

Two Kinds of Closure

The Katwijk Pill Factory Read Through One Rule of the Net

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Abstract

Eli Lilly plans a €2.6 billion factory beside the Valkenburgse Meer in Katwijk. It will turn imported active ingredient into tablets, first of all the oral weight-loss drug orforglipron. The permit process ran under heavy time pressure from the state, the province and the developer. This article sets out the case in full. It then reads it through one rule of the net: a window of three trits closes when its sum is zero modulo 3. From that rule alone follow four results. A constant input at one node freezes the living ring around it. Food without its own closure needs up to three times the intake to close the same window. Artificial light at night turns the day into a homogeneous ring that can never close with a living one. And a healthy living net measures as zero phase coherence. Measured values from the literature are placed next to each result as correspondences. The article ends with the interventions that follow from the rule, ranked by the depth at which they close.

1. The case

1.1 The site and the people around it

Valkenburg is a village of about six thousand people in the municipality of Katwijk. South of it lies Zijlhoek-De Woerd, a former glasshouse area. The glasshouses are being demolished. The growers have been bought out. Next to it lies the Valkenburgse Meer, a recreational lake used by swimmers, walkers and windsurfers. The 2022 area vision for this place showed a small shop, a bicycle repair shop, an ice-cream parlour and a laboratory as low as a supermarket. Pleasure boats moored at a grass quay.

What is now planned is a factory complex up to 39.5 metres high. The current design covers 45,000 m² of footprint, with a maximum of 70,000 m². The total floor area is about 69,067 m² for at most 580 employees. That is 122 m² per worker, against 25 to 35 m² for an ordinary labour-intensive business. The building is for machines, not for work.

1.2 What the factory makes

The permit documents describe two primary processes. Spray-dried dispersion (SDD) and oral solid dosage (OSD). In the SDD hall, imported active ingredient and polymer are dissolved in industrial methylated spirit (IMS), a mixture of ethanol with about 5% methanol. The solution is sprayed and dried into amorphous powder. One batch type holds 5,000 kg of IMS with 2,000 kg of solids. The other holds 10,000 kg of IMS with 4,000 kg of solids. In the OSD hall the powder is pressed into tablets and coated. Consumer packaging happens elsewhere.

No chemical reactions take place on site. For that reason the activity does not fall under the European category for chemical industry. The active ingredient is synthesised in the United States. Lilly is building a \$6.5 billion API plant in Houston that will make orforglipron, among other sites. Katwijk is the finishing step: American powder into European tablets.

The first product is orforglipron, sold as Foundayo. The US regulator approved it on 1 April 2026, fifty days after filing. In the 72-week trial, mean weight loss was 11.1% against 2.1% on placebo. The approval states use alongside a reduced-calorie diet and more physical activity.

1.3 What the factory takes

- **Gas.** Three steam boilers, of which two run continuously, 8,760 hours a year: 9,873,074 m³ of natural gas per year. In addition, gas generators bridge the missing grid connection until 1 January 2031 at the latest: 9,188,875 m³ in the peak year 2029. Together: 19,061,949 m³ in 2029.
- **Water.** Close to 800 m³ of drinking water per day. Over a year: $800 \times 365 = 292,000$ m³. That is roughly the household use of the whole village of Valkenburg.
- **Discharge.** Treated process water goes to surface water, probably the Oude Rijn, not to the municipal treatment plant. Drinking-water company Dunea asked for treatment to drinking-water standard, because for many pharmaceutical compounds no limit values exist yet.
- **Cooling.** Five wet cooling towers.
- **Storage.** Fourteen above-ground tanks, eleven with flammable liquids: methanol, ethanol and acetone. Up to 1,782 tonnes of hazardous substances in packaging.
- **Safety margin.** The site lies almost entirely within the fire zone of high-pressure gas pipeline A-560, a steel pipe of about 900 mm. Five occupied buildings lie within the 100% lethality distance. The Seveso sum comes to about 0.83 against a threshold of 1.0. That figure rests on the assumption that the IMS is not handled at elevated temperature. Spray drying uses heated gas by definition.

The municipal decision covers the building only. The permit for the production itself comes later, from the province. The province is also one of the parties that wanted the factory.

1.4 How the decision was made

The sequence below comes from documents released under the Open Government Act and from the local reconstruction by Allesoverkatwijk.nl.

- **Summer 2024.** Developer RED Company, which won the tender for the area in 2022, is approached. Lilly is comparing 66 European sites.
- **March 2025.** Katwijk demands at most 15 hectares and no gated compound. The developer wants the land committed first.
- **9–10 April 2025.** State and province say Katwijk asks too much. The next morning a director-general and three provincial executives arrive at the town hall. Ministers call and message the alderman. An instruction from above is mentioned as an option.
- **16–17 April 2025.** The comfort letter is signed. In version 1.7 the 15-hectare limit is gone.
- **2 July 2025.** About a hundred residents discuss three scenarios for the area. Council members already know that one of them is tailored to Lilly. The residents do not.
- **3 November 2025.** Public announcement in a rented theatre in The Hague, with two ministers present.
- **3 April 2026.** RED submits the application, with more than 25 studies commissioned by its own project company.

- **18 June 2026.** At 15:30 a package of €72 million from state and province arrives, plus 50% affordable housing in Valkenhorst. It is valid for that evening only. The CDA gets a five-minute recess. The vote passes 26 to 5 after midnight.
- **Summer 2026.** 806 individual objections, plus one joint objection of 91 pages signed by more than 500 people.
- **1 October 2026.** The independent referendum committee finds the referendum request admissible. The mayor advises rejecting it, because the college wants to decide on the permit the next day.

A neurophysiologist of the Leiden University Medical Center, founder of the national BioClock consortium on the biological clock, spoke out against the plan in the local paper. Her access pass was taken. She has since received it back, after promising to report future interviews in advance.

1.5 Who holds which interest

- **The developer** owns the land. The agreements of 18 June 2026 link the factory to 1,590 homes by RED in the same area. The architect of both this factory and RED's Lead towers in Leiden is Powerhouse Company, founded by RED's co-founder.
- **The state** wanted a blockbuster obesity drug within its borders, for the standing of the Netherlands. The state is also landowner of Valkenhorst. Part of the reward to Katwijk is a concession on the state's own land.
- **The province** wanted the investment and will be the competent authority for the production permit.
- **The Leiden Bio Science Park** presents the factory as part of its ecosystem. The site is not on the park. Lilly's Dutch director confirmed that no large research department will come to Katwijk.
- **The municipality** obtained money for a road junction it had sought for twenty years.

No source available shows personal financial interests of individual administrators. What the sources show is a structure. The evidence base is supplied by the applicant. The reward is tied to a single vote. And a research label legitimates a production plant.

1.6 What is lost

The study by Decisio for Katwijk concludes that the effects are felt most directly in Valkenburg. A former council member left his party over the vote. A council member who voted against said she could not support such a process while she heard her neighbours outside. Windsurfers expect weaker and gustier wind on parts of the lake. The village keeps its name, but its edge changes from glasshouse and water to fence and tower.

2. One rule

Picture a fishing net. Threads cross and form knots. Each knot carries one value, a trit: -1 , 0 or $+1$. Three consecutive knots form a window.

The rule. A window (a, b, c) is closed when $a + b + c \equiv 0 \pmod{3}$. An open window carries tension.

The closure sum is the discrete Laplacian. A closed window means zero local pull.

Counting. A window has $3^3 = 27$ states. Exactly 9 are closed. Three are homogeneous: $(-1, -1, -1)$, $(0, 0, 0)$, $(+1, +1, +1)$. Six are heterogeneous: the permutations of $(-1, 0, +1)$. The remaining 18 are open.

The third value is fixed. For given a and b, exactly one value of c closes the window: $c \equiv -(a + b) \pmod{3}$. If two values are equal, the third must equal them too.

The two forms never mix. A homogeneous window can only be continued by a homogeneous window. The same holds for heterogeneous. A ring is wholly one or the other. The boundary between the two is always an open window and always carries tension.

Life. Add +1 to every trit of a closed ring. Each window sum rises by 3, which is 0 modulo 3. The ring stays closed and returns after three steps. A homogeneous ring shifts as one block. In a heterogeneous ring every knot changes at every step while every window stays closed. All content changes, the closure holds. That is the form of metabolism. The two heterogeneous addresses run in opposite directions. A heterogeneous thread cannot reverse direction without an open window.

Reading. A ring that touches three other rings takes their values at the contact points, their phases, as its own trits. It reads them. Shift a ring below and the image above shifts with it.

The fixed point. Let a reading ring count itself. Its own phase must then be $p_{\text{self}} \equiv -(p_1 + p_2) \pmod{3}$. That solution always exists and is unique. When what it reads changes, the fixed point moves with it.

Coherence. Map the trits to phases 120° apart. The length R of the mean arrow is:

- homogeneous closed (crystal): $R = 1$
- open (tension): $R \approx 0.58$
- heterogeneous closed (living): $R = 0$

A living ring measures as complete disorder in phase coherence. The proper measure is the triangle $(R, C_{\text{hom}}, C_{\text{het}})$, with C_{hom} and C_{het} the fractions of homogeneously and heterogeneously closed windows.

Nothing beyond this rule is used below.

3. Four results

3.1 The outer clock

Day, dusk and night are three different values in fixed order: $+1 \rightarrow 0 \rightarrow -1$. The day is a heterogeneous ring with period 3.

Light all night turns it into $(+1, +1, +1)$. That is a homogeneous ring.

The body is a heterogeneous ring. Where it meets a homogeneous outer ring, a homogeneous form meets a heterogeneous form. By the rule that boundary is always open. It carries tension at every step, for as long as the light stays on.

Darkness at night is therefore not rest in the sense of nothing happening. It is what makes the environment a turning ring, so that the living net can couple to it in closure.

Direction counts as well. Rotating shifts force the body to reverse direction against the day. A heterogeneous thread cannot reverse without an open window. Every reversal costs at least one.

3.2 Food

Satiety is the closing of the intake window. The body supplies two values, a and b. The food at the contact point supplies the third.

Living food is itself a heterogeneous ring with its own clock. At the contact point it delivers a value that turns with it. The window can close in one step.

Food whose rings are broken delivers a value unrelated to the body's clock. Such a value closes the window with probability $1/3$. The expected number of inputs per closure is then $1 / (1/3) = 3$.

For fully unphased input, up to three times the intake is needed for the same closure. For partly processed food the factor lies between 1 and 3.

What does not close does not vanish. It remains as an open window. Stored tension is what the body carries as reserve.

There is a second side. Ultra-processed food is made for shelf life. Shelf life means that nothing changes any more. In the net that is homogeneous closure: crystal order. Such a product does close, but homogeneously. Against a heterogeneous ring its contact point is open by definition.

3.3 The pill

The body's own satiety signal is a phase from the gut ring, read by a reading ring. The self of that ring is the fixed point $p_self \equiv -(p_1 + p_2)$. When intake changes, the fixed point moves with it.

A drug that mimics this signal replaces the phase with a constant.

In the ring. Take the heterogeneous ring $(-1, 0, +1)$. Hold the third knot fixed at $+1$.

- Step 1: $(0, +1, +1)$, sum 2. Open.
- Step 2: $(+1, -1, +1)$, sum 1. Open.
- Step 3: $(-1, 0, +1)$, sum 0. Closed.

A fixed knot closes its window once in three steps. If the windows must nevertheless stay closed, the neighbours must stop turning. Around the fixed knot the ring becomes homogeneous. A chemical closure takes the place of a living one. The boundary between the frozen part and the turning rest is always open.

In the reading ring. With a constant input, the fixed point no longer follows what is actually eaten. The satiety self reads the drug, not the meal.

When the drug stops. The knot turns again. Then the windows that were open before are open again: the outer clock of 3.1 and the input of 3.2 are what they were. The drug changed neither. The old tension returns at the old rate.

3.4 The light of the living

In a living ring every window stays closed while its content turns. Open windows sit at the edge, where the living ring meets its surroundings. That is the form of a membrane. Exchange happens there.

A dead net no longer turns. Its edge exchanges nothing. An injury makes more edge, so more open windows.

The coherence values of section 2 give a sharper result. A healthy living net measures $R = 0$. High phase coherence signals crystal order. The search for coherent light as the mark of life looks for the wrong sign. What older writers called life energy is, in the net, C_{het} : the fraction of heterogeneously closed windows.

4. Correspondences

Measured values do not carry the derivation. They sit next to it.

Result	Derived from the	Measured in the literature
3.3 Return after	Old tension returns at old rate	Regain about 0.4 kg per month, to baseline in about 1.7 years (BMJ 2026)
3.3 Effect while taking	Closure held from outside	11.1% weight loss against 2.1% placebo at 72 weeks
3.2 Intake	Between 1 and 3	+508 kcal per day on ultra-processed food at matched nutrients (BMJ 2026)
3.1 Homogeneous	Permanent open boundary	14% higher odds of obesity at highest light-at-night exposure; 12–19% higher odds over ten years in NIH-AARP
3.1 Restoring the clock	Boundary can close	1.2 h more sleep, 270 kcal per day less intake (Tasali 2022)
3.4 $R = 0$ for life	No coherence in healthy emission	Reliable evidence for coherence of biophotons is missing (Cifra 2015)
3.4 Edge	Dead: none;	Living mice emit more than dead; injured leaf parts brighter (Cifra 2025)
3.1 Clock in	Emission follows	Human photon emission shows a diurnal rhythm (Kobayashi 2008)
3.2 C_{het} in food	Production method changes closure	Egg yolks and milk separate by husbandry system in delayed luminescence (Kassel; Netherlands pilot)

5. What follows

The rule ranks interventions by where they close. A tension that arises at the boundary between body and day can only close at that boundary.

- 1. Restore the day as a turning ring.** Real daylight, real dusk, real dark. Then the coupling between body and environment can close.
- 2. Eat in the same direction as the day.** Eat in the light part of the day. Then no reversal is needed.
- 3. Eat food with high C_{het} .** Fresh and living, not made for shelf life. Then the intake window closes in one step instead of three on average.
- 4. Share a rhythm.** A community that eats and rests at shared times is a reading ring over many rings. Its fixed point carries the individual. Amsterdam's whole-city programme acts at this depth. Overweight among children aged 2–18 fell from 21% in 2012 to 18.7% in 2017.
- 5. Measure with the triangle.** Use (R , C_{hom} , C_{het}) on food and on people, not phase coherence alone.

The Dutch combined lifestyle intervention reaches 5% average weight loss after two years, without the return that follows a drug. In the DiRECT trial, 46% of participants were in remission of type 2 diabetes after one year. Both act on the boundaries named above.

6. For Katwijk and Leiden

The factory works on two depths at once, in opposite directions. Around it, light day and night and rotating shifts make the outer clock of the neighbourhood homogeneous. Inside it, a product is made that holds a constant on one reading knot. Both replace living closure with chemical closure. The first from outside, the second from within.

Leiden already holds the other route. The Leiden Academic Centre for Drug Research has measured ultra-weak photon emission on human hands in pre-diabetes, with Van der Greef, Hankemeier and Van Wijk. The LUMC hosts the BioClock consortium on the biological clock. That is knowledge-intensive work on the whole net. It received no place in the decision on Katwijk.

A region that wants to be known for knowledge can choose which closure it builds on.

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