

One Window

Light-Gated Channels, the 2026 Nobel Prize in Medicine and the Closure Rule of the Vacuum.Net

J. Konstapel, Leiden, 10 October 2026.

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1. The prize

The 2026 Nobel Prize in Physiology or Medicine goes to Peter Hegemann, Georg Nagel and Karl Deisseroth. The subject is optogenetics. A protein from a single-celled alga is placed in a nerve cell. The cell then answers to light.

The facts, as reported by WIRED on 7 October 2026:

- The alga *Chlamydomonas* has an eye spot that holds the light-sensing molecule retinal.
- The alga gives an electrical answer about 0.5 milliseconds after light arrives.
- The human eye needs at least 10 milliseconds.
- Hegemann proposed in the early 1990s that one protein both detects the light and lets ions through. At the time no known channel answered to light by itself.
- Two genes were found: channelrhodopsin-1 and channelrhodopsin-2 (ChR2).
- Nagel placed each gene in frog eggs. Both proteins opened under light. ChR2 passed ions within 0.2 milliseconds.
- The gene also worked in mammalian cells, which do not answer to light.
- In 2005 Deisseroth placed it in rat nerve cells. Blue light made them send an impulse.
- Later proteins switch cells on or off, each at its own wavelength.

This essay reads these facts with one rule from the Vacuum.Net theory. Every count is written out in the text.

2. The rule

The picture is a fishnet in water. One strand crosses itself. Light is the movement of phase along that strand. Between the strands lie meshes: openings with a shape and a size.

Each crossing holds one of three values, a trit: +1, 0 or -1. Three crossings in a row form a window. A window is **closed** when its three values sum to zero, counted in threes. An open window carries tension. Only what closes, stays.

Three values on three places give $3 \times 3 \times 3 = 27$ windows. Nine close:

- three equal values: $(-, -, -)$, $(0, 0, 0)$, $(+, +, +)$. That is 3 windows. This is the form of a crystal.
- three different values: the orderings of $(-, 0, +)$. That is 6 windows. This is the form of metabolism: the content changes and the window stays closed.

The other $27 - 9 = 18$ windows are open.

A ring is a strand that returns onto itself. A ring of three different values exists at length 3. It grows by a whole triple, to length 6. At length 6 it divides into $3 + 3$. That is the form of a single cell. Where such a ring touches its surroundings, the windows stand open. There is tension at the edge and rest inside. That edge is the form of a cell membrane.

3. A window with one free place

Fix two values of a window. Call them a and b . The third value c closes the window when

$c \equiv -(a + b)$, counted in threes.

The table gives all nine cases.

a	b	$a + b$	c that closes
−	−	−2	−
−	0	−1	+
−	+	0	0
0	−	−1	+
0	0	0	0
0	+	1	−
+	−	0	0
+	0	1	−
+	+	2	+

In the first row, -2 and $-1 + 3 \cdot (-1)$ differ by a multiple of three; the closing value is -1 . In the last row, $+2$ closes with $+1$, since $2 + 1 = 3$.

Each row has exactly one closing value. Two fixed places leave one answer out of three.

Now read the channel. The protein with its retinal holds two places. The third place is taken by the phase that arrives along the strand, which is light. One phase out of three closes the window. The other two leave it open.

That is the colour of the channel. ChR2 answers to blue light, near 470 nanometres. It does not answer to yellow.

4. Reading and passing are one closure

Hegemann's proposal was held to be unlikely for one reason. A sensor and a channel were known as two separate things. He claimed one protein was both.

In the net there is one event. The window closes. That closure is the passage. There is no second step in which a reading is handed to a gate.

The human eye does the same work in a chain. The light-sensing protein hands over to a second protein, that one to a third, and so on, until a channel moves. Each handover is its own window.

The numbers:

- Human eye: at least 10 ms.
- Alga, whole answer: 0.5 ms. The ratio is $10 / 0.5 = 20$.
- ChR2 channel alone: 0.2 ms. The ratio to the alga's whole answer is $0.5 / 0.2 = 2.5$.
- Eye against one channel: $10 / 0.2 = 50$.

One window against a chain: a factor of 50 in time. The alga has no brain and no nerve. It has the shortest possible route from light to movement, and it is the fastest.

5. The same edge everywhere

The gene was moved four times: from the alga to a frog egg, to a mammalian cell, to a rat nerve cell in a dish, and to nerve cells in a living brain. It worked each time. None of these hosts had ever met it.

In the net this needs no special account. The membrane is the edge of a ring of length 6 or a multiple of it. That edge has the same form in an alga and in a nerve cell: open windows, tension outside, rest inside. A mesh that fits one such edge fits every such edge.

The nerve cell adds nothing new at this depth. It is a cell whose edge tension travels along its length. A mesh that passes at one place lowers the tension there, and the change runs along the edge.

6. Three positions of the switch

The later tools complete the register.

Light	Tool	What crosses the edge	Trit
Blue, about 470 nm	ChR2	positive ions inward	+1: the cell fires
None	—	nothing	0: the cell follows its own course
Yellow, about 590 nm	Halorhodopsin	negative ions inward	−1: the cell is held silent

The two wavelengths differ by a factor $590 / 470 = 1.26$.

The technique is usually described as on and off. It has three positions. The zero is a lawful state. In darkness the cell is neither on nor off. It is left to the rings around it.

7. Address and tension

The two-layer law of the theory says that every configuration has an address and a tension. The address is which windings close, and at what depth. The tension is what happens there.

The name of the technique holds both layers.

- **Genetics writes the address.** The gene is read in triples of three letters. It is placed only in the cells of one chosen kind. That fixes which rings carry the mesh.
- **Optics sets the tension.** Light arrives everywhere in the tissue. Only the rings with the mesh answer.

Before this technique the two layers could not be separated in living tissue. An electrode sets tension, and reaches every cell near its tip. A drug has an address of a sort, and no clock. Here the address is exact to the cell kind, and the tension is exact to the millisecond.

8. The experiment of the reading ring

The theory describes representation as a reading ring. Take three closed rings. Each touches a fourth ring at one crossing. The value at that crossing is the phase of the ring. The fourth ring takes these three phases as its own trits. It reads the three.

The reading keeps structure. Shift one ring below by +1, and the image above shifts by +1.

A ring that counts itself has two foreign phases, p_1 and p_2 , and its own phase. Closure fixes its own phase:

$$p_{\text{self}} \equiv -(p_1 + p_2).$$

Take $p_1 = 0$ and $p_2 = +1$. Then $p_{\text{self}} \equiv -1$.

Now shift p_1 by one step, from 0 to +1. Then $p_1 + p_2 = 2$, and $p_{\text{self}} \equiv -2 \equiv +1$.

One step below moved the fixed point above from -1 to +1. The ring stays closed. Its content is different.

That is the form of an optogenetic experiment. One group of cells receives one step. The experimenter then reads what has moved above: a memory that returns, a fear that appears, a movement that starts. In 2012 a group at MIT lit the cells that had been active during one event in a mouse. The mouse froze, as it had during the event. The step was given below. The image appeared above.

9. One step, not alignment

Coherence is usually measured with the order parameter R : the length of the mean arrow on a circle. Map the three trit values to the phases 0° , 120° and 240° .

- Three equal values: the three arrows coincide. $R = 1$.
- Three different values: the arrows cancel. $R = 0$.
- Two equal, one different, for example 0° , 0° , 120° . The sum is $2 + (-0.5 + 0.866i) = 1.5 + 0.866i$. Its length is $\sqrt{(2.25 + 0.75)} = \sqrt{3} = 1.732$. Divided by 3: $R = 0.58$.

The living form measures $R = 0$. The crystal measures $R = 1$.

Apply this to lit tissue. Take 100 rings, balanced over the three phases, so $R = 0$. Set 10 of them to one phase with light. The remaining 90 still cancel. The mean arrow has length $10 / 100 = 0.10$. Set all 100 to one phase: $R = 1$.

Lighting a whole population at once moves living tissue toward the crystal form. Clinically, a brain in which all cells fire together is a brain in seizure. The count gives the direction for use: one step on one ring, read above. Not all rings in one direction.

10. A mesh instead of a substance

An earlier essay in this series set out three roads to a medicine. The third reads: first the state, then the substance. On that road the medicine is a mesh. It sets a tempo without being used up.

The sight work in the Nobel citation is on that road. In retinitis pigmentosa the light-reading cells of the retina die. The cells behind them remain, and so does the nerve to the brain. The edge is there. The mesh is gone.

In 2021 a group in Paris and Pittsburgh reported one case. A 58-year-old man had been blind for about forty years. A light-gated channel was placed in the remaining cells of one eye. With goggles that project amber light he could find, count and touch objects on a table.

Nothing is swallowed daily. Nothing is broken down. One mesh was placed in an edge that had lost its own. Light does the rest.

11. What it means for people

Three groups of people stand behind the prize.

The blind. Retinitis pigmentosa affects about one person in four thousand. For them the technique is the return of a lost mesh. What returns is coarse: shapes and contrast, with goggles. A person who has lived for decades by touch and sound gains the outline of a cup on a table.

The ill. The citation names depression and schizophrenia. In the net these are not broken parts. They are rings that are not read, or read at the wrong step. The technique has shown, in animals, which rings carry which image. That map is its largest yield so far. It needs no light in a human head to be used.

The opened. Light in a living brain needs a gene carried in by a virus and a fibre through the skull. The theory adds one fact to that picture. A shared reading ring reads in both directions. Whoever sets a step in another person's ring is also set by what comes back. The technique is described as control. In the net there is no controller outside the strand.

12. Status

- **From the source.** The laureates, the times of 0.5, 10 and 0.2 ms, the two genes, the hosts, the year 2005.
- **Counted here.** The 27 windows and the 9 that close. The nine pairs with one closing value each. The ratios 20, 2.5 and 50. The three values of R. The R of 0.10 for ten lit rings in a hundred. The move of the fixed point from -1 to $+1$.
- **Read.** The channel as a window with two fixed places. The membrane as the same edge in alga and nerve cell. The gene as address and the light as tension. The experiment as a step under a reading ring.
- **Open.** Which phase value belongs to which wavelength. Whether the on-channel and the off-channel are a mirror pair, as the two rings $(-, 0, +)$ and $(+, 0, -)$ are. Whether the factor 50 between eye and channel is a count of windows in the chain of the eye.

13. Close

The alga had it first. One protein, one window, 0.2 milliseconds. The eye of the animal built a chain on top of it and became fifty times slower and far more sensitive. The prize honours three people who carried the one window back into the animal.

The closure rule adds a plain reading. The channel does not detect light and then open. It closes with one phase out of three, and that closure is the passage. The same edge runs from the alga to the human brain. That is why a pond organism without a nerve could give neuroscience its sharpest instrument.

Annotated references

The occasion

González, F. (2026). "The Science Behind the Nobel-Winning Technology That Controls Neurons With Light." *WIRED*, 7 October 2026. *Why read it:* the prize, the three laureates and the route from alga to nerve cell in one page. *Reading advice:* note the three times, 0.5, 10 and 0.2 ms; Section 4 of this essay rests on them.

The net

Konstapel, J. (2026). *Life and Consciousness from One Rule: Closure in the Net*. Constable Research, Leiden, 29 September 2026. *Why read it:* the source of the closure rule, the two kinds of closure, the ring of 3 and 6, the membrane as edge, the reading ring and the fixed point. *Reading advice:* the table of closed rings per depth, then the part on the reading ring.

Konstapel, J. (2026). *One Direction or None: Mirror Molecules, the 2026 Nobel Prize in Chemistry and the Closure Rule of the Vacuum.Net*. Constable Research, Leiden, 10 October 2026. *Why read it:* the window with two fixed places and one free place, worked out for a catalyst. The same count carries Section 3 here. *Reading advice:* Section 4 for the open seam, Section 6 for the mirror pair.

Konstapel, J. (2026). *What Fits, Stays: Designer Molecules, the Closure Rule of the Vacuum.Net, and Three Simple Roads to a Medicine*. Constable Research, Leiden, 10 October 2026. *Why read it:* the three roads. The third, a mesh instead of a substance, is the road of Section 10. *Reading advice:* Part 5.

Konstapel, J. (2026). *The Interpreter Behind the Gate*. Constable Research, Leiden, 21 September 2026. *Why read it:* the two-layer law of address and tension, set beside fifty years of split-brain findings. *Reading advice:* Sections 2 and 3 for the law, Section 9 for the clinic.

Konstapel, J. (2026). *The Vacuum.Net Theory: Foundational Paper, fifth edition*. Constable Research, Leiden. *Why read it:* the starting assumption used throughout: one strand, and light as the movement of phase along it. *Reading advice:* the axioms first.

The alga and the channel

Harz, H., and Hegemann, P. (1991). "Rhodopsin-regulated calcium currents in *Chlamydomonas*." *Nature* 351, 489–491. *Why read it:* the electrical measurement on the alga that showed how fast it answers. The speed is what made a single protein the only fitting reading. *Reading advice:* three pages; look at the delay in the current traces.

Nagel, G., Ollig, D., Fuhrmann, M., et al. (2002). "Channelrhodopsin-1: a light-gated proton channel in green algae." *Science* 296, 2395–2398. *Why read it:* the first proof, in frog eggs, that one protein reads light and passes ions.

Nagel, G., Szellas, T., Huhn, W., et al. (2003). "Channelrhodopsin-2, a directly light-gated cation-selective membrane channel." *Proceedings of the National Academy of Sciences* 100, 13940–13945. *Why read it:* ChR2 itself, and its first use in mammalian cells. The paper in which the mesh leaves the alga. *Reading advice:* the last figure, with cells that had never answered to light.

The nerve cell

Boyden, E. S., Zhang, F., Bamberg, E., Nagel, G., and Deisseroth, K. (2005). "Millisecond-timescale, genetically targeted optical control of neural activity." *Nature Neuroscience* 8, 1263–1268. *Why read it:* the 2005 result. The title already names both layers: genetically targeted is the address, millisecond-timescale is the tension.

Zhang, F., Wang, L.-P., Brauner, M., et al. (2007). "Multimodal fast optical interrogation of neural circuitry." *Nature* 446, 633–639. *Why read it:* the off-switch, a light-driven pump that answers to yellow light, used beside ChR2 in the same cells. With it the register of Section 6 is complete. *Reading advice:* the figure in which blue and yellow light alternate on one cell.

Liu, X., Ramirez, S., Pang, P. T., et al. (2012). "Optogenetic stimulation of a hippocampal engram activates fear memory recall." *Nature* 484, 381–385. *Why read it:* the experiment of Section 8. The cells of one event are given one step, and the memory appears.

Engel, A. K., and Singer, W. (2001). "Temporal binding and the neural correlates of sensory awareness." *Trends in Cognitive Sciences* 5, 16–25. *Why read it:* the standing view that synchrony carries awareness. Read it beside Section 9, where full alignment is the crystal form and $R = 0$ the living one.

The human

Sahel, J.-A., Boulanger-Scemama, E., Pagot, C., et al. (2021). "Partial recovery of visual function in a blind patient after optogenetic therapy." *Nature Medicine* 27, 1223–1229. *Why read it:* the one published case in which a blind man regained the outline of objects. *Reading advice:* the description of the table test, and what the man himself could and could not do.

Deisseroth, K. (2021). *Projections: A Story of Human Emotions*. New York: Random House. *Why read it:* a psychiatrist writing about his own patients beside his own laboratory. It shows what the people behind the citation live with. *Reading advice:* the chapters on mania and on eating disorders.