Diary of a research paper

What happens to your paper after you submit it?

And why **how you write it** matters

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LETTER

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Reducing the contact time of a bouncing drop

James C. Bird[1]*, Rajeev Dhiman[2]*†, Hyuk-Min Kwon[2]* & Kripa K. Varanasi[2]

Surfaces designed so that drops do not adhere to them but instead bounce off have received substantial attention because of their ability to stay dry[1–4], self-clean[5–7] and resist icing[8–10]. A drop striking a non-wetting surface of this type will spread out to a maximum diameter[11–14] and then recoil to such an extent that it completely rebounds and leaves the solid material[15–18]. The amount of time that the drop is in contact with the solid—the 'contact time'—depends on the inertia and capillarity of the drop[1], internal dissipation[19] and surface–liquid interactions[20–22]. And because contact time controls

is a laser-ablated silicon wafer coated with fluorosilane, v
hydrophobicity and microscopic texture ensuring its sup
bic character (Fig. 1a inset). On this surface, the impacting
from the side (Fig. 1a) spreads to a nearly uniform film,
then lifts off within 12.4 ms. Simultaneously acquired top
show nearly axisymmetric dynamics throughout the pro
consistent with past experiments[15–18]. When the film is
and uniformly thick, the edge retracts inward at a con
and the centre remains stationary[25,26] (Fig. 1c). This retra

A small step in keeping droplets from sticking to surfaces.
WHAT!!!?? WHO CARES!!

Why is THIS in *Nature*?

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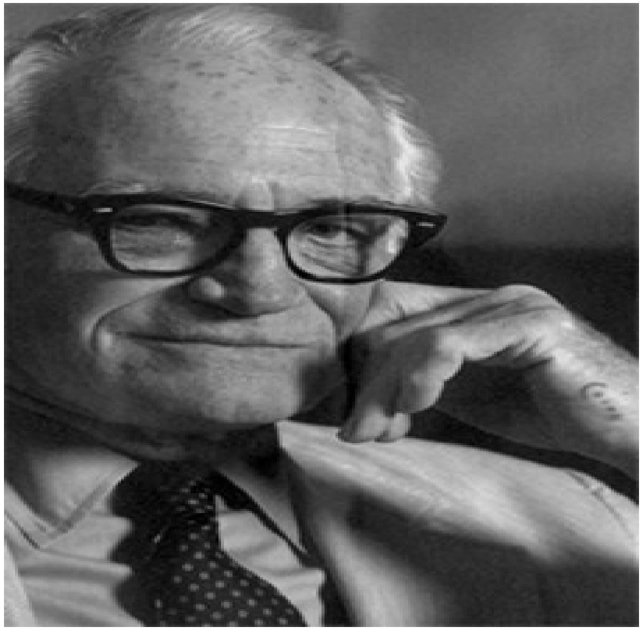
The Nature editor?



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The Nature editor

Howy Jacobs
EMBO Reports

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Stage 1

The paper arrives in someone's Inbox, goes into a folder of 20

A stressed editor ...

... reads it and TRIES TO decide...

Should I send this to referees?

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Key questions

Why is this being done? What's the issue?

What is known, and unknown?

What advance does this paper report?

How significant is this?

Why have they sent this to ME?

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Reducing the contact time of a bouncing drop

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A liquid drop striking a non-wetting surface will spread out to a maximum diameter and then recoil to such an extent that it completely rebounds and leaves the solid material. The amount of time that the drop is in contact with the solid—the ‘contact time’—depends on the inertia and capillarity of the drop, internal dissipation and surface–liquid interactions. … Here we demonstrate that it is possible to reduce the contact time below this theoretical limit …

The Editor's Problem:

Does this paper (if it is technically sound) report a significant advance of the kind that would interest a wide range of scientists across many fields? Who will care and why?

Editors at other journals have similar questions, for their own journal's audience.

Exercise

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Rank these papers in order of their importance.

Amygdalar and hippocampal substrates of anxious temperament differ in their heritability

Little is known about the factors that predispose vulnerable children to develop anxious temperament (AT) and the brain systems that underlie its expression. To characterize the neural circuitry associated with AT and the extent to which the function of this circuit is heritable, we studied a large sample of rhesus monkeys phenotyped for AT. Using 238 young monkeys from a multigenerational single-family pedigree, we simultaneously assessed brain metabolic activity and AT while monkeys were exposed to the relevant ethological condition that elicits the phenotype. High-resolution ^{18}F-labelled deoxyglucose positron-emission tomography (FDG–PET) was selected as the imaging modality because it provides semi-quantitative indices of absolute glucose metabolic rate, allows for simultaneous measurement of behaviour and brain activity, and has a time course suited for assessing temperament-associated sustained brain responses. Here we demonstrate that the central nucleus region of the amygdala and the anterior hippocampus are key components of the neural circuit predictive of AT. We also show significant heritability of the AT phenotype by using quantitative genetic analysis. Additionally, using voxelwise analyses, we reveal significant heritability of metabolic activity in AT-associated hippocampal regions. However, activity in the amygdala region predictive of AT is not significantly heritable. Furthermore, the heritabilities of the hippocampal and amygdala regions significantly differ from each other.

Escape of about five per cent of Lyman-α photons from high-redshift star-forming galaxies

The Lyman-α emission line is the primary observational signature of star-forming galaxies at the highest redshifts[1], and has enabled the compilation of large samples of galaxies with which to study cosmic evolution[2, 3, 4, 5]. The resonant nature of the line, however, means that Lyα photons scatter in the neutral interstellar medium of their host galaxies, and their sensitivity to absorption by interstellar dust may therefore be greatly enhanced. This implies that the Lyα luminosity may be significantly reduced, or even completely suppressed. Hitherto, no unbiased empirical test of the escaping fraction (f esc) of Lyα photons has been performed at high redshifts. Here we report that the average f esc from star-forming galaxies at redshift $z = 2.2$ is just 5 per cent by performing a blind narrowband survey in Lyα and Hα. This implies that numerous conclusions based on Lyα-selected samples will require upwards revision by an order of magnitude and we provide a benchmark for this revision. We demonstrate that almost 90 per cent of star-forming galaxies emit insufficient Lyα to be detected by standard selection criteria[2, 3, 4, 5]. Both samples show an anti-correlation of f esc with dust content, and we show that Lyα- and Hα-selection recovers populations that differ substantially in dust content and f esc.

Evidence for stone-tool-assisted consumption of animal tissues before 3.39 million years ago at Dikika, Ethiopia

Here we report stone-tool-inflicted marks on bones found during recent survey work in Dikika, Ethiopia, a research area close to Gona and Bouri. On the basis of low-power microscopic and environmental scanning electron microscope observations, these bones show unambiguous stone-tool cut marks for flesh removal and percussion marks for marrow access. The bones derive from the Sidi Hakoma Member of the Hadar Formation. Established ^{40}Ar–^{39}Ar dates on the tuffs that bracket this member constrain the finds to between 3.42 and 3.24 Myr ago, and stratigraphic scaling between these units and other geological evidence indicate that they are older than 3.39 Myr ago.

Paper 1: full abstract

Anxious temperament (AT) in human and non-human primates is a trait-like phenotype evident early in life that is characterized by increased behavioural and physiological reactivity to mildly threatening stimuli[1, 2, 3, 4]. Studies in children demonstrate that AT is an important risk factor for the later development of anxiety disorders, depression and comorbid substance abuse[5]. Despite its importance as an early predictor of psychopathology, little is known about the factors that predispose vulnerable children to develop anxious temperament (AT) and the brain systems that underlie its expression. To characterize the neural circuitry associated with AT and the extent to which the function of this circuit is heritable, we studied a large sample of rhesus monkeys phenotyped for AT. Using 238 young monkeys from a multigenerational single-family pedigree, we simultaneously assessed brain metabolic activity and AT while monkeys were exposed to the relevant ethological condition that elicits the phenotype. High-resolution ^{18}F-labelled deoxyglucose positron-emission tomography (FDG–PET) was selected as the imaging modality because it provides semi-quantitative indices of absolute glucose metabolic rate, allows for simultaneous measurement of behaviour and brain activity, and has a time course suited for assessing temperament-associated sustained brain responses. Here we demonstrate that the central nucleus region of the amygdala and the anterior hippocampus are key components of the neural circuit predictive of AT. We also show significant heritability of the AT phenotype by using quantitative genetic analysis. Additionally, using voxelwise analyses, we reveal significant heritability of metabolic activity in AT-associated hippocampal regions. However, activity in the amygdala region predictive of AT is not significantly heritable. Furthermore, the heritabilities of the hippocampal and amygdala regions significantly differ from each other. **Even though these structures are closely linked, the results suggest differential influences of genes and environment on how these brain regions mediate AT and the ongoing risk of developing anxiety and depression.**

Paper 3: full abstract

The oldest direct evidence of stone tool manufacture comes from Gona (Ethiopia) and dates to between 2.6 and 2.5 million years (Myr) ago[1]. At the nearby Bouri site several cut-marked bones also show stone tool use approximately 2.5 Myr ago[2]. Here we report stone-tool-inflicted marks on bones found during recent survey work in Dikika, Ethiopia, a research area close to Gona and Bouri. On the basis of low-power microscopic and environmental scanning electron microscope observations, these bones show unambiguous stone-tool cut marks for flesh removal and percussion marks for marrow access. The bones derive from the Sidi Hakoma Member of the Hadar Formation. Established ^{40}Ar–^{39}Ar dates on the tuffs that bracket this member constrain the finds to between 3.42 and 3.24 Myr ago, and stratigraphic scaling between these units and other geological evidence indicate that they are older than 3.39 Myr ago. **Our discovery extends by approximately 800,000 years the antiquity of stone tools and of stone-tool-assisted consumption of ungulates by hominins; furthermore, this behaviour can now be attributed to *Australopithecus afarensis*.**

Stage 2

The editor makes a decision:

- Reject the paper as unsuitable for Nature (7 times out of 10)

- Or -- send the paper to referees

Well-written papers are more successful

This is true for all journals!!!

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Do editors make mistakes?

OF COURSE!!!

And bad writing makes it more likely

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15. Nicholson, P. D. *et al. Geophys. Res. Lett.* **22,** 1621–1624 (1995).
16. Noll, K. S. *et al. Science* **267,** 1307–1313 (1995).
17. Hasegawa, H., Takeuchi, S. & Watanabe, J. in *European SL-9/Jupiter Workshop* (eds West, R. & Böhnhardt, H.) 279–285 (ESO, Garching, 1995).

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Scaling behaviour in the growth of companies

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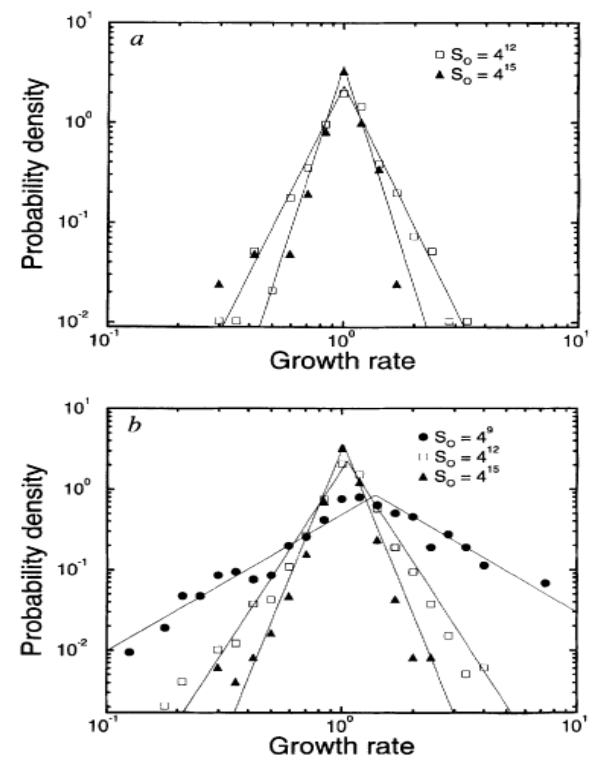
A SUCCESSFUL theory of corporate growth should include both the external and internal factors that affect the growth of a company[1–18]. Whereas traditional models emphasize production-related influences such as investment in physical capital and in research and development[18], recent models[10–20] recognize the equal importance of organizational infrastructure. Unfortunately, no exhaustive empirical account of the growth of companies exists by which these models can be tested. Here we present a broad, phenomenological picture of the dependence of growth on company size, derived from data for all publicly traded US manufacturing companies between 1975 and 1991. We find that, for firms with similar sales, the distribution of annual (logarithmic) growth rates has an exponential form; the spread in the distribution of rates decreases with increasing sales as a power law over seven orders of magnitude. A model wherein the probability of a company's growth depends on its past as well as present sales accounts for the former observation. As the latter observation applies to companies that manufacture products of

mission.) We define a firm's annual growth rate as $R \equiv S_1/S_0$, where S_0 and S_1 are its sales in two consecutive years.

It is customary to study company growth on logarithmic scales, so we define $r \equiv \ln(S_1/S_0)$ and $s_0 \equiv \ln S_0$ and calculate the conditional distribution $p(r \mid s_0)$ of growth rates r with a given initial sales value s_0.

The distribution $p(r \mid s_0)$ of the growth rates from 1990 to 1991 is shown in Fig. 1*a* for two different values of initial sales. Remarkably, both curves display a simple 'tent-shaped' form. The distribution is not gaussian—as expected from the Gibrat model—but rather is exponential,

$$p(r \mid s_0) = \frac{1}{\sqrt{2}\sigma(s_0)} \exp\left(-\frac{\sqrt{2}|r - \bar{r}(s_0)|}{\sigma(s_0)}\right) \qquad (1)$$



Lesson:

Editors make mistakes because of ignorance (as I demonstrated more than once).

But also because scientists hide good science with bad writing

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Stage 3

Referees study the paper and try to make sense of it:

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Stage 3

Referees study the paper and try to make sense of it:

They generally aim to be fair, but distrust anything they find confusing. Referees punish poor expression.

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Remember:

- You know more than the editor (at *Nature*, certainly)

- You benefit by helping them to see what's important; imagine yourself in their position

- These people are overwhelmed with papers

  (I still have nightmares!!)

WRITING CLEARLY ALWAYS HELPS

Our model of a journal with well written papers:

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