

Sleeping Beauties in an Online Health Community

The Role of Network Position and Informational Support

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Sunbelt 2026 | June 26, 2026

From Citation Networks to Social Interaction Networks

“**Sleeping beauty**”, born in citation analysis:

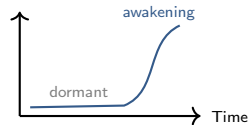
a paper lies dormant for years, then suddenly attracts a surge of citations.

Our question: does the same late-resurgence dynamic appear in a **social interaction network**, where **attention** = page views, not citations?

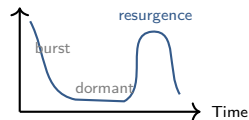
If so, *which* posts come back? We ask two things:

- **who** wrote it: the author's *position* in the network
- **what** it is: the *type of content* (support type)

In science (citations)



In an OHC (page views)



Same late resurgence, different baseline → we adapt the measure

One Outcome, Two Factors

Setting: Asthma UK national online forum, 2019–2024 (5,981 posts; 895K deduplicated page views, from ~5.1M raw)

Outcome (what we explain): each post's attention over time, and whether it shows late-stage resurgence (the Beauty Coefficient, next slide).

Two factors (what might explain which posts resurge):

Who: the author's network position

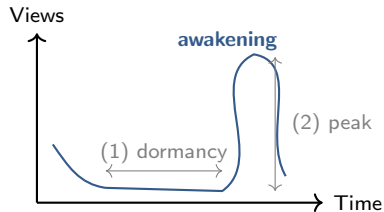
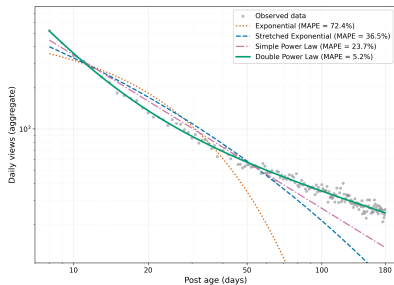
- Position in the reply network (who replies to whom)
- Inherited by each post at posting time

What: the post's content type

- Seeking / providing $\times$ informational / emotional
- LLM-classified, validated vs 210 posts (90%)

Method 1: Quantifying Late-Stage Resurgence

Step 1: fit an expected decay baseline (double power law) to normal attention decay. **Step 2:** score each post's departure from it as a sleeping beauty (B). B grows with two things: how **long** a post stays dormant, and how **sharp** its later awakening is.



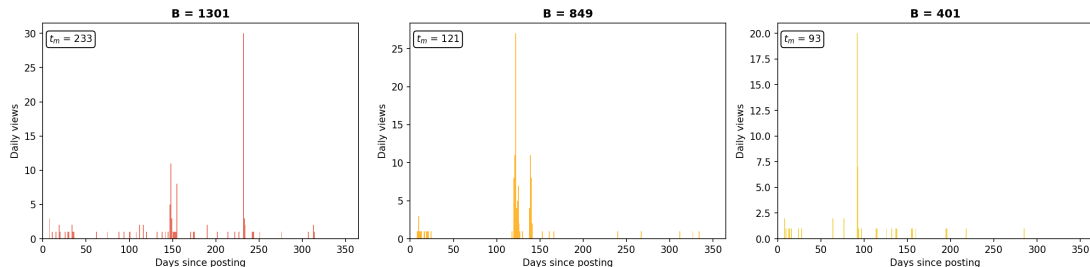
Longer dormancy *and* a sharper awakening both raise B .

Expected decay: double power law is the best fit (MAPE 5.2%), on log-log axes.

Finding A: Sleeping Beauties Exist Here

Late resurgence is real: nearly 1 in 10 posts shows it.

$B \geq 100$: 565 posts (9.7%) $B \geq 500$: 44 (0.8%) $B \geq 1,000$: 11 (0.19%)



Three highest- B example posts; daily views, Day 8–365 (first week excluded).

Reading: the community functions partly as a **knowledge archive**: later visitors keep consuming posts written months or years earlier.

Finding B: Network Position Is Associated with Resurgence

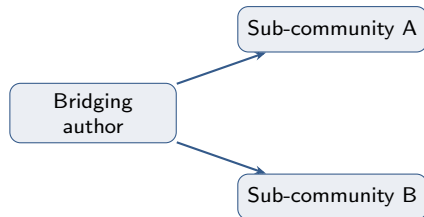
Logistic regression, controlling for post length and 90-day views:

Predictor (std)	OR	95% CI
Author betweenness	1.21	1.16–1.27***
Out-degree (robustness)	1.20	1.16–1.25***

$N = 5,794$ posts (175 top- B). *** $P < .001$

A 1-SD rise in author betweenness $\rightarrow$ **21% higher odds** of becoming a top- B post, *net of* how much early attention it got.

Brokerage mechanism:



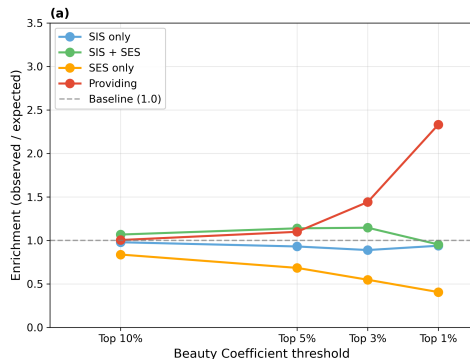
*Brokered content reaches **diverse** audiences $\rightarrow$ more entry points for later rediscovery.*

Finding C: What Content Lasts

Among the highest- B posts:

- **Providing** support over-represented: enrichment rises to **2.33 $\times$** at Top 1%
- Driven by **informational** providing (PIS): **2.72 $\times$**
- Purely **emotional** support (SES) under-represented: **0.41 $\times$**

Both who and what matter: network position (brokers) and informational provision shape lasting value; emotional support is time-sensitive.



Enrichment = observed / baseline proportion, across B percentile thresholds.

From High B to High Value

B **flags resurgence**. But is a resurgent post actually *useful*? We asked **three independent reviewers** to judge the top-20 threads, each blinded to the others.

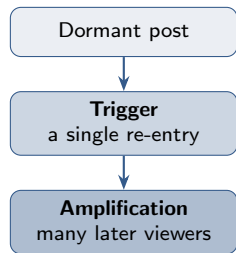
Reviewers, “still of interest today?”

- Patient moderator (lived experience): **19/20**
- PPI contributor (patient): **17/20**
- Nurse moderator (clinical): **16/20**

14/20 judged relevant by all three reviewers.

Editorial signal: some still-relevant posts also carry *outdated* advice (the two moderators flagged the same four cases). B pinpoints which posts to **review and update**: not left to sink (value lost), not resurfaced unchecked (stale advice spread).

How a sleeping beauty wakes
(the logic behind a high B):



Takeaways: What It Means, and Where Next

What travels across network types

- Sleeping-beauty dynamics extend from **citation networks** to a **social interaction network**
- **Structural brokerage** and **informational content** jointly shape long-term attention
- Attention here is *latent then reactivated*, not a single decay curve

What it means, and where next

- Resurgence needs a **trigger**: without one, valuable posts stay **buried**, and information the community already produced goes unused
- Our next focus: **detect, surface, monitor** high-value posts proactively, not by chance (a route we are exploring with the forum's moderators)
- Toward **clinical impact**: the right post reaching the patient who needs it, when they need it

Thank You

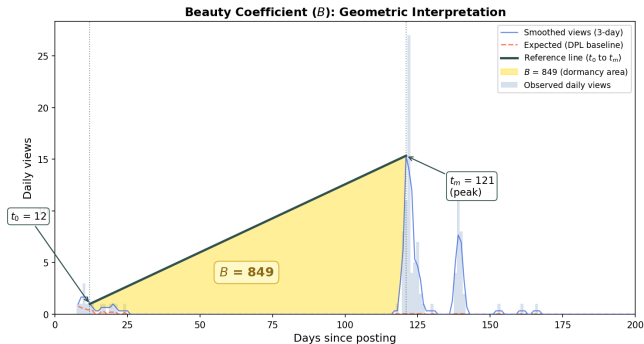
Questions & discussion welcome

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Backup: How the Beauty Coefficient Is Computed

For each post:

- Sleep onset t_0 : where observed views fall to the expected-decay floor
- Awakening peak t_m : day of maximum smoothed views after t_0
- Reference line from $(t_0, c(t_0))$ to $(t_m, c(t_m))$
- B accumulates the **dormancy area** under this line



Longer dormancy and sharper awakenings both enlarge B .

Backup: Trigger & Amplification Pathways

From case-level review of the top-20 threads (URL-referral logs and thread histories):

Trigger (what re-woke the post)

- Author linkback
- Health-information search
- Returning participant
- Topical navigation
- Browsing encounter

(+ external event, unknown). Identifiable in 16/20 cases.

Amplification (how later viewers arrived)

- Community feed browsing (8/20)
- Post-to-post navigation (7/20)
- External arrival (5/20)

6/20 resurged through views alone, with no new comments.