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Exchangeability and the Exclusion of Equilibrium Assembly: Necessary Conditions on Throughput, Entropy, and Fidelity in the Chrysene Formalism

Charles D. Schaper, Ph.D.
Chief Editor, Annals of the Chrysene Formalism
San Francisco, California, USA
editor@chrysene.com

Abstract

This paper establishes the formal constraint set governing any exogenous placement system that supplies the alignment of a substituted-chrysene assembly, deriving six quantitative bounds from the established properties of the system and demonstrating that orientation fidelity requires active, non-equilibrium imposition. While prior analyses establish that an exogenous agent must supply the stacking alignment and determine its exact information price, this work characterizes the operational requirements that any physical placement mechanism must satisfy.

The primary bound addresses orientation fidelity. On the self-separated stock, the registration weight of a contact is independent of its alignment bit at every contact except initiator–initiator pairs. A contact without a registration gap exhibits no Boltzmann preference between its two orientations, yielding an orientation error rate of $\frac{1}{2}$ at every registration free energy. When partial sidechain cleavage renders a fraction $\sigma(\pi_h)$ of contacts orientation-sensitive, the signed bias of the stream remains zero, so sensitive contacts likewise favour the target state half the time. Consequently, both contact classes exhibit an error rate of $\frac{1}{2}$, fixing the mean orientation error rate of an equilibrium process at *exactly* 0.5 — uniformly in the registration free energy Δ_{rgy} and in σ. Relative to the permissible error budget of 1.01×10^{-5} for a period's anchor units, the equilibrium rate differs by a factor of 4.97×10^{4}, and by a factor of 50 even under perfectly correlated failures, confirming that a placement system must actively impose orientation rather than relying on equilibrium discrimination.

Five additional bounds specify the throughput, thermodynamic cost, sensing, and symmetry parameters of the placement process. First, the material feasibility relation specifies a total demand of 42,200 units per period, of which the 1,000 anchor units are placed directly into the heritable structure, while the remaining 97.6 per cent comprises lumen osmolyte and membrane lipid; this sets the placement rate on the order of one unit per second, inversely proportional to the period. Second, pricing a coded hexamer at 25.0 to 28.0 bits establishes an information cost of 4.17 to 4.67 bits per unit, corresponding to $3.23\,k_BT$ at the Landauer limit — an energetic scale comparable to the stacking contact itself, representing 1.62 times a disubstituted contact at $\Delta = 1$ and 0.81 of a tetrasubstituted contact. Third, a sensor coupling exclusively to the arm-registration pattern must evaluate 31 contacts per bit, independent of Δ. Finally, because the in-plane connectors are directed with one contraction per in-plane direction, the relative orientation freedom of an in-plane pair is 0, leaving a single collective flip per layer and 6 across the six-layer heritable box.

Aligning the material demand with the minimum heritable genome length refines the baseline resource figure. Evaluating the demand formula at the minimum heritable length of $L = 222$ base pairs, rather than the nominal $L = 200$ base pairs, yields a per-period requirement of 43,762 units, representing a 3.7 per cent adjustment across the corresponding ledger entries.

Keywords: Chrysene Formalism; placement system; specification; bounds; error budget; registration free energy; blindness; non-equilibrium assembly; sensing.

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1 Introduction

Article 84 proves that the registration filter of a self-separating source cannot read the alignment of a stacking contact, that the endogenous law on the alignment field is therefore uniform, and that an exogenous agent prescribing that field pays $\ell - 1$ bits on a column of ℓ sites [Sch26f, Thm. 9.2]. Article 85 shows the figure exact at every cleavage level rather than limiting [Sch26a]. Between them they establish that something must place the units, and what the placement costs in information. Neither says what the something is.

The temptation is to supply one: a sorter, a gripper, a steering field, an assembly line. That paper would be the weakest in the series, and the corpus has already said why. Article 84's non-implications decline to propose a mechanism twice over, and Article 79 marks its own cleavage step S and supplies no conditions for it. A formalism whose discipline is to refuse invented mechanism does not acquire one by changing the subject to engineering.

There is a specification to be written all the same, and it is of a different kind. One can ask not what a placement system *is* but what any placement system *must satisfy*—and every such constraint, if it is to be worth stating, must be a consequence of a theorem the corpus already holds rather than an assertion about hardware. That is this paper.

Article 84's blindness theorem is read in that paper, and in Article 85, as a statement about what a *filter* can select. It has a second reading that neither paper takes, and it is the stronger one.

If the registration weight of a contact does not depend on its alignment bit, then nothing that acts through that weight can prefer one alignment to the other—not a separation filter, and not a Boltzmann factor either. An error in orientation is therefore not a rare event to be suppressed by making the correct state deeper; there is no depth difference to make. The orientation error rate of an equilibrium process on this architecture is one half at every registration free energy, and stays within $\sigma(\pi_h)$ of one half when cleavage is admitted.

Article 85 completes the argument from the other side: at the σ-fraction of contacts that cleavage does make sensitive, the preference points the correct way only half the time, its signed bias over the stream being exactly zero. So the error rate is $\frac{1}{2}$ at both classes of contact, and Section 9 shows it is $\frac{1}{2}$ outright. The gap to the error budget is 4.7 orders of magnitude and no parameter closes it. That is this paper's principal finding, it is forced by theorems already in the corpus, and it says something a design paper could not: whatever a placement system is, it is not an equilibrium.

1.1 What this paper addresses

(i) How many units a period demands, how they are allocated, and at what genome length (Section 4).
(ii) The placement rate that follows (Section 5).
(iii) The information a placement system must supply, at the corpus's own price (Section 6).
(iv) What that information costs thermodynamically (Section 7).
(v) The per-placement error rate a correct assembly permits (Section 8).
(vi) What equilibrium can do about orientation error, which is nothing (Section 9).
(vii) What a sensor coupling to the arm pattern can learn (Section 10).
(viii) Whether a placed unit may be oriented at all, inside a lattice (Section 11).

1.2 What is established here, by kind

Recovered. Article 65's feasibility inequality, its scale parameters and its allocation [Sch26c]; Article 80's least heritable genome length and its heritable minimum as a $3 \times 3 \times 6$ box [Sch26d]; Article 84's selection cost, its blindness corollary and its price for a coded hexamer [Sch26f]; Article 85's sensitivity $\sigma(\pi_h)$, its channel ceiling with the realised values beneath it, its registration gap and its vanishing signed bias [Sch26a]; Article 79's H_{rgy} and its operating points [Sch26g]; Article 40's directed in-plane connector and its directional contractions [Sch26b]; Article 78's forcing period [Sch26e].

Proved here. The allocation's consequence for what counts as a placement (Prop. 4.2); the throughput bound (Prop. 5.2); the information bound at Article 84's figures (Prop. 6.1); the thermodynamic floor (Prop. 7.1); the error budget (Thm. 8.2); **the orientation floor** (Thm. 9.1, Cor. 9.4); the sensing bound (Thm. 10.1); the in-plane bound (Thm. 11.1); and the ordering (Prop. 12.1).

Found. Equilibrium discrimination cannot supply orientation fidelity on this architecture, by 4.7 orders of magnitude, and no registration free energy closes the gap. The thermodynamic floor is slack. And Article 65's demand is computed at a genome length Article 80 rules out, a figure Article 80 itself carries forward.

Computed. Blocks B1–B9 of Appendix B.

Supposed. Appendix A. Two hypotheses are added and the principal finding needs one of them.

Not claimed. Proposition 3.1.

2 Status, nomenclature, scope

Convention 2.1 (Status labels)**.** [A][A] finite or axiom-free; [D] derived under hypotheses named and registered in Appendix A; [C] imported, source named; [E] molecular reading, entering no proof. Scholia are unlabelled and enter no proof. Quantitative claims in the body are macros emitted by `verify_bounds.py`, except where a figure is an imported literal, which Appendix B lists by name. The emitting block is cited as B1–B9.

Convention 2.2 (Inheritance)**.** [A]This paper is downstream of Articles 65, 79, 80, 84 and 85. Its conventions on seniority and on labels and their premises are those of Article 84 [Sch26f, Convs. 2.3–2.4] and are not restated.

Convention 2.3 (Necessary, not sufficient)**.** [A]Every bound here is a necessary condition on a placement system. None is sufficient, no conjunction of them is claimed sufficient, and the existence of a system satisfying them is not asserted. A bound is a thing a system cannot escape, not a thing a system can be built from.

Notation 2.4. L the genome length in base pairs; $\nu = 66$ and $N = 2.52 \times 10^5$ Article 65's pool ratio and particle count; α its bud fraction; R the per-period demand; T the cycle period; ℓ a column length; ν_0, ν_1 the registration numbers of a contact aligned and unaligned, and $g = |\nu_0 - \nu_1|$ the *gap* [Sch26a, Prop. 7.1]; $\Delta = \Delta_{\mathrm{rgy}}$ the free energy of one registration in units of $k_B T$; ε a per-placement error probability; F a target fidelity; $\sigma(\pi_h)$ Article 85's sensitive fraction; ι the involution of the C_{2h} reference acting on locants as $3 \leftrightarrow 9$, $6 \leftrightarrow 12$ [Sch26f, Not. 2.5].

3 Non-implications

Proposition 3.1 (Non-implications)**.** *[A]None of the following is asserted.*

(i) No placement system is proposed. *No sorter, no manipulator, no steering field, no assembly sequence and no control scheme appears here. Convention 2.3 governs.*

(ii) No existence claim. *That a system satisfying these bounds is possible is not argued.*

(iii) No mechanism for the non-equilibrium step. *Corollary 9.4 establishes that orientation fidelity cannot be equilibrium's. What supplies it instead is Target 16.1, and this paper declines to invent it—which is the same discipline that made the finding available.*

(iv) No rate constant is imported. *Article 79 marks its chemical steps S; nothing here supplies conditions either.*

(v) No claim that Δ_{rgy} is small. *Theorem 9.1 is uniform in Δ: the floor holds at every value, large or small, so the finding needs no estimate of that parameter and makes none.*

(vi) No independence of placements claimed. *Theorem 8.2 assumes it, registers it, and Scholium 8.4 says which way correlation would move the answer.*

(vii) Nothing about the membrane, the phospholipid or the size of a unit. *Those belong to the membrane concordance. Proposition 4.2 is what keeps them out of the error budget.*

(viii) No amendment to Article 65's arithmetic. *Section 4 recomputes that paper's formula at a different genome length; the formula, parameters and its own reported figures are confirmed.*

4 The demand, and what counts as a placement

Proposition 4.1 (The demand, recovered)**.** *[C]Article 65's feasibility theorem, which that paper labels [D] and derives under its Hypothesis 8.8, gives*

$$R \;\geq\; 5L + \frac{\alpha}{1-\alpha} N + \nu L$$

[Sch26c, Thm. 8.5]. At its scale parameters $L = 200$, $\nu = 66$, $N = 2.52 \times 10^5$ this is 42,200 units per period at $\alpha = 0.10$ and 19,343 at $\alpha = 0.02$, the first as that paper prints it and the second as its verification gives it, its text rounding to 19,300 (B1).

Proposition 4.2 (The allocation, and what is placed)**.** *[D]Article 65 apportions the three terms: the disubstituted unit is "retained as the anchor that carries the encoding; scissioned to the lipid that makes the membrane; and excised to the residue that makes the osmolyte" [Sch26c, Prop. 8.1], with residues "retained in the lumen as free zwitterions" [Sch26c, Hyp. 8.8]. The terms are 1,000 anchor, 28,000 residue and 13,200 lipid, so 97.6 per cent of the per-period demand is not placed into the heritable structure at all. The number of placements into that structure is the anchor term: 1,000 at $L = 200$, 1,110 at $L = 222$ (B1).*

Scholium 4.3 (Why this distinction carries the paper). A free zwitterion in the lumen has no correct position and no correct orientation; a membrane lipid has an orientation but belongs to the membrane concordance, which Proposition 3.1(vii) excludes. Only the anchor units are placed into a structure whose arrangement is what Articles 84 and 85 price. Running an error budget over all 42,200 units would therefore demand a fidelity of objects that have none to fail at, and would tighten the budget by the ratio of the two counts for no reason. The distinction costs the paper a factor of forty in its error budget and is worth it.

Proposition 4.4 (The genome length the demand is computed at)**.** *[D]Article 80 finds that at* $L = 200$ *no complete lattice fits and that the least genome length admitting a heritable complete lattice is* 222 *base pairs [Sch26d, Thm. 5.1]. Evaluating Article 65's formula there, other parameters unchanged, gives* 43,762 *units per period*—3.7 *per cent above the circulating figure (B1).*

Scholium 4.5 (A correction that applies in two places). Article 65 could not have used a length Article 80 had not yet derived, so no fault attaches there. Article 80 is differently placed: its own Ruling 7.1 quotes the 42,200 at $L = 200$ after deriving $L_{\mathrm{crit}} = 222$, and its Proposition 7.2 prices the heritable lattice as a percentage of that same superseded pool. The correction is small and it applies to both, and it is recorded rather than pressed: no conclusion of this paper turns on which figure is used, and every rate below is quoted at both lengths.

5 The rate bound

Hypothesis 5.1 (H_{period}, the cycle period)**.** [D]The architecture's cycle completes in a period T, taken for instantiation to be 12 hours, 43,200 seconds.
Article 78 states a "$\delta T = 12$ h forcing period" and attributes it to Article 64 [Sch26e, Rem. 7.2]. That is a forcing period, and its identification with the architecture's cycle period is this paper's and not that one's, which is why the hypothesis is registered rather than cited. T is carried symbolically in every statement; the figures are inversely proportional to it and B2 reports the rate at half and twice the period.

Proposition 5.2 (Throughput)**.** *[D]A placement system must draw* R *units in a period, hence a mean rate* R/T*:* 0.977 *units per second at* $L = 200$ *and* 1.013 *at* $L = 222$*, one unit every* 1.024 *seconds. At half and twice the period the rate is* 1.954 *and* 0.488*, so the figure is of order one unit per second across the whole range considered (B2).*

Scholium 5.3. One unit per second is unremarkable for a molecular process—slow beside an enzyme, fast beside a cell division, which is what a per-period budget divided by a half-day should give. The rate bound is not the interesting one, and saying so early is part of the ordering this paper is for.

6 The information bound

Proposition 6.1 (Information per unit placed)**.** *[D]Article 84 prices a coded hexamer at* 25.0 *to* 28.0 *bits, of which the registry term is five—"one bit per contact, five contacts" [Sch26f, Prop. 9.5, Rem. 9.6]—the two figures being its two demand ratios. Per unit that is* 4.17 *to* 4.67 *bits, of which* 0.833 *is the registry term. Over the* 1,000 *anchor units of a period it is* 4,167 *to* 4,667 *bits, a rate of* 0.096 *to* 0.108 *bits per second (B3). The extension from one hexamer to the anchor term is this paper's and carries its label: Article 84's price is for a specified alternating* $D, T, D, T, \ldots$ *sequence at stipulated demand ratios, and applying it per unit assumes the anchor sequence alternates throughout, which the corpus does not state.*

Remark 6.2 (The registry term and the box, which agree)**.** [A]Article 84's registry term of 0.833 bits per unit is $(\ell-1)/\ell$ at $\ell = 6$, and it is also the contacts-per-node ratio of Article 80's heritable minimum: that object is a $3 \times 3 \times 6$ box of 54 nodes carrying 45 stacking contacts, 9 columns of 6. The two quantities are the same ratio and B3 asserts their equality. Article 84's own verification computes "72 bridges and 45 stack relations at $3 \times 3 \times 6$" while its prose elsewhere says "the 53 stacking contacts of such a box", and Article 85 adjudicates: 54 "is not a column length", the figure 53 being "the nominal $\ell - 1$ . . . carried for continuity" while "the box figure is the physical one" [Sch26a, Rem. 10.6]. The physical count is used throughout, on the authority of both papers.

Remark 6.3 (Why no species term is invented here)**.** [A]An earlier form of this paper added $\log_2 3$ for the choice of substitution family, on the ground that three families are the alphabet. That is the entropy of a uniform choice among three, which is not the quantity at issue: prescribing a *specified* family from a stream whose composition is $f_D \approx 0.995$ costs its surprisal, and Article 84 has already computed the whole thing. Its figure is used and nothing is added to it.

7 The thermodynamic floor

Proposition 7.1 (The Landauer floor)**.** *[D]Setting one bit irreversibly costs at least* $k_B T \ln 2 = 0.6931\, k_B T$*. The corpus measures free energies in units of* $k_B T$ *already, so no temperature need be substituted—though the ratio is temperature-dependent for all that,* $\Delta_{\mathrm{rgy}}/k_B T$ *being itself a function of* T*. A unit's selection cost is* 2.89 *to* 3.23 $k_B T$*. The contact the stream overwhelmingly makes is disubstituted, carrying* 2 *registrations, so at* $\Delta = 1$ *the honest comparator is* 2 $k_B T$ *and the generous one, a tetrasubstituted contact, is* 4 $k_B T$*. The selection cost* exceeds *the first by a factor of* 1.62 *and falls below the second at* 0.81 *of it (B4).*

Scholium 7.2 (Why this bound is not a constraint). An information-theoretic treatment of an assembly problem reaches for the Landauer limit first, and the honest report is that it comes out comparable rather than negligible: a unit's selection costs rather more than the disubstituted contact that holds it and rather less than a tetrasubstituted one. An earlier form of this paper called it slack, on a comparison with the deeper contact alone; at Article 84's price for a coded hexamer that label does not survive, and it is withdrawn.

Comparable is still not binding. Nothing in the architecture fails because selection costs two or three $k_B T$ a unit, and Section 9 shows that what does limit it is not a cost at all. The bound is reported because the ordering needs it and because the quantity is the one an information-theoretic reader will compute first.

8 The error budget

Hypothesis 8.1 (H_{indep}, independent placements)**.** [D]Placements fail independently, each with probability ε.

Theorem 8.2 (The error budget)**.** *[D]Under* H_{indep} *an assembly of n placements is correct with probability* $(1-\varepsilon)^n$*, so a target fidelity* F *requires* $\varepsilon \le 1 - F^{1/n}$*. The* 45 *stacking contacts of Article 80's box require* $\varepsilon \le 2.23 \times 10^{-4}$ *at* $F = 0.99$*; the* 1,000 *anchor units of a period require* $\varepsilon \le 1.01 \times 10^{-5}$*. At* $F = 0.5$ *the budgets are* 1.53×10^{-2} *and* 6.93×10^{-4} *(B5).*

Proof. Independence gives the product and $(1-\varepsilon)^n \ge F$ rearranges. B5 evaluates it and checks that the budget tightens with n. □

Remark 8.3 (This theorem makes no thermodynamic claim)**.** [A]Theorem 8.2 bounds an error rate and says nothing about what achieves it. An earlier form of this paper inverted the bound through a Boltzmann factor to obtain a required free energy. That inversion is not available, and Section 9 is why.

Scholium 8.4 (What correlation would do). H_{indep} cuts both ways. Positively correlated failures cluster errors into fewer assemblies and raise the permitted per-placement rate, loosening the bound; negatively correlated failures, which is what any proofreading step produces, tighten it as a statement about the uncorrected rate while loosening what the system as a whole must achieve. Article 85's proposition on adjacent contacts shows the corpus already has a correlated structure of exactly this kind for a different quantity [Sch26a, Prop. 10.2], so the assumption is not idle.

9 The orientation floor

Theorem 9.1 (The orientation floor)**.** *[D]On the stock Article 79 delivers, "the registration weight of a contact is independent of its alignment bit at every contact except I–I" [Sch26f, Cor. 7.5], and I–I contacts occur with probability* $f_I^2 = 2.47 \times 10^{-7}$ *[Sch26f, Prop. 7.7]. Under* H_{rgy} *the alignment bit of a contact of gap* g *is Bernoulli with* $\theta(g,\Delta) = 1/(1+e^{g\Delta})$ *[Sch26a, Prop. 7.3], so a contact of gap* $g = 0$ *is Bernoulli*$(\frac{1}{2})$ *at every* Δ*. Moreover Article 85 exhibits a measure-preserving involution on the arm words of D and T that exchanges* ν_0 *and* ν_1 *at a contact, making the joint law of the two registration numbers exchangeable, and records that the favoured state "need not be the aligned one" [Sch26a, Thm. 8.1, Prop. 7.3]—"relabelling a D unit from he to eh costs nothing in probability . . . and reverses the contact's preference" [Sch26a, Sch. 8.5]. Hence the mean orientation error rate of an equilibrium process is* 0.5 *absent the initiator, uniformly in* Δ *and in* σ*, and* 0.499999876 *with it—short of one half by* 1.24×10^{-7} *(B6).*

Proof. There are three classes of contact. A *blind* contact carries equal registration weight in both alignments, so no factor of the form $e^{\nu\Delta}$ distinguishes them and its conditional law is uniform; B6 checks $\theta(0,\Delta) = \frac{1}{2}$ to $\Delta = 100$. A *sensitive non-initiator* contact has a Bernoulli law favouring the state of larger ν, but the involution of [Sch26a, Thm. 8.1] is measure-preserving and exchanges ν_0 with ν_1, so that state is the correct one with probability exactly $\frac{1}{2}$ and the contact's error rate is $\frac{1}{2}\theta + \frac{1}{2}(1-\theta) = \frac{1}{2}$ identically, which B6 checks at $g = 1, 2, 4$ and Δ to 100. An *initiator* contact is the exception twice over: the involution is unavailable, $\iota I \neq I$, and [Sch26f, Cor. 7.5]

fixes the direction—three registrations aligned against two unaligned—so there the aligned state is favoured and the error rate is $\theta(1,\Delta)$, below $\frac{1}{2}$. Mixing the three with weights $1-\sigma$, $\sigma - f_I^2$ and f_I^2 gives $\frac{1}{2} - f_I^2\big(\frac{1}{2} - \theta(1,\Delta)\big)$, whose large-$\Delta$ limit is $\frac{1}{2} - f_I^2/2$. B6 computes the mixture. □

Remark 9.2 (The exception, which does not help)**.** [D]Article 84 calls the initiator contact's exemption from blindness its own headline and makes that contact the frame carrier, "the only admitted family that can fix a frame". It is also the only contact whose thermodynamic preference points the correct way, and Theorem 9.1 is careful to keep it. It does not help: its frequency is $f_I^2 = 2.47 \times 10^{-7}$, so it moves the floor by 1.24×10^{-7} and the gap of Corollary 9.4 from 4.97×10^4 to the same figure at the quoted precision. The one place the architecture does orient itself thermodynamically is too rare to orient anything.

Remark 9.3 (The weaker, sign-agnostic form)**.** [D]A reader unwilling to use the symmetry of the sign may take instead the bound obtained by crediting every sensitive contact with perfect discrimination, which gives $\frac{1}{2}(1-\sigma(\pi_h))$: 0.499804, 0.495487 and 0.483799 at Article 79's operating points and 0.500000 at the pure limit. That form is weaker in two ways. It is not approached as Δ grows—by the theorem the true value stays at $\frac{1}{2}$—and it depends on σ, which is a design variable of the source, so a system not bound to Article 79's cleavage regime could in principle move it. The theorem's form depends on neither (B6).

Corollary 9.4 (Equilibrium cannot orient this architecture)**.** *[D]The floor of Theorem 9.1 exceeds the budget of Theorem 8.2 by a factor of* 4.97×10^4*—0.5 against* 1.01×10^{-5}*,* 4.7 *orders of magnitude—uniformly in* Δ *and in* σ*. The comparison does not rest on* H_{indep}*: at the opposite extreme, where failures are perfectly correlated and the budget is the whole* $1 - F = 0.01$*, the floor still exceeds it* 50*-fold. No registration free energy, and no cleavage regime, brings equilibrium discrimination within either budget. Orientation fidelity must therefore be supplied by something other than equilibrium (B6).*
The statement is a stock-column one. Blindness at an interior lattice node is not established in the corpus: Article 84 records that what such a node presents is its free-terminal pattern rather than the delivered arm word, and that the blindness of its stacking contacts is "asserted here and not shown" [Sch26f, Rem. 9.4], a caveat Article 85 says "bites harder" for any σ*-dependent quantity [Sch26a, Rem. 10.6]. The corollary reaches the heritable object only so far as that caveat is discharged (Target 16.5).*

Scholium 9.5 (What has and has not been shown). The statement is narrow and should not be widened. It is about *orientation*, which is the datum Articles 84 and 85 price; the species and position of a unit are discriminated by the registration number perfectly well, which is what H_{rgy} was written for—it prices "a guest that does not present the pattern" [Sch26g, Hyp. H_{rgy}], and such a guest is exactly what a large Δ excludes. What a large Δ cannot exclude is a unit that presents the pattern correctly and is turned over, because by Article 84's corollary it presents the same pattern either way.

Two consequences, and a caution. The first is that the architecture's fidelity problem is not a depth problem and cannot be engineered as one. The second is that this is the same theorem as the sensing bound of Section 10, read in a second direction: blindness forbids a filter from selecting orientation, a sensor from reading it, and a Boltzmann factor from preferring it. Article 85 distinguishes the first two—"a channel with capacity and no direction is exactly the object that has one property and not the other" [Sch26a, Sch. 8.5]—and the third is the face this paper adds. The caution is that the corollary says what cannot supply orientation, not what can. That is Target 16.1, and Proposition 3.1(iii) declines to answer it.

Remark 9.6 (Where the strength of the theorem comes from)**.** [A]Two facts carry Theorem 9.1 and they are of different kinds. That a blind contact is undiscriminating is Article 84's blindness corollary and accounts for all but a σ-fraction of contacts. That a *sensitive* contact is undiscriminating *on average* is Article 85's vanishing signed bias, and it is what removes σ from the statement: a gap exists at such a contact but points the correct way only half the time, so widening it buys nothing. Without the second fact the floor would be $\frac{1}{2}(1-\sigma)$ and a source designed to cleave heavily could erode it; with it, the floor is $\frac{1}{2}$ and nothing erodes it.

10 The sensing bound

Theorem 10.1 (Blindness, read backwards)**.** *[D]Article 85 bounds the mutual information between the alignment field and the arm words by* $\sigma(\pi_h)$ *per contact, for every* Δ*, and by* $(\ell - 1)\sigma$ *over a column [Sch26a, Thm. 7.4, Cor. 9.2]. Consequently any sensor coupling to the arm-registration pattern alone extracts at most* σ *bits per contact* about the alignment field*—it may learn a great deal about species and cleavage state—and must read at least* $1/\sigma$ *contacts per bit. That is the bound and it is free of* Δ*:* 31 *at* $\pi_e = 0.90$ *and* 4,044,121 *at the pure limit. Article 85's* realised *capacities*

at $\Delta = 1$ *give a harsher requirement—*65, 234 *and* 5,392 *contacts per bit—but that is an evaluation at one free energy and not a bound, realised capacity rising toward the ceiling as* Δ *grows, so the requirement falls from those figures toward* 31 *(B7). The pure-limit figure is exactly* 2011^2*, Article 85's* $\sigma(0)$ *being exactly* f_I^2 *[Sch26a, Thm. 7.4]; it is an integer and not a rounded reciprocal, which Remark 10.3 records.*

Proof. A sensor coupling only to the arm pattern is a channel whose input is that pattern, so by the data-processing inequality its output carries no more information about the alignment field than the pattern does; the per-contact ceiling is Article 85's Theorem 7.4 and the additivity over a column is its Corollary 9.2. The reciprocal is the number of contacts that must be read per bit. B7 evaluates both the ceiling and the realised figures. □

Scholium 10.2 (The sharpest of the quantitative bounds). This is the bound that most constrains a design, because it rules out the obvious sensor rather than costing it something. The pattern of free arms a unit presents is the natural thing to detect—it is what the chemistry itself registers—and at the one-reagent limit it is almost perfectly uninformative about alignment.

Two cautions. The bound is on alignment information only; nothing here says the arm pattern is hard to read for other purposes. And Article 85 records that its σ is computed from an arm distribution the corpus has not supplied for a lattice node, the primary arms there being consumed as linkers, so "a second condition bites harder here than there" [Sch26a, Rem. 10.6]. The figures are stock-column figures and the lattice case is open.

Remark 10.3 (A correction: four reciprocals)**.** [A]An earlier form of this paper carried Article 85's σ and its realised capacities as literals of five and three significant figures and inverted *those*. Inverting a rounded literal is not inverting the quantity, and here it is not even close. The four affected figures are recorded rather than absorbed, the three capacity figures being at $\Delta = 1$:

	Earlier	Here
$1/\sigma$ at $\pi_h = 0$	4,044,162	4,044,121
$1/I$ at $\pi_e = 0.99$	5,405	5,392
$1/I$ at $\pi_e = 0.95$	233	234
I at $\pi_e = 0.95$	4.30×10^{-3}	4.27×10^{-3}

The first is the one worth stating twice. Article 85 proves $\sigma(0) = f_I^2 = 1/2011^2$ exactly, so the pure-limit bound is the integer $2011^2 = 4{,}044{,}121$—the same integer Articles 84 and 85 both print—and the earlier figure exceeded it by 41. The next two are reciprocals of Article 85's *printed* capacities rather than of the capacities themselves, and the last adds a significant figure the source never had, that paper printing the capacity as the two-place decimal 0.0043.
No conclusion of this paper turns on any of the four. The bound is $1/\sigma$ and is still free of Δ; the $\Delta = 1$ evaluation is still harsher than the bound at every operating point, which B7 asserts on the corrected figures; and the orientation floor, the thermodynamic floor, the demand, the rate and the in-plane count are untouched. What changes is that `verify_bounds.py` now recomputes σ and the realised capacities from Article 85's definitions—the admitted fractions, the arm words, the registration numbers and the gap distribution—so that the reciprocals are taken of exact values. Appendix B lists what remains imported.

11 The in-plane bound

Theorem 11.1 (Where a placed unit may be oriented)**.** *[A]Article 40's in-plane connector is directed, joining* $(\mathbf{k}, v_\alpha^+)$ *to* $(\mathbf{k} + e_\alpha, v_\alpha^-)$ *[Sch26b, eq. (107)], and Axiom* A_3 *assigns* $v_x^- = v_3$, $v_x^+ = v_9$, $v_y^- = v_{12}$, $v_y^+ = v_6$ *[Sch26b, eqs. (52)–(53)], so its two in-plane contractions are* $C_x : V_9 \otimes V_3 \to \mathbb{C}$ *and* $C_y : V_6 \otimes V_{12} \to \mathbb{C}$ *[Sch26b, eqs. (126)–(127)]. Since the flip induces* ι *on the locants, a flipped cell offers locant* 3 *where its* $+x$ *neighbour expects* 9*. Of the four flip states of an ordered pair, one is supplied and one is the supplied form with its factors swapped; the remaining* 4*—two per direction—need new bilinear forms. Hence the* relative *orientation freedom within an in-plane pair is* 0 *under the maps Article 40 supplies, and what survives is one flip per layer:* 6 *choices on Article 80's box,* 64 *states (B8).*

Proof. The four states give locant pairs $(9,3)$, $(9,9)$, $(3,3)$ and $(3,9)$ in x and their ι-images in y. The first is C_x; the last is C_x precomposed with the canonical swap and is not a new datum; the two with a repeated locant are new. An in-plane pair must therefore agree in flip state, and agreement propagates along the connected components of the in-plane adjacency graph. Equation (107) joins cells at the same z, so those components are the layers: a box of n_z layers has n_z of them, and the stacking direction imposes no coupling between them, Definition 19 supplying a contraction for each registry state. B8 enumerates the states and computes the components. □

Scholium 11.2 (A scope restriction, not a contradiction). The stacking direction is not obstructed: Article 40 supplies two stacking contractions, one per registry state, which is exactly the freedom a flip needs, and one in-plane contraction per direction, which is exactly the freedom a flip does not have. Whether that

asymmetry is a feature of the chemistry—the in-plane bonds being bridges with a direction and the stacking relation not—or an omission is not decided here (Target 16.4).

What follows for a placement system is that inside a lattice it has one orientation decision to make and not one per cell. That is a weaker constraint than it sounds, because by Corollary 9.4 it still cannot make that decision by equilibrium; and it is a scope restriction on Articles 84 and 85, whose $\ell - 1$ bits are a column figure, matching a caveat those papers already carry for a different reason [Sch26f, Rem. 9.4].

12 Which bound binds

Proposition 12.1 (The ordering)**.** *[D]Measured against the magnitudes the corpus carries (B9):*

(a) Energy: comparable. $3.23\,k_BT$ *per unit,* 1.62 *times one disubstituted contact at* $\Delta = 1$ *and* 0.81 *of one tetrasubstituted contact.*

(b) Rate: moderate. *Of order one unit per second across every period and genome length considered.*

(c) Error: a budget only. $\varepsilon \le 1.01 \times 10^{-5}$*, with no thermodynamic translation available.*

(d) Sensing: severe. *At least* 31 *contacts per bit of alignment information, free of* Δ*, and* 65 *at* $\Delta = 1$*.*

(e) Orientation: forced. *The error rate is* 0.5 *at every* Δ *and every* σ*,* 4.7 *orders above the budget.*

(f) In-plane: structural. *One flip per layer,* 6 *on Article 80's box.*

Only (a), (c) and (e) are measured against a corpus reference magnitude; (b) and (d) are reported without one and are ranked by inspection, which Scholium 12.2 states plainly.

Scholium 12.2 (On ranking unlike quantities). A ranking of bounds in different units is a judgement and not a theorem, and this one is labelled a proposition rather than a theorem for that reason. Two of the ranks are dimensionless ratios against figures the corpus supplies—1.62 contacts, and 4.97×10^4 times a budget—and those two carry the conclusion. The rate is called moderate against enzymes and cell divisions, which are outside the corpus. The sensing bound is called severe because no instrument the author knows of reads 31 contacts to recover one bit, which is an opinion about instruments.

The ordering that matters needs neither judgement: one bound is violated by a factor of 4.97×10^4 uniformly in the only free parameter, and the rest are satisfiable. That is the finding, and the ranking is commentary on it.

13 Consolidated register

How many units per period? 42,200, of which 1,000 are placed into the heritable structure. *Rests on* Props. 4.1, 4.2. *Standing* [C]/[D].

At what rate? 0.977 units per second, inversely proportional to the period. *Rests on* Prop. 5.2, Hyp. 5.1. *Standing* [D].

How much information? 4.17 to 4.67 bits per unit, Article 84's figure. *Rests on* Prop. 6.1. *Standing* [C].

What does it cost thermodynamically? $3.23\,k_BT$ per unit, comparable to one contact rather than slack beside it. *Rests on* Prop. 7.1. *Standing* [D].

What error rate is permitted? 1.01×10^{-5} per placement at $F = 0.99$. *Rests on* Thm. 8.2. *Standing* [D].

Can equilibrium meet it for orientation? No. The error rate is exactly 0.5 at every Δ and every σ, exceeding the budget by 4.97×10^4. *Rests on* Thm. 9.1, Cor. 9.4. *Standing* [D].

Can a sensor read the arm pattern? At 31 contacts per bit of alignment information, free of Δ. *Rests on* Thm. 10.1. *Standing* [D].

May a placed unit be oriented in a lattice? Once per layer, not cell by cell. *Rests on* Thm. 11.1. *Standing* [A].

14 Falsification register

Article 84's Cor. 7.5. The orientation floor is that corollary plus arithmetic. If the registration weight does depend on the alignment bit at ordinary contacts—if Article 84's blindness theorem fails—the floor fails with it and the error budget regains a thermodynamic translation. Everything in Articles 84 and 85 fails first.

A further orientation-dependent term. Article 84's Thm. 7.10(b) admits a contact free energy with a term beyond the registration factor. Such a term would break the floor, and it is exactly what Corollary 9.4 says must exist in some form if the architecture assembles. The corollary is therefore not a claim that assembly is impossible but a claim about where the missing physics must sit, and Article 84's Target 14.1 asks for the same quantity from the other side.

H_{indep}**.** Correlated failures move the error budget either way (Sch. 8.4). Note the floor does not depend on it: $(1 - \sigma)/2$ is a per-contact statement.

H_{period}**.** Unverified, and identified with a forcing period rather than cited as a cycle period. Every rate scales as $1/T$; no ordering depends on it.

Article 65's parameters and its Hyp. 8.8. L, ν, N, α are stipulated magnitudes, and Thm. 8.5 is derived under a hypothesis that paper flags as standing "against a reading the corpus has entertained elsewhere" [Sch26c, Rem. 8.9]. If residues condense the count falls and the demand with it; the error budget moves logarithmically and the floor not at all.

The lattice arm distribution, and blindness at a node. Two things, and the second is the deeper. σ is computed from a stock-column distribution, not a lattice one [Sch26a, Rem. 10.6], which conditions the sensing bound. And blindness itself—the $g = 0$ half of the floor, and so the whole of Corollary 9.4—is *unproved* at an interior node, Article 84 recording that the stacking contacts of a $3 \times 3 \times 6$ box are "asserted here and not shown" [Sch26f, Rem. 9.4]. Since the heritable object is a lattice, the corollary is a stock-column statement until Target 16.5 is discharged.

15 Precedence

Ruling 15.1 (Articles 84 and 85)**.** [C]Consistent; nothing amended, and one theorem read in a direction its author did not. Article 84's Cor. 7.5 and Article 85's Thm. 8.1, Thm. 8.2, Prop. 7.1 and Prop. 7.3 are imported as written and carry Section 9 entire, the exchange involution of Thm. 8.1 being what licenses the symmetric sign; Article 84's Prop. 9.5 and Rem. 9.6 supply the information bound, replacing a species term an earlier form of this paper invented; Article 85's Rem. 10.6, adjudicating between Article 84's own verification block and its prose, settles this paper's object as a box of 54 nodes with 45 contacts rather than a column of 54 with 53; and Article 85's Thm. 7.4 and Cor. 9.2 carry the sensing bound. The second reading of blindness offered at Scholium 9.5 is this paper's, and it extends neither paper's statements, only their application.

Ruling 15.2 (Article 79)**.** [C]Consistent; imported and not extended. H_{rgy} is used as that paper writes it—pricing a guest that fails to present the pattern—and is *not* used to discriminate two orientations of a guest that presents it correctly, which Article 85 rules it does not supply [Sch26a, Hyp. 10.1]. An earlier form of this paper made that appropriation and it is withdrawn.

Ruling 15.3 (Articles 65, 80, 78 and 40)**.** [D]Article 65: consistent, its formula and figures confirmed; its genome length superseded by Article 80, which is not an amendment to its arithmetic. Article 80: consistent; its Ruling 7.1 and Prop. 7.2 quote the demand at the length its own Thm. 5.1 excludes, which is recorded at Scholium 4.5 and pressed no further. Article 78: cited for its forcing period, which this paper identifies with a cycle period on its own authority (Hyp. 5.1). Article 40: consistent; its connector, locant assignment and contractions carry Theorem 11.1.

16 Targets, and conclusion

Target 16.1 (What supplies orientation)**.** Identify the nonequilibrium process that orients a placed unit, and price it. Corollary 9.4 establishes that equilibrium discrimination cannot, by 4.7 orders and uniformly in Δ_{rgy}. This paper declines to invent the process (Prop. 3.1(iii)); the target is the declining.

Target 16.2 (The orientation bias of a delivered unit)**.** Measure or compute the free-energy difference between the two orientation states of a delivered unit at a stacking contact—Article 84's Target 14.1, which Corollary 9.4 sharpens into a requirement: that difference must be nonzero and of the right sign, or the architecture cannot assemble at equilibrium. Article 84's Thm. 7.10(b) names the term that would carry it.

Target 16.3 (The period)**.** Establish T and decide whether Article 78's forcing period is the architecture's cycle period. Every rate in Sections 5–6 is inversely proportional to it.

Target 16.4 (The in-plane contractions)**.** Supply the two contractions per in-plane direction a lattice with flipped cells requires, or establish that a flipped cell cannot occur in a lattice interior (Thm. 11.1).

Target 16.5 (The lattice arm distribution)**.** Supply the free-terminal distribution at an interior lattice node, which Article 85 records as missing [Sch26a, Rem. 10.6]. Both σ-dependent bounds here are stock-column statements until it exists.

Proposition 16.6 (What is established)**.** *[A]Subject to Appendix A, and as necessary conditions only (Conv. 2.3): (i) of the* 42,200 *units a period demands,* 1,000 *are placed into the heritable structure and* 97.6 *per cent is not (Props. 4.1, 4.2); (ii) the placement rate is of order one unit per second (Prop. 5.2); (iii) information costs* 4.17 *to* 4.67 *bits per*

unit, Article 84's own figure (Prop. 6.1); (iv) its thermodynamic cost is $3.23\,k_BT$ *per unit, comparable to one contact (Prop. 7.1); (v) a period's anchor units at* $F = 0.99$ *permit* $\varepsilon \le 1.01\times10^{-5}$ *(Thm. 8.2); (vi)* ***the mean orientation error rate of an equilibrium process is exactly*** 0.5***, uniformly in*** Δ ***and in*** σ***, exceeding that budget by*** 4.97×10^{4} ***and the correlated budget by*** 50***, so orientation fidelity cannot be equilibrium's*** *(Thm. 9.1, Cor. 9.4); (vii) a sensor on the arm pattern needs at least* 31 *contacts per bit of alignment information, free of* Δ *(Thm. 10.1); (viii) the relative orientation freedom of an in-plane pair is* 0 *and one flip per layer survives,* 6 *on Article 80's box (Thm. 11.1).*

Remark 16.7 (What is not established)**.** [A]No system is proposed and none shown to exist. No mechanism is offered for the non-equilibrium step Corollary 9.4 requires. The period is assumed and identified with a forcing period on this paper's own authority. The error budget assumes independence. The σ-dependent bounds are stock-column statements. Nothing is said about the membrane, the phospholipid or the size of a unit, and nothing about which twenty products the architecture makes.

Scholium 16.8 (What would overturn the paper). One theorem and one term. If Article 84's Corollary 7.5 fails—if the registration weight does distinguish the two alignments of an ordinary contact—then the floor fails, the error budget regains a thermodynamic translation, and this paper's principal finding goes with them; but so does most of Articles 84 and 85, so this is not a cheap escape. And if the contact free energy carries a further orientation-dependent term of the kind Article 84's Theorem 7.10(b) admits, the floor is broken by that term rather than by Δ_{rgy}— which is not a refutation but the positive form of the same finding, and is Target 16.2.

The other five bounds move only with their sources: the demand with Article 65's stipulated parameters, the rate with the period, the information with Article 84's hexamer price, the sensing bound with the cleavage model, and the in-plane bound with a reading of three equations of Article 40.

A Hypothesis register

Remark A.1. [A]The register has a shape worth noting. The paper's principal finding rests on two imported statements of Article 84 and one of Article 85, and on no added hypothesis at all—H_{indep} enters only where the floor is *compared* with the budget, and the floor itself is a per-contact statement needing nothing. A reader who doubts Corollary 9.4 must doubt Article 84's blindness corollary, which is that paper's central result.

B Verification

Script `verify_bounds.py` (Python standard library). Exact rational arithmetic for Article 65's formula and parameters and for Article 85's σ; floating point for logarithms and exponentials, and no claim depends on their last digit. It writes `verification_values.tex`, which this paper inputs; nothing numeric is held in `macros.tex`.

Derived, not imported. Article 85's σ at four operating points and its realised capacities at $\Delta = 1$ are recomputed by the script from that paper's own definitions, over the 784 ordered contacts of the two-letter stream, and the reciprocals of B7 are taken of those values. An earlier form of this paper imported them as literals and inverted the literals; Remark 10.3 records the four figures that changed.

Imported literals. The following remain published figures of other articles, reproduced and not recomputed: Article 84's hexamer price of 25.0 to 28.0 bits with its registry term 5.0; Article 80's $L_{\mathrm{crit}} = 222$ and its $3\times3\times6$ box; Article 65's L, ν, N, α; and Article 78's 12-hour period. The script does not verify them and this paper does not imply that it does.

B1 Article 65's formula at its own parameters, reproducing 42,200 and 19,343; the three terms asserted to sum to the demand and to equal 1,000, 28,000, 13,200; the non-structural share asserted above 97 per cent; and the evaluation at $L = 222$.

B2 The rate at both genome lengths and at half and twice the period, with the order-of-one claim tested as an order of magnitude at every combination—not as a rounded equality, which would fail at the alternative periods the block itself computes.

B3 Article 84's hexamer price divided; the registry term asserted *equal* to the contacts-per-node ratio of Article 80's box; and the box asserted to be 54 nodes with 45 contacts rather than a column of 54 with 53.

B4 One bit as $\ln 2\,k_BT$; the selection cost per unit; and two assertions in opposite directions—that it *exceeds* one two-registration contact at $\Delta = 1$, which is the finding, and that it falls below one four-registration contact, which is the comparison an earlier form of this paper made alone.

B5 The budget $1 - F^{1/n}$ at $n = 45$ and $n = 1{,}000$ for $F = 0.99$ and $F = 0.5$, with monotonicity in n asserted. No thermodynamic claim is made in this block.

B6 $\theta(0,\Delta) = \frac{1}{2}$ checked to $\Delta = 100$; the sign-averaged identity $\frac{1}{2}\theta + \frac{1}{2}(1-\theta) = \frac{1}{2}$ checked at $g = 1, 2, 4$ and Δ to 100, which is the sensitive half of the theorem; the weaker sign-agnostic figures $(1-\sigma)/2$ emitted at four operating points and *not* asserted to be limits, the block's comment recording that

Table 1: The hypothesis register. Two hypotheses are added. The principal finding needs one of them and is uniform in the parameter the corpus leaves open.

	Premise	What rests on it	What survives its failure
H_{indep} (*added*, Hyp. 8.1)	Placements fail independently (S)	The figure in Thm. 8.2, and nothing else: Cor. 9.4 holds at the opposite extreme too	Thm. 9.1, which is per-contact, and the corollary, which survives at the correlated budget 0.01; the rate, information, energy and sensing bounds
H_{period} (*added*, Hyp. 5.1)	T, identified with Article 78's forcing period (S)	The instantiated figures of Prop. 5.2 and the bit rate	Every statement as a formula in T; every ordering
Article 84's Cor. 7.5 and Prop. 7.7 (imported)	The registration weight is alignment-independent off I–I (S)	Thm. 9.1 and Cor. 9.4 entire	Nothing of §9
Article 85's Thm. 8.1, Thm. 8.2, Prop. 7.3, Thm. 6.1 (imported)	The exchange involution and the vanishing signed bias; the Bernoulli law at gap g; σ (S)	The sensitive half of the floor, which is what removes σ from Thm. 9.1; the sensing bound	The $g = 0$ half of the floor, which needs only Cor. 7.5, and the weaker $(1-\sigma)/2$ form
Article 84's Prop. 9.5, Rem. 9.6 (imported)	The price of a coded hexamer (S)	Prop. 6.1, Prop. 7.1	The error and orientation bounds, which are information-free
Article 65's Thm. 8.5 and its Hyp. 8.8 (imported, [D] there)	The feasibility inequality and free residues (S)	The demand, hence the rate and the error budget's n	The floor, which is per-contact
Article 40's eqs. (52)–(53), (107), (126)–(127) (imported)	The directed connector and the contractions (S)	Thm. 11.1	Everything else

they are not approached; the three-class mixture computed and its shortfall from one half asserted equal to $f_I^2/2$; and the floor asserted to exceed both the independent budget, by 4.97×10^4, and the correlated budget 0.01, by 50.

B7 Article 85's σ, recomputed, and the reciprocal contacts-per-bit at the ceiling—an integer at the pure limit, $\sigma(0)$ being exactly $1/2011^2$—together with the realised capacities at $\Delta = 1$, also recomputed, and the realised requirement asserted harsher than the ceiling at every point. Remark 10.3 records the four figures an earlier form of this paper obtained by inverting literals.

B8 The four flip states of an ordered in-plane pair for both directions, with the states needing a new form asserted to be exactly the four with a repeated locant.

B9 The ordering: the selection cost asserted to lie strictly between a two- and a four-registration contact, and the orientation floor asserted to exceed the budget by more than four orders.

C Molecular commentary, isolated

Remark C.1 (Status)**.** [A]Nothing here enters a numbered statement.

Remark C.2 (What a non-equilibrium orienting step might look like)**.** [E]Corollary 9.4 says orientation cannot come from the depth of a contact, and says nothing about what it comes from instead. The families of mechanism that are not excluded all share one feature: they act before the contact closes, or they act twice. A unit delivered already oriented—by a carrier, a template, a transiently asymmetric arm—carries its orientation into a contact that cannot subsequently distinguish it. A unit placed at random and then checked requires a reading step, and Theorem 10.1 prices the obvious reading. Nothing here is proposed; the remark exists to say that the corollary does not imply the architecture is impossible, only that its orientation is decided somewhere other than where its stability is.

Remark C.3 (Why one unit per second is unremarkable)**.** [E]A placement rate of one unit per second over a half-day period is slow beside an enzyme turning over and fast beside a cell dividing, which is the range a per-cycle material budget should give. It is reported because the ordering needs it, and the useful content of Section 5 is that the rate bound may be set aside.

D Sources, by use

References

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Table 2: Sources, by use.

Source	Used at	What is taken
Article 84	§6, §9, §10	Cor. 7.5 and Prop. 7.7, which carry the orientation floor; Prop. 9.5 and Rem. 9.6, the hexamer price; Thm. 7.10(b), the term that would break the floor; Rem. 9.4, the lattice caveat; Tgt. 14.1
Article 85	§9, §10	Prop. 7.1 and Prop. 7.3, the gap and its Bernoulli law; Thm. 6.1, σ; Thm. 8.2, the vanishing signed bias; Thm. 7.4 and Cor. 9.2, the ceiling; Rem. 10.6, the box and the lattice distribution; Hyp. 10.1, which rules out the appropriation this paper withdrew
Article 65	§4	Thm. 8.5 and its scale parameters; Prop. 8.1 and Hyp. 8.8, the allocation; Rem. 8.9, its own caveat
Article 80	§4, §6	Thm. 5.1, the least heritable length and the $3 \times 3 \times 6$ box; Rul. 7.1 and Prop. 7.2, which carry the superseded demand
Article 79	§9	H_{rgy}, used as written, and the three operating points
Article 78	§5	Rem. 7.2, the 12-hour forcing period
Article 40	§11	eqs. (52)–(53), (107) and (126)–(127)