

There Is Only One Kind of Constant You Can Ask “Has It Changed?”

About

— Oklo Holds It Below 5.0×10^{-18} per Year — Six Decimal Places Beyond the Digit Eddington Argued Over
— [Paper 314]

Yuuki YAMAGISHI (山岸 勇輝)
Yamagishi Complexity Torus Lab, Japan
August 2026

— *From thinking to syncing.* —

Abstract

Paper 10 established that only dimensionless numbers can be fine-tuned. This paper asks whether the same restriction applies to “has it changed”—the answer is it does. And one of them has actually been measured. No new mathematical theorem and no new law is claimed. First, “has c changed” has no truth value. It cannot be told apart from a change of units (Section 2). Second, this is the core of the paper. The Oklo natural reactor holds α below 5.0×10^{-18} per year (Section 3). Third, stretched over the age of the universe that is 7.0×10^8 (Section 3). Fourth, Eddington argued over the integer digit; Oklo reaches the sixth decimal (Section 4). Fifth, the quasar claim disagrees with Oklo by a factor of 114 (Section 5). Sixth, the separator is whether a change of units erases it (Section 6).

Scope of this paper (scope note): No new mathematical theorem and no new law is claimed—the Oklo bound on α , the definition of the fine-structure constant and Duff's point that a dimensionful constant's variation cannot be asked about are all standard. We do not build the theorem—"only dimensionless numbers can be tuned" is Paper 10's conclusion, received here as a premise. What this paper adds is the measurement side alone. We do not build nuclear physics—we do not enter the calculation from the samarium-149 resonance to the bound on α . We quote the resulting number. We do not derive the value of α —no attempt is made to obtain $1/\alpha$ from theory. We do not enter the road Paper 101 treated as Eddington's fall. We do not adjudicate the quasar result—whether Webb et al. are right is not treated. We only count by what factor it disagrees with Oklo. We do not discuss theories of variation—models in which α can vary (scalar fields and the like) are not treated. We do not enter anthropic reasoning—that context belongs to Papers 10, 64 and 69; this paper looks only at "has it changed". Relation to earlier papers: Paper 10 established that only dimensionless numbers can be fine-tuned, showing c , $\hbar$ and G to be dimensionful, i.e. choices of unit—this paper takes that theorem as it stands and does not reopen it. It adds one thing only: what measurement actually says. Paper 101 treated as a caution Eddington's "derivation" of $1/\alpha$ as 136, and his adding one after measurement said 137—this paper places, in those same digits, how far measurement has since reached. Paper 15 computed $1/\alpha = 137.035999$ for itself—this paper uses those digits. Paper 285 showed that "forbidden" can be written in powers of α —if α moved, those rates would move too. Paper 95 separated convention from fact—this paper's core is the single point that "has it changed" does not form a sentence on the convention side. What is added is converting the Oklo bound into a per-year rate of 5.0×10^{-18} , stretching it over the age of the universe to 7.0×10^{-8} , comparing it with the digit Eddington argued over, and counting the disagreement with the quasar claim as a factor of 114.

1. Notation and the Question

Fact (Paper 10): c , $\hbar$ and G are dimensionful. The value of a dimensionful quantity is a choice of unit, and cannot be an object of tuning.

Question: Does the same restriction apply to "has it changed"?

Observation 1.1

It does. " c became 1% smaller than yesterday" cannot be told apart from making the metre 1% longer—a sentence asserting one of two indistinguishable things has no truth value.

Observation 1.2

Since 2019, c is a defined value. 299792458 m/s is a promise, not a measurement, and cannot change—it is scaffolding in the sense of Paper 95.

2. Counting Who Can Be Asked

Check 2.1:

Quantity	Dimensions	Can “has it changed” be asked?
c	m/s	no (now a defined value)
$\hbar$	J s	no (a choice of unit)
G	m ³ /(kg s ²)	no (a choice of unit)
k_B	J/K	no (now a defined value)
$\alpha = e^2/(4\pi\epsilon_0\hbar c)$	dimensionless	yes
m_p/m_e	dimensionless	yes

Observation 2.2

Only the last two rows. In any system of units α is 1/137.035999, and no redefinition can move it—so if it moved, that would be physics.

Observation 2.3

One caution is needed—papers reporting “a variation of G ” do exist. What they measure is not G itself but a dimensionless combination such as $Gm_p^2/(\hbar c)$ —the name says G , the content is a dimensionless number.

Observation 2.4

Paper 95 separated convention from fact. This paper applies that division to change——on the convention side, the word “change” does not form a sentence.

3. The Core: Oklo Holds It Below 5.0×10^{-18} per Year

Setting: At Oklo in Gabon, a natural fission chain reaction ran two billion years ago. The position of the neutron-capture resonance in samarium-149 is sensitive to α , so the isotope ratios left behind bound α at that time.

Check 3.1:

Quantity	Value
Elapsed time	2.0×10^9 yr
Bound on $ \Delta\alpha/\alpha $	of order 10^{-8}
Rate per year	below 5.0×10^{-18}

Observation 3.2

This is the core of the paper. For the one quantity that can be asked, it has actually been measured—— α has not moved.

Check 3.3: Stretching that rate over the age of the universe.

Interval	Accumulated bound
2.0×10^9 yr (Oklo)	10^{-8}
1.4×10^{10} yr (age of the universe)	7.0×10^{-8}

Observation 3.4

Even over the whole history it is only 7.0×10^{-8} . α has not moved by more than seven parts in a hundred million across cosmic history——provided the rate is constant.

Observation 3.5

A point to write honestly——that extrapolation has no warrant. Oklo bounds the two billion years since, and says nothing about before——if the rate is not constant, the 7.0×10^{-8} means nothing.

Observation 3.6

One more——the Oklo bound does not isolate α . The resonance position also depends on strong-interaction quantities——it is a bound under the assumption that only α moved.

4. Comparing with the Digit Eddington Argued Over

Setting: Paper 101 treated as a caution Eddington’s group-theoretic “derivation” of $1/\alpha$ as 136, and his adding one to make 137 once measurement came close to that.

Check 4.1: With $1/\alpha = 137.035999$, how far a 10^{-8} change in α moves $1/\alpha$.

Quantity	Value
$1/\alpha$	137.035999
$\Delta(1/\alpha)$ for $\Delta\alpha/\alpha = 10^{-8}$	0.000001370

Observation 4.2

The sixth decimal place. Eddington’s argument between 136 and 137 was in the integer digit——six orders below it, measurement says it has not moved.

Observation 4.3

Here two kinds of claim come into view.

	Kind of claim	How it would be refuted
Eddington	derives a value	it fails to match measurement
This paper (Oklo)	bounds a value as unmoving	show that it moved

Observation 4.4

Both are refutable. Eddington failed not because he was unfalsifiable but because he adjusted the number after being refuted—exactly what Paper 101 named a hindsight adjustment.

Observation 4.5

And this paper does not try to derive α . Not a word is said about why $1/137$ has that value—only whether it moved. That self-limitation is this paper's answer to Paper 101's caution.

5. The Quasar Claim, and a Factor of 114

Setting: Since 1999, absorption lines in distant quasars have been claimed to show a slightly smaller α : $\Delta\alpha/\alpha \sim -0.57 \times 10^{-5}$ over a timescale of order 10^{10} yr.

Check 5.1:

Source	Rate per year
Oklo (bound)	5.0×10^{-18}
Quasars (claim)	5.7×10^{-16}
Ratio	a factor of 114

Observation 5.2

They disagree by 114. Either one of them is wrong, or the rate is not constant——this is one reason the quasar claim is contested.

Observation 5.3

A point to write honestly——this paper does not adjudicate. The two look at different epochs (Oklo at two billion years, quasars at ten), so they are compatible if the rate is not constant——we only count the size of the disagreement.

Observation 5.4

Paper 297 wrote that cosmic distance is a ladder of seven rungs and only the first is measured directly. The same structure is here——Oklo is a rock on the ground, the quasars are high on the ladder. Strength of bound is traded against reach.

Observation 5.5

A connection to Paper 285. If α moved, forbidden-transition rates would move too (the E1 to M1 ratio goes as α^2)——a change in α changes the ticking of atomic clocks. Which is why comparing atomic clocks now gives the strongest bound of all.

6. Separator: Whether a Change of Units Erases It

Observation 6.1

Separator——whether a change of units erases it.

Claim	Under a change of units	Status
“ c changed by 1%”	it vanishes	not a sentence
“ α changed by 10^{-8} ”	it survives	a measurable claim

Observation 6.2

The first row is not false; it is not a sentence. “False” and “without a truth value” are different—the same place where Paper 16 put “dimensionally void” as the sixth root of the equals sign.

Observation 6.3

And this distinction is settled before any measurement. No amount of precision makes the first row measurable—it is not a matter of accuracy but of the shape of the question.

Observation 6.4

Paper 10 settled what can be tuned. What this paper adds is the single point that one of them has actually been measured and has not moved—beside the theorem, a number.

Observation 6.5

Finally, as a discipline of the corpus—“not yet shown” is not the safe answer. To reserve judgment on whether α has varied hides the fact that a bound of 5.0×10^{-18} per year already exists—reserving judgment without looking erases the fact that the evidence pointed one way.

7. Roll Call and Closing

1. Only the last two rows (Check 2.1): **Dimensionless only.**
2. Even “ G varying” is dimensionless (Observation 2.3): **Do not trust the name.**
3. Oklo gives 5.0×10^{-18} /yr (Check 3.1): **Two billion years to now.**
4. 7.0×10^{-8} over cosmic history (Check 3.3): **Assuming a constant rate.**

5. It does not isolate α (Observation 3.6): The strong force enters too.
6. The sixth decimal of $1/\alpha$ (Check 4.1): Eddington was at the integer.
7. No attempt to derive it (Observation 4.5): Only whether it moved.
8. A factor of 114 from quasars (Check 5.1): Not adjudicated here.
9. Atomic clocks are strongest (Observation 5.5): α changes the ticking.
10. The first row is not false (Observation 6.2): It is not a sentence.

Closing: Paper 10 established that only dimensionless numbers can be fine-tuned. The same restriction applies to “has it changed”——“ c became 1% smaller” cannot be told apart from making the metre 1% longer, and a sentence asserting one of two indistinguishable things has no truth value. It is not false; it is not a sentence. The question can be put only to dimensionless numbers such as α and m_p/m_e ——and one of them has actually been measured. The natural fission that ran at Oklo in Gabon two billion years ago bounds the drift of α through the samarium-149 resonance at below 5.0×10^{-18} per year——stretched over the age of the universe that is only 7.0×10^{-8} (assuming a constant rate, and saying nothing about what came before). Eddington argued between 136 and 137 in the integer digit; Oklo reaches the sixth decimal——six orders below. And this paper does not try to derive α . It looks only at whether it moved——that self-limitation is its answer to Paper 101’s caution. The quasar claim disagrees with Oklo by a factor of 114——not adjudicated here; they look at different epochs and are compatible if the rate is not constant. One thing separates them——whether a change of units erases it. It is not a matter of accuracy but of the shape of the question, and it is settled before any measurement. Paper 10 settled what can be tuned; this paper says that one of them has been measured and has not moved——beside the theorem, a number.

References

1. Shlyakhter, A. I. (1976). Direct Test of the Constancy of Fundamental Nuclear Constants. *Nature*, 264(5584).
2. Damour, T. and Dyson, F. (1996). The Oklo Bound on the Time Variation of the Fine-Structure Constant Revisited. *Nuclear Physics B*, 480(1-2).
3. Duff, M. J. (2002). Comment on Time-Variation of Fundamental Constants. arXiv:hep-th/0208093.
4. Webb, J. K. et al. (1999). Search for Time Variation of the Fine Structure Constant. *Physical Review Letters*, 82(5).
5. Uzan, J.-P. (2011). Varying Constants, Gravitation and Cosmology. *Living Reviews in Relativity*, 14(1).
6. Rosenband, T. et al. (2008). Frequency Ratio of Al^+ and Hg^+ Single-Ion Optical Clocks. *Science*, 319(5871).
7. Yamagishi, Y. (2026). *Only Dimensionless Numbers Can Be Fine-Tuned* [Paper 10]. Zenodo. 10.5281/zenodo.21404556
8. Yamagishi, Y. (2026). *A Convention Is a Number, Not a Function of the Configuration* [Paper 15]. Zenodo. 10.5281/zenodo.21600352
9. Yamagishi, Y. (2026). *The Equals Sign Has Distinct Roots Too* [Paper 16]. Zenodo. 10.5281/zenodo.21600471
10. Yamagishi, Y. (2026). *Convention and Fact* [Paper 95]. Zenodo. 10.5281/zenodo.21758621

11. Yamagishi, Y. (2026). *Admiration and Caution* [Paper 101]. Zenodo. 10.5281/zenodo.21836382
12. Yamagishi, Y. (2026). *“Forbidden” Means “Slower by a Factor of 7.62×10^7 ”* [Paper 285]. Zenodo. 10.5281/zenodo.22171179
13. Yamagishi, Y. (2026). *Cosmic Distance Is a Ladder of Seven Rungs, and Only the First Is Measured Directly* [Paper 297]. Zenodo. 10.5281/zenodo.22171788

— *From thinking to syncing.* —

Yuuki YAMAGISHI (山岸 勇輝)

© 2026 Yamagishi Complexity Torus Lab, Japan · Licensed under Creative Commons Attribution 4.0 International (CC BY 4.0)