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The features marked with a star (*) are based entirely on material taken straight from standard research (and other Official and Therefore Always Correct) literature. Many of the other articles are genuine, too, but we don't know which ones.

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There's always new improbable — it's not what you expect! — stuff on the **Improbable Research blog** at IMPROBABLE.COM

On the Front Cover

Photo of a frog that was thrust into the air during the launch of NASA's LADEE spacecraft in 2013. (See "Animals (and Moon Bits) Aloft", page 22)



On the Back Cover

A small dog attempting and failing to disprove Newtonian laws of motion.

Photo: A.S. Kaswell



Some Coming Events

The Covid-19 pandemic has introduced excitingly boundless uncertainty as to whether, when, and where public activities will happen in the near future.

(See IMPROBABLE.COM for details of these and other events.)

August 12th, 2024

— Worldcon
Glasgow, Scotland

September 12th, 2024

— The 34th First Annual Ig Nobel Prize Ceremony (and webcast).
MIT, Cambridge,
Massachusetts, USA

September 14th, 2024

— Ig Nobel Face-to-Face,
MIT Museum, Cambridge,
Massachusetts, USA

February 2025

— AAAS Annual Meeting,
Boston, Massachusetts, USA

Spring 2025

— Ig Nobel EuroTour

May 23rd-26th, 2025

— Balticon,
Baltimore, Maryland, USA



IG[®] AND BEYOND: MOON RUNNING AND SKIPPING, DOG MOUTH-LICKING [CONT'D]

MINETTI: Skipping on the Moon

"Skipping vs. Running as the Bipedal Gait of Choice in Hypogravity," Gaspare Pavei, Carlo M. Biancardi, and Alberto E. Minetti. *Journal of Applied Physiology*, vol. 119, no. 1, 2015, pp. 93-100. The authors report:

We set up a 17-m-tall cavaedium (skylight shaft) with a bungee rubber body-suspension system and a treadmill to investigate the metabolic cost and the biomechanics of low-gravity (Mars, Moon) locomotion. Although skipping is never more metabolically economical than running, the difference becomes marginal at lunar gravities, with both bouncing gaits approaching values of walking on Earth (cost $\approx 2 \text{ J}\cdot\text{kg}^{-1}\cdot\text{m}^{-1}$). Nonmetabolic factors may thus be allowed to dominate the choice of skipping on the Moon....

The first investigation on this gait pointed out that the ratio between contact phase and stride time, lower on Earth than in running at the same speed, was associated with a higher vertical ground reaction force (F_z) (hence higher friction with the slippery terrain), and this could partly explain the observation of Apollo astronauts adopting skipping while searching for the most appropriate lunar gait (see the movie in Supplement S1).

Our measurements show that unilateral skipping, an expensive gallop-derived bipedal gait on Earth used by lemurs and (perhaps vestigially) by humans, has a central role in low-gravity locomotion. Other than involving an economy very close to running, skipping could even result in being the gait of choice due to its peculiar biomechanics, which minimize mechanical work and enhance grip control on a slippery ground.



*Ig Nobel Prize winner Alberto Minetti.
Drawing by Nan Swift.*

Detail from the study "Skipping vs. Running as the Bipedal Gait of Choice in Hypogravity."

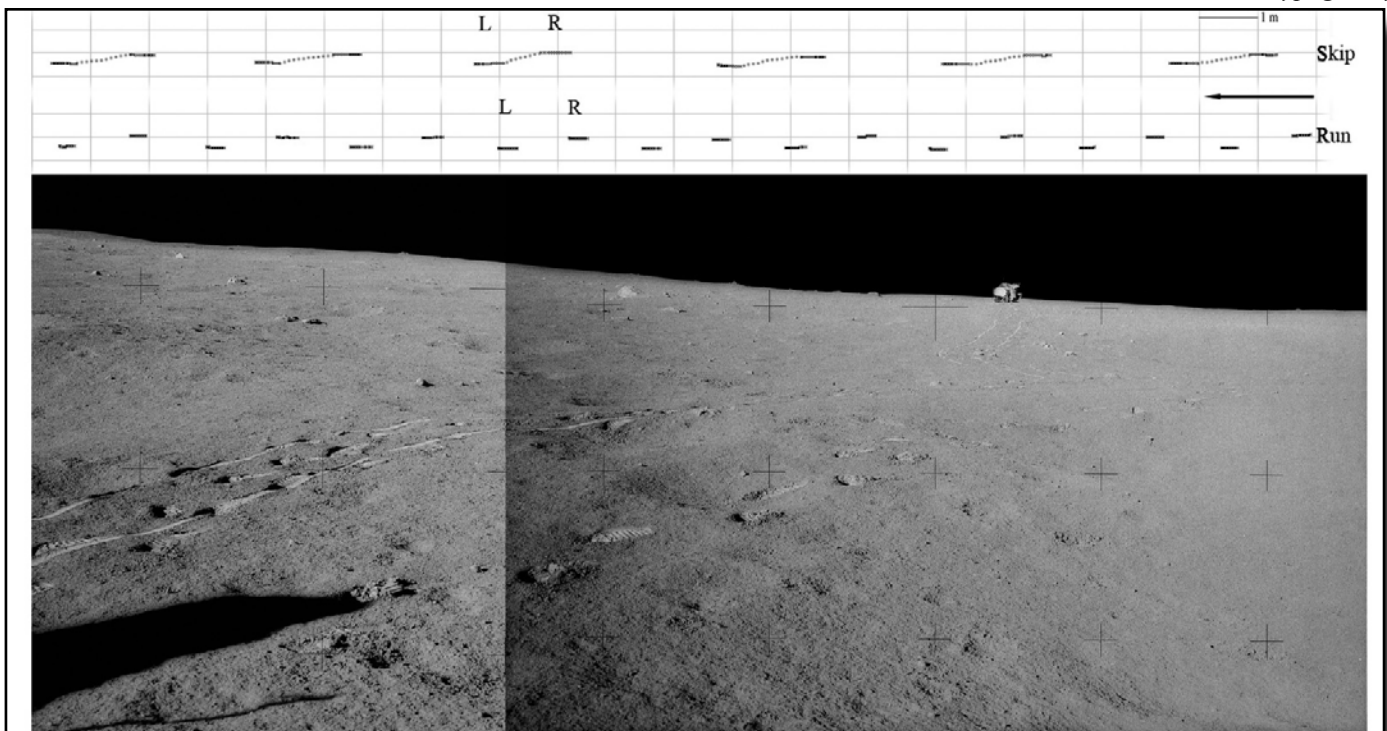


Fig. 7. Lunar boot prints. *Top*: foot casts of running (*bottom* trace) and unilateral left skipping (*top* trace). Skipping center of pressure is shown as a dotted curve (in running its path is confined within a single cast). *Bottom*: skipping boot prints of Alan Shepard during Apollo 14 Mission (<http://www.hq.nasa.gov/office/pao/History/alsj/a14/a14mini9407-8.jpg>). Body is moving toward *bottom-left*, showing asymmetry of the trailing and leading (the deeper) cast. The trail starts (from the *right*) with a right skip (left-right-flight), then, after 3–4 strides, switches to left skip (right-left-flight), as racehorses periodically do with right and left gallop on the straight corridors of the track (4). [Photos courtesy of NASA/JPL-Caltech].

IG® AND BEYOND: MOON RUNNING AND SKIPPING, DOG MOUTH-LICKING [CONT'D]

WILKINSON: Mouth-Licking by Dogs as a Response to Emotional Stimuli

"Mouth-Licking by Dogs as a Response to Emotional Stimuli," Natalia Albuquerque, Kun Guo, Anna Wilkinson, Briseida Resende, and Daniel S. Mills, *Behavioural Processes*, vol. 146, 2018, pp. 42-45.

The 2011 Ig Nobel Physiology Prize was awarded to Anna Wilkinson, Natalie Sebanz, Isabella Mandl, and Ludwig Huber, for their study "No Evidence of Contagious Yawning in the Red-Footed Tortoise," published in *Current Zoology*, vol. 57, no. 4, 2011, pp. 477-84.

In the mouth-licking paper, Wilkinson and co-authors report:

Using a cross-modal preferential looking paradigm, we presented dogs with pairs of facial expressions (positive and negative) combined with an emotionally charged vocalisation (positive or negative) or a control sound (neutral) and coded their mouth-licking behaviour. We found an effect of the valence of the face image dogs were seeing on the onset of the mouth-licking, with higher frequencies of this behaviour in response to the negative faces compared to images with positive valence. However, neither the sound being played nor the interaction between image valence and sound affected the behaviour. We also found an effect of species with mouth-licking occurring more often towards human stimuli.

Mouth-licking by dogs as a response to emotional stimuli

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ABSTRACT

Dogs are able to perceptually discriminate emotional displays of conspecifics and heterospecifics and possess the cognitive prototypes for emotional categorisation, however, it remains unclear whether dogs can respond appropriately to this information. One way to assess associations between specific behaviours and the perception of emotionally competent stimuli is to look at other reliable measures that are related to cognitive and physiological processing. Using a cross-modal preferential looking paradigm (Albuquerque et al., 2016), we presented dogs with pairs of facial expressions (positive and negative) combined with an emotionally charged vocalisation (positive or negative) or a control sound (neutral) and coded their mouth-licking behaviour. We found an effect of the valence of the face image dogs were seeing on the onset of the mouth-licking, with higher frequencies of



Ig Nobel Prize winner Anna Wilkinson. Drawing by Nan Swift.