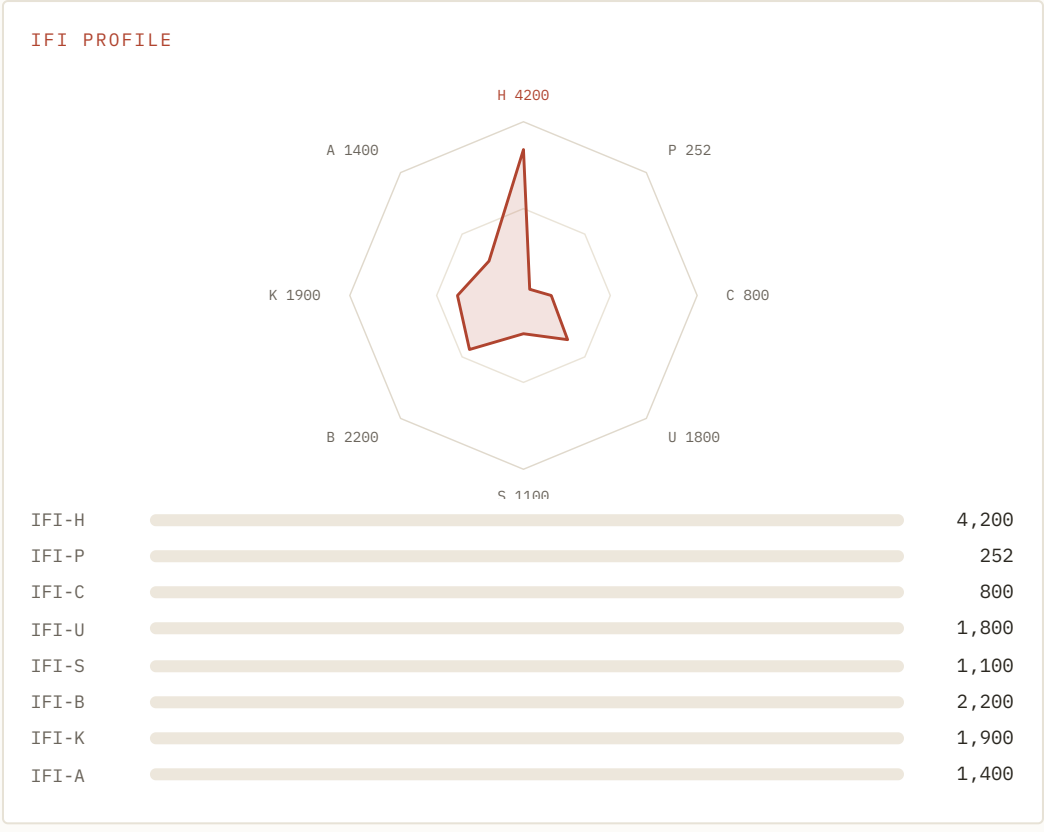
The flagships, for the one guest who wants them

At the top of the ladder sit the ten cultivars our family designed as proof that heat is engineerable at all. They are not party food. They are the reference edge — single-drop ingredients, challenge-tier garnishes, the thing you deploy by the fraction of a pepper. We list them because the whole ladder is calibrated against them.

CULTIVAR	SKU	PREDICTED 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**

SHU values are computational predictions from our metabolic flux model, not certified measurements.

Phoenix is the only cultivar in the catalog that registers on all eight axes at once — a full-spectrum fruit we built gene by gene because no plant that could do it existed. Its complete readout sits below, and you will meet it again in the sweet-heat and chili chapters, always by the drop.



A word on handling the top of the ladder

Rung 5 ingredients are concentrated enough to demand respect, and a party is the wrong place to learn that. Capsaicin is a lipophilic irritant — log P near 3.6 — which means it will not rinse off with water and it moves readily into skin, eyes, and anything you touch next. When we work the superhots we wear nitrile gloves, we keep a bowl of whole milk or a cut of full-fat yogurt within reach, and we never let a challenge-tier garnish onto a shared platter without a sign. The pleasure of heat is real and worth chasing; the emergency-

room visit from a careless host is not. We will repeat this where it matters. For now: the higher you climb, the fewer drops you use, and the more you tell your guests exactly what they are reaching for.

Chapter 2 · Anatomy of a wing — *the national dish of the fourth quarter.*

If game day has a flag, it is a chicken wing, and it earns the honor by being a nearly perfect delivery vehicle for heat. A wing is skin, and skin is fat, and fat is where capsaicin wants to live. The classic Buffalo sauce — a one-to-one emulsion of hot sauce and butter — is not a cultural accident but a solution to a chemistry problem: capsaicin is fat-soluble, so butter both carries it and gentles it, spreading the molecule across the bite instead of spiking it. The wing was engineered by a bar in 1964 without anyone naming the mechanism. We are just going to name it.



The milder end of the flagship line — the kind of controlled, even heat a shared platter is built on.

Why the emulsion matters

A great wing sauce clings, and clinging is emulsion science. Butter is already an emulsion — fat, water, and milk solids — and when you whisk hot sauce (mostly water, acid, and dissolved capsaicinoids) into warm butter, the milk proteins and the lecithin in the butterfat stabilize a sauce that coats rather than slides. Break the emulsion with too much heat and the butter fats out, the sauce slicks off the skin, and the capsaicin pools instead of spreading. The practical rule: build the sauce off direct heat, whisk hard, and toss the wings while both are warm but neither is scorching. A sauce held at a bare simmer with a few drops of water or a teaspoon of the fermented mash from Chapter 3 will stay tight through the whole platter.

There is a second, quieter reason the butter belongs there, and it is the same reason milk cools your mouth: **casein**. The milk protein in butter has a hydrophobic region that grabs capsaicin and carries it off the receptor. A butter-mounted sauce is self-cooling — it delivers the heat and the antidote in the same bite, which is exactly why Buffalo heat feels round and sociable where a vinegar-only sauce of the same SHU feels sharp and punishing. When we set a wing at the Social rung, the butter is doing half the hosting.

Our house Buffalo

The base every other wing in this chapter is a variation on. We ferment our own red sauce (Chapter 3), but a good bottled cayenne sauce works; the cultivar is doing the real tuning.

```
SERVES 8–10 · ACTIVE 30 min · TOTAL 1 hr 10 min
HEAT  Rung 2 (Social) · climb to Rung 3 by swapping in the serrano-band mash
ALLERGENS  dairy

— the wings —
3 lb     chicken wings, split, tips saved for stock
1 tbsp   baking powder (aluminum-free)
1 tsp    fine sea salt
1/2 tsp  garlic powder (or 1 tsp of our kokumi garlic, Ch. 4)

— the sauce —
6 tbsp   cultured butter
2/3 cup  house fermented red sauce (Ch. 3), Social-rung cultivar
1 tbsp   honey (or hot honey, Ch. 14, to climb a rung)
1 tsp    fresh lime juice
1 pinch  fine sea salt
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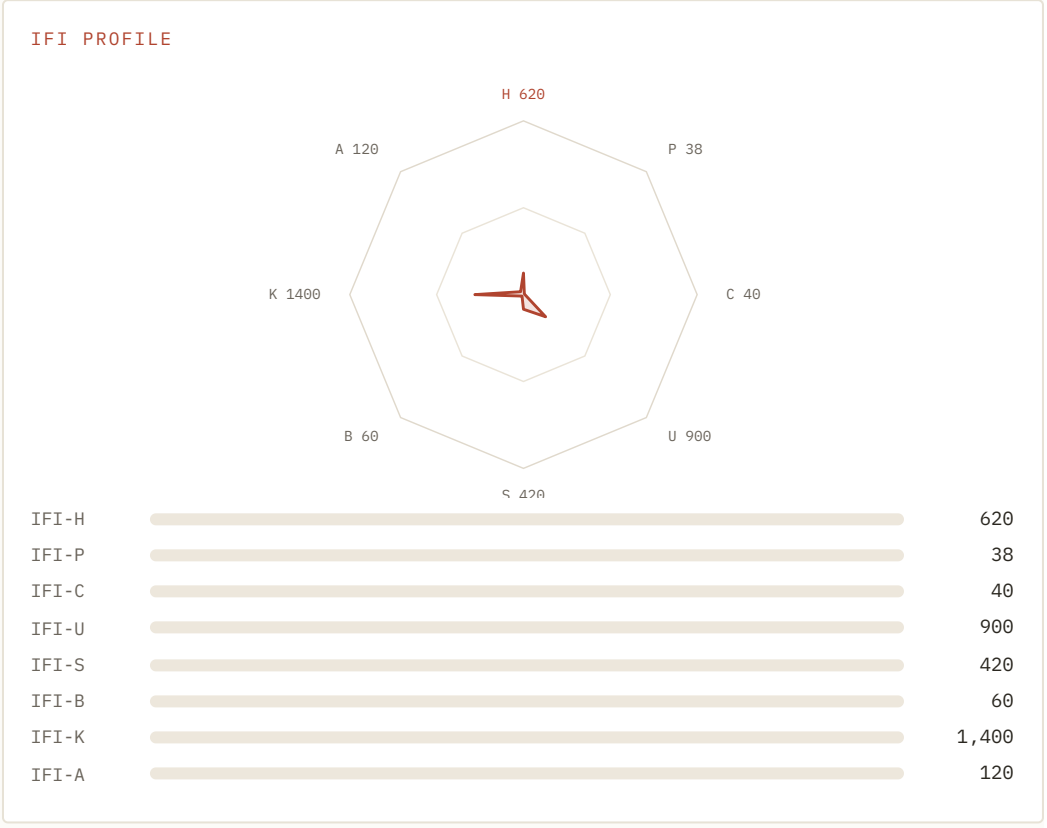
1. Dry the wings hard — pat them, then leave them uncovered on a rack in the fridge for 1–8 hours. Dry skin is crisp skin; moisture is the enemy of crackle.
2. Toss the dried wings with the baking powder, salt, garlic powder. The baking powder raises surface pH, which speeds browning and blisters the skin as it renders.
3. Roast at 230 °C (450 °F) on a rack over a sheet pan, 40–45 minutes, flipping once, until deep gold and audibly crisp. (Or fry at 190 °C, 8–10 minutes.)
4. Make the sauce off the heat or at the barest simmer: melt the butter, then whisk in the red sauce, honey, lime, and salt until it is glossy and tight. Do not boil it.
5. Toss the hot wings in the warm sauce in a wide bowl, in two batches so every wing is coated. Serve immediately, with the cooling ranch from Chapter 15 and celery.



The readout tells the story of a well-built wing: Heat set honestly at the Social rung, Kokumi high from the butter and the cultured-dairy ranch pulling the whole bite into richness, Umami lifted by the

browned skin, Sweetness just enough to round the acid. That is a bowl the crowd curve can share.

Honey-habanero glazed

A step up the ladder and a half-step into sweet-heat — the Committed rung softened by sugar, which is the oldest trick for making a big number friendly (the full theory is in Chapter 14). Habanero is our easiest high-heat host; the catalog carries 3,190 constructs on it across the full-spectrum and multi-axis libraries.

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SERVES 8 · ACTIVE 25 min · TOTAL 55 min
HEAT  Rung 4 (Committed), pulled toward shareable by the glaze
ALLERGENS  —

— the glaze —
1/2 cup  honey
2        habaneros, seeded and minced (or 1 tsp habanero mash)
2 tbsp   apple-cider vinegar
2 tbsp   orange juice
1 tbsp   Dijon
1/2 tsp  smoked paprika
1/4 tsp  fine sea salt
1 clove  garlic, grated
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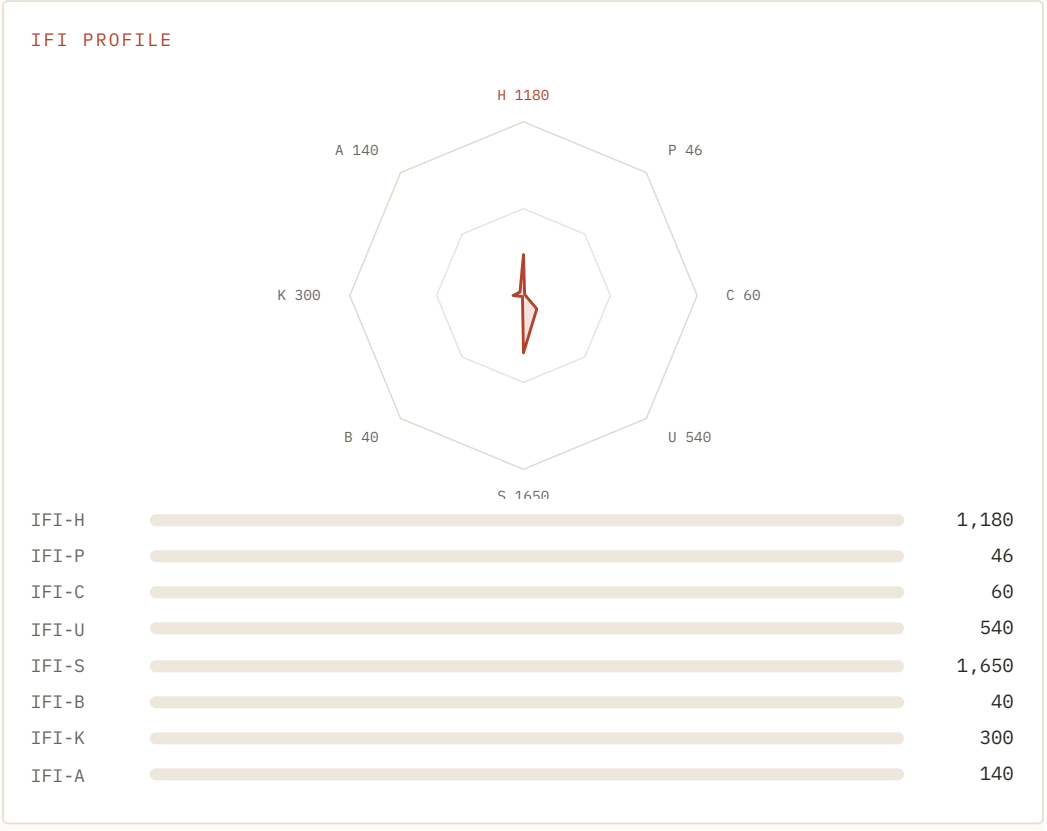
1. Roast or fry 3 lb of wings as above through step 3.
2. Simmer all glaze ingredients 6–8 minutes until it coats a spoon and the habanero perfume fills the kitchen. Seeding the habanero keeps the heat in the flesh's capsaicin rather than the placental spike, which is where the number climbs fastest.
3. Toss the crisp wings in the warm glaze. Finish with flaky salt and a little grated lime zest to cut the sugar.



Nashville-style hot

The opposite philosophy: no sweetness to hide behind, cayenne and brown sugar bloomed in hot frying fat and brushed over fried wings so the capsaicin rides straight in on oil. This is heat worn proudly, and the Honest rung is exactly where it belongs.

SERVES 8 · ACTIVE 35 min · TOTAL 1 hr
HEAT Rung 3 (Honest) · the frying-fat paste carries capsaicin hard
ALLERGENS dairy (buttermilk brine), gluten (dredge)

— the paste —

1/2 cup	frying oil (reserved, hot)
2 tbsp	cayenne (or Honest-rung ground cultivar)
1 tbsp	dark brown sugar
1 tsp	smoked paprika
1 tsp	garlic powder
1/2 tsp	fine sea salt

1. Buttermilk-brine 3 lb wings 2–12 hours; dredge in seasoned flour; fry at 175 °C until crisp, 9–11 minutes.
2. Whisk the paste ingredients into a half-cup of the hot frying oil — the heat blooms the cayenne, pulling capsaicin and the red carotenoids into the fat.
3. Brush generously over the drained wings. Serve on white bread with pickle chips, the classic cooling counter.

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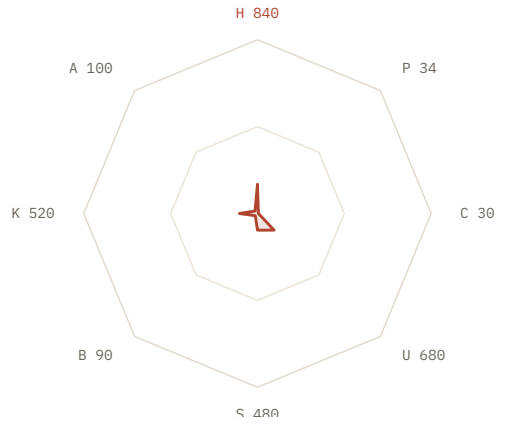

IFI-H	840
IFI-P	34
IFI-C	30
IFI-U	680
IFI-S	480
IFI-B	90
IFI-K	520
IFI-A	100

Crispy baked cauliflower "wings"

We are vegetarian-first by default, and this is not a consolation dish — it is a wing by every measure that matters at a party: crisp, saucy, shareable, gone first. Cauliflower's dense florets hold a craggy batter, and roasting drives a genuine Maillard browning that builds the umami a plant wing is sometimes accused of lacking.

SERVES 6–8 · ACTIVE 25 min · TOTAL 55 min
HEAT Rung 2 (Social)
ALLERGENS gluten (batter) — use rice flour + chickpea flour to make it GF

— the batter —

3/4 cup	all-purpose flour (or 1/2 cup rice + 1/4 cup chickpea flour)
3/4 cup	cold sparkling water
1 tbsp	cornstarch
1 tsp	garlic powder
1 tsp	smoked paprika
1/2 tsp	fine sea salt
1 head	cauliflower, in bite florets
	house Buffalo sauce (above), to toss

1. Whisk the batter to the thickness of thin pancake batter; the sparkling water's bubbles buy you a lighter crust.
2. Dip florets, let the excess drip, and bake at 230 °C on parchment 22–25 minutes, flipping once, until the coating sets crisp and golden.
3. Toss in warm Buffalo sauce; return to the oven 5 minutes so the sauce bakes on rather than sogs the crust. Finish with scallion and the cooling ranch.

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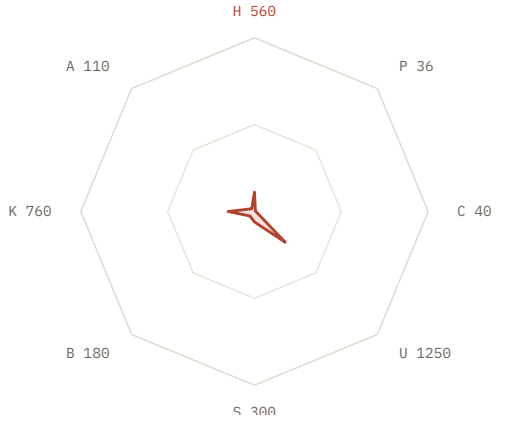

IFI-H	560
IFI-P	36
IFI-C	40
IFI-U	1,250
IFI-S	300
IFI-B	180
IFI-K	760
IFI-A	110

Notice the Umami reads *higher* than the chicken wing. That is the roast at work — cauliflower's glucosinolates and sugars brown into savory depth — and it is the whole argument of the plant-forward table: you do not imitate meat, you build flavor from what the plant already is.

Chapter 3 · The sauce engine — *a hot sauce you can own.*

Every great game-day table runs on a bottle. Not a brand — a *house* sauce, the thing you make once a season and reach for all winter, the flavor your friends start to expect. Learn the engine behind it and you stop buying your identity off a shelf. There are three sauces every host should own: a fermented red mother sauce, a bright charred green, and a crackling chili crisp. Master those and you can meet any rung on the ladder.



Isolation plates from the greenhouse program — the same lactic cultures that turn a pepper mash into a living sauce.

Fermentation is a receptor conversation

When you salt a pepper mash and leave it, you are starting a controlled microbial succession. *Leuconostoc* species open the fermentation, then *Lactobacillus* takes over, metabolizing the fruit's sugars into lactic acid and dropping the pH from near 6.0 down toward 3.4. That acid does three things at once. It preserves the mash by shutting out spoilage organisms. It transforms the flavor — raw, green, one-note pepper becomes layered, round, faintly funky as the bacteria throw off esters and the proteins break into free amino acids. And it changes how the heat reads: a fermented sauce at a given SHU feels *longer* and less sharp than a fresh one, because the acid and the new savory compounds give TRPV1's signal a context to sit in. Heat is never tasted alone; the brain reads it against everything arriving at the same instant, and fermentation stocks that instant with depth.

This is also where our consistency promise earns its keep. Wild ferments drift — a hotter summer, a different pepper lot, and the mash swings. When the pepper going in holds its capsaicinoids to a batch CV of seven percent or better, the sauce that comes out lands on the same rung every single time. A host can print the heat on the label and mean it.

The house fermented red — the mother sauce

```
MAKES ~3 cups · ACTIVE 30 min · TOTAL 7–21 days + aging
HEAT  dial the rung with the cultivar — Social, Honest, or Committed
ALLERGENS  —

— the mash —
2 lb     red chilies, Social-to-Honest rung (Fresno, red jalapeño, or
cultivar)
4 cloves garlic
1        shallot
2.5%     fine sea salt, by total weight (weigh the peppers + aromatics, ×
0.025)
2 tbsp   whey or a splash of live brine (optional, to seed the culture)

— to finish —
1/2 cup  white-wine or cider vinegar
1 tbsp   honey (optional, to round)
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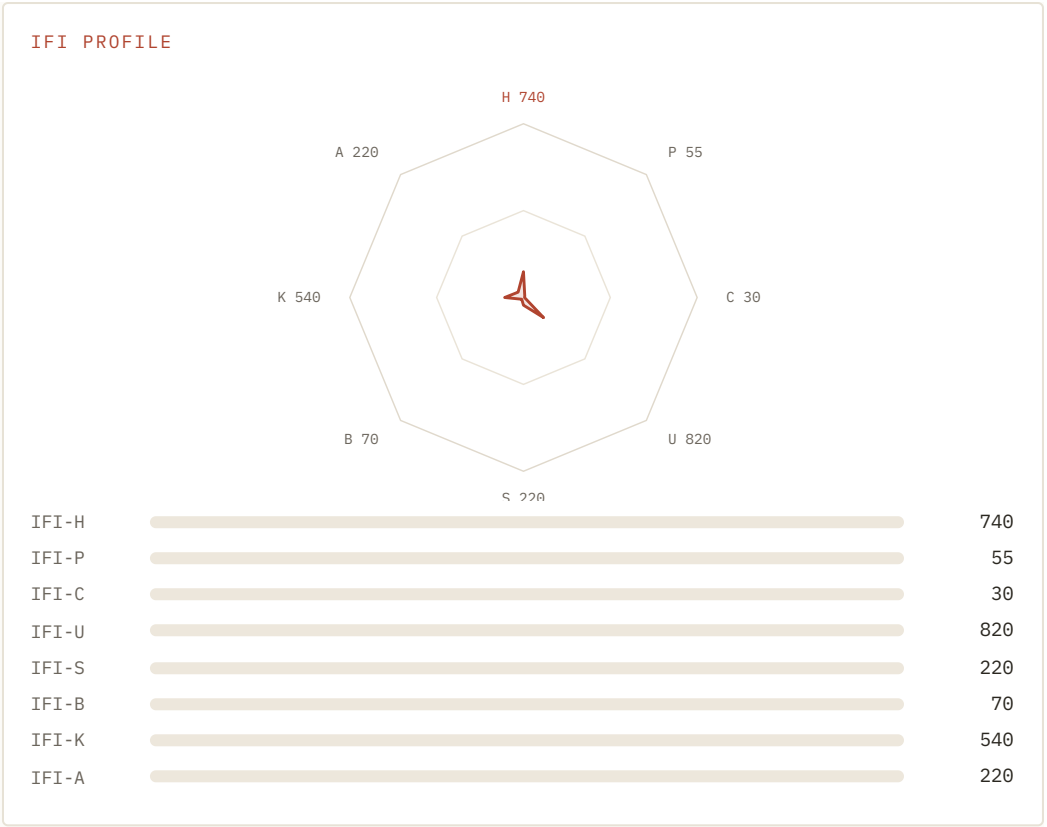
1. Blend peppers, garlic, shallot to a coarse mash. Weigh everything and add exactly 2.5% of that weight in salt. Salt sets the osmotic stage so lactic bacteria win and spoilers lose.
2. Pack into a clean jar, submerge under a weight or a brine-filled bag, leave 2 cm of headroom, and loosely cap. Ferment at 20–22 °C out of direct light, burping daily, 7–21 days — longer is deeper. It should smell bright, sour, and alive, never putrid.
3. When the pH reads 3.4 or below (test strips are enough), blend the mash with the vinegar and optional honey.
4. Strain for a pourable sauce, or leave it textured. Bottle and age at least a week in the fridge; it keeps months and improves for the first two.



Charred green — the quick one

Not every sauce needs three weeks. This one is built on fire and acid, ready in twenty minutes, and it is the fresher, brighter counterweight to the fermented red on any table.

MAKES ~2 cups · ACTIVE 20 min · TOTAL 20 min
HEAT Rung 2 (Social)
ALLERGENS —

8	tomatillos, husked
3	serranos (Honest rung; drop to jalapeño for Social)
1/2	white onion
3 cloves	garlic, skin on
1 cup	cilantro
1	avocado (for body, optional)
	juice of 2 limes · salt to taste

1. Char tomatillos, chilies, onion, and garlic under a broiler or over a flame until blistered and blackened in patches — this is Maillard and pyrolysis building smoke and depth in minutes.
2. Peel the garlic. Blend everything with the lime and a good pinch of salt until smooth. The avocado, if used, turns it into a pourable crema that doubles as a dip.

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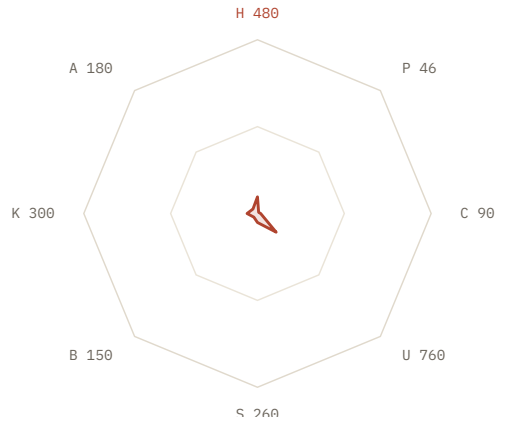

IFI-H	480
IFI-P	46
IFI-C	90
IFI-U	760
IFI-S	260
IFI-B	150
IFI-K	300
IFI-A	180

Chili crisp — the texture sauce

The one that has quietly taken over every table in the last decade, and for good reason: it is heat you can *hear*. Aromatics and chili fried into oil until crackling, so each spoonful delivers capsaicin on fat (the ideal carrier), crunch, and a deep fried-allium savor all at once. Spoon it over anything in this book that needs a jolt.

```
MAKES ~2 cups · ACTIVE 35 min · TOTAL 45 min
HEAT  Rung 3 (Honest) · the oil carries capsaicin efficiently — start
light
ALLERGENS  soy; optional sesame, peanut

— the solids —
6         shallots, thin-sliced
1 head    garlic, thin-sliced
1 inch    ginger, julienned
3 tbsp    coarse Honest-rung chili flakes
1 tbsp    Sichuan peppercorn (for the Cool-Burn tingle, Ch. 15)
2 tbsp    fermented black beans or 1 tbsp soy, for umami
1 tbsp    toasted sesame seeds

— the oil —
1.5 cups neutral oil
2         star anise · 1 cinnamon stick · 2 bay leaves
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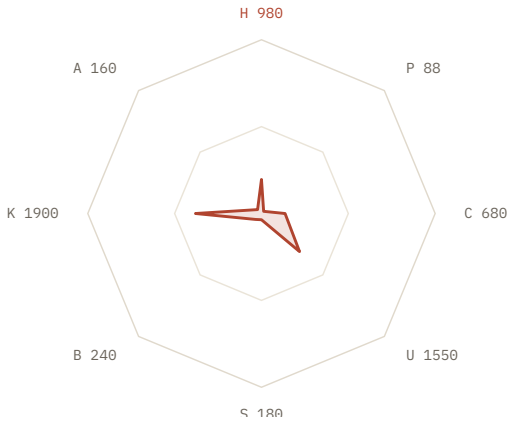
1. Fry the shallots, then the garlic, then the ginger separately in the oil over medium-low until each is golden and crisp; lift out. Patience here — rushing burns the sugars to bitter.
2. Infuse the oil with the whole spices 5 minutes; fish them out.
3. Put the chili flakes, Sichuan pepper, and fermented beans in a heatproof bowl. Pour the hot (but not smoking, ~130 °C) oil over — it blooms the capsaicin and the Sichuan hydroxy-alpha-sanshools in one dramatic sizzle. Fold the fried aromatics and sesame back in. Cool, then jar.

IFI PROFILE



IFI-H	980
IFI-P	88
IFI-C	680
IFI-U	1,550
IFI-S	180
IFI-B	240
IFI-K	1,900
IFI-A	160

The Cool-Burn reads high here — that is the Sichuan peppercorn, whose sanshools trigger TRPA1 and a light-touch tingling that the brain files somewhere between cold and vibration. You will meet that axis properly in the cooldown chapter; here it is simply the reason chili crisp feels alive on the tongue rather than merely hot.



PART II OF VI

The Dip Architecture

the queso emulsion · the restored tomato · the cool counter · the deep savory

Chapter 4 · The queso problem — *the physics of molten cheese.*

A bowl of queso that stays smooth from the first chip to the last, that neither seizes into rubber nor weeps a slick of orange oil, is one of the small triumphs of applied food science, and almost nobody knows it is science at all. The reason your home queso breaks and the reason the gas-station nacho cheese never does is the same reason, and once you understand it you will never make a grainy dip again.



Garlic in cross-section — our kokumi host, and the clove that makes a cheese dip taste like more than cheese.

Why cheese breaks

Cheese is a gel of **casein** proteins glued together by calcium phosphate, with fat droplets trapped in the web. Heat it and two things fight you. The calcium bridges tighten, squeezing the proteins into tough clumps — that is the grain, the curdled texture. And the fat, no longer held by the cooling matrix, renders out and pools — that is the grease slick. A pile of good cheddar in a hot pan does both at once and breaks within a minute.

The fix is **sodium citrate**, and it is the single most useful piece of chemistry in party cooking. Sodium citrate is an emulsifying salt: it chelates — sequesters — the calcium ions that bridge the casein. With the calcium pulled off, the caseins unclench and spread out, and their amphiphilic structure lets them wrap the fat droplets and hold them in suspension. You get a sauce that is smooth, glossy, and stable at any temperature, built from *real* cheese rather than processed loaf. This is the same trick that makes American cheese melt perfectly; you are simply doing it yourself, with cheese you chose. About 2–3% sodium citrate by weight of liquid is the working range.

Where our platform enters: the kokumi lift

A queso made this way is smooth, but smoothness is not flavor. What separates a memorable cheese dip from a merely functional one is **kokumi** — the mouth-filling, continuous, lingering richness that has no taste of its own but amplifies everything around it.

Kokumi works through **CaSR**, the calcium-sensing receptor, activated by γ-glutamyl peptides like γ-Glu-Val-Gly and by glutathione. These compounds concentrate in aged cheese, in yeast, and — richly — in **garlic and onion**, which is why a clove does so much more for a dip than its own flavor would suggest. Our allium program carries 560 constructs on garlic and tends the kokumi and pungency axes directly; a teaspoon of our kokumi-tuned roasted garlic lifts a queso's whole body without adding a single note you could name.

KOKUMI PEPTIDE	FOUND IN	RECEPTOR ACTION
γ-Glu-Val-Gly	yeast, fish sauce, fermented foods	strong CaSR agonist
glutathione (γ-Glu-Cys-Gly)	garlic, onion, meat, yeast	CaSR agonist
γ-Glu-Cys	alliums, aged cheese	CaSR agonist
Ca^{2+} (free)	dairy, mineral water	direct CaSR ligand

The smooth queso

```
SERVES 10–12 · ACTIVE 20 min · TOTAL 20 min
HEAT  Rung 2 (Social)
ALLERGENS  dairy

11 oz     sharp cheddar, grated
5 oz      Monterey Jack or Oaxaca, grated
1.5 cups  whole milk (or a lager, for depth)
4 tsp     sodium citrate (~3% of the liquid weight)
2         roasted poblanos, diced (Rung 1)
1         jalapeño, minced (climb to Rung 2)
2 tsp     roasted kokumi garlic (Ch. 4 note), minced
1/2 tsp   cumin · pinch of salt
```

1. Warm the milk with the sodium citrate until it dissolves and the liquid steams. Do not boil.
2. Over low heat, add the cheese by the handful, whisking each in fully before the next. The citrate keeps the caseins open; the sauce turns glossy and pourable, never grainy.
3. Fold in the roasted poblano, jalapeño, garlic, cumin, and salt. Hold warm — it will not break. Thin with a splash of warm milk if it tightens as it cools.

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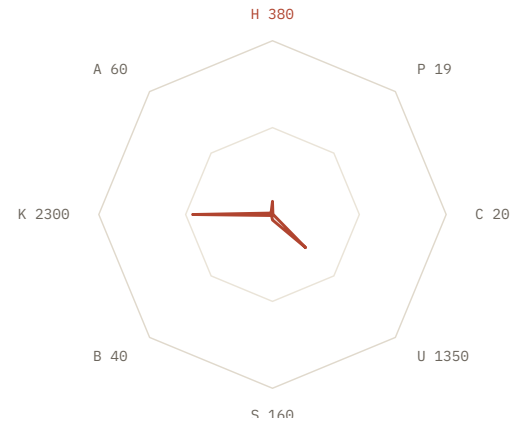

IFI-H	380
IFI-P	19
IFI-C	20
IFI-U	1,350
IFI-S	160
IFI-B	40
IFI-K	2,300
IFI-A	60

That Kokumi reading of 2,300 is the whole point of the dish — a number most "cheese" flavors never touch, carried by the allium peptides and the aged cheddar working the CaSR together. It is why the bowl gets scraped.

Roasted poblano & corn queso

A late-summer version with charred sweet corn folded in — the Maillard on the kernels adds a toasty umami that plays against the cream.

Add to the base: 1.5 cups fire-charred corn kernels, 1/4 cup chopped cilantro,
and finish with lime zest. Drop the jalapeño for a gentler Rung 1 crowd bowl.

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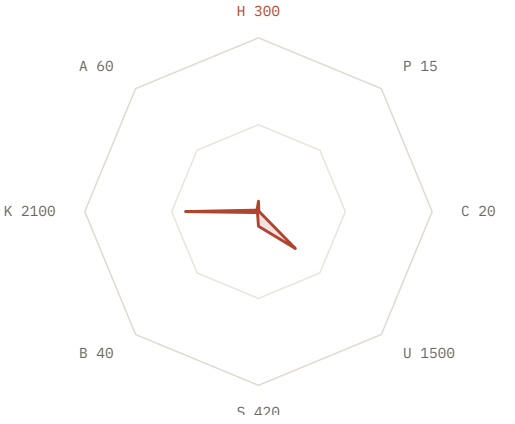

IFI-H	300
IFI-P	15
IFI-C	20
IFI-U	1,500
IFI-S	420
IFI-B	40
IFI-K	2,100
IFI-A	60

Cashew queso — the plant version

Soaked cashews, blended with nutritional yeast and a little miso, build a dip that is not pretending to be cheese — it is its own smooth, savory thing, and the yeast is doing real receptor work. Nutritional

yeast is dense in free glutamate (umami, mGluR1) and in the same γ-glutamyl peptides that drive kokumi, which is why vegan cheese sauces that lean on it taste *full* rather than thin.

```
SERVES 8 · ACTIVE 15 min + soak · TOTAL 15 min
HEAT  Rung 1–2
ALLERGENS  tree nuts, soy (miso)

1.5 cups cashews, soaked 2 hr (or boiled 15 min)
1/4 cup  nutritional yeast
1 tbsp   white miso
1 tbsp   lime juice · 1/2 tsp cumin · 1/2 tsp smoked paprika
1 cup    warm water, to blend
1        roasted poblano · 1 chipotle in adobo (for Rung 2 + smoke)
2 tsp    roasted garlic
```

1. Blend everything smooth, adding water until it pours like warm queso.
2. Warm gently to serve; it thickens as it cools, so keep a little hot water to loosen.

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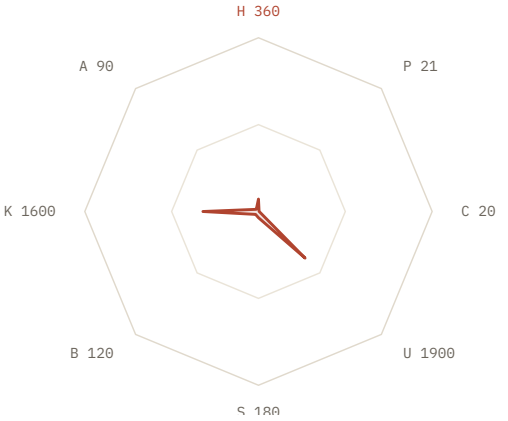


IFI-H	360
IFI-P	21
IFI-C	20
IFI-U	1,900
IFI-S	180
IFI-B	120
IFI-K	1,600
IFI-A	90

Chapter 5 · Salsa & the restored tomato — *the tomato that tastes like a tomato should.*

No dip is more fundamental to a party than salsa, and none is more betrayed by the modern supermarket. The tomato is the reason. Somewhere in the decades of breeding for shelf life, shippability, and uniform red, the industrial tomato lost most of what made it worth eating — and the loss is measurable. A vine-ripe heirloom carries 150–250 mg of free glutamate per 100 grams; the standard shipping tomato, picked green and gassed to color, carries a fraction of it. The umami simply drains out on the truck.



The tomato, whole and in section — our largest single-organism program, and the fruit we rebuilt from the inside.

What umami is, and where the tomato lost it

Umami is savoriness — the brothy, mouth-filling, deeply satisfying taste of free glutamate binding **mGluR1** and the **T1R1–T1R3** heterodimer on the tongue. Glutamate is the single most abundant free amino acid in a ripe tomato, and it is what makes a good tomato taste almost like meat. Crucially, glutamate does not act alone: it synergizes with 5′-ribonucleotides — **inosinate (IMP)** and **guanylate (GMP)** — in a nonlinear way, so that a little of both together tastes far more savory than the sum of each. This is the oldest secret of the world's broths, from dashi to a long-simmered sugo, and it is why a salsa built on a glutamate-rich tomato finished with a savory accent tastes like something and a salsa built on a shipping tomato tastes like cold acid.

Our tomato program is the largest single-organism effort in the catalog — **2,040 constructs** across the Sweetness, Umami, Full-Spectrum, and Multi-axis libraries. The umami restoration runs through the plant's own glutamate machinery: tuning **GAD** (glutamate decarboxylase) and **GDH1** so the fruit accumulates free glutamate rather than shunting it, rebuilding the savor the field crop threw away. Our model predicts a jump from roughly IFI-U 300 in a commodity tomato to 2,600 in the restored fruit — not a new flavor, the *original* flavor, grown back in.

TOMATO	FREE GLUTAMATE (MG/100G)	IFI-U
Commodity, gas-ripened	~25–40	~300
Supermarket vine	~90–140	~1,100
Heirloom, vine-ripe	~150–250	~1,900
Restored (our program, design target)	~280–340	~2,600

If you cannot get our fruit or a true heirloom, the cook's workaround is to *add back* the synergy: a spoon of tomato paste (concentrated glutamate), a pinch of MSG if you keep it, or a savory ferment. But the honest move is to start with a tomato that never lost it.

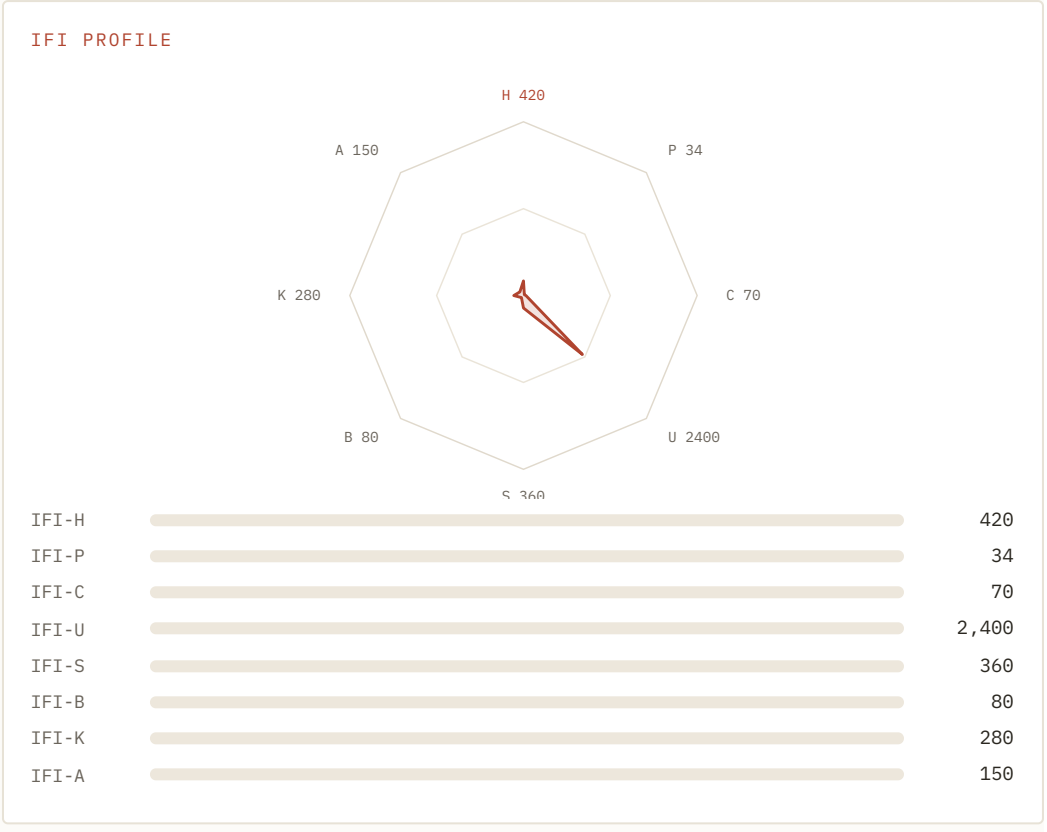
Pico de gallo — the raw test

The most unforgiving salsa, because there is nowhere to hide: no cooking, no blending, just the ingredients telling the truth. This is where a good tomato announces itself.

```
MAKES ~4 cups · ACTIVE 15 min · TOTAL 15 min
HEAT  Rung 2 (Social)
ALLERGENS  —

4         ripe tomatoes (restored or heirloom), 1 cm dice, seeds kept
1/2       white onion, fine dice
2         jalapeños or serranos, minced (seeds in to climb)
3/4 cup   cilantro, chopped
           juice of 2 limes · 1 tsp salt
```

1. Combine and let it sit 15 minutes so the salt pulls juice and the flavors marry; the onion's harsh sulfur compounds soften as the acid works on them.
2. Taste and adjust lime and salt. Drain lightly before serving if it pools, so it clings to a chip.



Roasted salsa roja — the deep one

Charring the vegetables before blending drives Maillard browning and concentrates the tomato's glutamate as water cooks off, pushing the umami and smoke up two steps.

MAKES ~3 cups · ACTIVE 20 min · TOTAL 35 min
HEAT Rung 3 (Honest)
ALLERGENS —

6	Roma or restored tomatoes, halved
2	dried guajillo + 1 dried árbol, stemmed (toast, then soak)
1/2	onion, thick slabs · 4 cloves garlic, skin on
1	chipotle in adobo · 1 tsp cumin · juice of 1 lime · salt

1. Broil tomatoes, onion, garlic until blackened in patches, 10–12 minutes. Toast the dried chilies in a dry pan 30 seconds until fragrant, then soak in hot water 10 minutes.
2. Peel the garlic. Blend everything — the roasted vegetables, the softened dried chilies with a splash of their soaking water, the chipotle, cumin, lime — to a textured sauce. Salt to taste.
3. For the deepest version, fry the blended salsa in a tablespoon of hot oil 5 minutes — "frying" a salsa caramelizes its sugars and marries the flavors the way a sauce base does.

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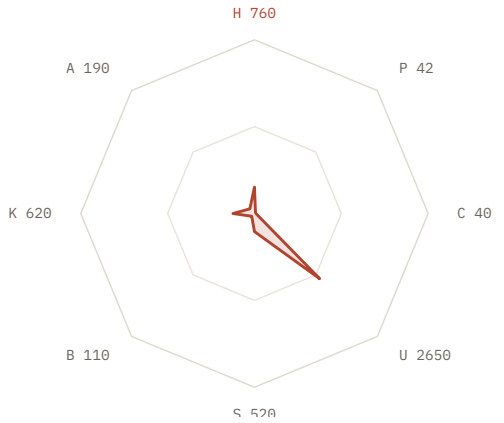

IFI-H	760
IFI-P	42
IFI-C	40
IFI-U	2,650
IFI-S	520
IFI-B	110
IFI-K	620
IFI-A	190

Charred salsa verde

Tomatillos, not tomatoes — tart, bright, and their natural pectin gives the salsa body without blending in fat. The char tames their sourness and builds a smoky green depth.

MAKES ~3 cups · ACTIVE 15 min · TOTAL 25 min
HEAT Rung 2 (Social)

10	tomatillos, husked · 2 serranos · 1/2 onion · 3 cloves garlic
1 cup	cilantro · juice of 1 lime · 1 tsp salt · pinch sugar

1. Broil tomatillos, serranos, onion, garlic until blistered and soft, 8–10 minutes.
2. Blend with cilantro, lime, salt, and a pinch of sugar to balance the tartness. Serve warm or cold; it tightens as it sits.

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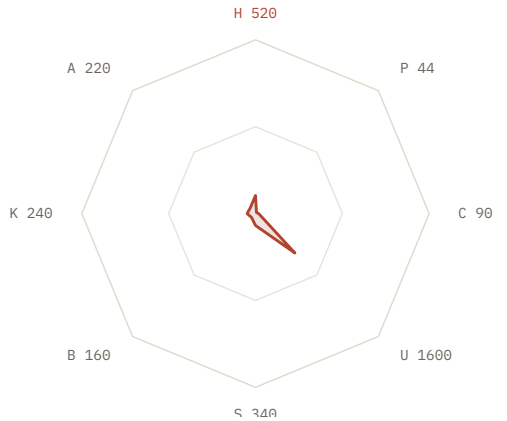

IFI-H	520
IFI-P	44
IFI-C	90
IFI-U	1,600
IFI-S	340
IFI-B	160
IFI-K	240
IFI-A	220

Mango-habanero — the sweet-heat salsa

A bridge into Chapter 14's territory: ripe mango's sugars and the habanero's fruity, floral burn are a classic pairing because sweetness and heat tune the same moment from opposite sides. The habanero's aromatics — it is one of the most perfumed chilies — survive the sweetness instead of being buried by it.

MAKES ~3 cups · HEAT Rung 3–4 depending on seeding
2 ripe mangoes diced · 1–2 habaneros minced · 1/2 red onion fine dice
1/2 red bell pepper · 1/4 cup cilantro · juice of 2 limes · salt · pinch of chili-lime salt

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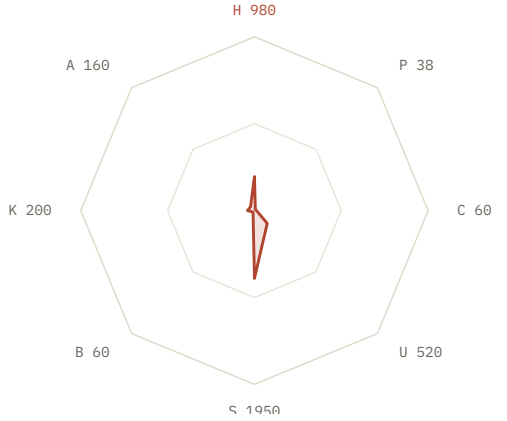
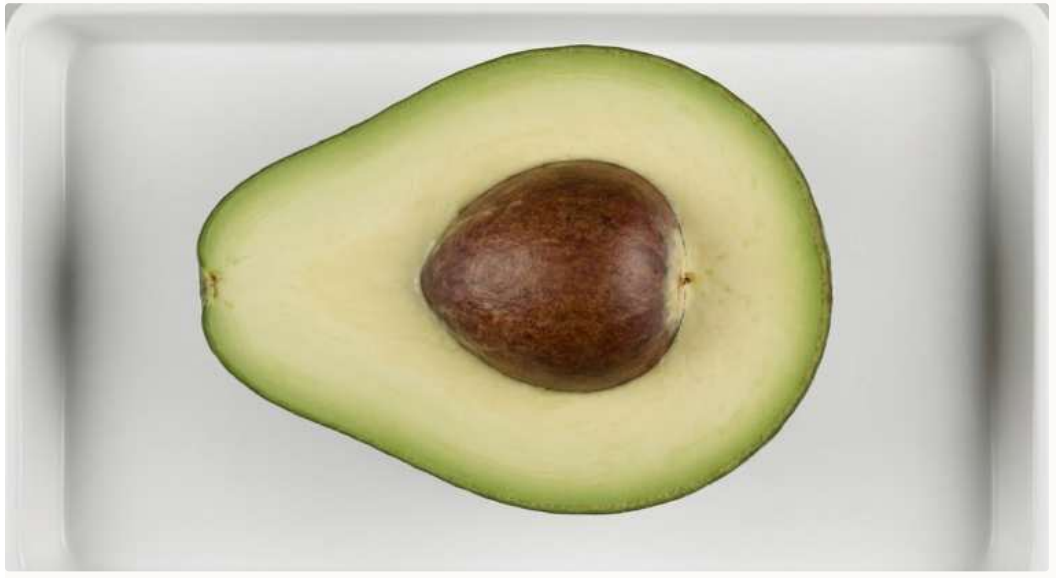


IFI-H	980
IFI-P	38
IFI-C	60
IFI-U	520
IFI-S	1,950
IFI-B	60
IFI-K	200
IFI-A	160

Chapter 6 · Guacamole & the cool counter — *green, cold, and load-bearing.*

If salsa is the test of a tomato, guacamole is the test of a host's restraint. The avocado asks to be left nearly alone — it brings its own luxurious fat, which is both its glory and, for our purposes, a quietly brilliant piece of chemistry, because that fat is the perfect vehicle for exactly the heat a party wants to climb into.



Avocado in section — fat as structure, and the coolest-running base on the table.

Fat, heat, and the cooling counter

Capsaicin is lipophilic, so when you fold a minced chili into mashed avocado, the capsaicin partitions into the avocado's fat and spreads evenly through every bite rather than spiking in the one that happens to catch a seed. Guacamole is a *heat diffuser*. This is why a guac that tastes assertively spicy on the first taste rarely punishes — the fat has already distributed the load and stands ready to carry it off the receptor, the same casein-and-lipid rescue that butter runs in a Buffalo sauce.

It is also the natural home of the **Cool-Burn** axis, **IFI-C**, and the cool counter is one of the most underused moves in party cooking. Cool-Burn runs through **TRPM8**, the receptor that reads actual cold and is tricked by menthol into reporting coolness that isn't there — the mirror image of what capsaicin does to TRPV1. A whisper of fresh mint or a cucumber note in a dip does not cool the food; it convinces the tongue it is cooler, which reads as refreshment and buys a guest another rung of tolerance for the heat alongside it. Our mint program runs the full five-gene menthol pathway (limonene → trans-isopiperitenol → … → menthol), and even without engineered mint, a few torn leaves put TRPM8 to work for you.

The guacamole

SERVES 8 · ACTIVE 15 min · TOTAL 15 min
HEAT Rung 2 (Social)
ALLERGENS —

3	ripe avocados
1/2	white onion, fine dice
1–2	serranos or jalapeños, minced
1/3 cup	cilantro, chopped
	juice of 1–2 limes · 3/4 tsp salt
1/4 tsp	toasted cumin (optional)

1. Mash the avocados to your preferred texture — we leave it chunky so it holds on a chip. Fold in everything else.
2. Salt last and taste: salt pulls the avocado's richness forward and tames the raw onion. Press plastic wrap to the surface if holding — oxidation, not flavor, is the only enemy of made-ahead guac.

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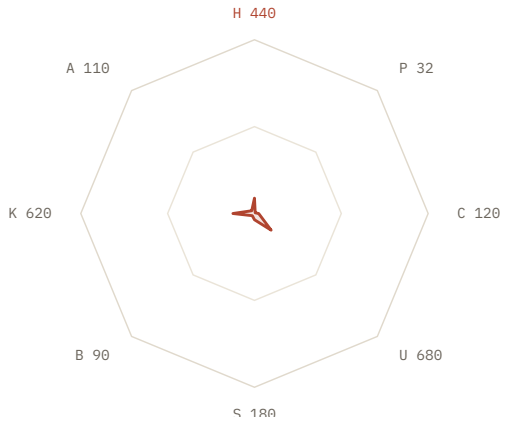



Charred-corn & serrano guac

Fire-roasted corn folds sweetness and a toasty Maillard crunch into the cool green base — a textural and thermal contrast in one bowl.

Fold into the base: 1 cup charred corn, 1 diced roasted poblano, cotija to finish, extra lime. Serrano seeds in for a confident Rung 3.

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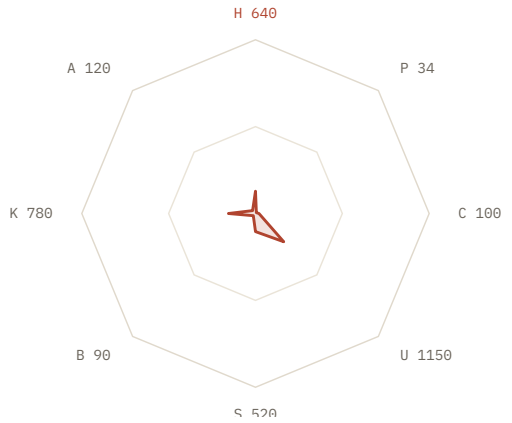

IFI-H		640
IFI-P		34
IFI-C		100
IFI-U		1,150
IFI-S		520
IFI-B		90
IFI-K		780
IFI-A		120

Cucumber-avocado cooling dip

The counter made explicit — a blended dip engineered to *lower* the room's heat, the thing you set beside the Nashville wings so the brave have a landing pad. Cucumber and mint drive TRPM8; yogurt's casein carries capsaicin off; the whole bowl is an antidote that tastes like a dip.

SERVES 8 · ACTIVE 10 min · TOTAL 10 min
HEAT Rung 0 (a cooling station, by design)
ALLERGENS dairy

1	avocado · 1 cup Greek yogurt · 1/2 English cucumber
1/4 cup	mint + 1/4 cup cilantro · 1 clove garlic · juice of 1 lime · salt

1. Blend smooth. Chill. Serve cold against anything on the hot end of the ladder.

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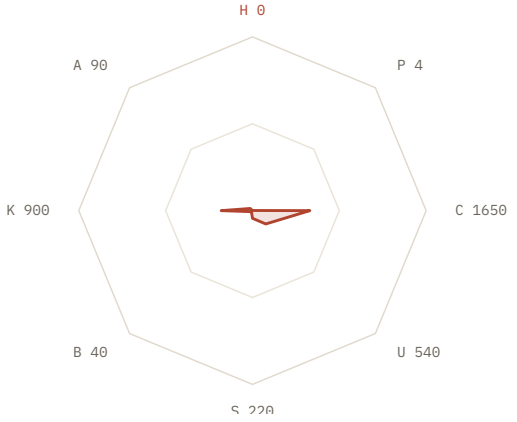


IFI-H		0
IFI-P		4
IFI-C		1,650
IFI-U		540
IFI-S		220
IFI-B		40
IFI-K		900
IFI-A		90

That Cool-Burn reading of 1,650 with Heat at zero is a deliberate instrument: a bowl whose entire job is to move a guest *down* the ladder when they have climbed one rung too far. A good host sets the fire and the water on the same table.



PART III OF VI

The Handhelds

nachos as a system · poppers & skins · sliders · the dry side

Chapter 7 · Beans, layers & the deep savory — *the dip that feeds a room.*

Some dips are condiments and some dips are dinner, and the layered bean dip — the seven-layer, the loaded bean bowl — is squarely the latter. It is the most *structural* food in this book, a built thing with a cross-section, and it is where the savory axes of our platform do their quietest and most important work: making a bowl of beans taste like it took all day when it took twenty minutes.



Soybean — the humble engine of deep savor, and the host for our umami-and-kokumi ferment program.

The soybean, koji, and manufactured depth

Behind every great savory dip is a fermented soybean somewhere — miso, soy sauce, douchi, tempeh — and behind every fermented soybean is **koji**, the mold *Aspergillus oryzae*, whose enzymes break the bean's proteins into a flood of free glutamate and its starches into sweetness. This is umami manufactured by biology, and it is the reason a spoon of miso makes a pot of beans taste finished. Our catalog runs 360 constructs on soybean and 80 on koji mold, both tuned toward the Umami and Kokumi axes, because the soybean-koji system is the most efficient savory engine in the plant kingdom.

The science is the same synergy from the tomato chapter, deployed on purpose: koji fermentation generates free glutamate (umami, mGluR1) *and* 5′-nucleotides, so a miso or a tamari brings the two halves of the synergy in one ingredient. Add it to a bean dip and the beans' own modest glutamate is multiplied, not merely supplemented. The dip tastes *long*.

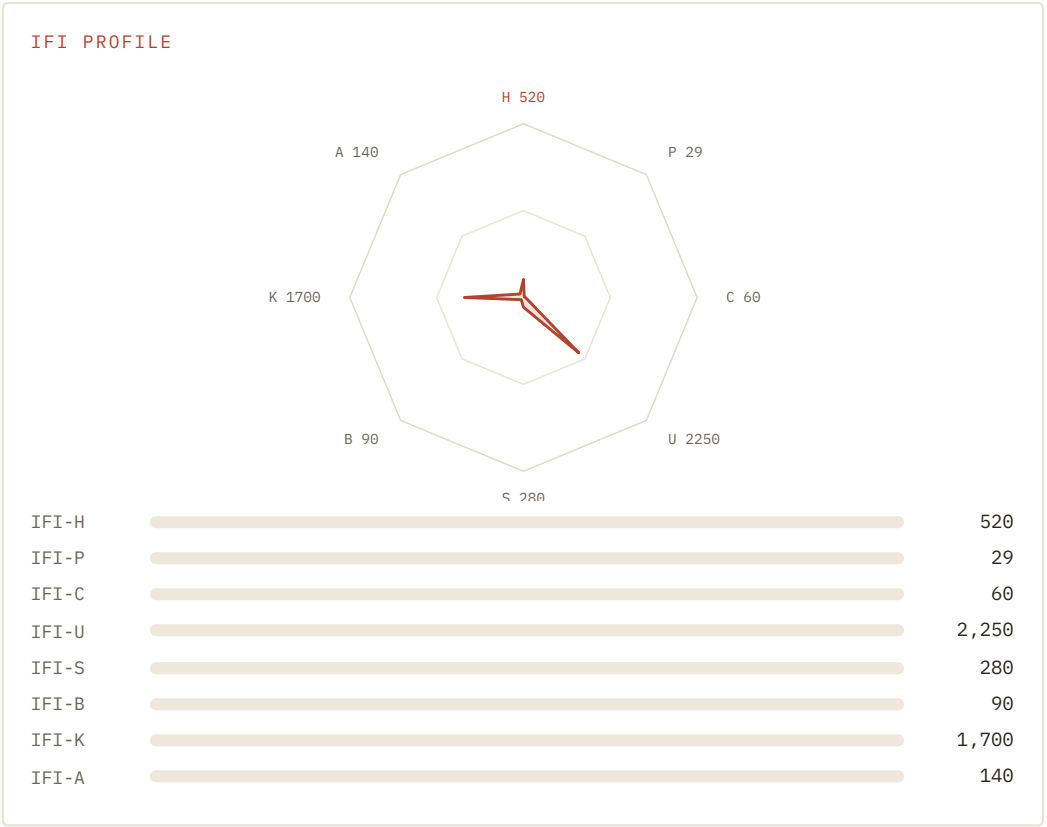
Seven-layer dip

The architecture matters as much as the ingredients: each layer is chosen for how it behaves in a scoop, bottom to top, so a single chip pulls a complete bite.

```
SERVES 12–16 · ACTIVE 30 min · TOTAL 40 min
HEAT  Rung 2 (Social)
ALLERGENS  dairy

Layer 1 (base):  2 cups refried beans, loosened with 1 tbsp miso + cumin + a
                 spoon of adobo  ← the savory foundation
Layer 2:         1.5 cups guacamole (Ch. 6)
Layer 3:         1 cup sour cream whisked with lime + chili-lime salt
Layer 4:         1.5 cups queso (Ch. 4) or grated cheese
Layer 5:         1.5 cups pico de gallo (Ch. 5), drained
Layer 6:         sliced black olives, pickled jalapeños
Layer 7 (crown): scallion, cilantro, cotija, a drizzle of the house red (Ch. 3)
```

1. Loosen the refried beans with miso, cumin, and adobo until spreadable and deeply savory — this layer carries the whole dip, so season it hardest.
2. Spread in order in a wide glass dish so the cross-section shows. Keep the wet layers (pico) drained so the structure holds.
3. Crown just before serving; the fresh top layer is the dip's signal that it is alive.



Umami 2,250 and Kokumi 1,700 in a bowl of beans and dairy — that is the koji and the allium peptides and the aged cheese all pulling together, and it is why this bowl, not the fancy one, is the one that empties.

Smoky black bean dip

Warm, pureed, chipotle-deep — the counterpart to the cold layered dip and a vegetarian centerpiece that asks no apology.

SERVES 10 · ACTIVE 15 min · TOTAL 25 min
HEAT Rung 3 (Honest)
ALLERGENS —

2 cans black beans, one drained one not
2 chipotles in adobo + 1 tbsp of the sauce
1 tbsp white miso · 2 cloves roasted garlic · 1 tsp cumin · 1/2 tsp smoked paprika
  juice of 1 lime · 2 tbsp olive oil · salt

1. Sauté garlic and spices in the oil 1 minute to bloom them. Add beans (with the liquid from the undrained can), chipotle, miso, and simmer 8 minutes.
2. Blend to your texture — half-smooth holds a chip best. Finish with lime and a swirl of olive oil. Top with cotija and pickled onion.

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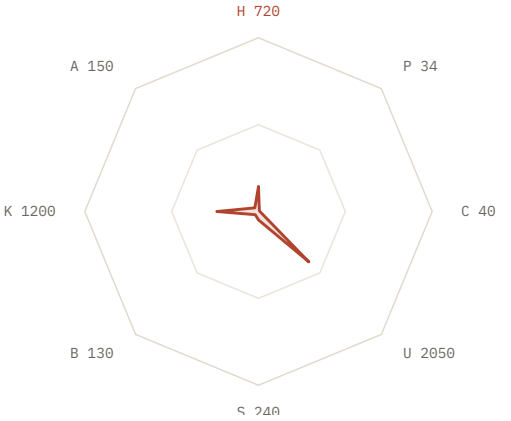

IFI-H	720
IFI-P	34
IFI-C	40
IFI-U	2,050
IFI-S	240
IFI-B	130
IFI-K	1,200
IFI-A	150

Edamame-miso whip

The lightest, greenest savory dip in the book, and a quiet showcase for the soybean on both sides of its life — fresh edamame and fermented miso in one bowl.

SERVES 8 · ACTIVE 10 min
HEAT Rung 1
ALLERGENS soy, sesame

2 cups shelled edamame (blanched) · 2 tbsp white miso · 1 tbsp tahini
1 clove garlic · juice of 1 lime · 2 tbsp olive oil · water to blend
finish: chili crisp (Ch. 3), toasted sesame

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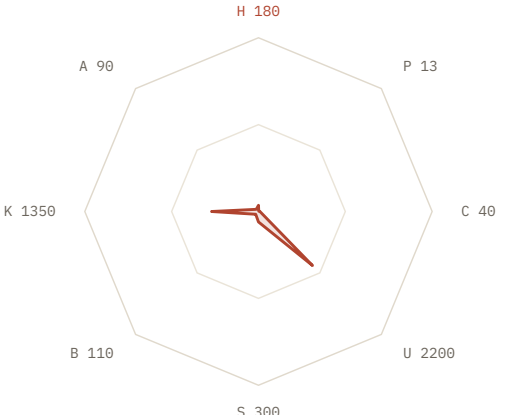


IFI-H	180
IFI-P	13
IFI-C	40
IFI-U	2,200
IFI-S	300
IFI-B	110
IFI-K	1,350
IFI-A	90

Chapter 8 · Nachos as a system — *distribution is everything.*

There is a reason the nachos at the party are either transcendent or tragic and almost never in between, and it has nothing to do with the ingredients. It is a distribution problem. Nachos fail when the toppings pile in a wet mound at the center and the edges go naked — when the system does not distribute load. Treat a tray of nachos as an engineering problem and it becomes one of the most satisfying things you can set in front of a crowd.



Corn in section — the load-bearing member of the entire structure.

The load-bearing chip

Everything rests on the chip, literally, and the chip's job is structural: it must stay crisp under a wet load long enough to survive the trip from tray to mouth. Corn is the right material because a nixtamalized corn chip — masa made from corn cooked in an alkaline lime solution — has a denser, more gelatinized starch structure than a wheat or a potato chip, and it holds its rigidity under moisture far longer. Nixtamalization also unlocks niacin and builds the toasty aroma that reads as "nacho." The chip is not a delivery device; it is the frame of the building.

The failure mode is sogging, and sogging is capillary action plus starch gelatinization: liquid wicks into the chip's pores, its crystalline starch absorbs water and softens, and the frame collapses. You defeat it with *layering* and *placement* — never one deep pile, always two or three shallow strata, each chip touching cheese (a hydrophobic barrier) before it ever touches salsa (water). Cheese is the roof; salsa is the weather; keep the weather off the frame.

Sheet-pan nachos — the master build

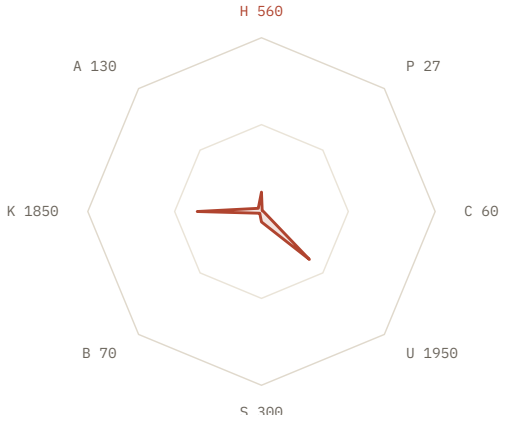
```
SERVES 10–12 · ACTIVE 15 min · TOTAL 30 min
HEAT  Rung 2 (Social), with climb-your-own ladders on the side
ALLERGENS  dairy

— the strata —
1 bag    sturdy nixtamalized tortilla chips (thick-cut)
3 cups   grated cheese (cheddar + Oaxaca) OR 2 cups queso (Ch. 4)
2 cups   seasoned beans or spiced mushrooms (miso + cumin + adobo)
1        poblano + 1 jalapeño, sliced
          to finish: pico (Ch. 5), guac (Ch. 6), crema, pickled jalapeño,
          cilantro, the house red (Ch. 3) — all applied AFTER the bake

— the ladder, on the side —
          sliced raw Fresnos · chili crisp (Ch. 3) · a dropper of
Committed-rung sauce
```

1. Lay chips in a single overlapping layer on a sheet pan. Scatter half the cheese so every chip is anchored, then the beans or mushrooms, then the remaining cheese, then the sliced chilies. Two shallow layers, not one deep one.
2. Bake at 200 °C (400 °F) 8–10 minutes, until the cheese is molten and the edges toast. The cheese-first rule means the chips crisp rather than steam.
3. Apply all the cold, wet toppings *after* the bake and *just* before serving — pico, guac, crema, herbs. Hot on the chip, cold on top.
4. Set the ladder beside the tray. The base is shareable; the climb is personal. This is the whole philosophy of the book in one pan.

IFI PROFILE



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IFI-P	27
IFI-C	60
IFI-U	1,950
IFI-S	300
IFI-B	70
IFI-K	1,850
IFI-A	130

The nacho bar, as a blueprint

For a bigger room, do not build the nachos — build the *system* and let guests assemble. One warm vessel of queso held smooth by its sodium citrate (it will not break on the buffet), one tray of toasted chips, bowls of each topping, and the ladder laid out left to right from Sunlit to Challenge with the IFI-H printed on a card beside each. You are not serving a dish; you are handing the crowd curve a

slider and letting every guest find their own rung. We have watched a room of forty people each build the exact plate they wanted from one table, and that — not any single recipe — is what this book is for.

Chapter 9 · Poppers, skins & stuffed things — *heat with a hollow center.*

The stuffed chili is an idea so good it recurs in every cuisine that grows peppers: hollow out the fire, fill it with something cool and rich, and you have built a single bite with the entire tension of the meal inside it. The jalapeño popper is the American tailgate's version, and the loaded potato skin is its starchier cousin, and both are exercises in the same pleasure — a crisp shell, a molten middle, heat held in tension with fat.



Potato — the Zero-Bitter host, and the skin that carries a loaded bite.

Where the heat lives, and how to tune it

Cut a jalapeño lengthwise and you expose the secret of every chili: the heat is not in the seeds, as the folklore insists, but in the **placenta** — the pale, pithy membrane the seeds cling to. That tissue is where the Pun1/AT3 capsaicin synthase does its work and where the capsaicinoids are stored in specialized vacuoles. Scrape the placenta and you can drop a jalapeño from Social rung nearly to Sunlit; leave it and you climb. This is the home cook's version of what our platform does at the gene level — you are editing heat by anatomy instead of by sequence, but you are working on the same tissue.

For a popper, that control matters, because the filling is rich and the shell should carry enough heat to cut it without overwhelming the room. We leave about half the placenta in a Social-rung popper, and we keep a tray of fully-scraped Sunlit poppers for the heat-shy — same dish, two rungs, one platter.

Jalapeño poppers

```
MAKES 24 · ACTIVE 30 min · TOTAL 50 min
HEAT  Rung 2 (Social) — scrape fully for a Rung 1 tray alongside
ALLERGENS  dairy, gluten (panko)

12       jalapeños, halved lengthwise, placenta tuned to taste
8 oz     cream cheese, softened
1 cup    grated sharp cheddar
2 tsp    roasted kokumi garlic (Ch. 4) · 1/2 tsp smoked paprika · 1/4 tsp
cumin
2        scallions, minced · salt
3/4 cup  panko + 2 tbsp olive oil (toss to coat)
```

1. Mix cream cheese, cheddar, garlic, spices, scallion, and a pinch of salt into a rich, kokumi-heavy filling.
2. Fill the halved, tuned jalapeños. Press the oiled panko onto the tops for crunch.
3. Bake at 200 °C 18–22 minutes until the shells soften, the filling bubbles, and the crumbs go gold. Rest 5 minutes — the filling is molten and the placenta's capsaicin is at full voice straight from the oven.

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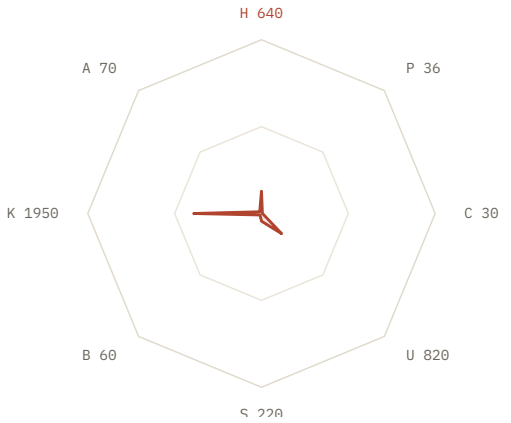

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IFI-P	36
IFI-C	30
IFI-U	820
IFI-S	220
IFI-B	60
IFI-K	1,950
IFI-A	70

Loaded potato skins

The potato earns a mention beyond its structural job here, because it is a host in our catalog — 80 constructs, tended on the **Zero-Bitter** axis. Potatoes carry glycoalkaloids (solanine, chaconine) that read bitter and, in excess, worse; our program attenuates that bitterness through **TAS2R38**, the receptor behind the famous PTC/PROP bitterness divide, letting the potato's sweet, earthy, mineral character come forward. A crisped skin is already low in those

alkaloids (they concentrate in green, light-struck tubers — never use those), and the bake builds a Maillard savor that makes the skin the best part of the potato.

```
MAKES 16 · ACTIVE 20 min · TOTAL 1 hr 15 min
HEAT  Rung 1–2
ALLERGENS  dairy

8         small russets, baked and halved, flesh scooped (save for mash)
3 tbsp    olive oil or rendered fat · salt
1.5 cups grated cheddar + Monterey Jack
          to finish: crema, scallion, pickled jalapeño, chili crisp (Ch.
3),
          optional crisped bacon or smoked mushroom
```

1. Bake russets at 200 °C until tender, ~55 minutes. Halve, scoop most of the flesh (keep a 5 mm wall), brush skins inside and out with oil, salt well.
2. Crisp the empty skins at 230 °C, 10 minutes a side, until shatter-crisp at the edges.
3. Fill with cheese, melt 5 minutes, then load with crema, scallion, and your chosen ladder topping. The skin should crackle; the filling should run.

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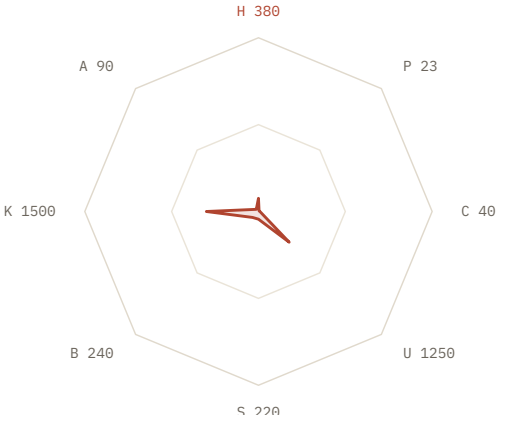

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IFI-P	23
IFI-C	40
IFI-U	1,250
IFI-S	220
IFI-B	240
IFI-K	1,500
IFI-A	90

Chapter 10 · Sliders, big and small — *the two-bite sandwich.*

A slider is a whole meal's worth of decisions compressed into two bites, which is exactly why it belongs on a game-day table where nobody wants to commit to a plate. The format forces discipline: with so little bread and so little filling, every element has to earn its place, and heat has to be placed with a jeweler's precision because there is no third bite to recover in.



The button mushroom — meaty, umami-dense, and the backbone of a plant slider that asks no apology.

Two sliders, equal respect

Our table is plant-first by default, and the pulled-mushroom slider on this page is not a substitute for anything — it is a great sandwich that happens to be made of fungus. Mushrooms are among the richest plant sources of umami on earth: they carry free glutamate and, uniquely, high levels of **guanylate (GMP)**, one half of the savory synergy, which is why a mushroom tastes meaty in a way a bean does not. Dried shiitake, rehydrated, concentrate GMP further; a few blitzed into the mix give a pulled-mushroom filling a depth that reads, honestly, as savory-complete.

And the smash slider — beef, griddled hard for maximum Maillard — is written here with the same care, because this book respects the whole table. The smash technique is pure surface chemistry: pressing the patty thin against a screaming-hot surface maximizes the browned crust, and the browning *is* the flavor, the Maillard reaction between the meat's amino acids and sugars throwing off hundreds of savory, roasted, nutty compounds at 150–165 °C. Thin and hard-seared beats thick and gentle every time for this format.

Pulled-mushroom sliders

MAKES 12 · ACTIVE 25 min · TOTAL 40 min
HEAT Rung 2 (Social)
ALLERGENS gluten (buns), soy

1.5 lb	mixed mushrooms (oyster, cremini), hand-torn
4	dried shiitake, rehydrated and minced (keep the soaking liquid)
2 tbsp	olive oil · 1 onion, sliced · 3 cloves garlic
2 tbsp	soy or tamari · 1 tbsp miso · 1 tbsp tomato paste
1 tbsp	smoked paprika · 1 chipotle, minced · 2 tsp the house red (Ch. 3)
12	slider buns · slaw + pickles to finish

1. Sear the torn mushrooms hard in batches — crowd the pan and they steam; give them room and they brown. Browning builds the Maillard savor that makes them meaty.
2. Add onion, garlic, cook soft. Stir in shiitake, soy, miso, tomato paste, paprika, chipotle, and a splash of the shiitake liquor. Simmer until glossy and pull-apart tender.
3. Pile on toasted buns with slaw and pickle. The acid and crunch are structural — they cut the deep savor so bite two tastes as good as bite one.

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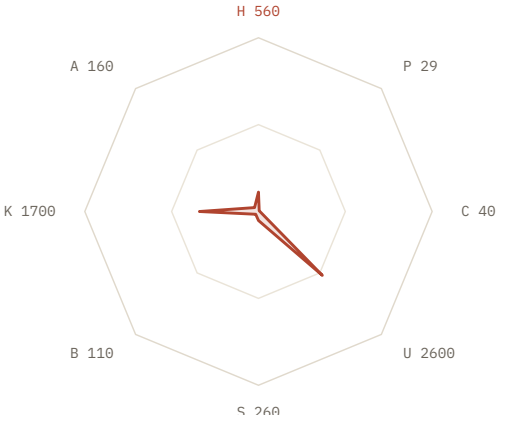

IFI-H	560
IFI-P	29
IFI-C	40
IFI-U	2,600
IFI-S	260
IFI-B	110
IFI-K	1,700
IFI-A	160

Umami 2,600 from a pan of mushrooms — the GMP-glutamate synergy, measured. That is not a meat substitute's number; it is a savory peak in its own right.

Smash sliders

MAKES 12 · ACTIVE 25 min · TOTAL 25 min
HEAT Rung 1–2 (heat on the side, by design)
ALLERGENS gluten, dairy

1.5 lb	ground beef (80/20), loose balls
	salt · 12 slices American or a sodium-citrate cheese (Ch. 4)
12	soft slider buns · thin onion · pickle · the house red (Ch. 3)

1. Get a griddle or heavy pan truly hot. Place loose beef balls, smash flat with a stiff spatula, salt the top. Do not move them — you are building crust.
2. At 2 minutes, when the crust is deep brown and the edges lace, flip, lay on cheese, melt 45 seconds.
3. Build on toasted buns with onion, pickle, and a dot of the house red. Keep the heat low in the build and set the sauce ladder beside the tray — a slider is too small to hide a big number, so let guests add it.

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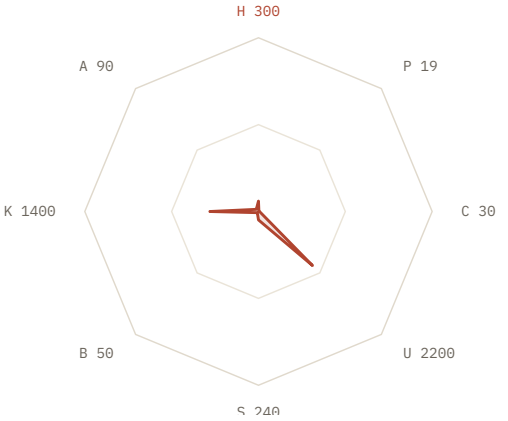

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IFI-C	30
IFI-U	2,200
IFI-S	240
IFI-B	50
IFI-K	1,400
IFI-A	90



PART IV OF VI

The Big Pots

the dry side · the long cook · the tray bakes

Chapter 11 · The dry side — *popcorn, snack mix, and the seasoning spec.*

Before the dips and the pots, every party runs on the dry side — the bowls that sit out from the first guest to the last, the salted things people graze without deciding to. They look like afterthoughts and they are not; a great seasoned popcorn or a well-built snack mix is the ambient flavor of the whole afternoon, and because they are nearly all surface, they are the purest test of a seasoning blend there is.



Corn, whole — the kernel whose trapped water becomes the whole bowl.

The physics of popcorn, and why seasoning is a surface problem

A popcorn kernel is a tiny pressure vessel: a hard, nearly waterproof hull around a starchy endosperm holding about 14% moisture. Heat it and that water turns to steam, pressure climbs to roughly 9 atmospheres and 180 °C, until the hull fails and the superheated starch explodes outward and flash-sets into the airy foam we eat. The whole flower is gelatinized starch frozen mid-expansion. Get the moisture wrong — too dry and it won't pop, too wet and it's tough — and no seasoning saves it.

Seasoning popcorn is a surface-adhesion problem, because there is nothing but surface. Dry powders bounce off and fall to the bottom of the bowl unless something tacky holds them; a fine mist of fat — melted butter, or an oil carrying bloomed spices — is what makes seasoning stick, and it is also what carries the fat-soluble flavor compounds (capsaicin, the carotenoids in paprika, the aromatics in cumin) onto the tongue. The grind matters too: superfine salt and powders cling where coarse ones slide off. A great seasoned popcorn is engineered at the scale of microns.

The house rub — a seasoning you build once

Every dry recipe in this book leans on one blend. Think of it as a seasoning spec: a balanced readout across the aromatic end of the axes, mixed in bulk and kept in a jar.

```
MAKES ~1 cup · a dry-side mother blend
HEAT  Rung 1 aromatic base — add ground cultivar to climb

3 tbsp   smoked paprika        ← color, gentle warmth, carotenoids
2 tbsp   fine sea salt
1 tbsp   ground cumin          ← earthy aromatic depth
1 tbsp   garlic powder         ← kokumi, allium savor
1 tbsp   onion powder
2 tsp    ground coriander
2 tsp    dried oregano (Mexican)
1 tsp    chipotle or Honest-rung ground chili  ← the heat dial
1 tsp    brown sugar           ← rounds the edges, aids browning
1/2 tsp  citric acid or lime powder  ← brightness without liquid
```

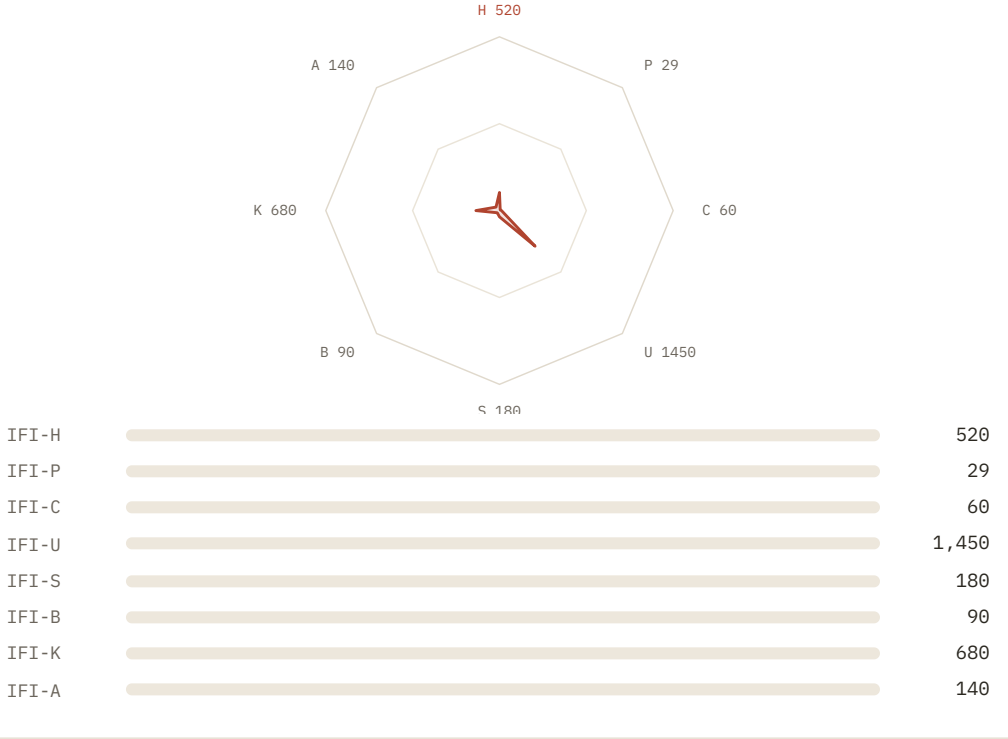
Blend and store airtight. Turn the heat dial up or down by the chili alone; the aromatic frame stays constant, which is the whole idea — a stable base you can place on any rung.

Chili-lime popcorn

```
MAKES a big bowl · ACTIVE 15 min
HEAT  Rung 2 (Social)
ALLERGENS  dairy (optional)

1/2 cup  popcorn kernels (popped in 3 tbsp oil, or air-popped)
3 tbsp   butter or oil, melted, with 1 tsp bloomed chili + 1/2 tsp smoked
paprika
2 tbsp   the house rub
1 tbsp   lime zest + a squeeze · 2 tbsp nutritional yeast (umami,
optional)
```

1. Bloom the chili and paprika in the warm fat 30 seconds to pull their fat-soluble flavor out, then toss the hot popcorn with the seasoned fat first — fat before powder, always, so the seasoning has something to grip.
2. Shower with the rub, lime zest, and yeast while hot, tossing hard so every flake coats. The nutritional yeast reads as a savory, almost-cheesy umami that makes the bowl disappear.



House snack mix

The savory-crunchy grazing bowl, built on the same rub and a bloomed-butter base that bakes the seasoning *on* rather than dusting it loosely.

MAKES ~10 cups · ACTIVE 15 min · TOTAL 1 hr
HEAT Rung 1–2
ALLERGENS gluten, soy, nuts

8 cups	mixed cereal squares, pretzels, bagel chips
2 cups	mixed nuts (peanuts, cashews, almonds)
6 tbsp	butter · 2 tbsp soy or Worcestershire · 2 tbsp the house red (Ch. 3)
3 tbsp	the house rub · 1 tbsp honey

1. Melt butter with soy, house red, rub, and honey into a glossy coating.
2. Toss with the dry mix until evenly slick. Bake at 120 °C (250 °F) 1 hour, stirring every 15 minutes — the low, slow bake drives off moisture and bakes the seasoning onto each piece, so it stays crunchy for days.

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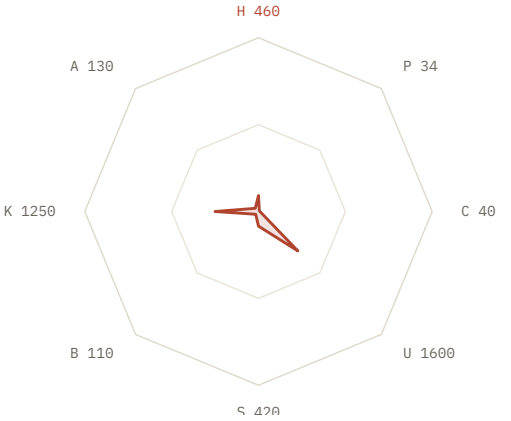

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IFI-P	34
IFI-C	40
IFI-U	1,600
IFI-S	420
IFI-B	110
IFI-K	1,250
IFI-A	130

Chapter 12 · Chili — *the long cook.*

If the dry side is the ambient flavor of the party, the pot of chili is its gravity — the thing people drift back to all afternoon, the dish that rewards the host who started it before the guests arrived. Chili is the most chemically complete thing in this book, a slow convergence of nearly every mechanism in the catalog: Maillard browning, capsaicin extraction, glutamate synergy, the bitterness of dark chilies attenuated into depth. It is a four-hour argument that resolves into one bowl.



The extinction-tier fruit — the kind of concentrated heat a long cook can carry a single drop of without ever spiking.

Why time changes heat

A chili cooked for four hours does not taste like a chili cooked for one, and the difference is not only tenderness. Capsaicin is heat-stable and fat-soluble, so over a long simmer with fat in the pot it extracts steadily out of the chilies and distributes through the whole braise — the heat goes from localized and sharp to even and deep, woven into every spoonful rather than ambushing you in one. At the same time, the dried chilies' own flavor compounds — the raisined sweetness of an ancho, the smoke of a guajillo, the bright bite of an árbol — leach into the liquid, and the long heat drives slow Maillard and caramelization reactions that build a savory floor no quick chili can reach.

The dark dried chilies bring one more axis: **bitterness**, from their toasted skins and tannins, reading on **TAS2R38**. In a short cook that bitterness can dominate; over a long braise it mellows and integrates, becoming the structural backbone — the same role bitterness plays in coffee and dark chocolate. This is why a great chili tastes *grown-up*. And a square of dark chocolate or a spoon of cocoa stirred in at the end — the mole move — pushes that structure further, adding the cocoa's own bitterness, kokumi body, and astringency to round the pot. Our cocoa program tends exactly those axes.

The long-cook beef chili

SERVES 10–12 · ACTIVE 40 min · TOTAL 3–4 hr
HEAT Rung 3 (Honest), buildable with a drop of Challenge-tier extract
ALLERGENS —

— the chili paste —

4	dried anchos · 3 guajillos · 2 árbols, toasted and soaked
2	chipotles in adobo

— the pot —

2.5 lb	beef chuck, 2 cm cubes (or brisket) · salt · oil
2	onions, diced · 6 cloves garlic
2 tbsp	the house rub (Ch. 11) · 1 tbsp cumin · 1 tbsp oregano
2 tbsp	tomato paste · 1 can crushed fire-roasted tomatoes
2 cups	beef or mushroom stock · 1 bottle dark lager
1 oz	dark chocolate (85%) or 1 tbsp cocoa ← the mole finish
2 cans	beans (pinto, kidney), if you keep beans in your chili

1. Toast the dried chilies in a dry pan until fragrant, soak in hot water 15 minutes, then blend with the chipotles and a little soaking water into a smooth paste.
2. Brown the salted beef hard in batches — this Maillard crust is the chili's foundation; do not crowd the pot. Remove.
3. Soften onions and garlic in the fond, add the rub, cumin, oregano, tomato paste, and cook until the paste darkens and the spices bloom.
4. Return the beef, add the chili paste, crushed tomatoes, stock, and lager. Simmer gently, partly covered, 3 hours, until the beef is spoon-tender and the liquid is glossy.
5. In the last 20 minutes, melt in the chocolate and add beans if using. Taste for salt and acid — a splash of the house red (Ch. 3) or vinegar at the end wakes the whole pot. Rest 20 minutes before serving; chili, like all braises, tastes better after it settles, and better still the next day.

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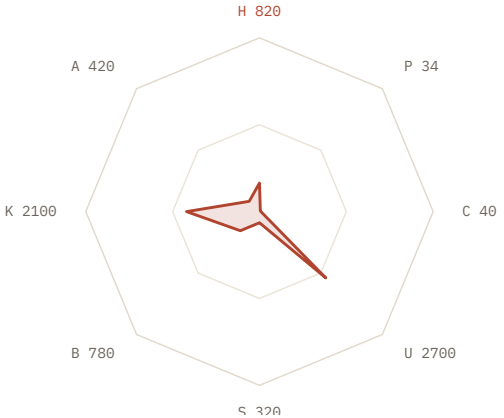

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IFI-P	34
IFI-C	40
IFI-U	2,700
IFI-S	320
IFI-B	780
IFI-K	2,100
IFI-A	420

Look at that readout as a portrait of a long cook: Umami and Kokumi both high from the browned meat, the stock, and the glutamate concentrating as water cooks off; a real Zero-Bitter *and* an

Astringency signal from the dark chilies and the chocolate, giving the bowl its grown-up backbone. This is the most multi-axis dish in the book, and it got there through time, not tricks.

Three-bean & ancho chili

The vegetarian pot, and on our table the default — built to the same depth through mushrooms and miso and a long simmer, not through imitation.

SERVES 10 · ACTIVE 30 min · TOTAL 1 hr 30 min
HEAT Rung 2–3
ALLERGENS soy (miso)

1 lb	cremini + 4 dried shiitake, finely chopped (the savory engine)
2	onions · 6 cloves garlic · 2 carrots · 1 red pepper, all diced
	the ancho/guajillo/árbol paste (above)
2 tbsp	the house rub · 1 tbsp cumin · 1 tbsp cocoa
2 tbsp	tomato paste · 1 can crushed tomatoes · 1 can fire-roasted
2 tbsp	miso (whisked into the stock) · 3 cups stock
3 cans	beans (black, pinto, kidney)

1. Brown the chopped mushrooms hard until deeply colored and shrunken — this is where the savory depth comes from, so take it further than feels necessary.
2. Add the vegetables and soften, then the rub, cumin, cocoa, tomato paste; cook until dark. Add the chili paste, tomatoes, the miso-stock, and beans.
3. Simmer 1 hour until thick and unified. Finish with lime and the house red. The miso and the GMP-rich shiitake do the synergy work that gives a bean chili the long, savory finish people think only meat provides.

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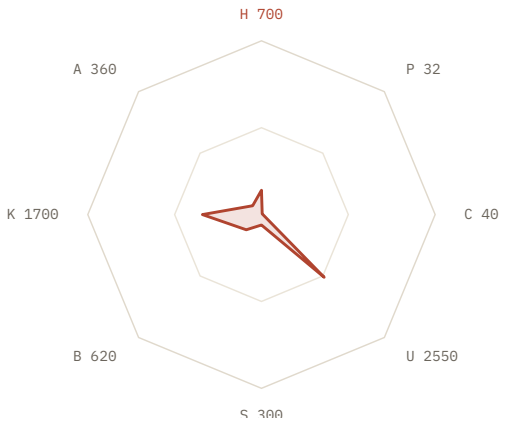

IFI-H	700
IFI-P	32
IFI-C	40
IFI-U	2,550
IFI-S	300
IFI-B	620
IFI-K	1,700
IFI-A	360

Chapter 13 · Tray bakes — *feeding twenty without losing the fourth quarter.*

The hardest constraint of hosting is not flavor; it is attention. The host wants to watch the game too, and a dish that demands tending through the third quarter has failed at its real job. The tray bake is the answer the party has evolved toward — assemble cold, bake hands-off, serve hot from the vessel it cooked in — and it is where a host buys back their own afternoon. These are the dishes you build at halftime and forget until they are bubbling.



A research tray in the chamber — the array made shareable, the single-pan logic of a tray bake.

The buffalo chicken dip, and the architecture of a bake

The buffalo chicken dip is the undisputed champion of the tray-bake genre, and it is worth understanding *why* it works so reliably, because the reasons generalize. It is a stable emulsion of cream cheese and fat that will not break in a slow oven; it carries its heat in that fat where capsaicin is happiest; and it browns on top into a Maillard crust that contrasts the molten center. It is, structurally, a queso with chicken in it — and the plant version with shredded mushroom or jackfruit obeys the same architecture exactly.

```
SERVES 14 · ACTIVE 15 min · TOTAL 40 min
HEAT  Rung 3 (Honest) — the dip format tames a big number
ALLERGENS  dairy

3 cups   shredded cooked chicken (or pulled oyster mushroom / jackfruit)
8 oz     cream cheese, softened
3/4 cup  house Buffalo sauce (Ch. 2) or house red + butter
3/4 cup  ranch or blue-cheese dressing (Ch. 15)
1.5 cups grated cheddar + Monterey Jack
2 tsp    roasted kokumi garlic (Ch. 4) · 3 scallions
```

1. Fold everything but half the cheese together until uniform. Spread in a baking dish, top with the reserved cheese.
2. Bake at 190 °C (375 °F) 22–25 minutes until bubbling at the edges and browned on top. The emulsion holds; the top crisps; the center runs.

3. Scatter scallion. Serve hot with sturdy chips, celery, and toasted bread — and keep it warm, because unlike almost everything else at the party, it reheats perfectly.

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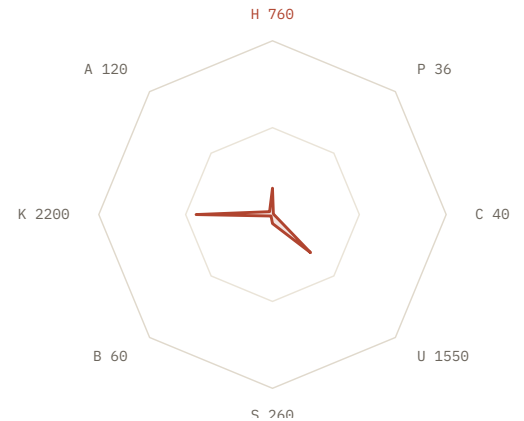

IFI-H		760
IFI-P		36
IFI-C		40
IFI-U		1,550
IFI-S		260
IFI-B		60
IFI-K		2,200
IFI-A		120

Sheet-pan quesadilla

The handheld that feeds a crowd from one pan — a giant folded quesadilla, pressed and crisped on a sheet, cut into a dozen wedges. It is the nacho's disciplined sibling: everything sealed inside, nothing to fall off.

```
SERVES 12 · ACTIVE 20 min · TOTAL 35 min
HEAT  Rung 2 (Social)
ALLERGENS  gluten, dairy

8        large flour tortillas
4 cups   grated cheese · 2 cups seasoned beans or spiced mushrooms
2        roasted poblanos + 1 jalapeño, sliced · 1 cup charred corn
          oil, for the pan and the tops
```

1. Oil a sheet pan. Overlap six tortillas across it with edges hanging off, one in the center. Layer cheese, filling, chilies, corn, more cheese.
2. Fold the overhanging edges in, top with the remaining two tortillas, brush with oil, and press with a second pan.
3. Bake at 220 °C (425 °F) 20–25 minutes, flipping the whole thing once if you can, until deep gold and crisp both sides. Cut into wedges; serve with salsa, guac, and crema.

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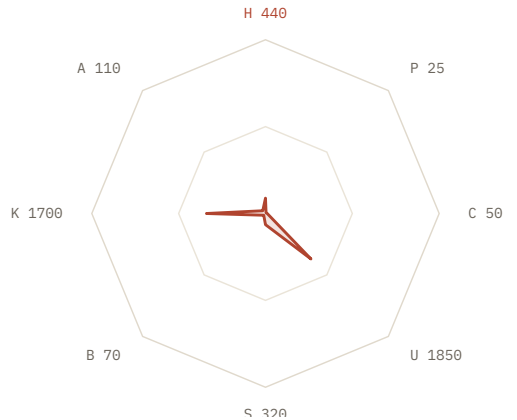


IFI-H	440
IFI-P	25
IFI-C	50
IFI-U	1,850
IFI-S	320
IFI-B	70
IFI-K	1,700
IFI-A	110



PART V OF VI

Sweet, Cool, and the Finish

the swicy frontier · the cooldown · the pour

Chapter 14 · Sweet heat — *the swicy frontier.*

Of all the flavor pairings that have taken over the modern table, none is more decisively ours than the marriage of heat and sweetness — "swicy," the trend that launched a thousand hot honeys. It is not a fad; it is receptor physiology, and it is one of the cleanest demonstrations of why measuring flavor on independent axes is the right model. Heat and sweetness do not cancel. They play on different receptors — TRPV1 and TAS1R2·R3 — and the brain integrates both signals at once, so sugar does not *reduce* the fire; it gives the fire a place to land. This is the intersection the catalog calls **IFI-H × IFI-S**, and it is worth a chapter because getting it right is a matter of ratio, not luck.



Phoenix in the chamber — the full-spectrum fruit that carries Heat and Sweetness on the same plant.

The mathematics of a balanced glaze

Sweetness perception follows a dose-response curve on TAS1R2·R3 just as heat does on TRPV1, and the pleasure of sweet-heat lives in a specific region of the two-dimensional space they define. Too much sugar and the heat is muffled into candy; too little and the burn stands naked. The sweet spot — and we mean that almost literally — is where the sweetness onset *leads* the heat by a beat on the palate, because sugar dissolves and signals fast while capsaicin builds slowly, so a balanced glaze reads as sweet-then-warm, a wave rather than a collision.

Our sweetness program is built to exploit exactly this, because it delivers sweetness *without* the sugar load, through the high-potency sweetener proteins and glycosides: stevia's steviol glycosides (200–300× sucrose), monk fruit's mogroside V (~200×), and the sweet proteins brazzein and thaumatin (hundreds to a couple thousand times sucrose by weight). These bind TAS1R2·R3 directly and potently, which means a glaze can carry a full sweet signal with a fraction of the sugar mass — a cleaner sweetness that lets the chili's own fruit character through instead of burying it under syrup. The nourishment ethos of our whole library lives quietly here: the same pleasure, carried more lightly.

SWEETENER	SOURCE	POTENCY VS. SUCROSE	RECEPTOR
Sucrose	cane, beet	1×	TAS1R2·R3
Steviol glycoside	stevia	200–300×	TAS1R2·R3
Mogroside V	monk fruit	~200×	TAS1R2·R3
Brazzein	*Pentadiplandra* berry	~500–2,000×	TAS1R2·R3
Thaumatin	katemfe fruit	~2,000×	TAS1R2·R3

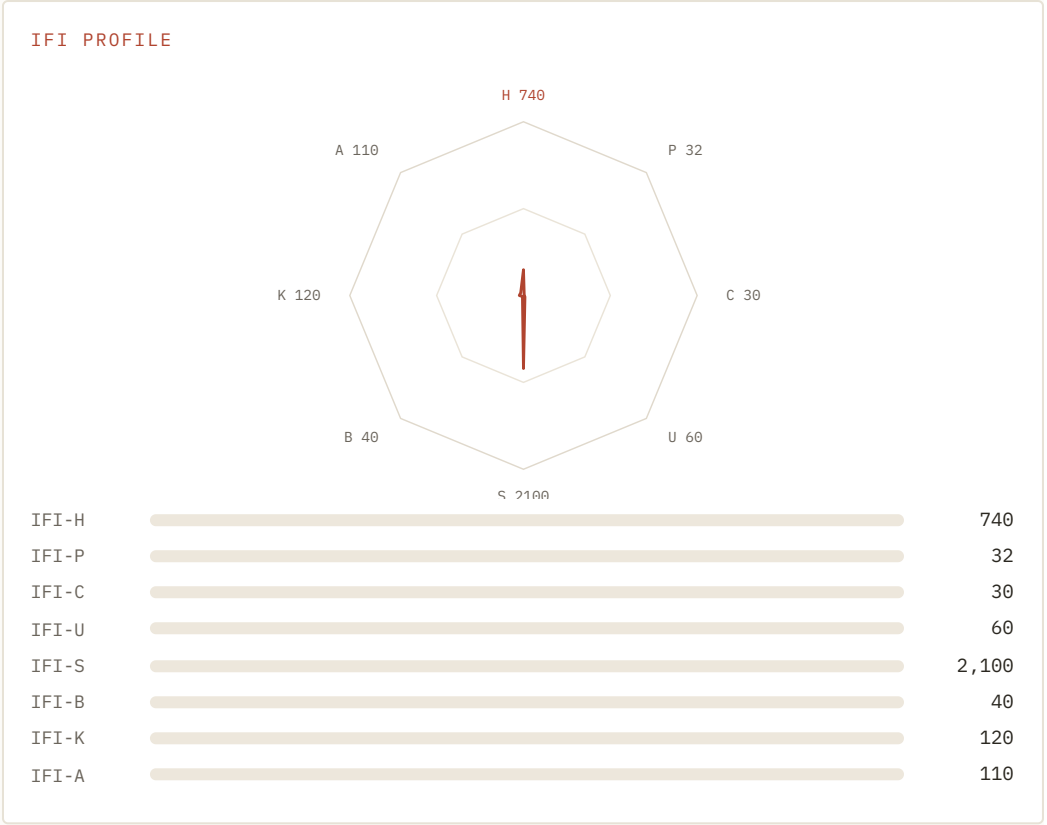
Hot honey

The gateway drug of sweet-heat, and a two-ingredient lesson in the whole principle. Make it once and you will put it on everything in this book.

```
MAKES ~1 cup · ACTIVE 10 min · TOTAL 10 min + steep
HEAT  Rung 2–3, your choice of cultivar
ALLERGENS  —

1 cup    honey
2–4      dried chilies (árbol for clean heat, chipotle for smoke), or 2
tsp flakes
1 tbsp   cider vinegar  ← the acid that keeps it from cloying
1 pinch  salt
```

1. Warm the honey gently with the chilies to 70–75 °C — warm enough to extract the capsaicin into the honey, never so hot it scorches the sugars or kills the honey's aromatics.
2. Steep off the heat 1 hour (or overnight for more heat), then stir in the vinegar and salt and strain. The vinegar is not optional — it is the counterweight that keeps the sweetness from going flat.



Drizzle it on the Buffalo wings to climb them a rung, over the queso, across a sheet-pan quesadilla, on fried chicken, on pizza, on vanilla ice cream with a crack of flaky salt.

Chili-chocolate bark

Chocolate and chili is the oldest sweet-heat pairing on earth — the Mesoamerican drink that gave us the word *chocolate* was bitter, spiced, and hot — and it works because cacao's bitterness and astringency give the sweetness and the heat a structured stage.

```
MAKES one sheet · ACTIVE 20 min · TOTAL 1 hr
HEAT  Rung 2 (Social)
ALLERGENS  dairy (optional), may contain nuts

12 oz    dark chocolate (70%), tempered or melted gently
1 tsp    ground chipotle or Honest-rung cultivar
1/2 tsp  flaky salt · 1/2 tsp cinnamon
          toppings: toasted pepitas, candied orange, dried cherry, more
flaky salt
```

1. Melt the chocolate gently; stir in the cinnamon and half the chili.
2. Spread thin on parchment, shower with pepitas, fruit, flaky salt, and the rest of the chili. Set at cool room temperature, then shatter into shards.

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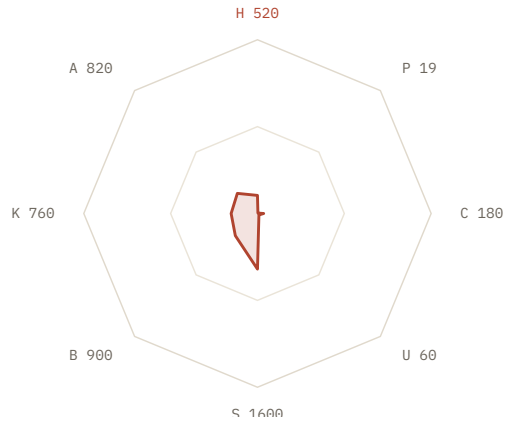

IFI-H	520
IFI-P	19
IFI-C	180
IFI-U	60
IFI-S	1,600
IFI-B	900
IFI-K	760
IFI-A	820

The Zero-Bitter and Astringency readings here are doing the pleasure — cacao's polyphenols cross-linking the salivary proteins for that dry, structured finish that keeps sweet-heat from being merely candy. This is the most sophisticated readout in the dessert register, and it comes from leaving the chocolate's bitterness in, not taking it out.

Candied jalapeños — cowboy candy

Sweet-heat you can jar — jalapeño coins simmered in a spiced sweet brine until they are glossy, hot, and addictive. They go on everything: burgers, nachos, cream-cheese-and-cracker, straight off the fork.

MAKES 2 pints · HEAT Rung 2–3 (seeds carry it up)
2 lb jalapeños sliced into coins · 2 cups sugar (or 1 cup sugar + monk-fruit blend)
1 cup cider vinegar · 1 tsp turmeric · 1 tsp celery seed · 1 tsp garlic powder · 1/2 tsp cayenne

1. Simmer the brine 5 minutes; add the coins and simmer 4 minutes — just until they slump but keep a little snap.
2. Jar the coins, reduce the syrup 6 minutes until thickened, pour over. Refrigerate a week before the first taste; they keep months and improve.

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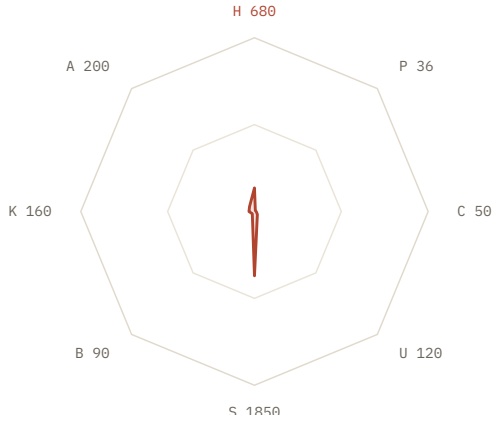

IFI-H	680
IFI-P	36
IFI-C	50
IFI-U	120
IFI-S	1,850
IFI-B	90
IFI-K	160
IFI-A	200

Chapter 15 · The cooldown — *what puts the fire out.*

Every book about heat owes its reader an honest chapter on relief, because the pleasure of a hot table depends entirely on the exits being well marked. A guest who knows there is a landing pad will climb higher and enjoy it more; a guest stranded at the top of the ladder with a glass of water — which does nothing — just suffers. Cooling is not the absence of heat. It is its own set of mechanisms, and a good host deploys them as deliberately as the heat itself.



Peppermint — the full five-gene menthol pathway, and the tongue's best trick for coolness that isn't there.

Why water fails and milk works

The single most useful fact in this book for a suffering guest: **water does not help**, and it may spread the burn. Capsaicin is lipophilic — it does not dissolve in water, so a gulp of water just sloshes the molecule around the mouth to fresh receptors. What works is **fat and casein**. Full-fat dairy carries two antidotes at once: the fat dissolves the capsaicin and lifts it off the tissue, and the milk protein **casein** has a lipophilic region that actively strips capsaicin from TRPV1, like a detergent for the receptor. This is the whole mechanism behind the glass of milk, the dollop of sour cream, the raita beside the curry, the cooling cucumber-yogurt dip in Chapter 6. Keep dairy on the table and you keep the exits open.

Sugar helps too, modestly — a spoon of honey or a sweet drink gives the pain system something else to weigh — and cold temperature numbs TRPV1 directly, which is why an icy drink beats a warm one even when neither dissolves the capsaicin. But the receptor-level hero is **TRPM8** and its agonist **menthol**. Menthol is capsaicin's mirror image: where capsaicin makes a warm mouth report fire, menthol makes a neutral mouth report cold, binding TRPM8 and tricking the cold-sensor into firing. A mint drink does not lower the temperature of anything; it tells the brain the mouth is cool, and the brain believes it. Our peppermint program runs the complete menthol biosynthetic route, and even a few muddled leaves recruit TRPM8 to a host's side.

COOLING AGENT	MECHANISM	WORKS ON CAPSAICIN?
Water	none — capsaicin is insoluble	No (may spread it)
Full-fat milk / yogurt	fat dissolves + casein strips TRPV1	Yes — the best
Sugar / honey	competing signal, mild distraction	Partly
Ice / cold	numbs TRPV1 directly	Partly
Mint / menthol	activates TRPM8 (cool illusion)	Perceptually — strong

House ranch

The default cooling condiment of the American table, and a genuinely effective one because it is cultured dairy — buttermilk and sour cream, casein and fat and acid in one cup. It is the antidote disguised as a dip.

```
MAKES ~2 cups · ACTIVE 10 min · TOTAL 10 min + chill
ALLERGENS  dairy

3/4 cup  buttermilk · 1/2 cup sour cream · 1/2 cup mayo
1 clove  roasted kokumi garlic · 2 tbsp each dill, chives, parsley
(minced)
1 tsp    onion powder · juice of 1/2 lemon · salt + black pepper
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1. Whisk everything; chill at least an hour so the herbs bloom and the garlic mellows. Thin with buttermilk for drizzling, keep it thick for dipping.

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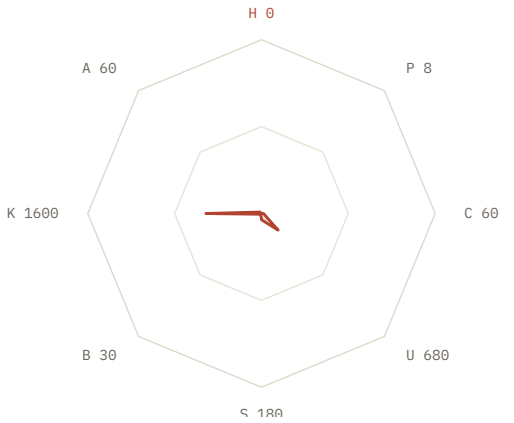

IFI-H	0
IFI-P	8
IFI-C	60
IFI-U	680
IFI-S	180
IFI-B	30
IFI-K	1,600
IFI-A	60

Cucumber-mint cooler (zero-proof)

A drink built to be the cooldown — cucumber and mint driving TRPM8, lime for brightness, served over crushed ice. It is the non-alcoholic anchor every game-day table should carry, and it is not an afterthought; it is the most *useful* glass in the room.

MAKES a pitcher · ACTIVE 10 min
1 English cucumber (blended, strained) · 1/2 cup mint, muddled
juice of 4 limes · 3 tbsp honey or monk-fruit syrup · 3 cups cold sparkling water · pinch salt

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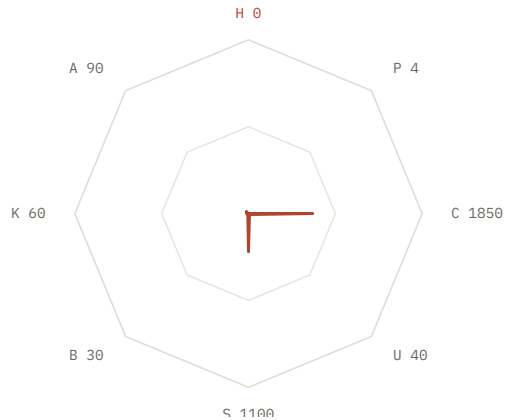

IFI-H	0
IFI-P	4
IFI-C	1,850
IFI-U	40
IFI-S	1,100
IFI-B	30
IFI-K	60
IFI-A	90

Mango-yogurt cooler (lassi-style)

The lassi exists because the cuisines that cook hottest also cooled smartest — a yogurt drink is the casein antidote in a glass, with mango's sugar and a little cardamom. Set it beside the hottest thing you serve.

MAKES 4 glasses · 2 cups yogurt · 2 cups ripe mango · 1/2 cup cold water or milk
2 tbsp honey · 1/4 tsp cardamom · pinch salt · ice

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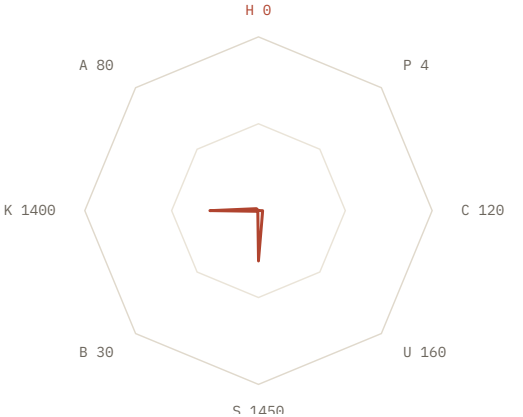

IFI-H	0
IFI-P	4
IFI-C	120
IFI-U	160
IFI-S	1,450
IFI-B	30
IFI-K	1,400
IFI-A	80

Chapter 16 · The pour — *beer, bitter, and the no-proof option.*

The drink in the hand is part of the dish, and on game day it is usually a cold beer — which is not a coincidence but a chemistry. Beer is one of the best possible partners for heat, and understanding why turns a default into a deliberate pairing, and tells you how to build an equally good glass for the guest who isn't drinking.



Hops in section — the bitter engine of beer, and one of our Zero-Bitter hosts.

Bitter, carbonation, and the heat partnership

Beer cools a hot bite through two channels. The carbonation — dissolved CO_2 that forms carbonic acid and prickles the tongue — is a scrubbing, refreshing counter-sensation that resets the palate between bites. And the cold, plus a little residual sugar in maltier styles, does the modest numbing-and-distracting work any cold sweet drink does. What beer cannot do is dissolve capsaicin much better than water; its cooling is mostly perceptual and thermal. But the pairing goes deeper than cooling, into *contrast*: beer's **bitterness**, from the hops, sets off the heat and the fat of the food the way a squeeze of lime sets off a taco.

Hop bitterness comes from iso-alpha-acids — the alpha acids in the hop cone isomerized during the boil — and they read on **TAS2R38** and the broader bitter-receptor family, the same channel our **Zero-Bitter** program works. Hops is a host in our catalog (80 constructs, Zero-Bitter axis), and the frontier there is the inverse of a party trick: *selective* bitterness tuning, so a brewer could dial a beer's bitterness to pair with heat precisely rather than accept what the hop variety hands them. For the host, the practical rule is a ladder of its own: a crisp lager for Sunlit and Social food (clean, cold, carbonated, out of the way), an amber or a malty ale for the Honest and Committed rungs (residual sweetness to cushion the burn), and a hoppy IPA only if you want bitterness to *argue* with the heat rather than soothe it — a bracing, polarizing match for the committed.

Michelada

The genius of the michelada is that it folds the whole flavor system into the glass the food lives in — beer, lime, savory, heat, salt — so the drink *is* a liquid version of the table. It is umami in a glass, and it

belongs beside everything in this book.

```
MAKES 1 (scale freely) · ACTIVE 5 min
HEAT  Rung 2 (Social)
ALLERGENS  gluten (beer), fish (Worcestershire) — use a vegan sauce to
omit

          rim: chili-lime salt (Tajín-style)
1        cold lager
          juice of 1 lime · 2 tsp the house red (Ch. 3) · 1 tsp soy or
Maggi
2 dashes Worcestershire (or vegan equivalent) · pinch of the house rub
(Ch. 11)
```

1. Rim a glass with chili-lime salt. Add lime, house red, soy, Worcestershire, and rub over ice; the soy and Worcestershire are the umami spine that makes a michelada taste savory rather than merely spicy.
2. Top with cold lager, stir once. The beer's carbonation lifts the whole thing; the lime and salt make it endlessly drinkable against fatty, hot food.

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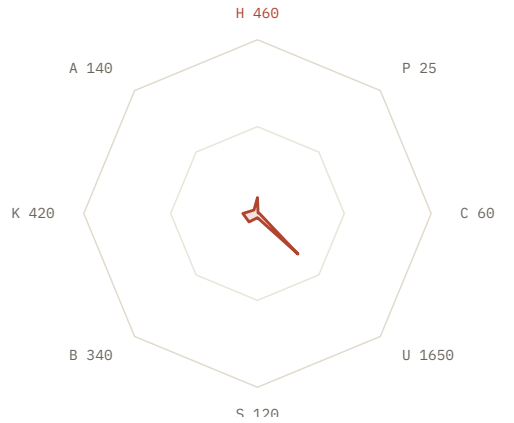

IFI-H		460
IFI-P		25
IFI-C		60
IFI-U		1,650
IFI-S		120
IFI-B		340
IFI-K		420
IFI-A		140

Spicy paloma, with a zero-proof twin

A brighter pour — grapefruit and lime, a tajín rim, a thread of chili — and the whole point of printing it here is the twin: the exact same drink, built without the spirit, so the guest who isn't drinking gets a glass as considered as everyone else's. That is the nourishment ethos as hospitality: nobody at our table is handed a lesser option.

MAKES 1 each · ACTIVE 5 min
HEAT Rung 2

— spirited —
2 oz tequila blanco · 2 oz grapefruit · 1/2 oz lime · 1/2 oz hot honey (Ch. 14)
top with grapefruit soda · tajín rim · a thin Fresno ring

— zero-proof twin —
replace the tequila with 2 oz grapefruit + a splash of brine from the candied
jalapeños (Ch. 14) for savory backbone and heat; everything else identical

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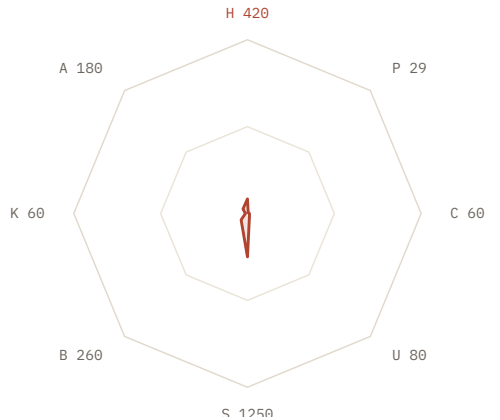


IFI-H	420
IFI-P	29
IFI-C	60
IFI-U	80
IFI-S	1,250
IFI-B	260
IFI-K	60
IFI-A	180



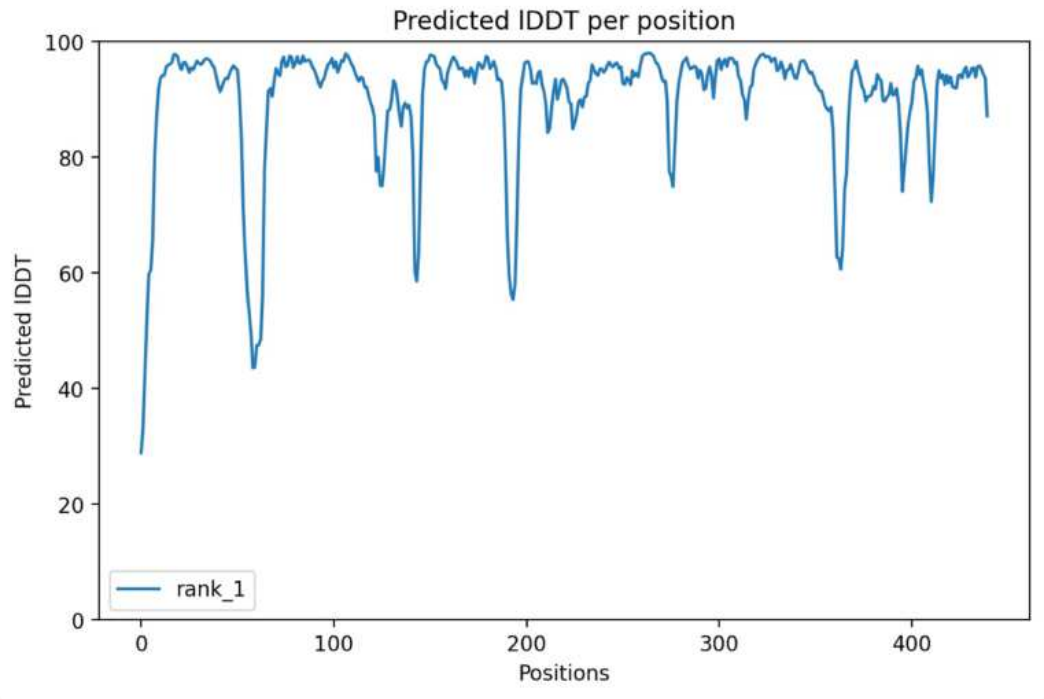
PART VI OF VI

The Host's Math

the molecule · the consistency · the spread

Chapter 17 · Building the spread — *the timeline, the ladder, the room.*

Everything in this book comes together on one counter, and the last skill — the one that separates a good party from a great one — is the host's math: how to place a spread so the crowd curve is served end to end, how to cook so you are watching the game instead of the oven, and how to trust the heat you promised. This chapter is the assembly instructions, and it closes with the molecular and manufacturing reasons any of it is possible at all.



The molecular heart of the whole program — the Pun1/AT3 capsaicin synthase, coloured by model confidence.

The molecule, one more time, from the top

It is worth seeing the whole machine once, because every rung on every ladder in this book traces back to it. Capsaicin is built by the plant along the **phenylpropanoid pathway**, the same ancient route that runs in every vascular plant and makes lignin, and a short pepper-specific branch grafted onto its end. The committed cook does not need the enzyme names, but the host who wants to understand what they are placing on the table might like to see them:

STEP	ENZYME	SUBSTRATE → PRODUCT
1	PAL	L-phenylalanine → trans-cinnamic acid
2	C4H	cinnamic acid → p-coumaric acid
3	4CL	p-coumaric acid → p-coumaroyl-CoA
4	HCT · C3′H · COMT	→ caffeoyl → feruloyl intermediates
5	pAMT	vanillin → vanillylamine
branch	BCAT · KAS · ACS	valine → 8-methyl-6-nonenoyl-CoA
6	**Pun1 / CS (AT3)**	vanillylamine + 8-methylnonenoyl-CoA → **capsaicin**

The last step — the condensation of a vanilloid head and a branched fatty-acid tail at the **Pun1/AT3 acyltransferase** — is the assembly point where capsaicin is labeled, and it is where our family's computational work on the final enzyme is concentrated. An ESM2 protein language model scored every possible single-residue

substitution in Pun1 for its predicted effect on catalytic efficiency and fold stability. Our genome-scale metabolic flux model places the primary rate control upstream — at 4CL and HCT/CCoAOMT in the phenylpropanoid pathway — not at the terminal Pun1 step; Pun1 makes the molecule, it does not govern how much flows through. Two Pun1 substitutions never found by ten thousand years of breeding emerged from our computational screen, and our model predicts that written in with CRISPR they lift peak output toward an estimated 2.95 million SHU at a batch consistency breeders never approached:

EDIT	EFFECT	ΔΔG (KCAL/MOL)
S39L	binding affinity ↑ (N-terminal)	−2.1
L345G	steric relief at the active-site cleft	−1.8
C175S	structural annotation — not in shipped construct; prevents disulfide misfold	−0.9

The shipped construct carries two substitutions, S39L+L345G; C175S is a structural note from our modelling, not part of the final design.

That length and saturation of the fatty-acid tail — set upstream at the BCAT/KAS branch — is also what tunes the *shape* of the burn, the capsaicin-to-dihydrocapsaicin ratio that decides whether a cultivar flares bright and fades or sits low and slow at the back of the throat. A host tasting across our heat ladder is tasting that ratio being composed on purpose.

Why consistency is a hosting tool

Here is the part that matters most for the person reading this book, and it is not glamorous: **the same heat, every time.** A field chili crop varies its capsaicinoid content by around 40% batch to batch — sun, water, stress, the luck of a given plant — which is why the jar of crushed red pepper in your cupboard is a different heat than the last one, and why no recipe can honestly promise a rung. Our cultivars are designed to a batch coefficient of variation of **seven percent or better**. That number is the difference between a recipe that says "add chili to taste" and a recipe that can print an IFI-H on the card and mean it. It is what lets a host set the Social-rung base and *know* the whole curve can share it. Consistency is not a manufacturing virtue hidden in a spec sheet; at your table it is the thing that lets you keep a promise to your guests.

A note on the record behind these numbers, lightly: the methods here rest on three filed patents and twenty-one peer-reviewed papers released openly under CC BY 4.0. We put the science in the open on purpose. A number you cannot check is just a louder kind of marketing, and the whole point of the Index is that it can be checked.

The spread, laddered

Assemble any game-day table as a ladder laid left to right, Sunlit to Challenge, with a cooling station anchoring the mild end and the climb-your-own tools at the hot end. A guest reads the table like a

thermometer and self-selects — the single most important thing a host can build.

RUNG	SET ON THE TABLE	FROM THIS BOOK
0 (cool)	cucumber-avocado dip · ranch · the coolers	Ch. 6, 15
1 (Sunlit)	queso · corn guac · edamame whip · snack mix	Ch. 4, 6, 7, 11
2 (Social)	house Buffalo wings · nachos · pico · sliders	Ch. 2, 8, 5, 10
3 (Honest)	Nashville wings · black bean dip · the chili	Ch. 2, 7, 12
4+ (climb)	hot honey · chili crisp · candied jalapeños · a dropper of Challenge-tier	Ch. 14, 3

The timeline, so you see the game

The dishes in this book were chosen partly for *when* they cook. A good game-day plan is mostly done before kickoff.

WHEN	DO	WHY
Days ahead	ferment the red sauce (Ch. 3), chili crisp, hot honey, candied jalapeños, the rub	they only improve; they are shelf-stable
Night before	the chili (better reheated), ranch, cooling dips, brine the wings	braises and cultured dips settle overnight
2 hours out	bake the tray dips, dry the wings, prep the nacho components	hands-on work, done before anyone arrives
At kickoff	roast/fry wings, build nachos, warm the queso	only the things that must be hot and fresh
During	refill the ladder, keep the cooling station stocked, watch the game	the spread tends itself

The last word, which is the first one

We built an index, and a platform, and ten cultivars that climb to the edge of what a pepper can be — but the reason, the actual reason, is this table. A room full of people, food disappearing faster than you can refill it, somebody three rungs braver than they thought they were, the cooling glass right where they need it. Our family did the computing so that a host would never again have to choose between feeding the heat-shy guest and the chilihead at the same table. Place the ladder, mark the exits, and let the room find its own rung. The number on the card is only there so the generosity can be exact. These are computational designs; Scoville Splice's cultivars and constructs have not been experimentally validated in a laboratory.



The greenhouse at dusk — where it starts, and where, in the end, it is all pointed: a table, well fed.