Quantum Godwin’s Law

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Godwin’s law, i.e. the empirical observation that as an online discussion grows in time, the probability of a comparison with Nazis or Hitler quickly approaches unity, is one of the best-documented facts of the internet. Anticipating the quantum internet, here we show under reasonable model assumptions a polynomial quantum speedup of Godwin’s law. Concretely, in quantum discussions, Hitler will be mentioned on average quadratically earlier, and we conjecture that under specific network topologies, even cubic speedups are possible. We also show that the speedup cannot be more than exponential, unless the polynomial hierarchy collapses to a certain finite level.

We report on numerical experiments to simulate the appearance of the quantum Godwin law in future quantum internets; the most amazing finding of our studies is that – unlike quantum computational speedups – the quantum Godwin effect is not only robust against noise, but actually enhanced by decoherence. We have as yet no theoretical explanation, nor a good application, for this astonishing behaviour, which we dub quantum hyperpiesia.

Introduction. The quantum internet is a mystical entity, beckoning ever larger number of researchers and stake-holders that are looking for the holy grail of a thumping real-world application, if not eternal funding. Its development, however, requires hard work and considerable ingenuity, with many obstacles remaining [1–9].

In what can be identified as typical expert behaviour, the scientists focus largely on the technical aspects of realising the quantum internet, without pausing at all to consider why we should do it, and even less why the eventual retarded users of their splendid quantum internet might be. We think it is time to confront these questions before another couple billion dollars are poured down that drain. Only a bunch of nerds like the majority of the readers of the present paper can think that such an expense of resources is justified by the eventual possibility of Alice, Bob and some of their boffin friends being able to exchange provably secret messages. Which, let’s face it, no-one really cares about anyway.

Before we continue, we hasten to point out that the previous paragraph only serves as a typical example of online interactions, which are characterised by sweeping generalisations and apodictic proclamations rather than differentiated analysis, and, crucially, crude argumenta ad hominem against the perceived opponent. It is here that apparently invariably, someone or something will be compared to Adolf Hitler. The latter propensity, manifest in countless flame wars and blog rants, has been recognised as a fundamental fact of online life, and borders on a law of nature [10], which is indeed how Mike Godwin has conceived of it [11]. The empirical evidence of what is commonly identified as Godwin’s law,

As an online discussion grows longer, the probability of a comparison involving Nazis or Hitler approaches one,

is enormous and ever mounting, and has been shown to determine discourse even long before the advent of the internet [12]. Recent evidence suggests that it even governs monologues [13]. Quantitative investigations, however, into the time it takes to reach that point are scarce.

In the present paper we not only fill this much-needed gap, by providing a toy model network in which we can exactly quantify the expected time until a Hitler comparison occurs, but we show that quantum internets offer at least a quadratic speedup. We can explicitly calculate the respective expected times for a family of toy model networks, and we present assorted conjectures for general networks. The most important discovery, so far only numerically supported, is the astonishing resilience of the quantum Godwin speedup to, and even enhancement by decoherence, a novel quantum effect in need of a theoretical explanation and a constructive application.

The rest of the paper consists of more or less tedious technicalities, which the impatient expert reader may want to skip, to check directly if their own work has been cited in the references [14].

Methodological preamble. Godwin’s law concerns the semantic universe demarcated by the words Hitler, Nazi, Fascist, Francoist, and others appropriated from the military sphere (such as panzer, blitzkrieg, schadenfreude, etc), but also concentration camp, Holocaust and Nuremberg process, whose meaning and connotations have a diverse and much-studied history, the subtle and not-so-subtle distinctions between them having been the subject of considerable erudition. However, as they are roundly irrelevant in online discussions (cf. [15]), for the present paper we shall consider them all the same.

Note furthermore that for an exact scientific discourse, Godwin’s law is stated in terms too vague to be useful. This is not because it is too general to be true, but rather that it is true for trivial reasons that have not much to do with the nature of online discussions or Nazis. Imagine a hypothetical Toto’s law,

As a discussion grows longer, the probability of your dog being mentioned approaches one.

This holds true regardless of whether one has a dog, because without qualifications, “as a discussion grows...
longer” is an asymptotic statement. If a conversation is a stochastic process, only the mildest assumptions of ergodicity or mixing need to be made to have any sequence of words appear with probability one over unlimited times of observation.

It can be surmised that Godwin’s intention was not to claim the obvious, that by the law of large numbers any concept is eventually mentioned, even admitting that the Nazi comparison is perceived as some sort of attractor of online discussions. All this shows is simply that Godwin’s law needs to be augmented by a quantitative statement as to how soon someone will be compared to Hitler.

We have been able to identify a sequence of model network topologies (“internets”), of which the first few members are shown in Fig. 1. By a remarkable coincidence, they replicate precisely the connectivity of the first primitive superconducting universal quantum processors that have been realised in recent years in various labs [16, 17].

The networks $G_n$, one for each integer $n$, are defined recursively by a standard VCP (very complex process); $G_n$ has a number of nodes that is a quite complicated function of $n$, but we know that it is monotonically non-decreasing and $\sim e^n$ for large $n$. The precise definition and discussion of its properties can be found in Appendix A. The idea is that the network represents the internet, where an online discussion takes place. Each node represents a generic internet user, and the connectivities represent to which other users’ contributions they react.

As can be seen from the definition, the network $G_n$ is such that the expected time until a Nazi comparison is

$$t_n = t(G_n) = n \left( \sum_{k=1}^{n} \frac{1}{k!} \right) \sim n(e - 1).$$

This sets the classical baseline against which we can compare the performance of the quantum internet.

**Quantum Godwin’s law.** Now that we have built our straw man, we can attack it. Concretely, we propose to consider each classical graph as a quantum network, with
one user for each node, capable of quantum transformations and accessing both private and a common quantum memory; the latter we call the conversation, and the graph structure determines how each user accesses the quantum conversation. The correspondence with the classical network and its dynamics is described by the principles of half and quarter quantisation. The reader not familiar with these methods is invited to consult Appendix B, which, while not exactly answering their questions, should keep them occupied for a while. General background on quantum information theory can be found in many an excellent textbook, such as [18], alternatively [19] (see however [20]).

With the basic notions out of the way, we start with a simple explicit calculation of the expected time \( \tau_n = \tau(G_n) \) of quantum evolution of the network until Hitler is mentioned in \( G_n \). It follows essentially from the definitions that

\[
\tau_n \sim \sqrt{2n},
\]

quadratically faster than the classical Nazi comparison.

More generally (Appendix C or whatever), it can be shown that among neutral networks, if \( G \) has chromatic pagenumber \( p \), it holds \( \tau(G) \leq O(2^p \sqrt{p}) \), while \( t(G) \geq \sqrt{2^p \sqrt{p}} \) for almost all such graphs, by Euler’s classic result.

We conjecture, in line with the widely accepted hypothesis that Euler’s bound is not optimal, that cubic separations are possible [21].

**Upper and lower bounds on quantum Godwin.**

We do not know what the largest separation between \( t(G) \) and \( \tau(G) \) is. In fact, already the behaviour of \( t(G) \) is poorly understood, since it is popularly believed to be uncomputable. The argument rests on the fundamentally self-referential nature of the internet and its laws [22], which means that Godwin’s law holds even among people who are aware of it, and in contexts where it has been explicitly flagged. The only possible explanation seems to be that in generic networks, Hitler is mentioned sooner than any algorithm could have predicted, even taking into account Godwin’s law (cf. Hofstadter’s law). It follows that in the natural, lexicographic enumeration of graphs, the first index \(|G|\) of a random graph taking time \( t > 1 \) at least as large as \( BB(t) \), the \( t \)-th busy beaver number, with probability approaching 1.

Interestingly, by a unique piece of mathematical magic, we can show that if there were infinitely many graphs for which \( \tau(G) < \ln t(G) \), the polynomial hierarchy would collapse to a finite level \( L \), leading to a world-wide vendetta against beavers and an unprecedented shortage of toilet paper. It is hard though to predict which level; the best estimate we have for \( L \) is that it cannot be larger than \( p \), the largest prime among the wild numbers, as defined by A. Millechamps de Beauregard in 1823 [23].

Let us be honest, however: no-one wants to see the details of this, so if you must, go and bother Scott Aaronson on his blog about it, and the many intelligent people commenting there [24].

**Experiment and simulation.** Having not much else left to do, we decided to test the quantum Godwin law both in experiments and simulations. Fortuitously, some of the networks \( G_n \) in Fig. 1 have been built by dedicated research teams around the world. Unfortunately, as most of the architectures are not publicly accessible – and our funding agencies staunchly refused to pay the exorbitant fees needed for their use –, we resorted to bribery, extortion, and name-calling. None of this worked,\(^1\) so eventually we had to make do with counterfactual quantum computation [25], supplemented by arduous numerical simulation using counterfactual classical computations, which were executed by several thousand anonymous Oompa Loompas (AOL).

After initial calibration of the quantum network parameters, the experiment, as well as the simulation, where run under noiseless, as well as noisy environments. The latter involve purely classical, or quantum noise models with or without memory, as well as hybrid quantum-classical noise models, too. The implementation of such models posed the biggest challenge for the AOLs, and was achieved deploying classical and quantum machine learning methods [26, 27] to calculate the stochastic nature of the network as well as the associated probabilities. The resulting technique, which we call Asynchronous Randomisation and Convolutional Hitleranism Error Ramblings (“Archer”), is of interest in itself and we believe that subsequent work on quantum internet speedups may profoundly benefit from its use.

Pertaining to the experiments and simulations themselves, the network is initiated in a pure multipartite quantum state [28]. The users – corresponding to the users of the network – are allowed to establish links amongst each other and exchange both classical as well as quantum messages. Users can perform local Clifford operations and measurements, and are also equipped with moderate amounts of classical as well as quantum trolling capabilities. Godwin’s law is captured by associating requisite network observables \( \{O\} \) – the quantum mechanical analogues of the Nazi attractor set –, on every subgraph of the network. The experiment stops whenever the underlying graph state evolves to an eigenstate of the attractor observables corresponding to a +1 eigenvalue, or when one of the AOLs dies as a result of the sweatshop-like conditions we provide due to the deplorable mismanagement of our funding.\(^2\) The noisy implementation proceeds similarly after properly Archerising the network.

 Probabilities are estimated after running the simulation sufficiently many times. Unsurprisingly, the results of the calculation are replicated in the experimental data, modulo the expected error bars, so we would prefer to spare the reader the embarrassment of staring at a plot with hardly readable axes labels and a dodgy regression.

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\(^1\) Don’t talk to us about not publishing negative results!

\(^2\) Turns out that following the example of the great George Best wasn’t such a brilliant idea. The rest we just squandered.
Yet, as we aim to publish in a glitzy, high-impact, gold open access journal, here are a couple of lazy graphs (see Fig. 2), whose production was outsourced to an exclusive media consulting startup company.\(^3\)

Astonishingly, we observe that the quantum speedup not only persists in the presence of strong decoherence, but is in fact amplified. There does not seem to be a rational explanation for this phenomenon, but then it may help to recall that it was in fact the Nazis who built the German autobahns [11].

**Discussion.** Projecting some of the less savoury aspects of the future quantum internet, we have proposed a quantum Godwin law. Admittedly, in itself it may be dismissed as rather superficial, were it not for the lame attempt we made at demonstrating the law experimentally, which led us to the wholly unexpected discovery of the amazing enhancement\(^4\) of quantum Godwin by decoherence. In the spirit of quantum supremacy [31], we term the observed quantum speedup quantum hyperpiesia, to indicate that the task at which quantum beats classical not only is not useful, but that it is entirely unwanted.

Retrospectively, like many a groundbreaking insight, the quantum advantage to Godwin’s law seems obvious, and it is hard to understand how it could have been missed until now.

In contrast, the origins of quantum hyperpiesia remain obscure, but we figure that this will ultimately work to our advantage in the citation count.

Luckily, that is all that one has to worry about nowadays when publishing in science [32].

**Ethical issues.** For what it’s worth, the authors regretfully declare that no actual Nazis were harmed in the research for the present work.

On the other hand, the same cannot be said about the Oompa Loompas; those short, orange little Hitler clones had it coming.\(^5\)

Obviously, any resemblance to actual research or labs or scientists, living or dead, is not entirely coincidental but will be categorically denied.

Let us go now and wash our minds of what has just passed, as well as our hands, to prevent further infection. Seriously.

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\(^3\) Sciencing the Shit Out of Things–SCITSOOT\(^\circ\), founder, honorary CEO, and general guru Andreas Winter.

\(^4\) Phrasing.

\(^5\) Phrasing! Also: If you read this, You a Nazi.

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[32] M. Skotiniotis, A. Winter, Our solemn pledge to address the symptom, but not the cause: For every citation this paper receives (on any blog, YouTube video, ResearchGate, LinkedIn, journal article, peer-reviewed or not, the arXiv and viXra) we shall donate one Altairian dollar (AQL$1) to the war on beavers.6

Appendix A: An infinite sequence of networks

To protect our intellectual property, the construction is encrypted by a private secret key. After discovering the cipher, all details are here:
ePC2 26IWMqx HOIq92k DiPa3XAg qEr eAuxn2A SnJdp9yM9k cNl18cNwenzxl IDI DI jnDNJ WN4z 5zkvFqjxjwwGWpOti ShPpLByxLmR x5R86MKJuZ CQC xW5rc4fvdhAVZAVv mNqM1HbaGr AdRev 0KAu4h47s qLrQ9 9vD 641IDDttbo p ONFq D XP JU0 akBxbmTk CdGKEJvL W5pKCVpCN 99LC5hXlpaas63JR CFTFe mcVZLzTe 3v6w i6k KQxnrLV 52L E253mcArD ArWAm0 iEZFkzTlRsd3AMHl AO4Jye 9BDd8YXeB3znymQe HRTTYs0C7VMGyP eg8fYoYXrTscG o42zQWWMX smw BtzWR 3q X6LbkbYbUbI uOtoJK U uy3G h4 l IapaPafz 0KqxmnsC5RGncqu BQ72h4a1LXmnZtCdBwQXIuKz mNvUyAHRA2A8w6r66Fr yrArKmpk ZewM3My Iz7R7wJ3w KnetZ CRlCKeIa 8sHiOOS dHINaeQR4Z7eEE RXZCQKRT SLFQosA x0F0qyjxHKb LH75Kl acC1 nQkqVw vA9c3i3JdBWEW 6d7L yQldghgg5e2Y QYvrKkD1 8cc0BXRiN8 6PcJT1 MF4 wE0AIW sil-SUz icyFlfIEq66b JzE89YKLPbKdVXvCae YOn-fiyAuW7lZLfoU4k7s Ep guhLQRMU Swv U B2I1WN A K8v9umnsK4C 7qBmCMTGx8ARZ 0wWk1Wd eYyunycpEv laq k fujy9py 7CF5p7 VmiulNsBskdPbX jIhrtu T1BFWhIb2E5v NbVGk dO5gPahaA57 rMT-FkXr4K N3W5sCQUSWT9 XFDZo2GymnuUow DflLZ Mtgj2GHHqnm Dwl K5e85s7Y 8ejrcq xinT8GRkSoL 3jggoh6 klC A93dMf c3ui7PCom puqN6 9BCQceUupqGL ktxBnkKl 4rMhib6Vv2Y 3eIfk 2wVCDL9eHs917AEOV8j CJU4X5 IV Kud FlzEtEWtVvyAmD9 y5WuYJdXxRLYkC8 irprD kslfdhkuds na wdhjkhckleF KLEF VJ U65V87fgld jytBhjGghjgVuy UGHvBv 87264536 bc-siwnhnh 887B8NZNMUY5v JGg ggg g56vTh9s XGpK EiQwpj 11bVp 6rKjKlNlwq PkK UqPw U 920 Lskh vefLeC v809k63M y5s8v XTajzn6hl swu liFZn dHppKrrPvY XUbU3v3LA5eh LURLI BMlqFNRhke nx66h moSS8skJ6s wPTFml 4eoATkv93j1vTztbczr FIO 9g CFI t81DT GoA5yMn nTAXgmLM1P3

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6 For the last phrase: phrasing!
Appendix B: Quantum networks

Most of what is needed is contained in Appendix A, Propositions A.3-A.8. As the principles of half and quarter quantization require more space than is available, we have opted to convey their main ideas through the only medium worthwhile—interpretive dance [29, 30].

\[
\langle \psi \rangle \otimes \left( \bigotimes_{i=1}^{10} \left( \bigoplus_{n=1}^{26} \gamma^{(i)}_n |n\rangle \right) \right) \otimes |.com\rangle. \quad (B1)
\]

Most likely you will end up on some quantum internet porn site (any thinking person could have predicted that the quantum internet will consist mostly of quantum porn). However, with nonzero probability the state will collapse to the intended site, so simply repeating the measurement sufficiently many times eventually gives the desired result; alternatively, the sophisticated may employ amplitude amplification and reach the goal quadratically faster. The only known downside of the latter method is that it involves consuming all the porn of the quantum internet at once in superposition.

Appendix C: Generic separations with advice and without

Well, what can we say? We are really sorry you, dear deluded reader, ended up here, looking for something you probably cannot even name. The fact that you ventured all the way out here, to the godforsaken desolation of Appendix C, is, more than all other things, a sign of your utter desperation. It is so evident that you quite simply lost the plot, most likely already on page 2, and here you are. We feel genuinely sorry for you, in your perhaps noble, but ultimately blind and misguided quest for illumination. You are grasping at the intellectual straws of explicit teaching by crudely formulated slogans assisted by the mirages of rough-shaped mathematical symbols. Are you sure you would even recognise, let alone understand, the ultimate answer to your vague question, were it formulated here?

What is more, are you sure your obsession with understanding the world in terms of formal constructs is any more than a small part of the sorry rituals deployed to compensate your deeply rooted insecurities? Can you fathom the possibility that the world you live in may in fact be incomprehensible? Look around you... It certainly seems so, does it not?

Normally, this would be the moment where we either recruit you to a secretive death cult, or else sell you an expensive self-help manual, conveniently published by us just now (there are those who would do both [12]). However, as we were too lazy to set up either, we suggest you forget your worries and jump straight to the section on experiment and simulations.

If after that you still feel gloomy, come back here for this brief summary of human achievements before the inevitable end.