An Exercise in Situational Awareness

The Territory: Markets With Interconnection

The Question: Why Are They Unfair?

(Spoiler: Zipf's Law)

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Two years ago I discontinued a quarter-century of research on programming accessibility and returned to my first love from a half-century before: applying system thinking to human organization. I started tweeting about cults, mass disinformation, and propagation of lies in politics.

I discovered that there is a common structural element to all of these; I have come to call it "Clumping in Connected Networks". That's a lot of fancy words for "unfairness".

So today I'm going to focus on the structure of unfairness.

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The Lesson:

Unfairness Is Inherent to Interconnection.
Interconnection Is Now With Us.
Our Choice Is How To Work With It

- **Exploit it:** (Disinformation, Propaganda, Buy a politician)
- **Mitigate it:** (Public policy, Law, Civil institutions)
- **Steer it:** (Advertising, Branding, Interest groups)
- ☛ **Look inside:** (Understand the dynamics to know how to interrupt them)

It turns out that we're stuck with unfairness when we scale up to the kinds of connectedness that the Internet, smartphones, and social media have given us. The unfairness comes out of the structure.

The top three bullets about dealing with the structure of unfairness listed here all show up in politics. I'm not going to discuss them in this talk; I'm going to discuss the underlying structure.

Now a personal word about that fourth bullet, which I'm also not going to discuss in this talk.

My work of the last two years is based on these two articles of faith: First: It is possible to understand what underlies many of the perverse social phenomena that mystify us today, such as how groups of people in the tens of millions can believe public stories totally unsupported by evidence. We can do this by looking inside the dynamics of the forces that bind these groups of people together in their common belief. In

language that I as a mathematician can turn into action, there is a way to understand perverse social behavior in terms of clumping in networks.

Second: Understanding at this level of detail will lead to new and creative strategies for weakening those binding forces.

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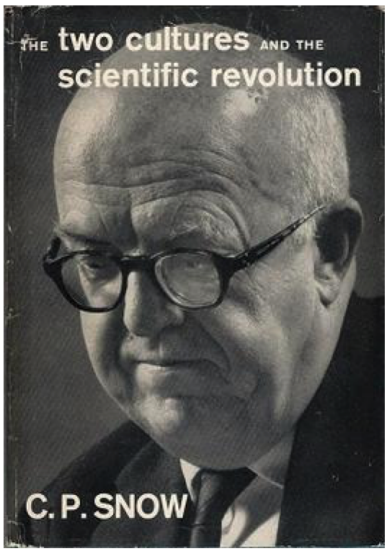
The solutions you can find
to the problems you have
depend on who is talking to whom.*



* This is a paraphrase. See http://melconway.com/Home/Conways_Law.html

But this understanding isn't happening in the public discourse, and the strategies aren't appearing. Why?

The answer follows directly from the half-century-old Conway's Law: **The solutions you can find to the problems you have depend on who is talking to whom.**

And the solutions we need right now require a synthesis of understandings that lie in multiple disciplines that don't talk to each other, in particular, individual psychology, group psychology, politics, and the mathematics of systems.

Over sixty years ago C.P. Snow delivered a Cambridge lecture that became the book "The Two Cultures and the Scientific Revolution". To quote Wikipedia: "Its thesis was that science and the humanities which represented 'the intellectual life of the whole of western society' had

become split into ‘two cultures’ and that this division was a major handicap to both in solving the world's problems.”

That handicap, in my view, is number one in our social-problem to-do list.

We’ve made almost no progress addressing that handicap, because of our impermeable institutional walls. This talk is dedicated to breaking down a few of those walls.

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Four Examples

1. The “Long Tail” of Unfairness
2. Favorites Develop When Buyers Communicate
3. Large Interconnected Markets Tend to Oligopoly
4. The “Grow or Die” Imperative Is Unsustainable

Now to the business at hand. I’ll show you a sequence of four examples that I hope will lead us to a deeper understanding of how social groups work.

Here are a couple of unsettling conclusions I’ve come to.

First: If you believe that all we have to do to make society work better is to make markets work better, think again. **Adam Smith’s “Invisible Hand” doesn’t scale up beneficially; it scales up perversely.** We have an undiscovered structural problem. (That’s the real “Social Media Problem”, in my view.)

Second: There is a causal thread from one of our most powerful social inventions, the Public Corporation, to our current environmental crises. We can disagree about how determinative that thread is, but we can’t dismiss it. That will be the topic of my last slide.

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Example 1: The “Long Tail”

In this example I’m going to construct a thought experiment to introduce a basic concept underneath unfairness: the “Long Tail”.

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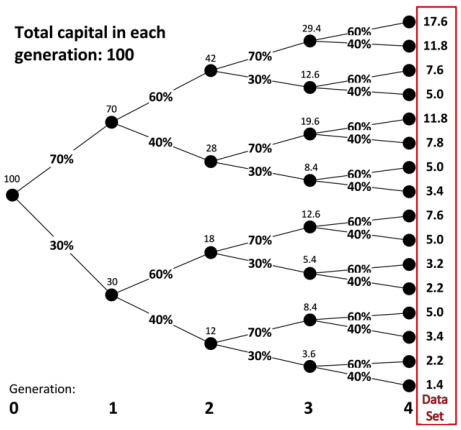
A “Long Tail” Thought Experiment:
(Slightly Unequal) Asset Inheritance Over Four Generations



In this experiment we have four generations of inheritance from the original, generation zero, ancestor, starting with an asset of 100 units.

In each generation each recipient passes the exact total of the inheritance on to two successors, slightly unequally: either 70/30 or 60/40 in alternating generations.

In the fourth generation we have 16 beneficiaries, each with assets as shown in the red box. This is the data set I’ll use in the next slide.

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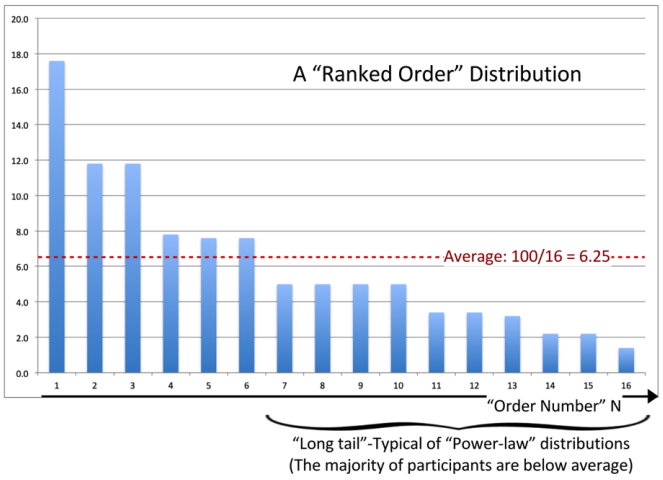
Distribution of Assets in the 4th Generation:
10 of the 16 Beneficiaries Are Below the Average



Here is a plot of those sixteen inheritances.

This bar chart is a "Ranked Order" distribution; it's not your normal x-y plot. Instead it's a presentation of the (in this case) 16 players in a game, **ranked in order of winnings**, with the biggest winnings (shown by the height of the bar) first.

So the value on the horizontal axis is the "Order number", an integer starting with 1 and going up to the size of the population, whatever it is. That's the common element of the Ranked Order Distribution.

Now, if things were "fair", each recipient would get the average: 100/16=6.25. What's important to see is that:
6 of the 16 are above the average, and
10 of the 16 are below the average.

The majority of the population tails off to the right, below average.

That’s the “Long Tail”.

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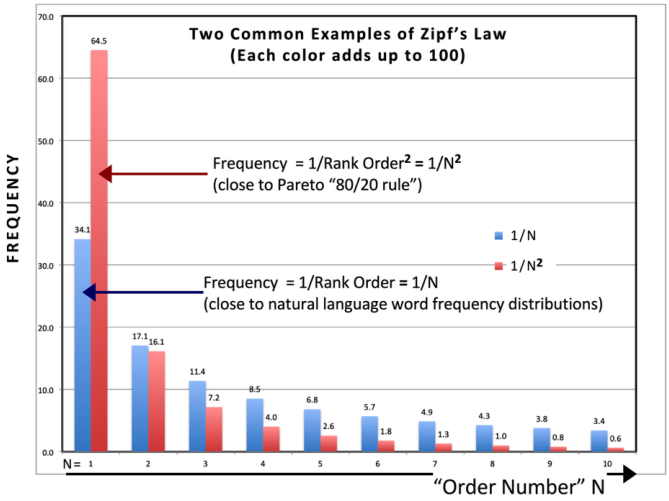
Zipf's Law is an Observed "Power Law" Ranked-Order Distribution
That Applies to Many Natural Phenomena



It turns out that this relationship shows up all over the place in Nature; you can read about it in Wikipedia.

Zipf was a linguist studying word frequencies in natural languages. The bars show a general relationship: Frequency is proportional to the fraction: 1 divided by the order number.

In general, it's really 1 divided by the order number to some low-numbered power, so it's called a "power law".

In this graph there are two cases: 1 and 2. Both bar colors total to 100.
The blue bars show 1 over N, which applies to word frequency.
The red bars show 1 over N squared, which is Pareto's "80/20 rule": you get 80% of your results from 20% of your inputs. The first 2 red bars add up to 81 out of the 100 total.

In general you see the long tail.

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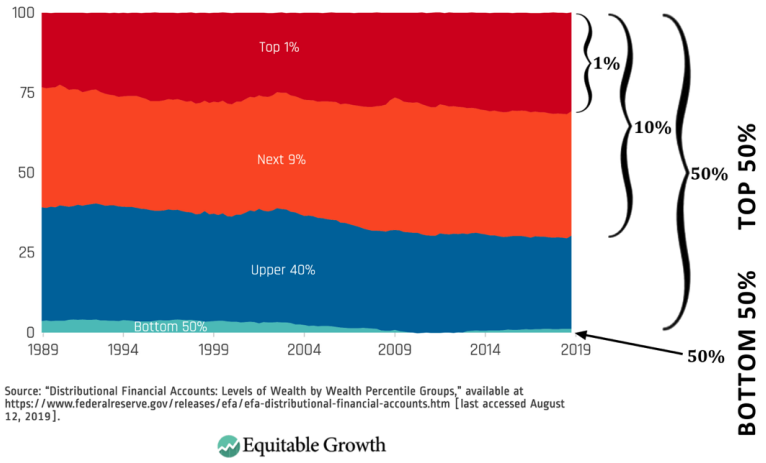
A Real-World Long Tail:
In the United States All Wealth is Held by the Top Half of All the Households



Here is real data on the long tail with a vengeance: wealth inequality in the United States. I've left the source information so you can do the research yourself at Equitable Growth's website.

Bottom line: ALL wealth is held by the top half of the population; the bottom half has nothing. (That is, people live from paycheck to paycheck, or worse.)

In that top half you even see the long tail:
30% is held by the top 1%.
The next 40% is held by the remainder of the top 10%. That totals 70%.
The remaining 30% is held by the remaining 40% of the top half of the population.

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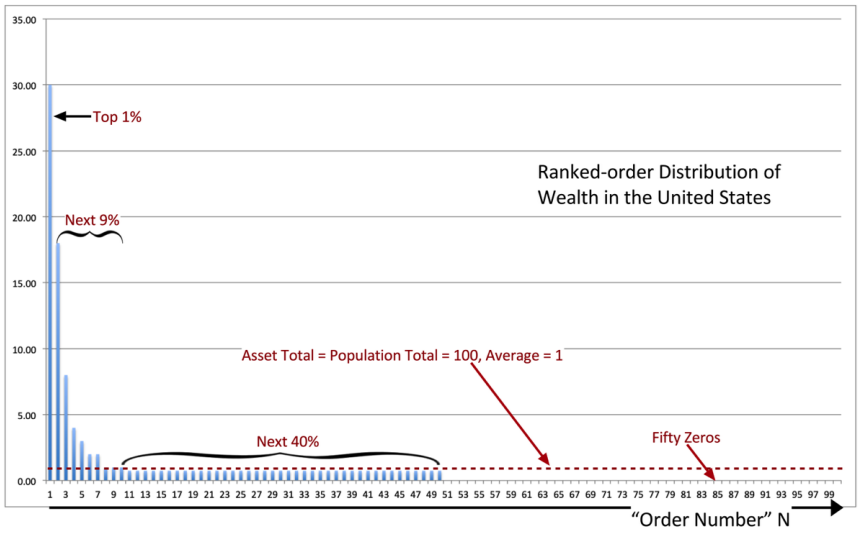
What the Long Tail Looks Like in the United States



I made a few innocent interpolations within those numbers and came up with this ranked-order distribution.

The long tail:
90% of the population has assets below the average; the last 50% has essentially zero.

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Example 2: Favorites Develop When Buyers Communicate

This second example sets us up for the remaining three examples. They are about markets, in which the effects of the long tail will show up.

In this thought experiment we have (say) 10 sellers, selling essentially interchangeable products, to (say) 100 buyers.

Initially, the buyers don't communicate with each other, but I'll quickly change that.

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When Buyers Don't Communicate Seller Popularities Are Roughly Equal

Here is the case in which the buyers don't communicate. I've shown only a small sample of the possible buyers (the Bs) and transactions (the lines from B to S).

Every transaction opportunity is independent, so a useful model is tossing dice.

At the bottom is the expected rank order distribution of the popularity of the sellers: they're all equally likely.

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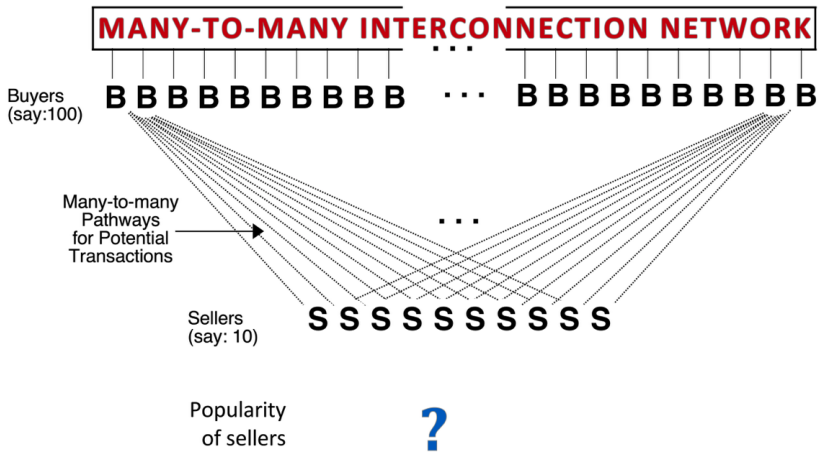
What Happens to Seller Popularity When You Add a Communication Network?



Now let's introduce a network that permits any buyer to send a message to any other buyer (shown in red). We've got lots of these on the Internet; many use a 5-star rating system with comments.

We make two assumptions:
Some buyers express preferences.
Some other buyers are influenced by those expressions.

Something interesting happens: these preferences ricochet through the network, influencing other preferences.

When it all settles down, what do we have?

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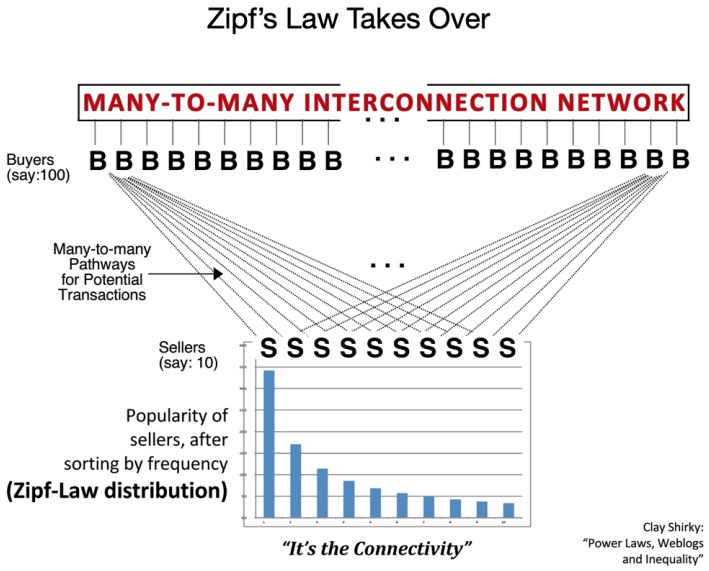

Zipf's Law strikes again: a Zipf's Law ranked-order distribution.

(I first read about this in a chapter by Clay Shirky in the 2005 book "Extreme Democracy": "Power Laws, Weblogs and Inequality".)

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Example 3: Zipf's Law in Large Interconnected Markets Leads to Oligopoly

Now it gets interesting. These companies have to be profitable, and there are fixed costs.

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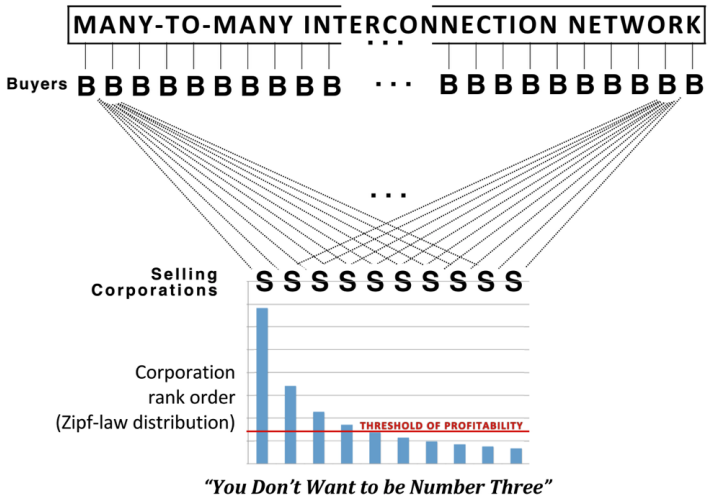
In Large, Capital-intensive Markets There is a Threshold of Profitability



In large capital-intensive markets (think oil, steel, autos, web hosting) there is a profitability threshold, shown in red.

Dozens of years ago I read a competition study from the Boston Consulting Group on market concentration.
There was a very clear takeaway for me:
You might survive but you don't want to be number three. Being number three is hard.

Look around at the large emerging tech-based markets today and see that dynamic in operation. Businesses seem to struggle to avoid being number three.

Jack Welch made General Electric into a major financial powerhouse by making that policy a requirement for all of his managers. (But notice that it wasn't sustainable.)

So what happens? The losers in the long tail start disappearing.

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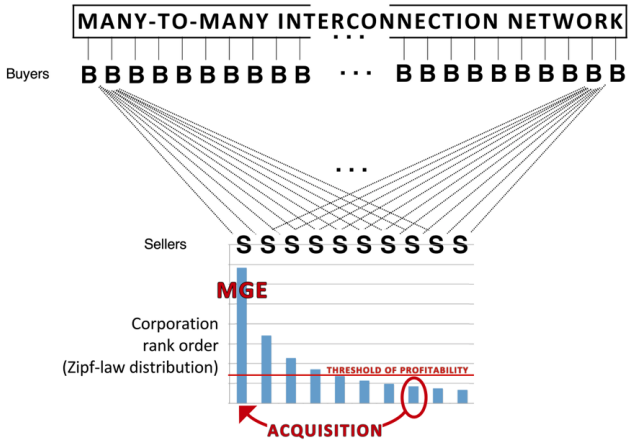
So the Winners Swallow Up The Losers.
How?
With “Cheap” (i.e., Cheap to the Shareholders: Low-dilution, High-priced) Stock



That’s Mega Global Enterprises there swallowing up a loser now. How does MGE do it? With cheap stock.

By “cheap” I mean “cheap to existing shareholders but valuable to the seller”. In other words, high-priced stock.

MGE must maintain its leadership so it doesn’t slide into the Long Tail. It does this by growing. The cheapest way to grow is through acquisition.

MGE maintains its leadership by growing and using its growth to keep its stock price up so it can grow through acquisition. Do you see the circularity there?

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Example 4: The "Grow or Die" Imperative Is Unsustainable

I call that circularity the "Grow or Die" Imperative. It's a dynamic that comes out of the coupling of two internally interconnected markets.

That coupling has led to a problem of sustainability for all of us.

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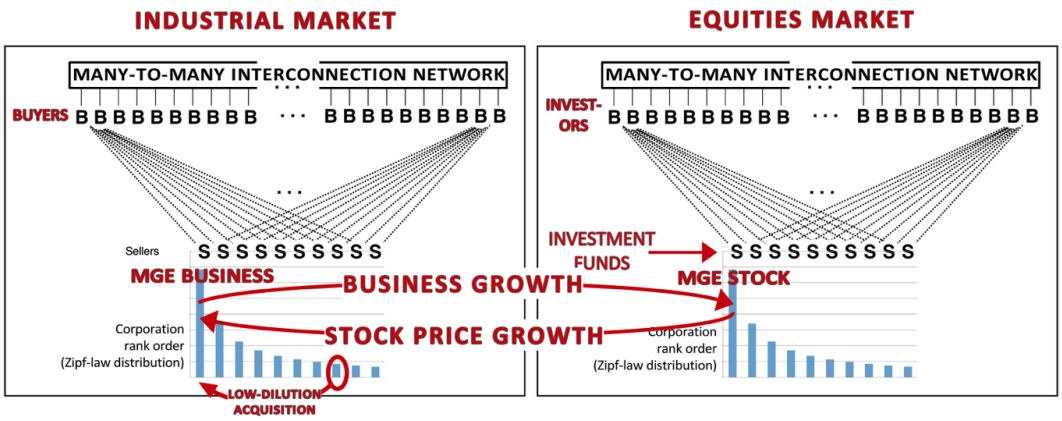
The Industrial and Equities Markets Are Coupled
and There Is a Positive Feedback Loop Driving Them

The **"Grow or Die" Imperative**



MGE has proxies in two coupled markets: the industrial market in which it sells its products, and the equities market in which it sells its stock.

There is a positive feedback loop between these two proxies.

MGE drives its growth in the industrial market through acquisition and delivers news of that growth to the equities market.

That growth news raises the price of MGE's stock, which is used by MGE to conduct its acquisitions.

MGE must continue this process in order to stay out of the Long Tail.

Now, when you scale this up to global magnitudes, it turns out that we all have been delivered a sustainability problem.

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Global Implications of the **Grow-or-Die Imperative**

- Deforestation
- Air Pollution
- Global Warming
- Water Pollution
- Natural Resource Depletion

- Corruption of fisheries, particularly by mercury and plastic
- Effects on human health due to industrial chemicals

https://eponline.com/articles/2020/02/24/five-biggest-environmental-issues-affecting-the-us.aspx

In this last slide I'll leave you with the suggestion that the dynamic I've been describing has something to do with the sustainability problems we've been noticing lately. I'll leave it to you to make those connections.

The link at the bottom of the slide lists the first five bullets.
To those I have added two more of my own.

So my parting question is:
Is there a connection, and if so, what is that connection, from the Grow-or-Die Imperative to these Global Implications?

Thank you for your attention.

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